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Hydro Services 16N-8180
Birmingham, AL 35203
205 257 2251 tel
arsegars@southernco.com

August 31, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Final 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.

Consistent with FERC's April 12, 2019 SPD, Alabama Power filed the Draft Operating Curve Change Feasibility Analysis Phase 1 Report (Draft Report) on April 10, 2020. Stakeholders were to submit their comments to Alabama Power on the Draft Report by June 11, 2020. Comments on the Draft Report were submitted by FERC staff and the Alabama Department of Conservation and Natural Resources. In addition, two stakeholders submitted comments regarding new studies on Project operations to compare pre-dam conditions to post-dam conditions, as well as incorporating "predictive data from the studies of climate change". These comments are included in the updated consultation record (May 2019 through July 2020) for this study (Attachment 1) and responses to these comments are provided in Attachment 2. The final Operating Curve Change Feasibility Analysis Phase 1 Report is contained in Attachment 3.[2]

[1] Accession No. 20190412-3000

[2] Please note that the look and format of Harris relicensing study reports has changed since submittal of the Draft Report; however, the content of the report has not changed except for the edits made based on stakeholder comments.

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 – Operating Curve Change Feasibility Analysis Consultation Record (May 2019-August 2020)
Attachment 2 – Comments and Responses on the Draft Operating Curve Change Feasibility Analysis Phase 1 Report
Attachment 3 – Final Operating Curve Change Feasibility Analysis Phase 1 Report

cc: Harris Stakeholder List

Attachment 1

Operating Curve Change Feasibility Analysis Consultation Record (May 2019-August 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 <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>

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	rbmorris333@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	~~Kelter~~ lakebutch@KW.com
17	Taconya Goar	taconya.goar@dcnr.alabama.gov
18	Sylvia French	sandnfrench@gmail.com
19	TOM GARLAND	
20	Jim Crew	jfcrew@southernco.com
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	Carl 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

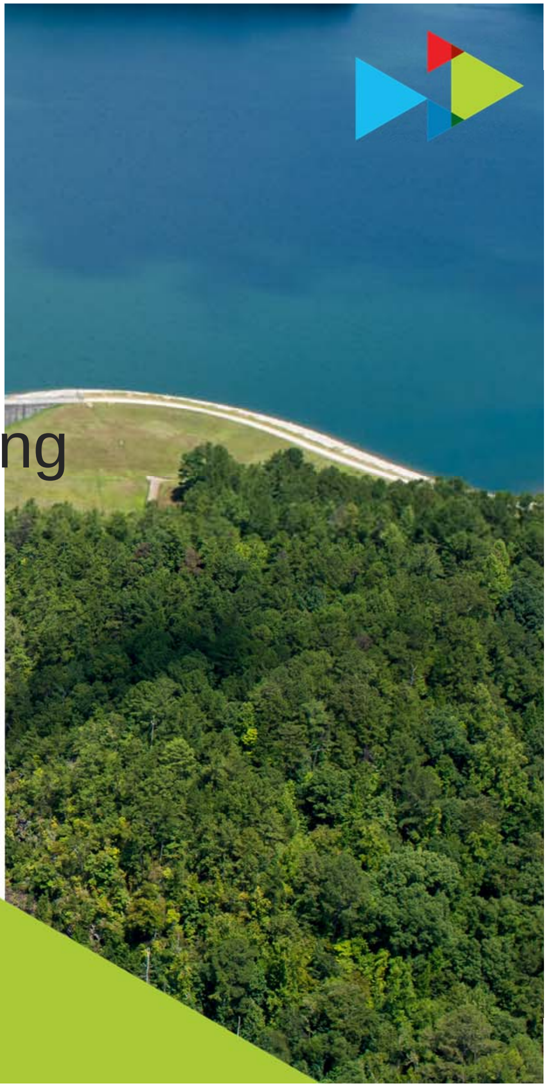
Alabama Power

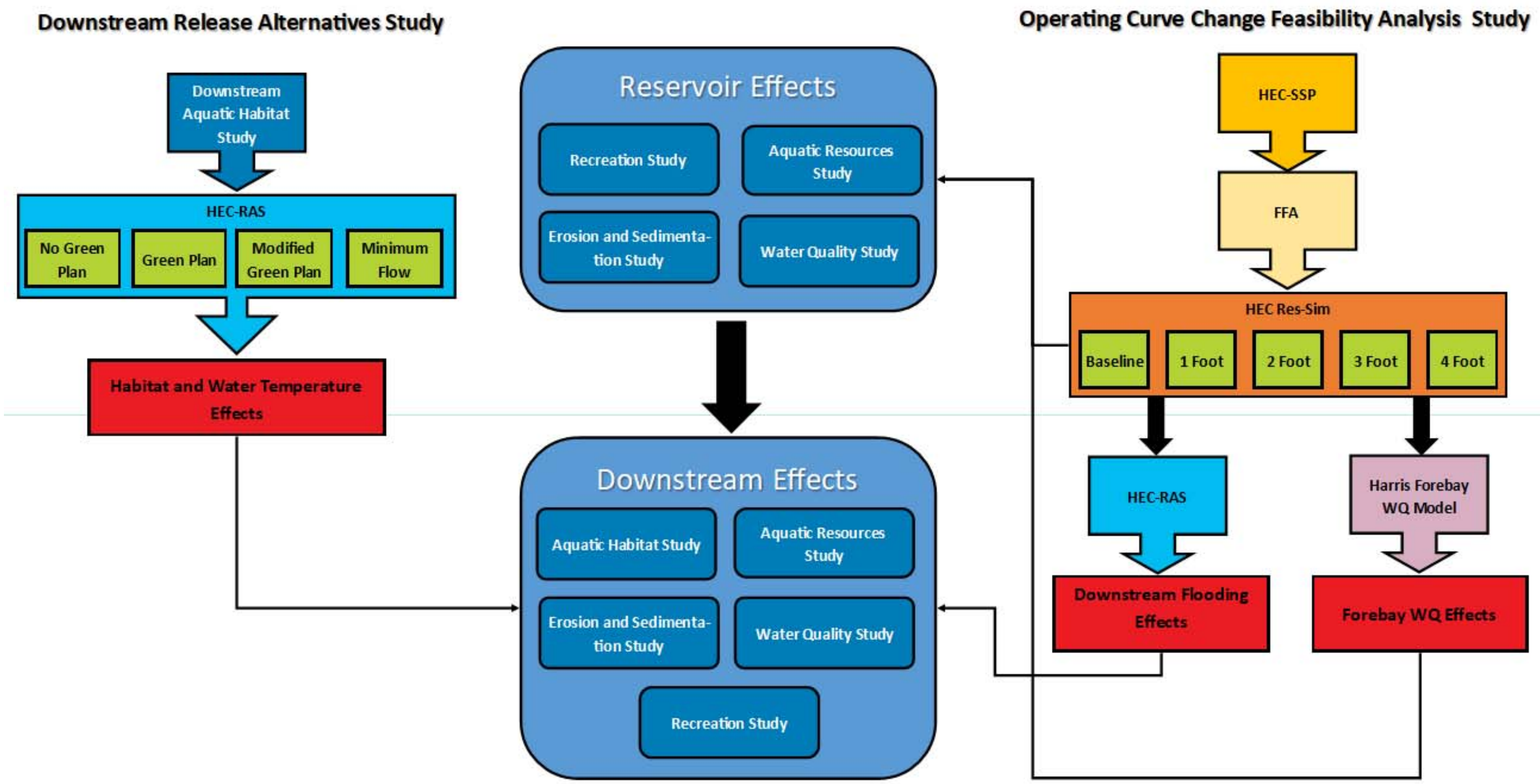
R.L. Harris Project Relicensing

Project Operations – HAT 1

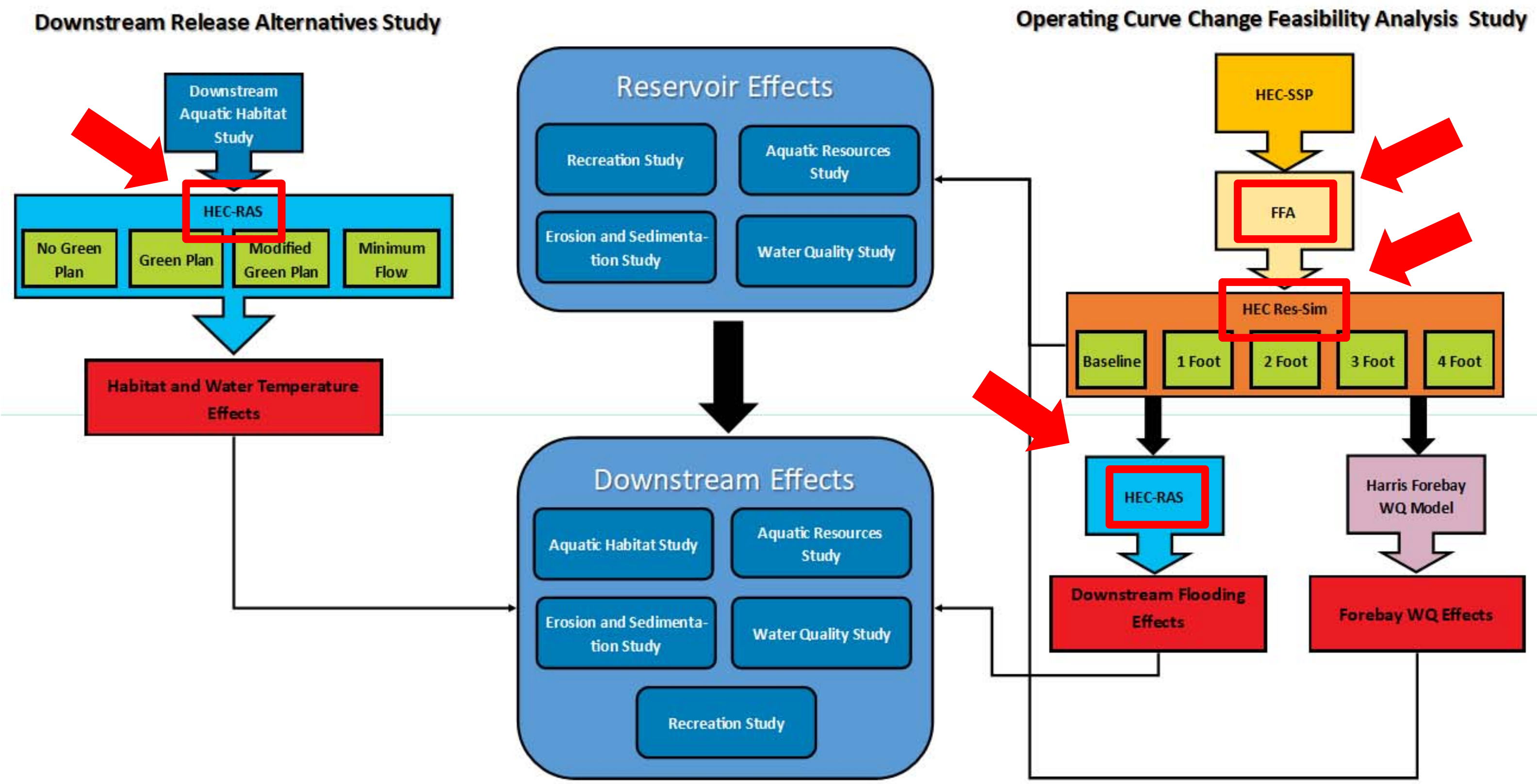
Model Inputs and Methodologies for Operating Curve Change Analysis and Downstream Release Alternatives

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
Downstream Aquatic Habitat Study
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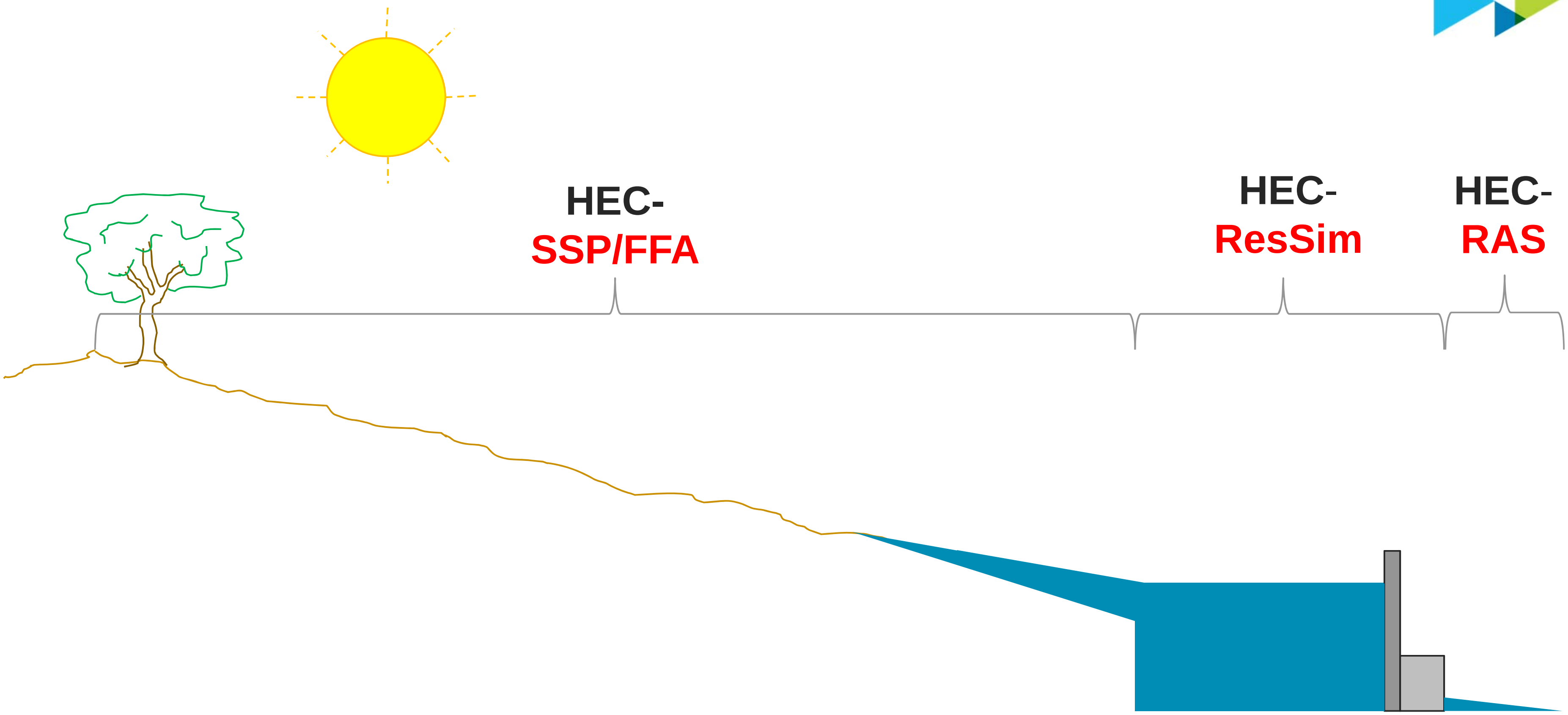
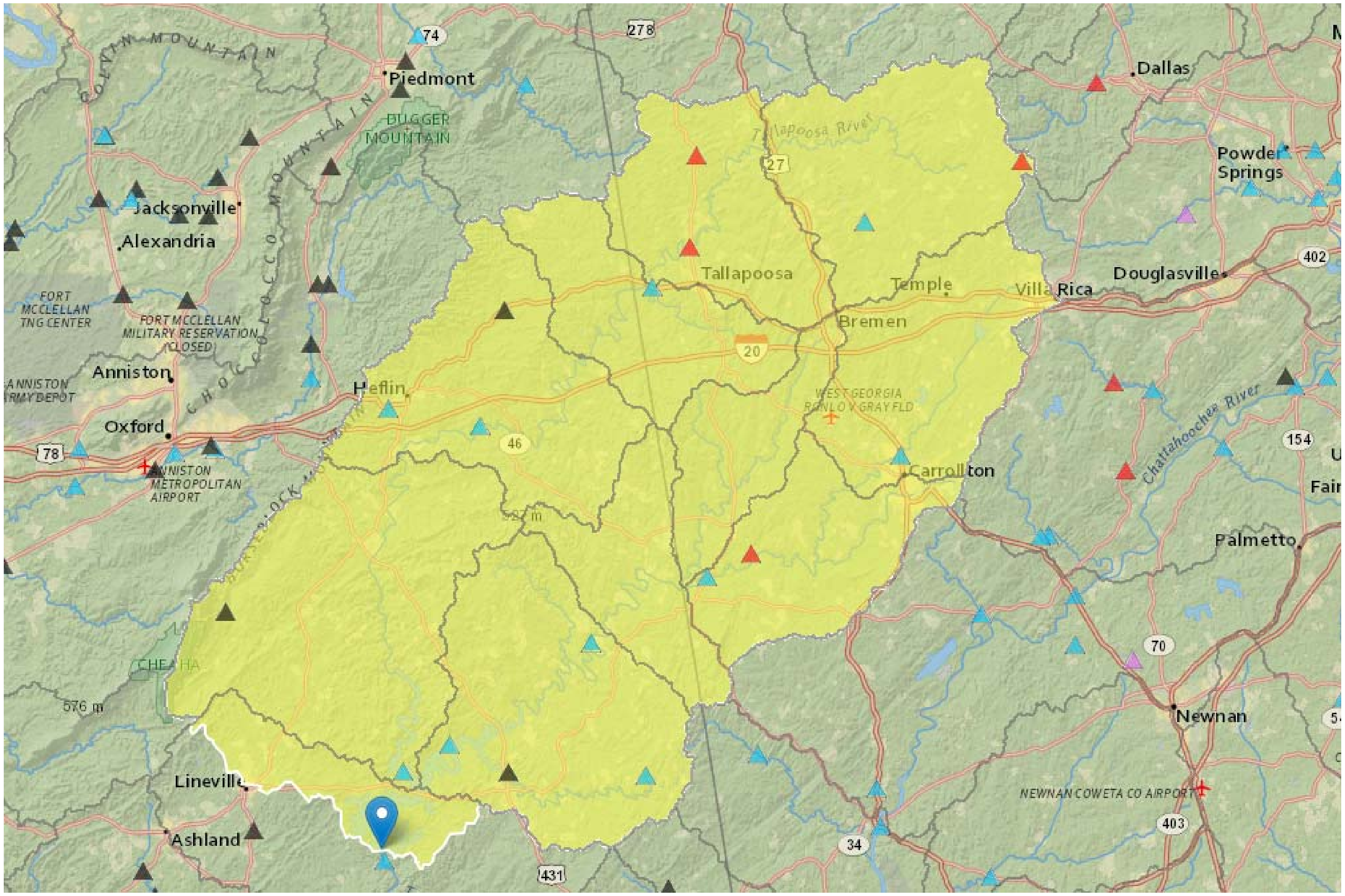
HEC Res-Sim
Baseline
1 Foot
2 Foot
3 Foot
4 Foot
HEC-RAS
Harris Forebay WQ Model
Downstream Flooding Effects
Forebay WQ Effects

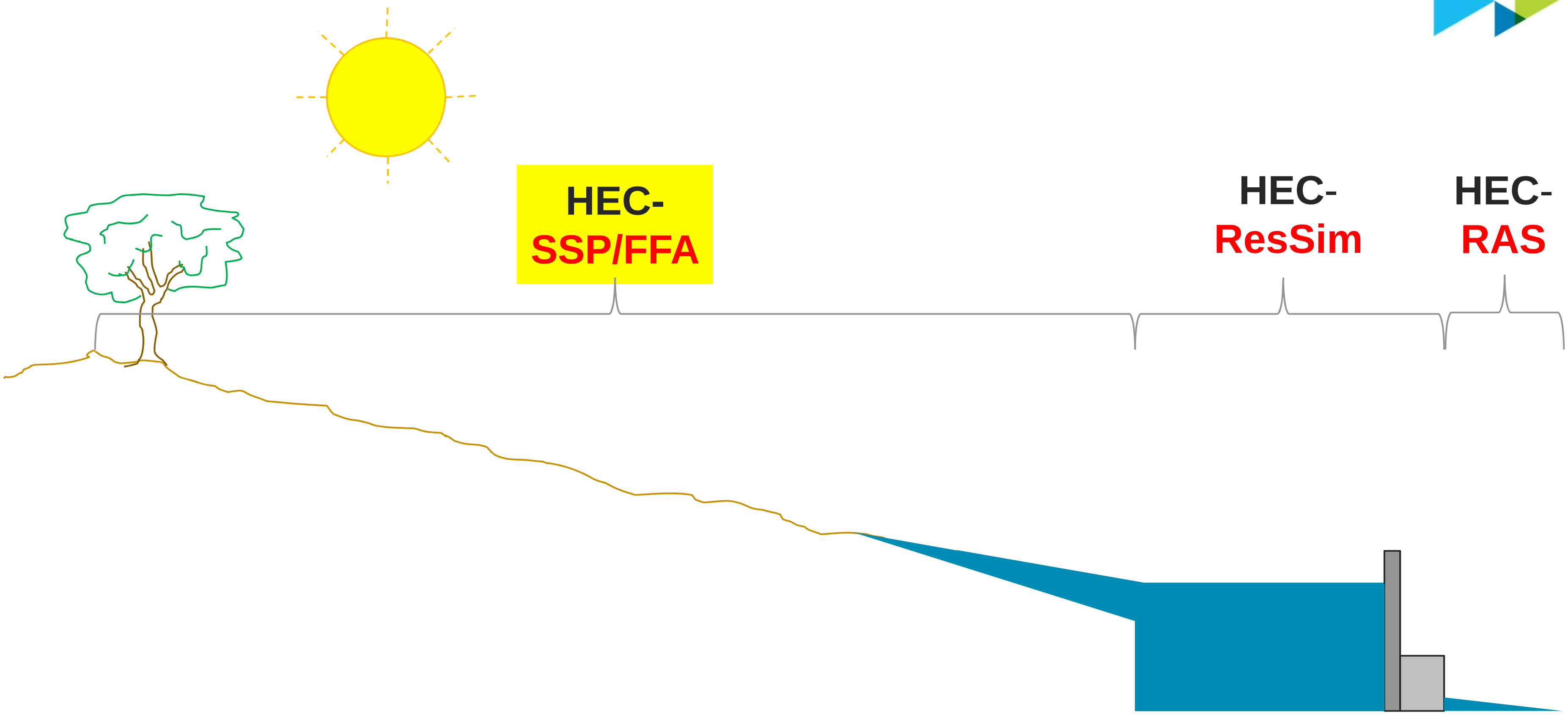
Where the models are used…



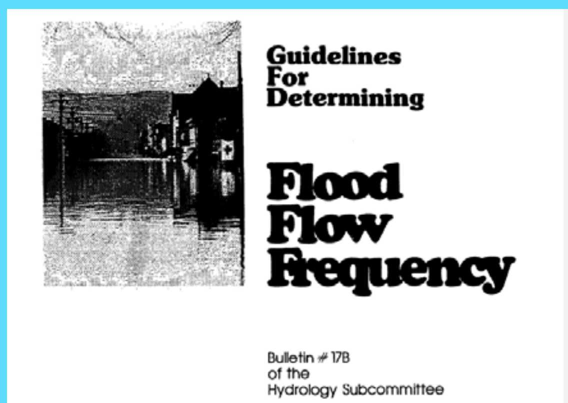
Harris Watershed Boundary



Where the models are used…



HEC-SSP (Statistical Software Package)


Guidelines For Determining

Flood Flow Frequency

Bulletin # 17B
of the
Hydrology Subcommittee

FFA

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?

1	2	3
4	5	6

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

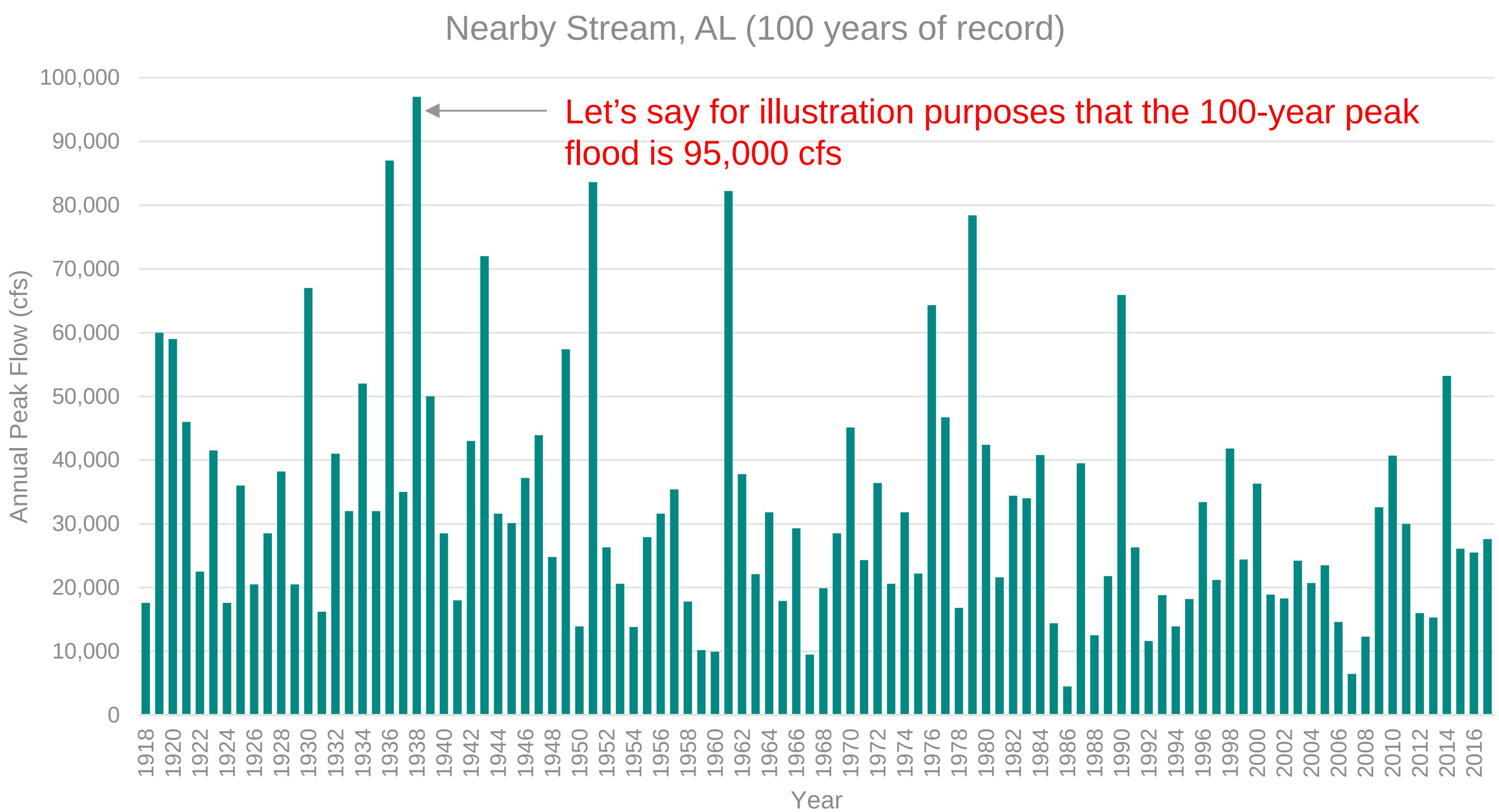
How many would pick a different card because you think that 1, 2, 3, 5, and 6 will have the $ before it can come back around to the 4-Card?

Very Common Misconception

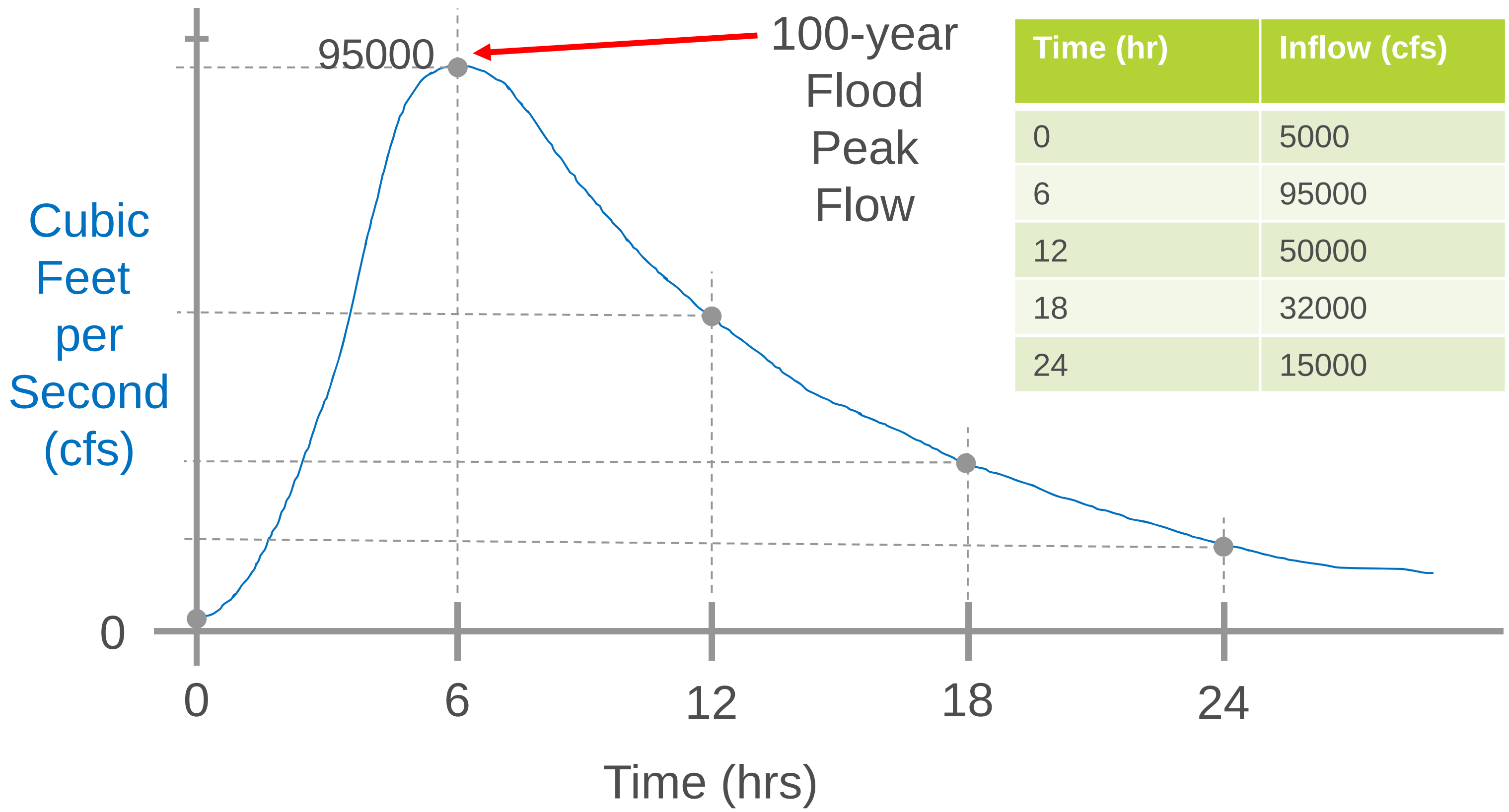
"If the 100-year flood just occurred, then we don't have to worry about another flood like that for the next 99 years."

WRONG!!!

(For Illustration Purposes Only)

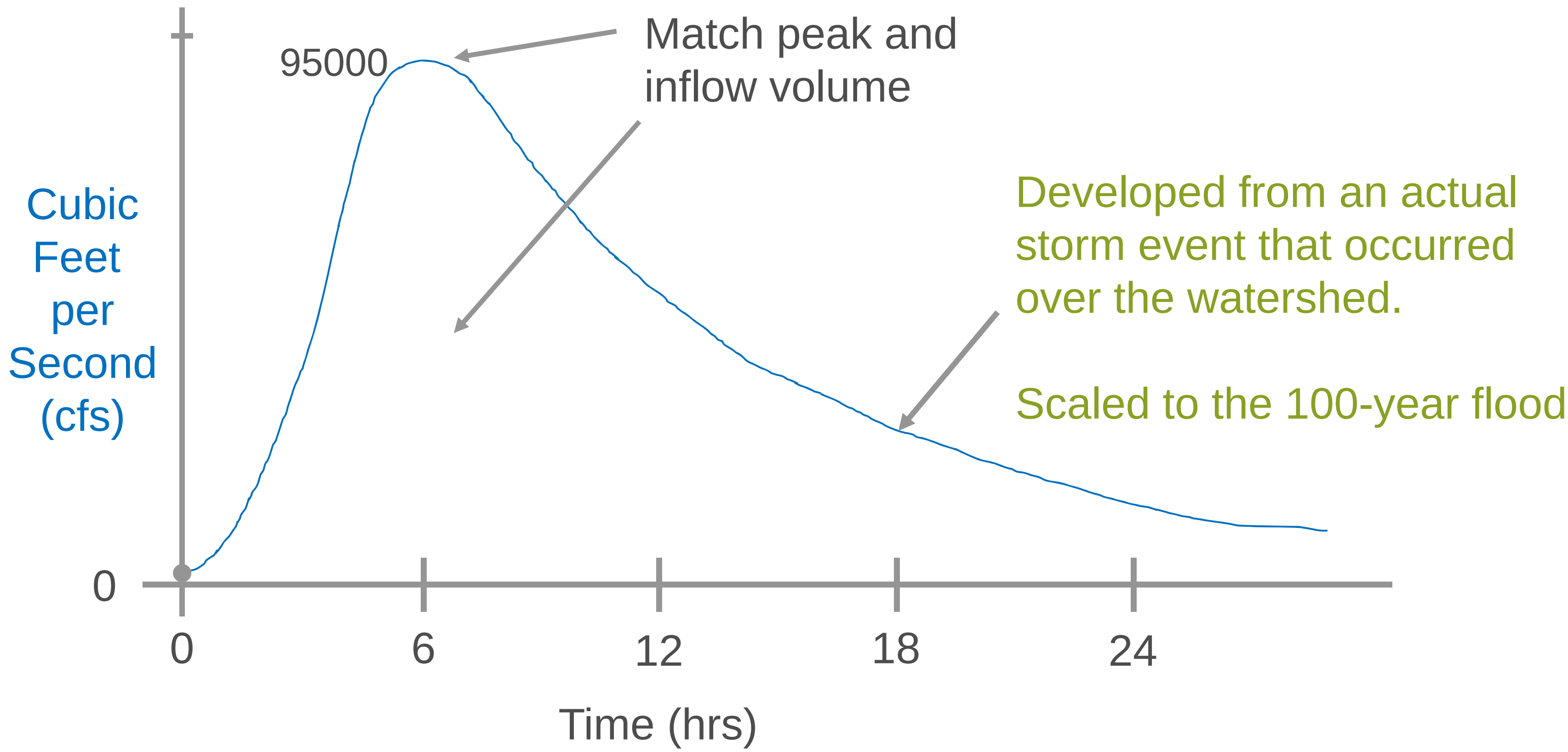


Inflow Hydrograph for Nearby Stream, AL
(For Illustration Purposes Only)

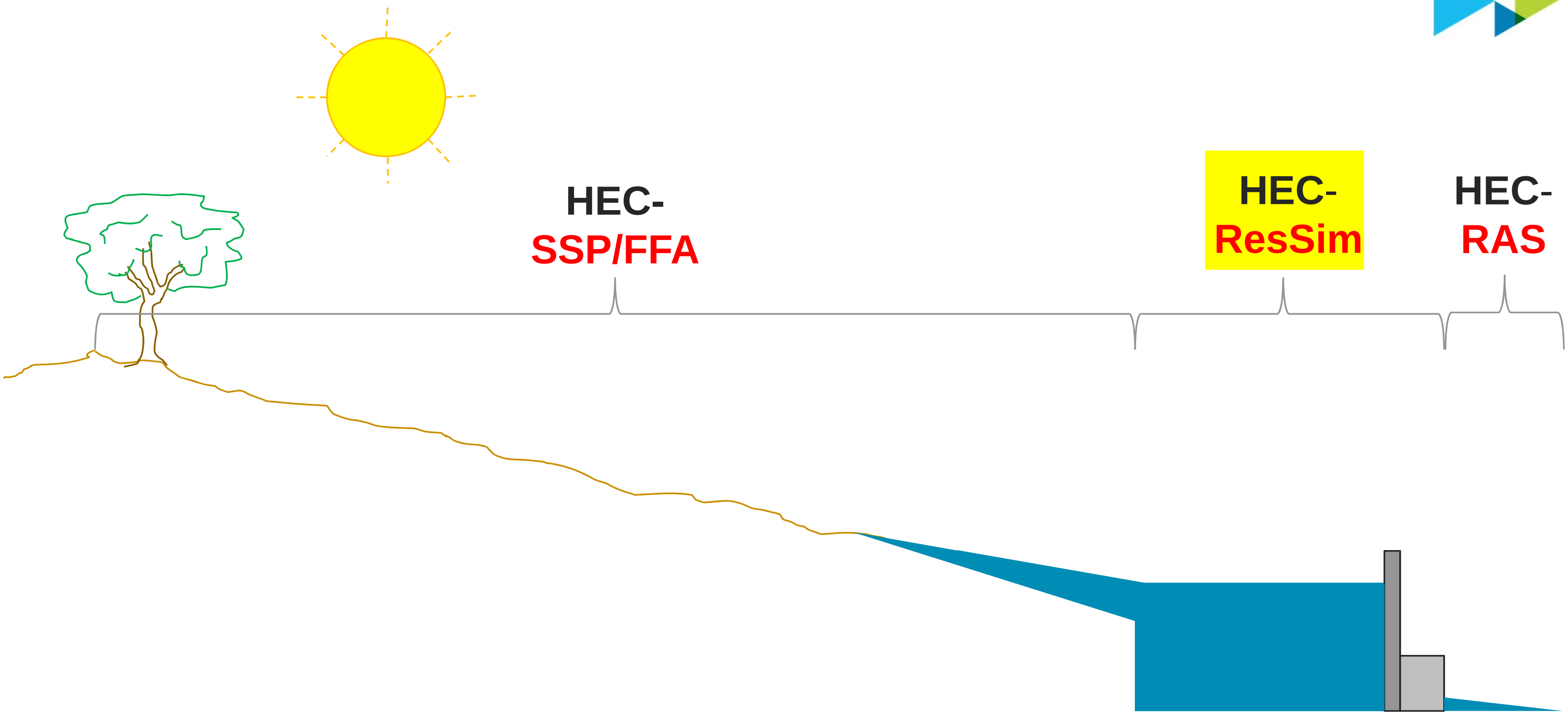


Time (hr)	Inflow (cfs)
0	5000
6	95000
12	50000
18	32000
24	15000

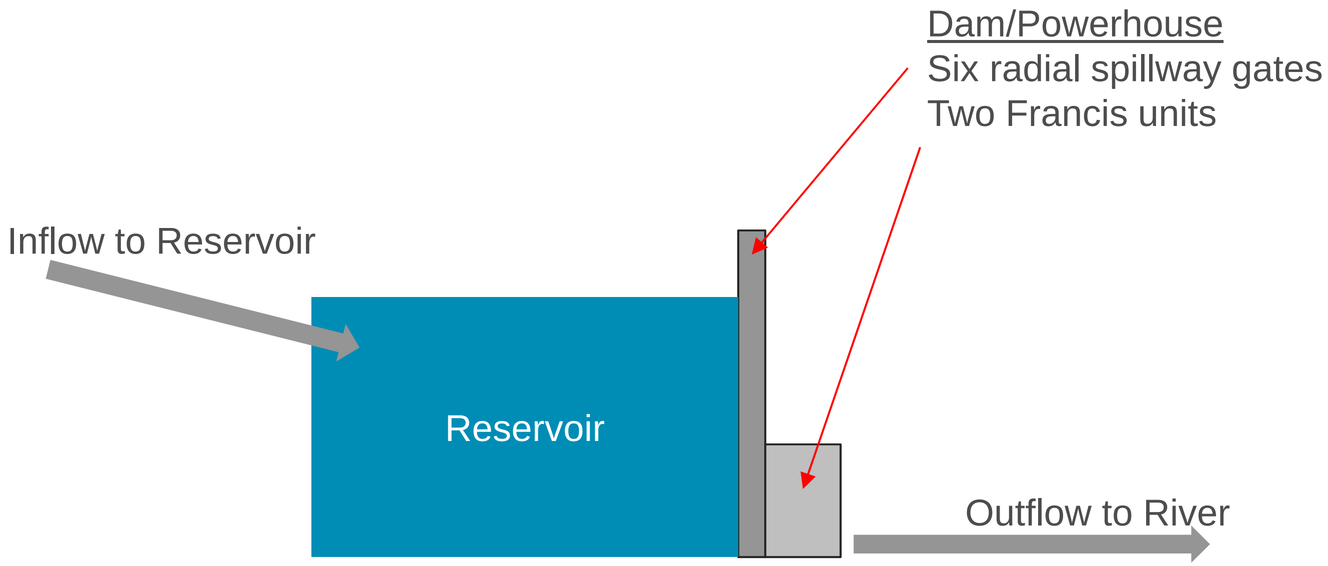
Inflow Hydrograph for Nearby Stream, AL **(For Illustration Purposes Only)**



Where the models are used…

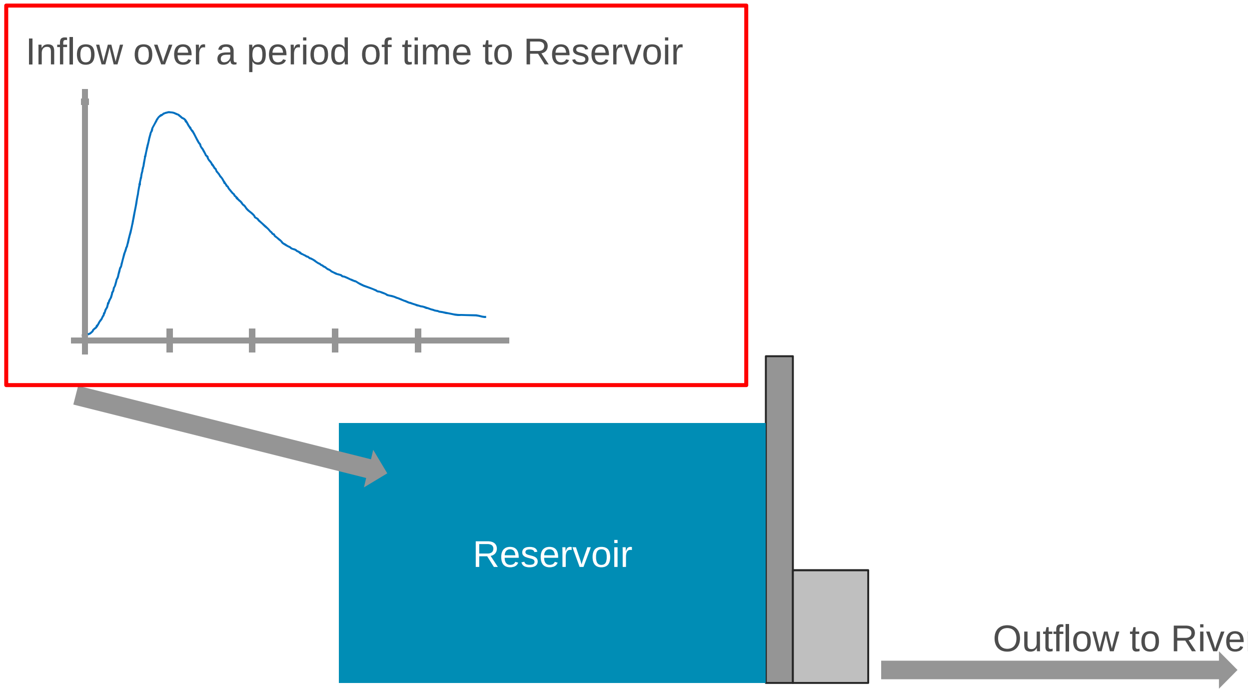


Schematic used to discuss HEC-ResSim



How **HEC-ResSim** sees the Reservoir

1. **FFA and ”scaled” actual event**

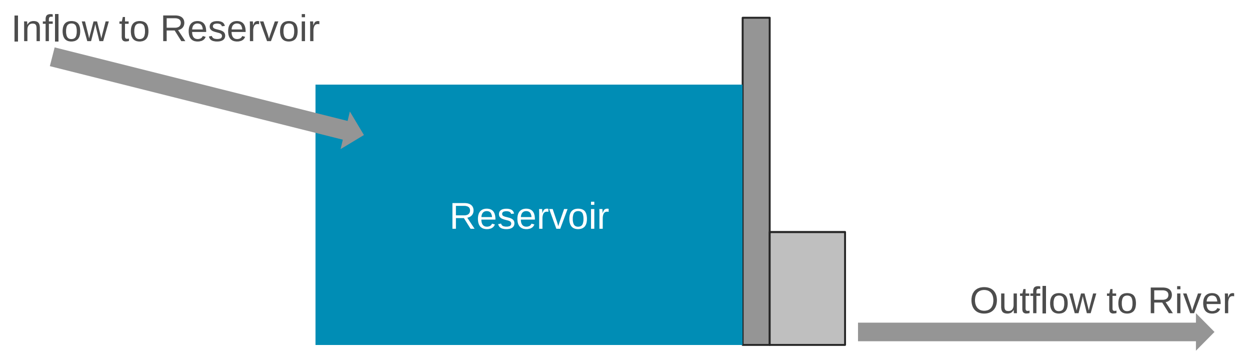


HEC-ResSim

2.

Elevation-Volume Table

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



HEC-ResSim

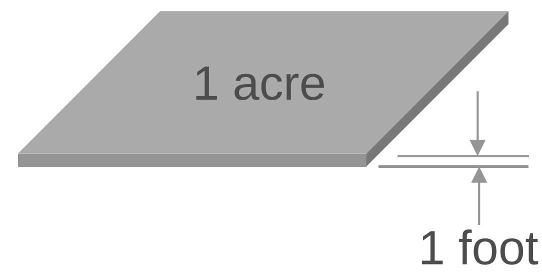
2.

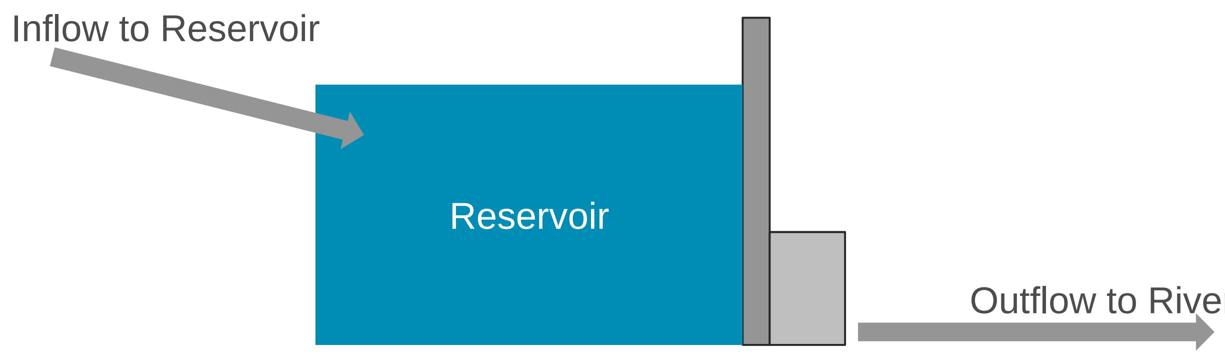
Elevation-Volume Table

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

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

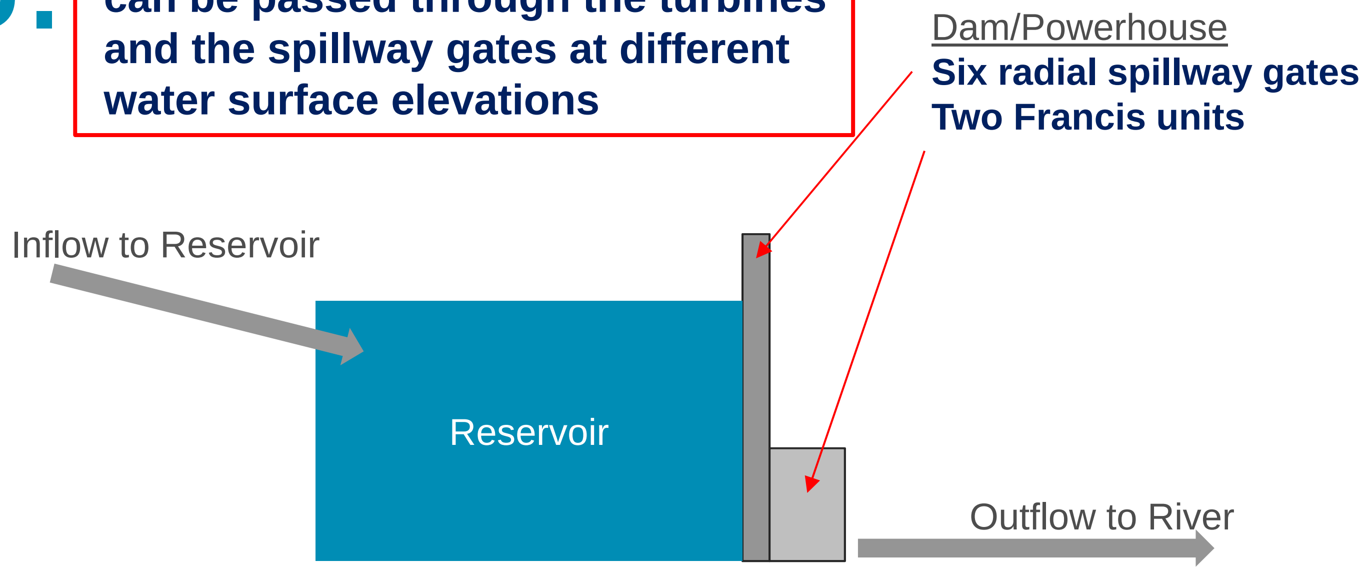
It is a measure of volume where one acre-foot is an area of one acre covered with one foot of water





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

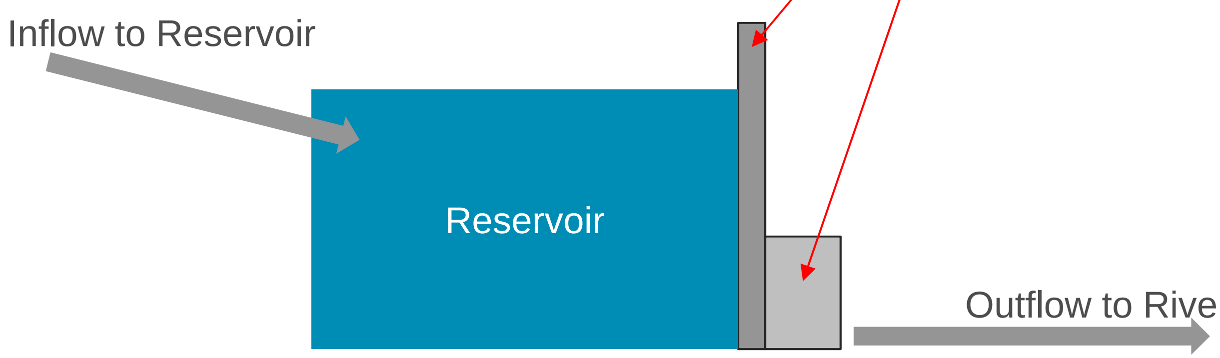
This tells us how the reservoir must be operated.

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**

Dam/Powerhouse

Six radial spillway gates

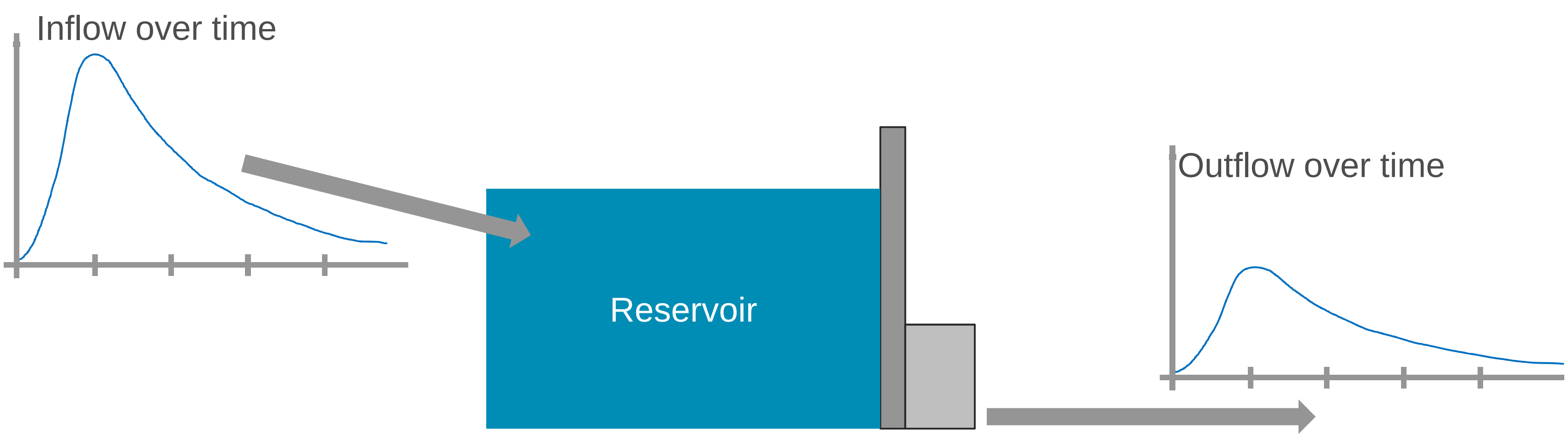
Two Francis units

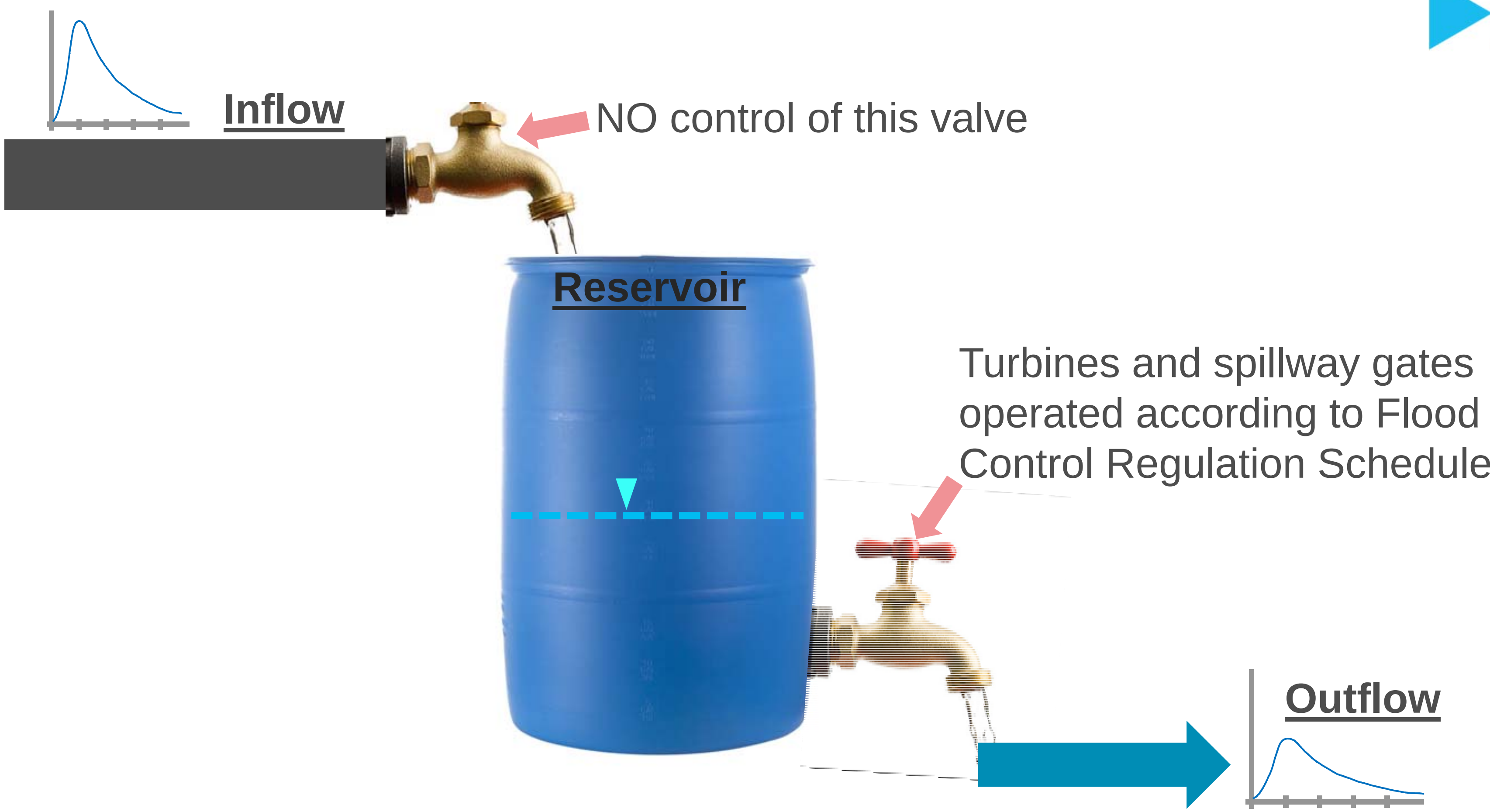


If **INFLOW** is higher than **OUTFLOW**: ELEVATION

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

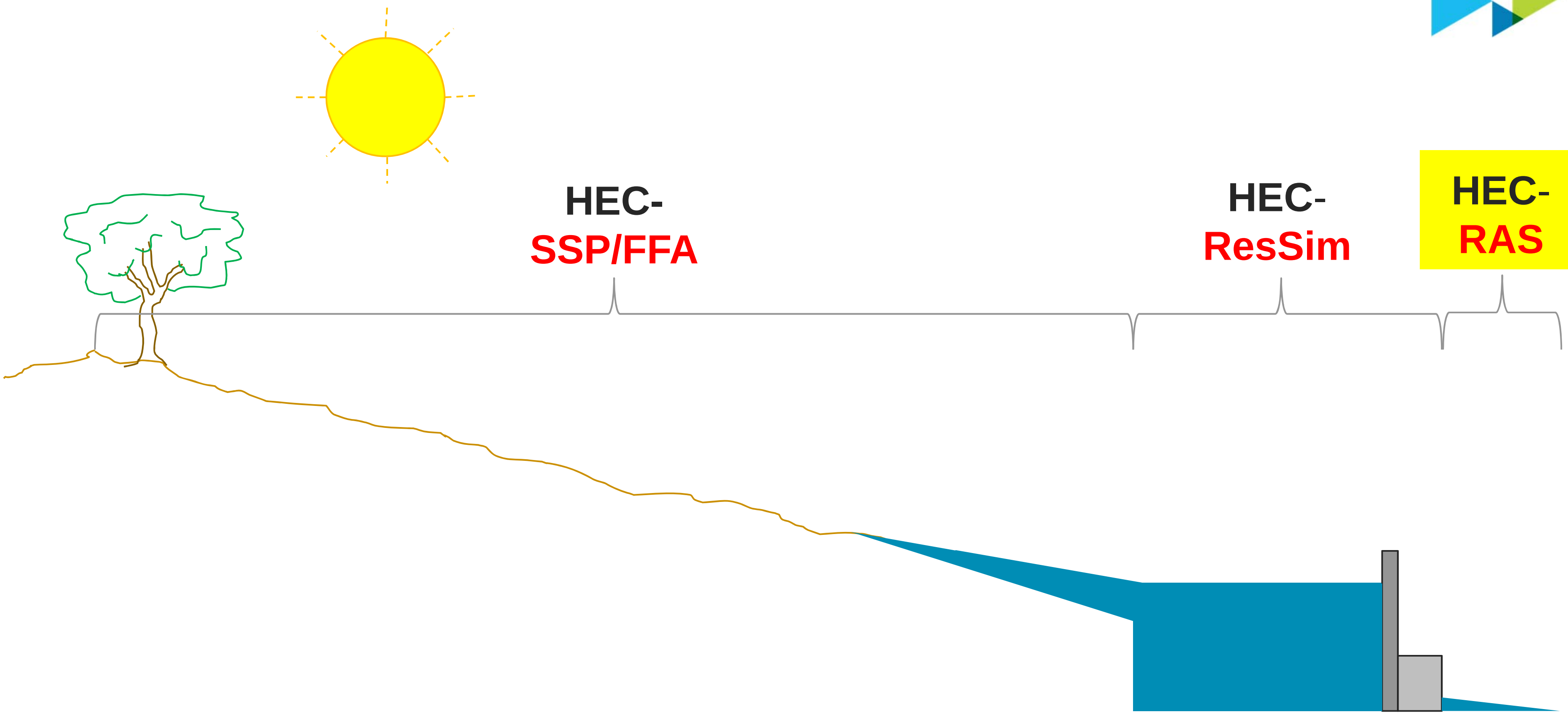
Outputs from HEC-ResSim

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

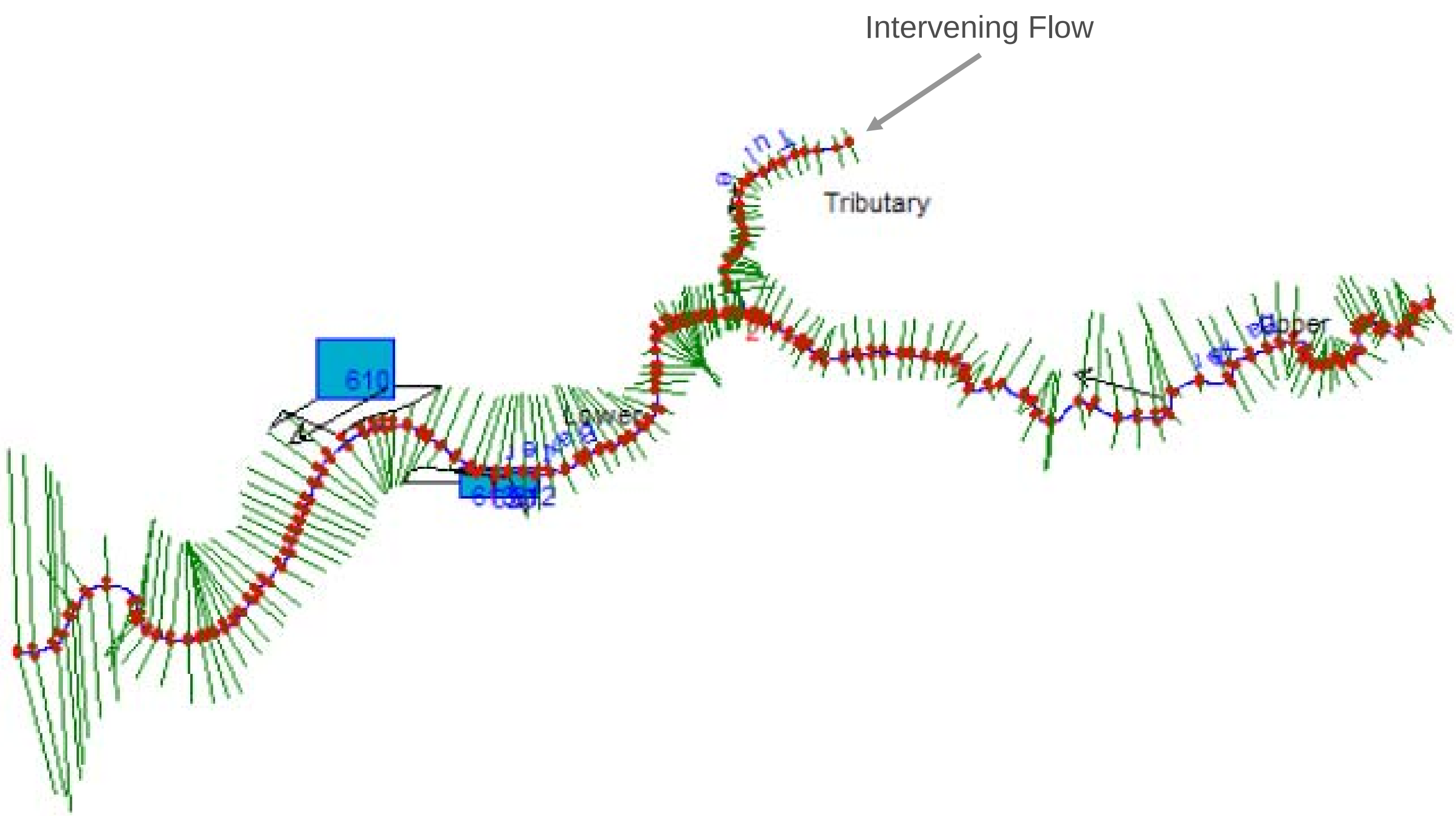
- The outflow hydrograph (turbines + spillway) to be used in **HEC-RAS**

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

Where the models are used…

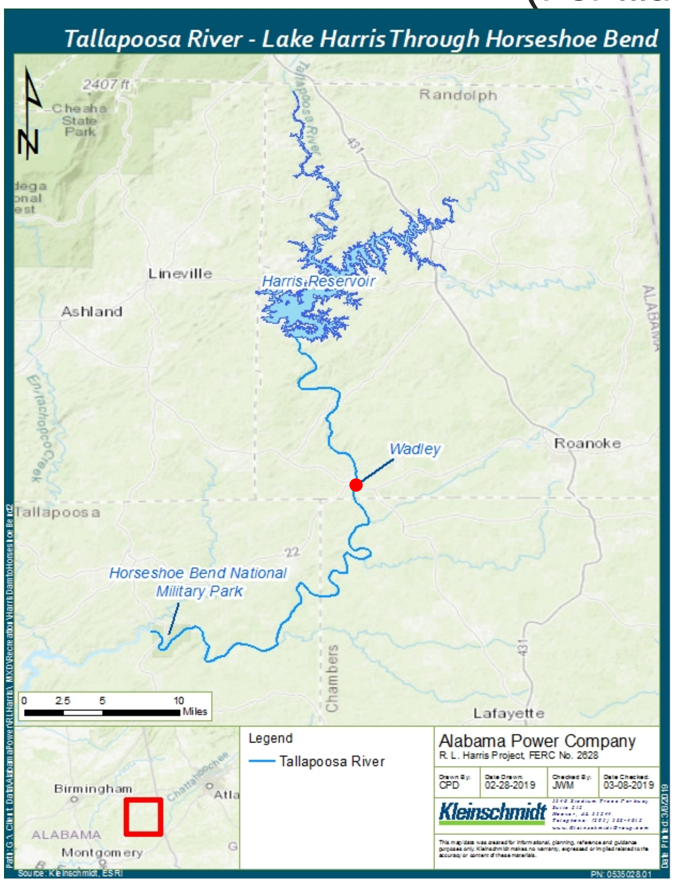


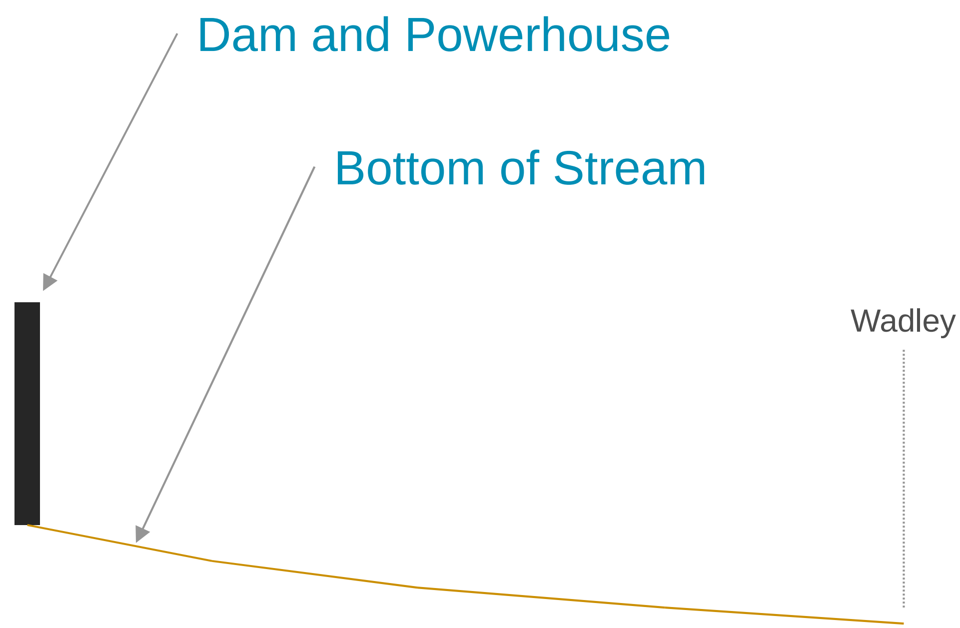
HEC-RAS cross-sections on a river
(For Illustration Purposes Only)



Schematic used to discuss HEC-RAS

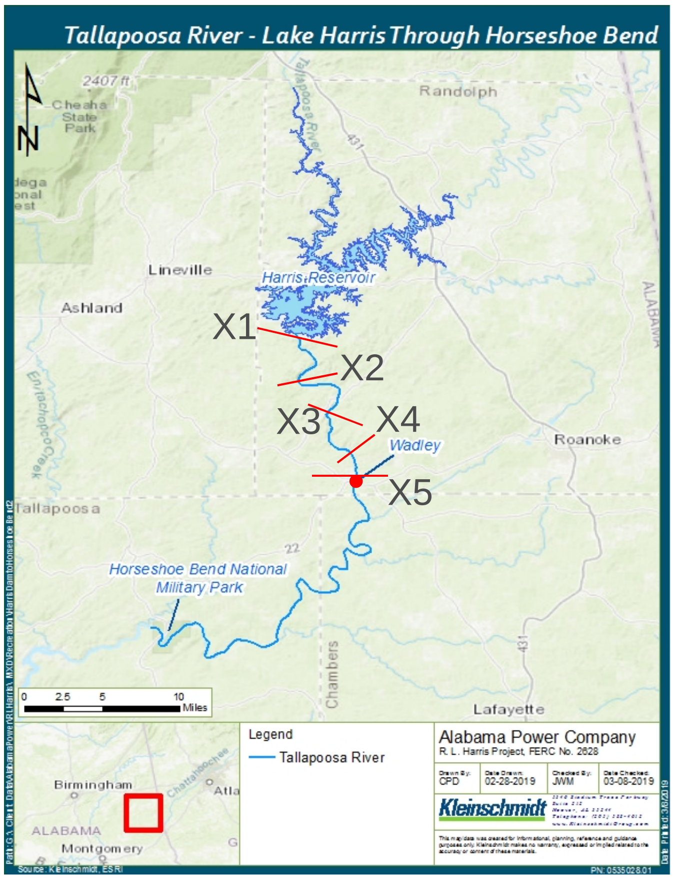
(For Illustrations Purpose Only)



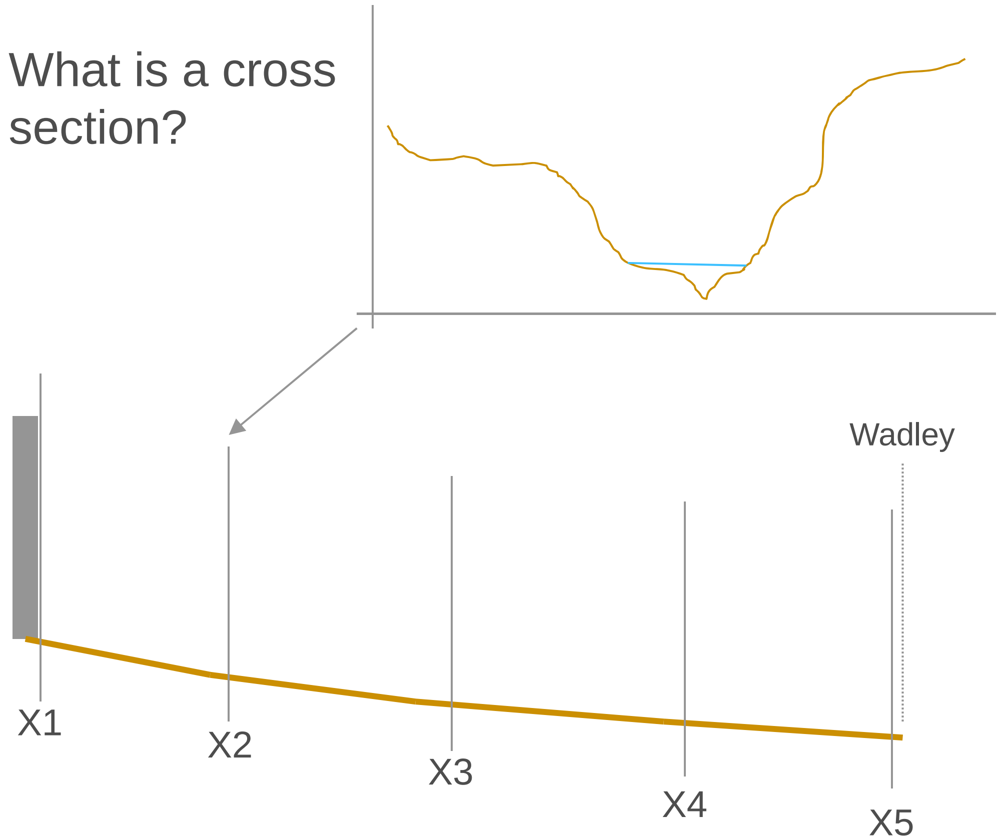


HEC-RAS Stream Cross Sections

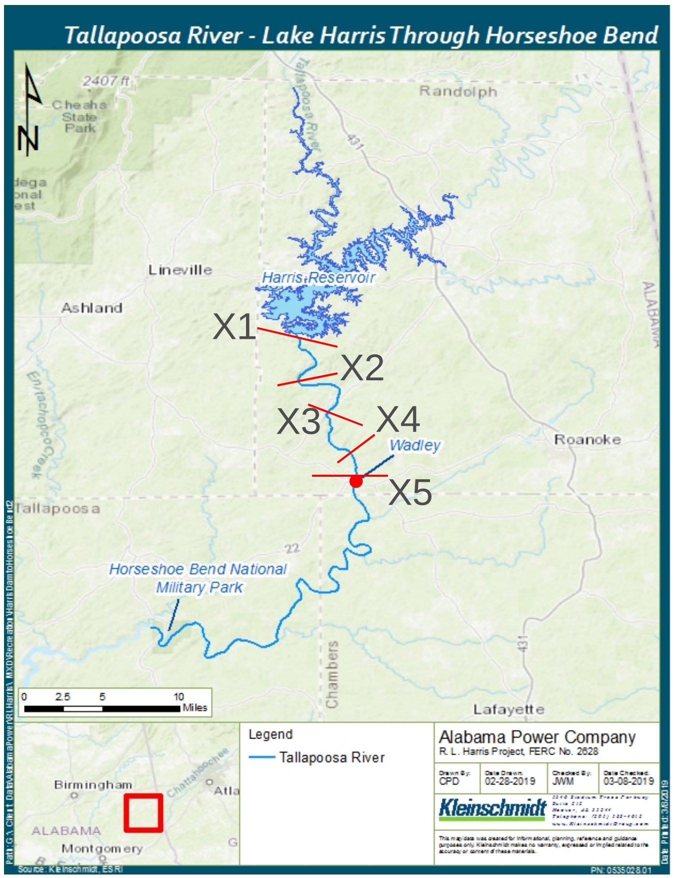
(For Illustration Purposes Only)

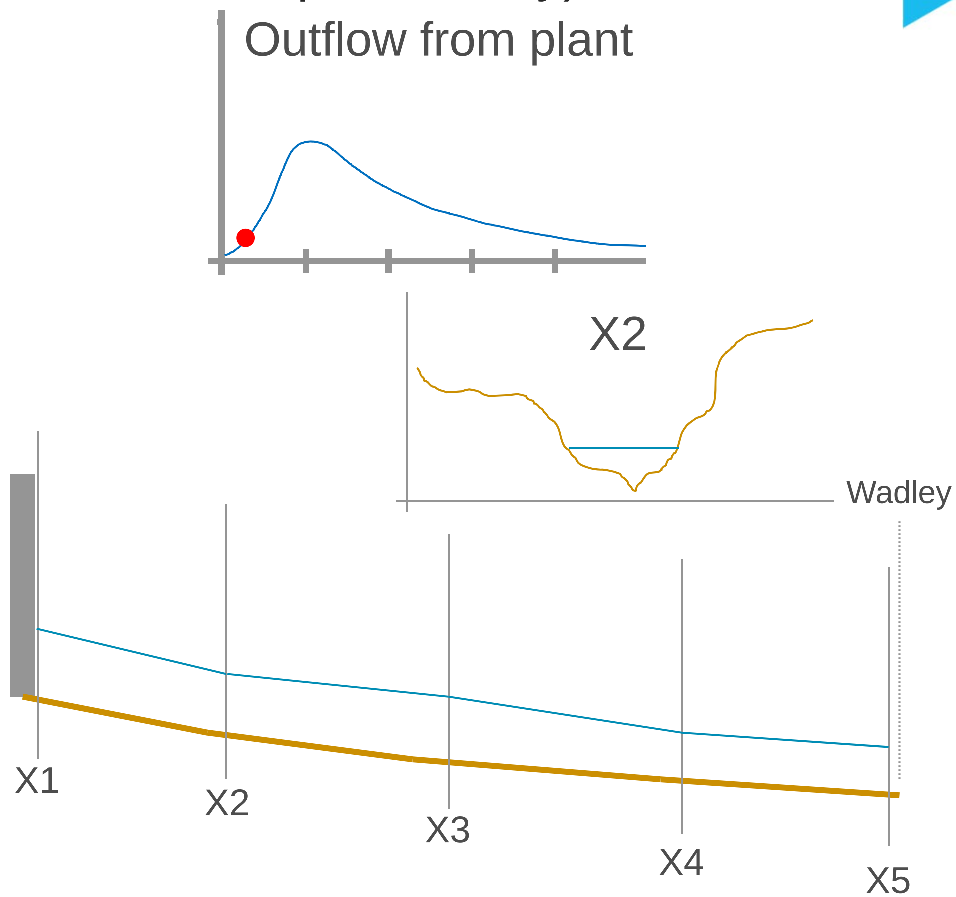


What is a cross section?

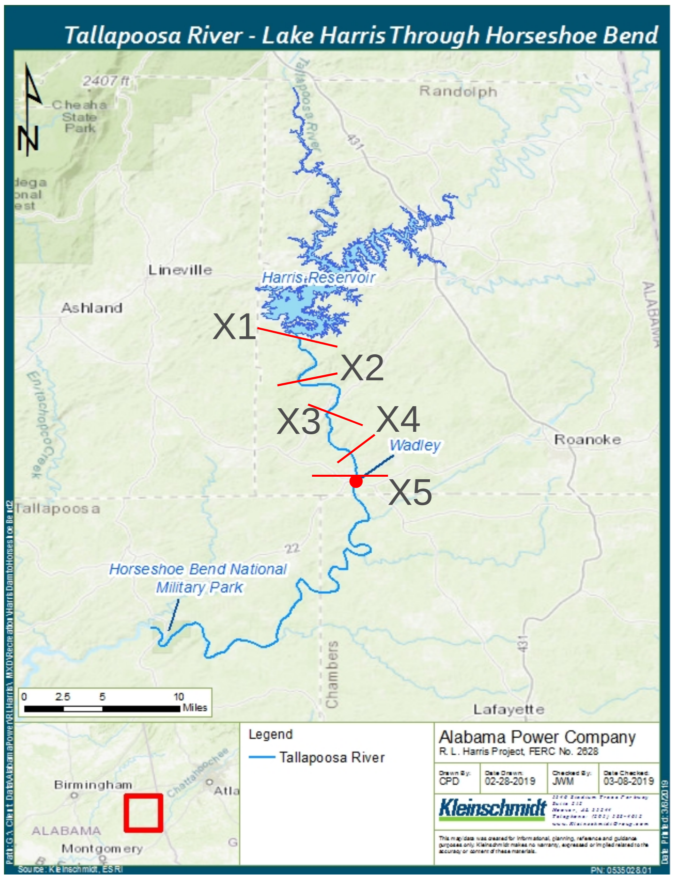


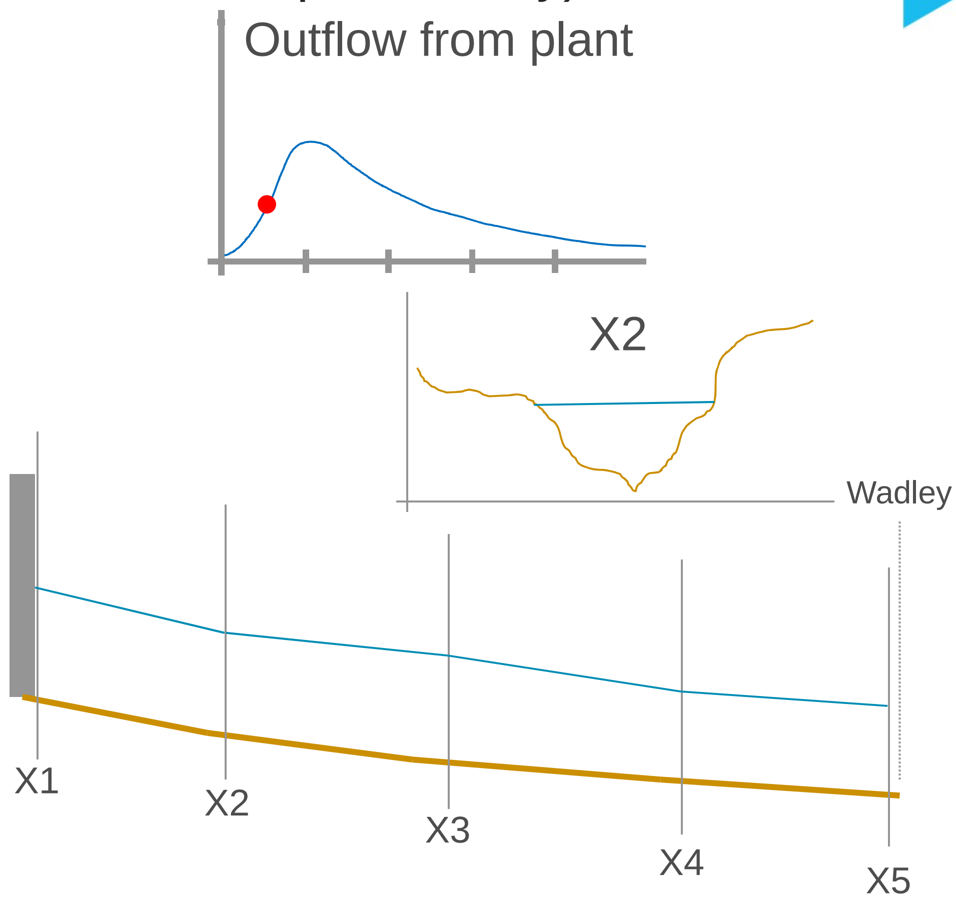
HEC-RAS (For Illustration Purposes Only)



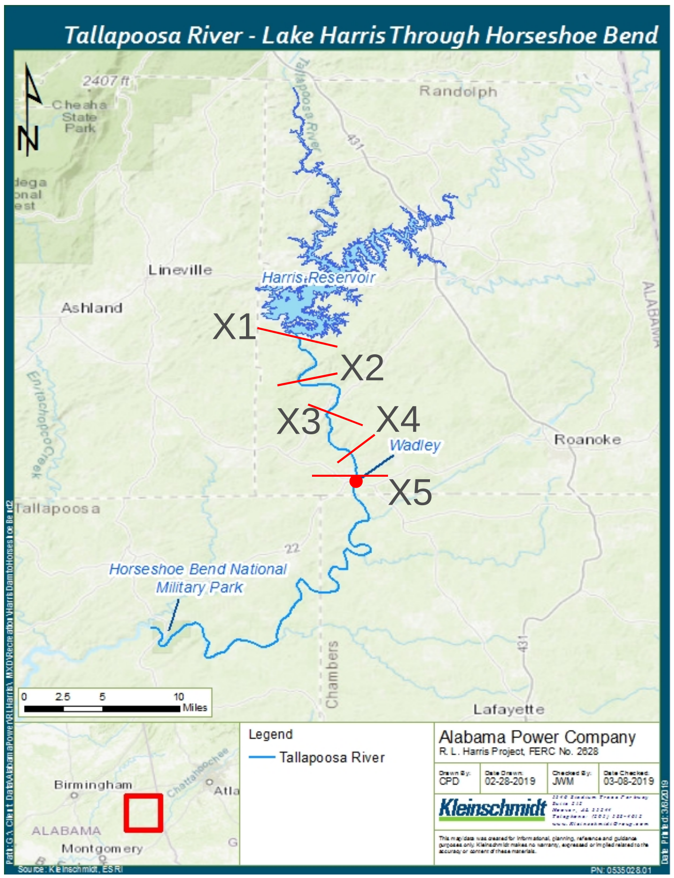


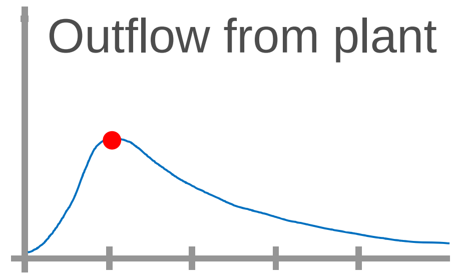
HEC-RAS (For Illustration Purposes Only)

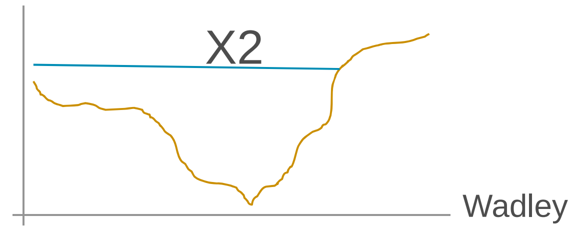


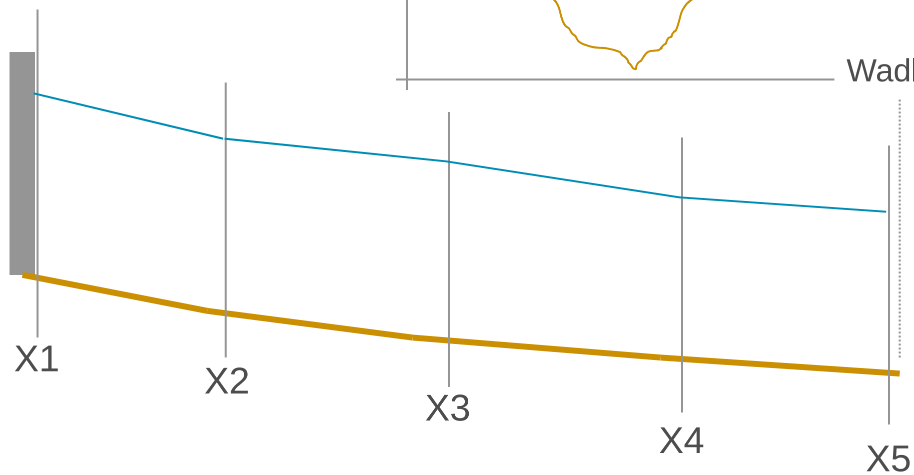


HEC-RAS (For Illustration Purposes Only)









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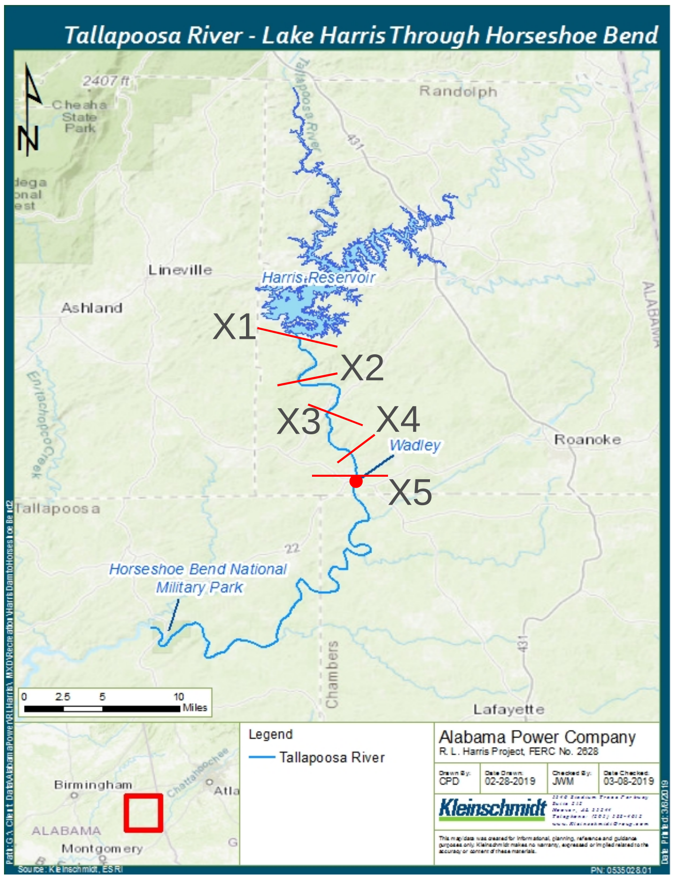

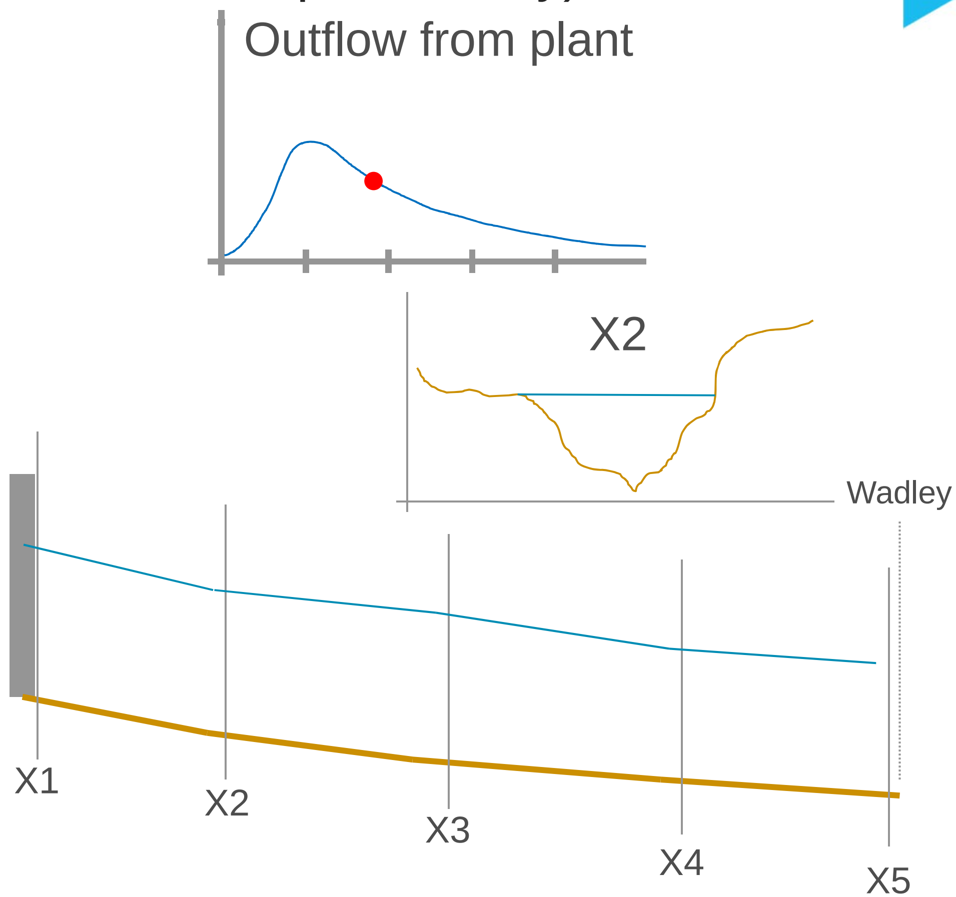

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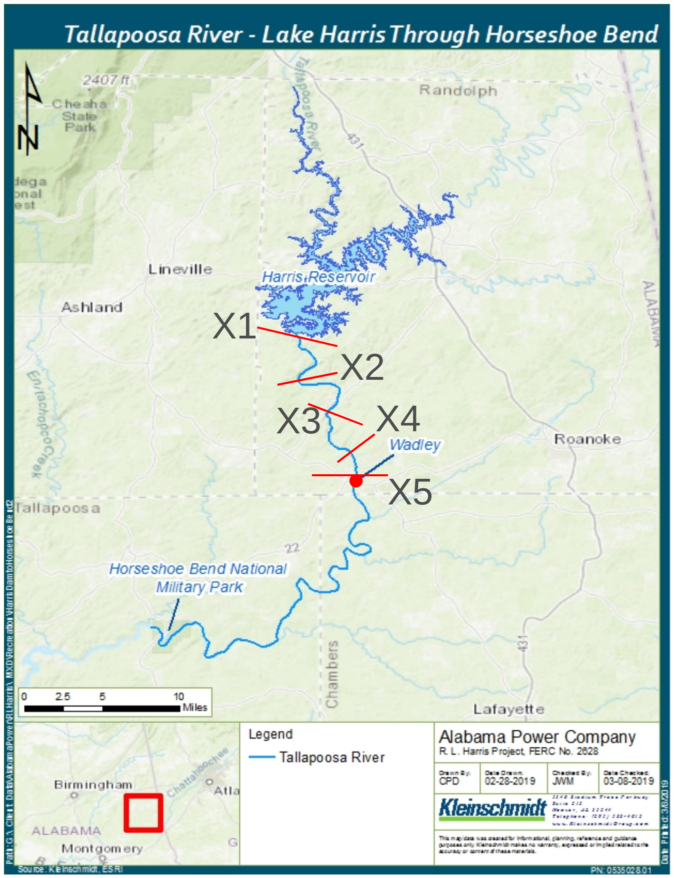
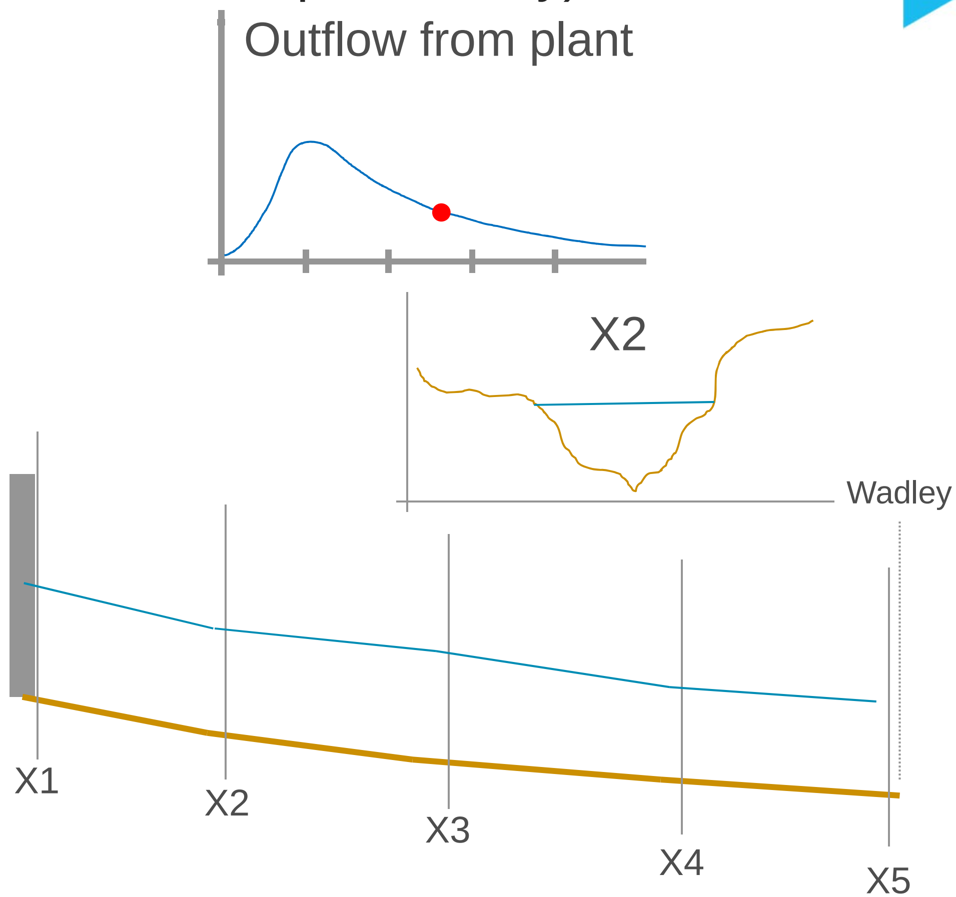
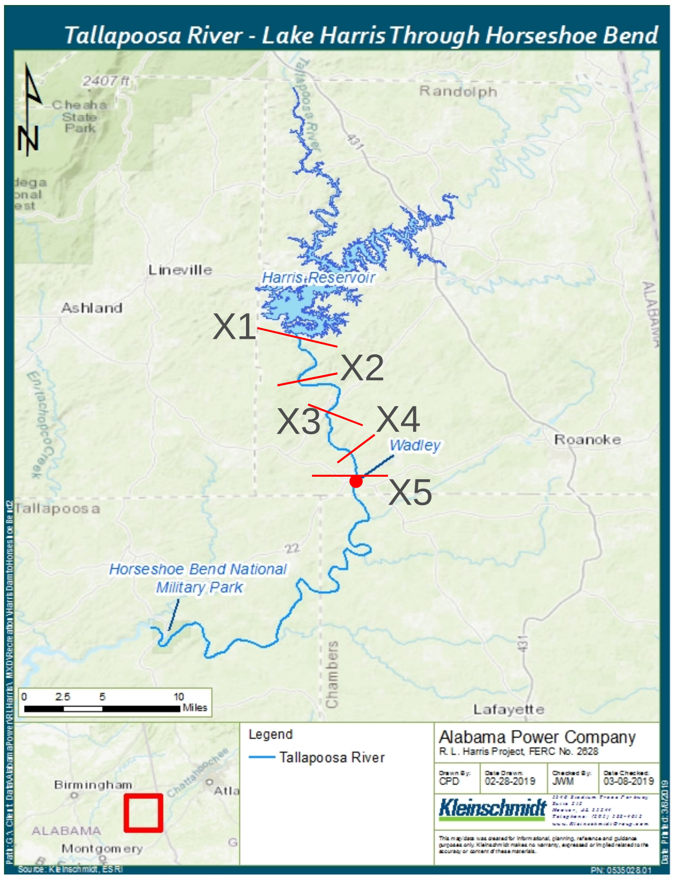
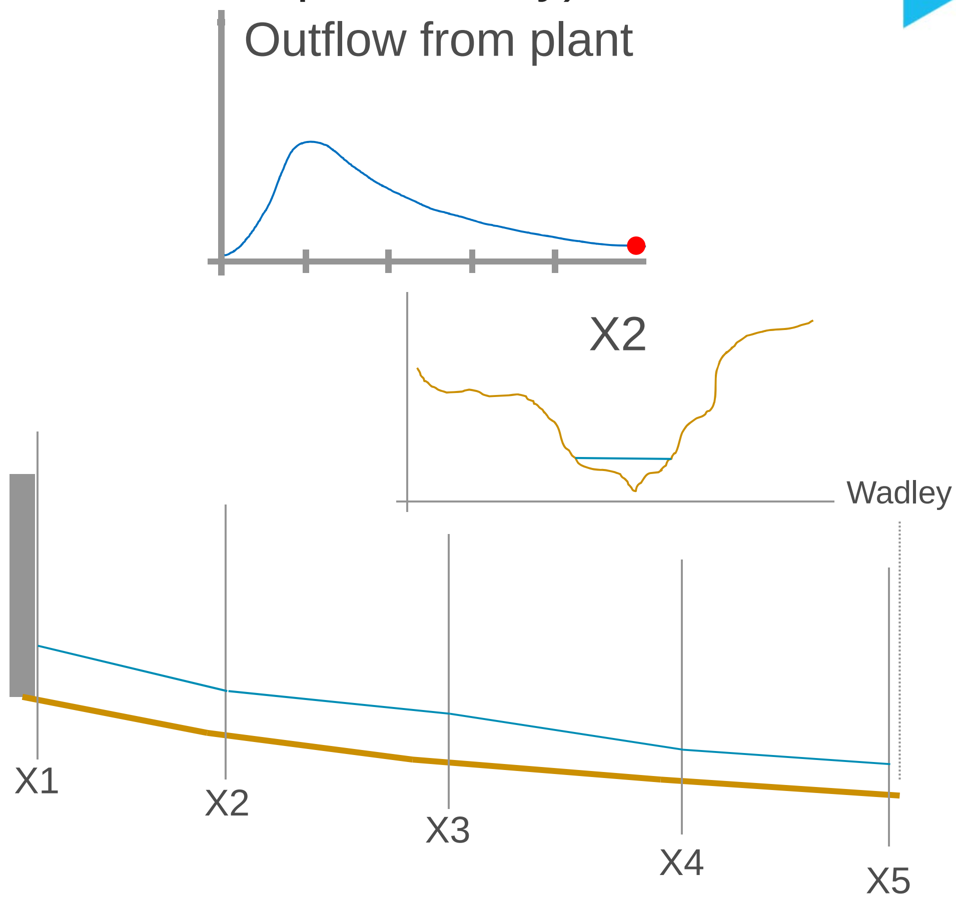


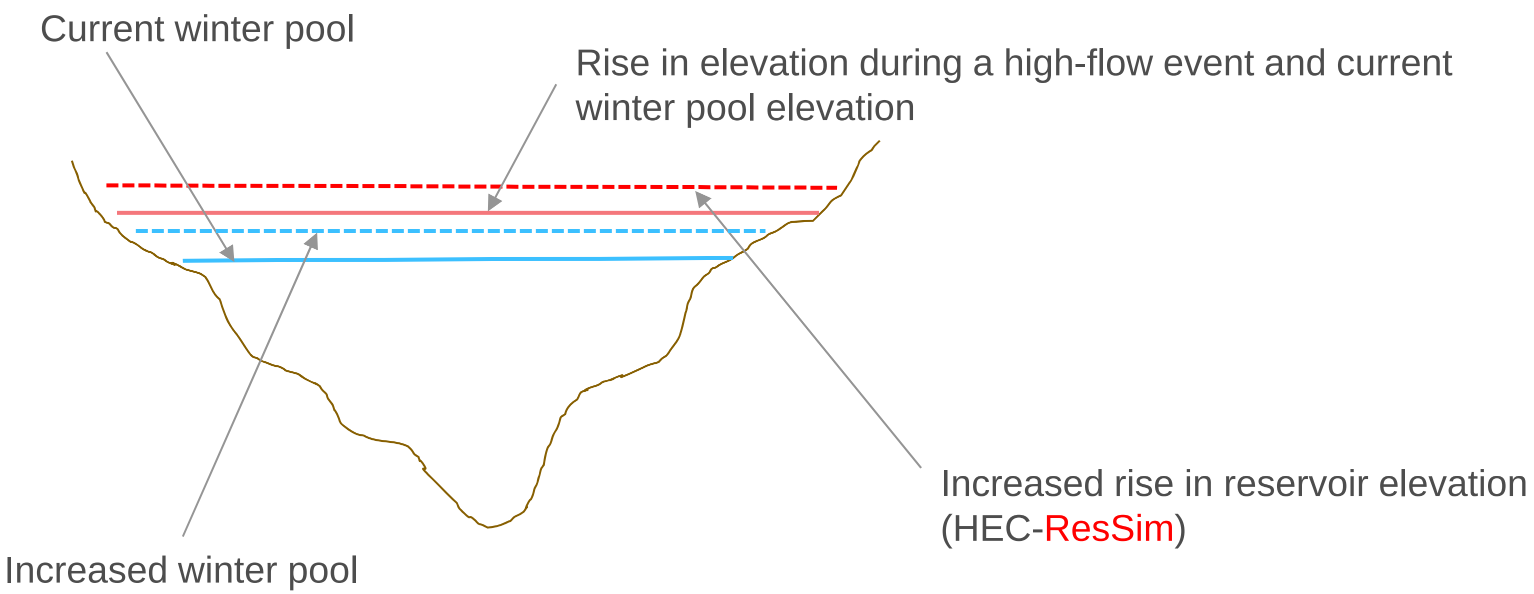


HEC-RAS (For Illustration Purposes Only)



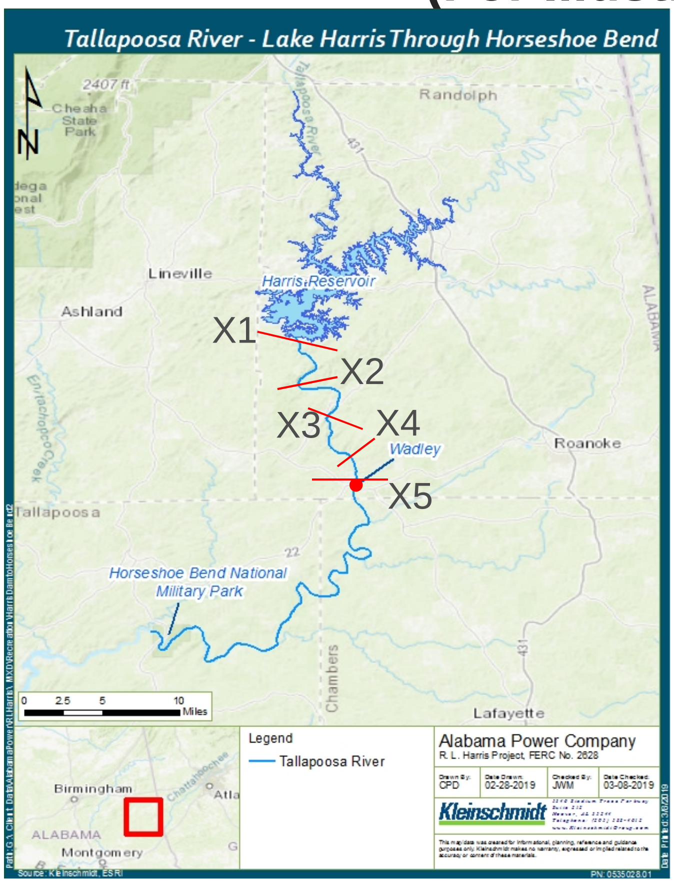


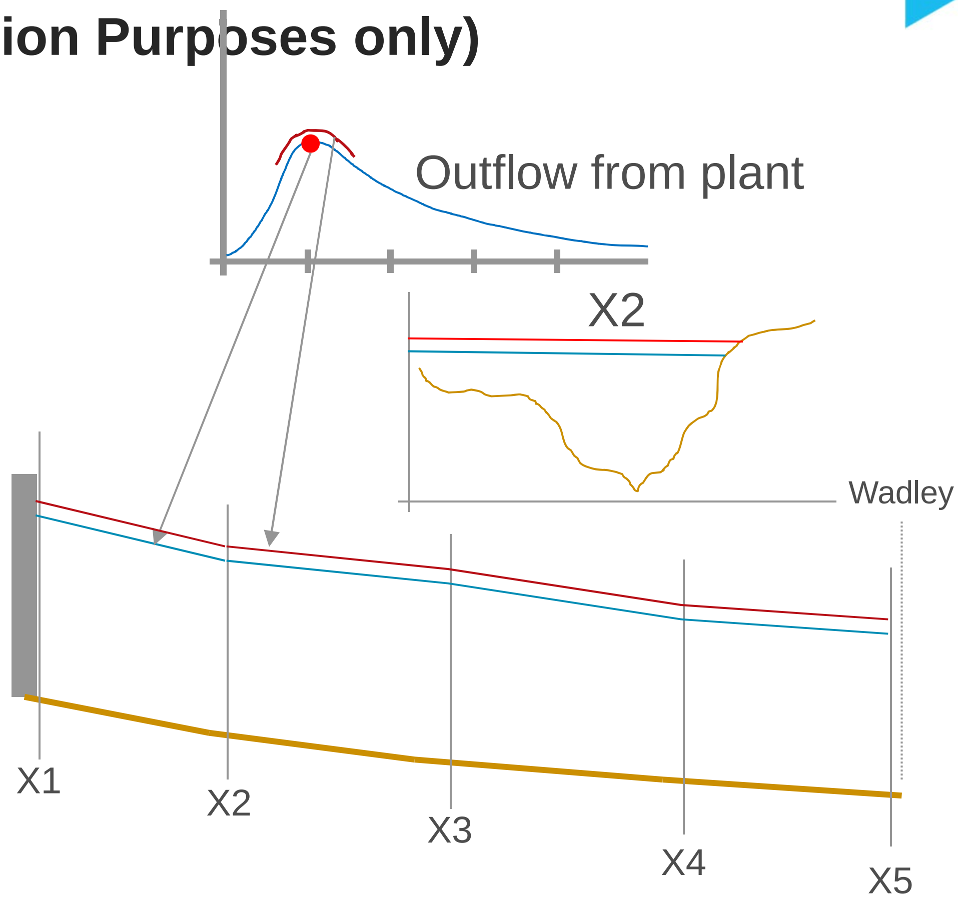
If the winter pool is increased, what happens during a high-flow event?



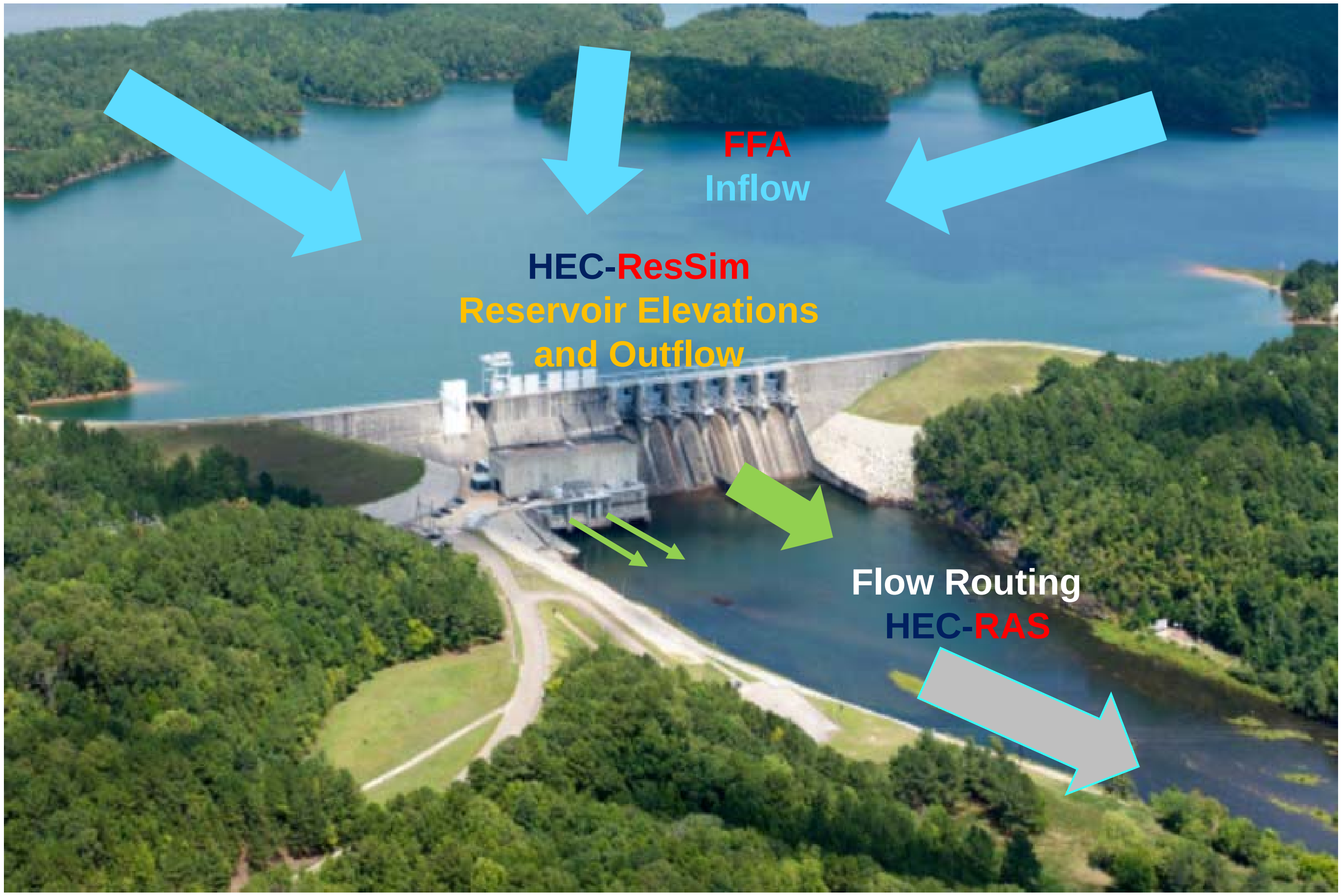
AND…

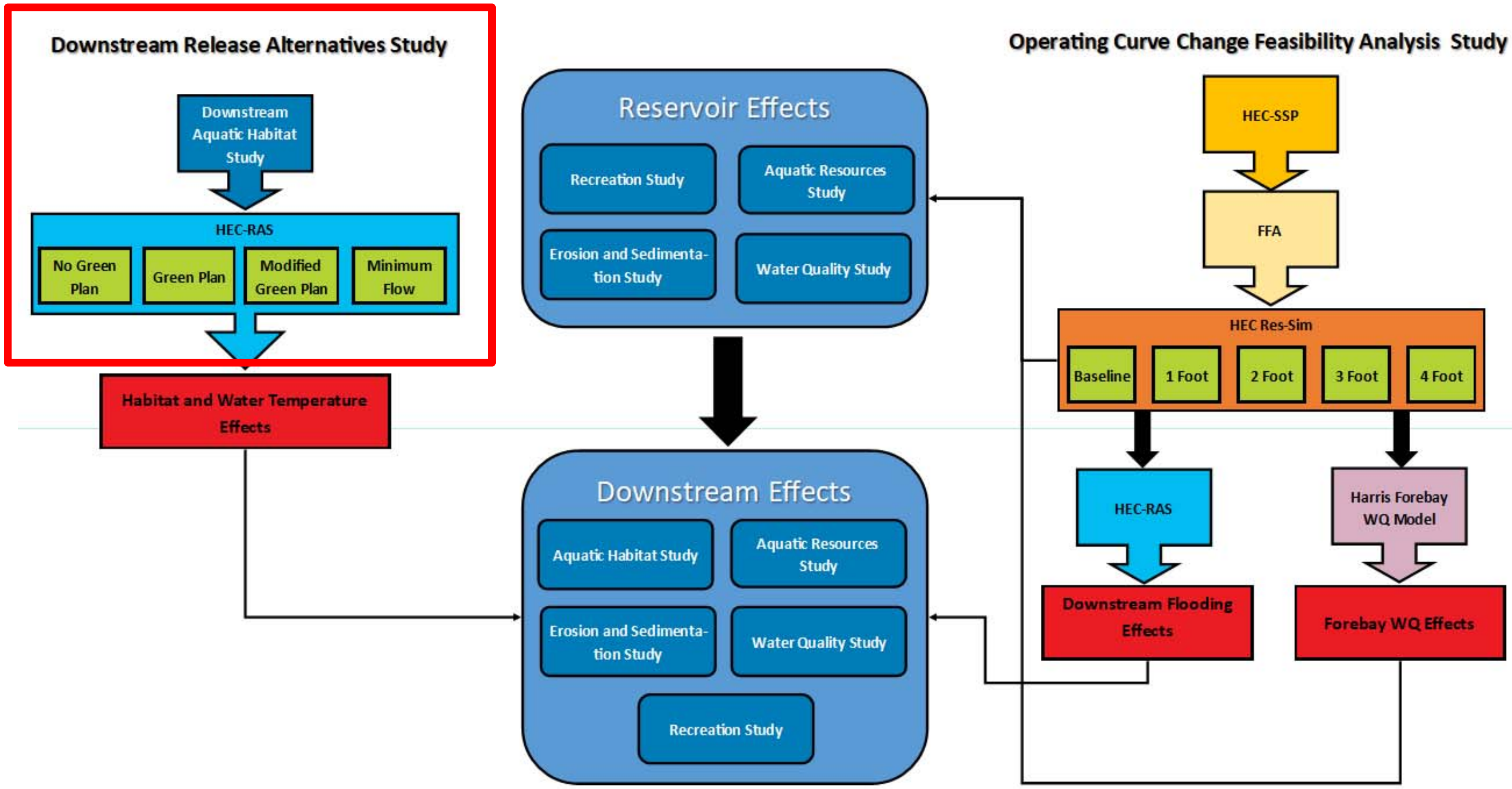
What happens when more water is released?
(For Illustration Purposes only)





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
Water Quality Study
Downstream Effects
Aquatic Habitat Study
Aquatic Resources Study
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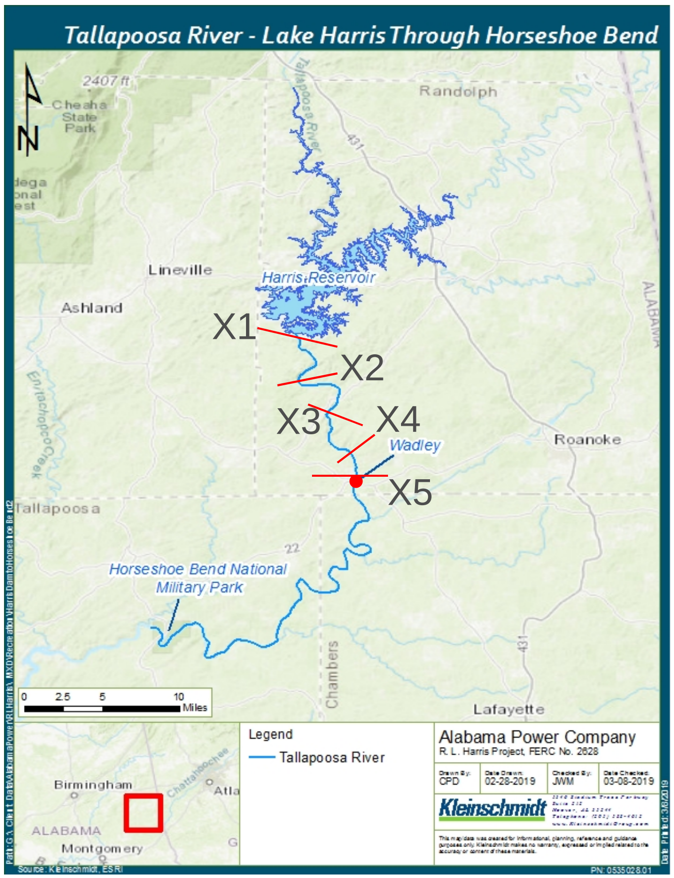
Operating Curve Change Feasibility Analysis Study
HEC-SSP
FFA
HEC Res-Sim
Baseline
1 Foot
2 Foot
3 Foot
4 Foot
HEC-RAS
Harris Forebay WQ Model
Downstream Flooding Effects
Forebay WQ Effects

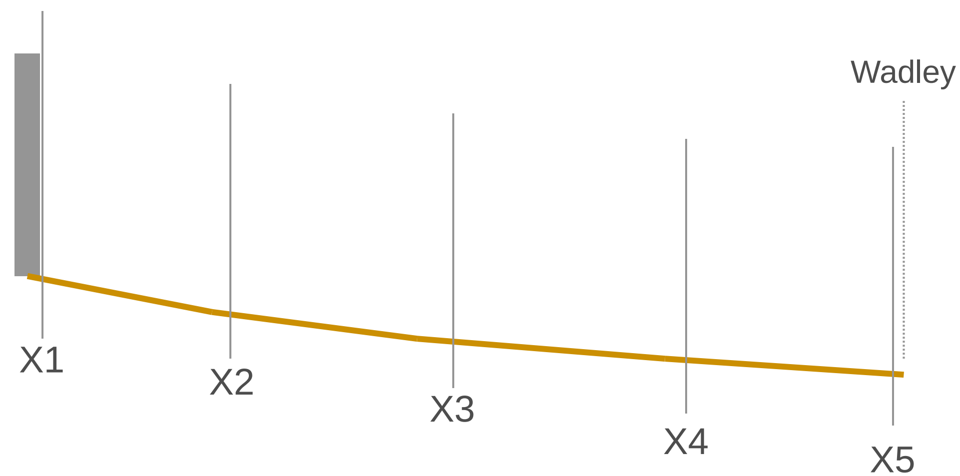
Downstream Release Alternatives Study

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
- No Green Plan
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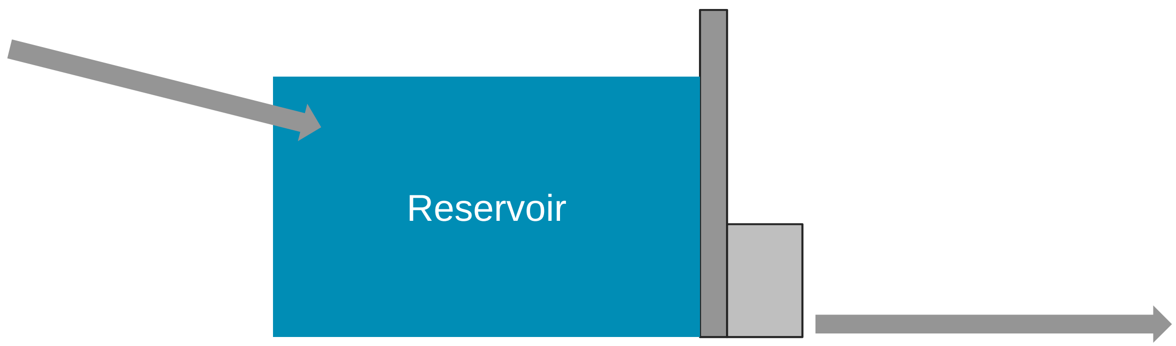
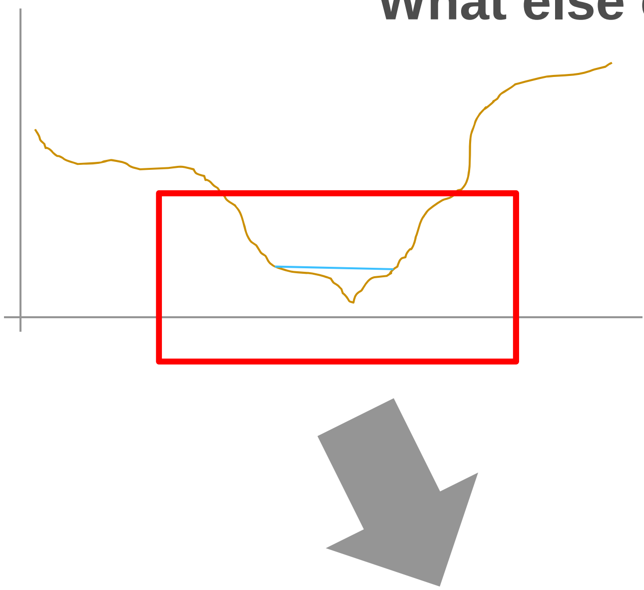
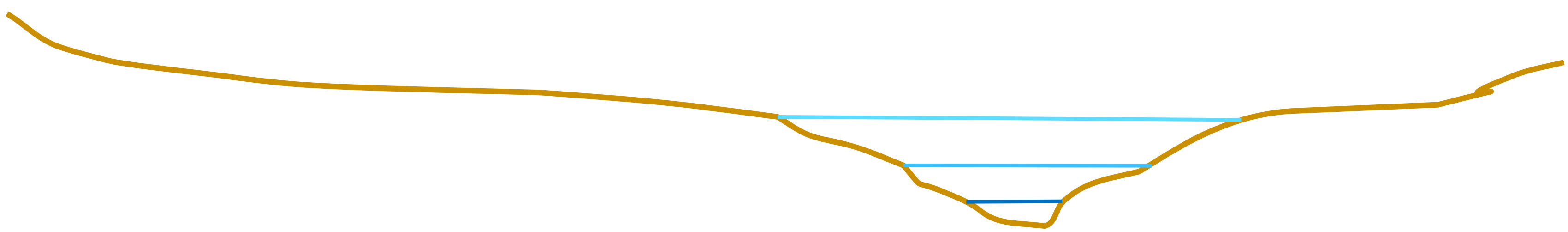
- 150 cfs continuous minimum flow



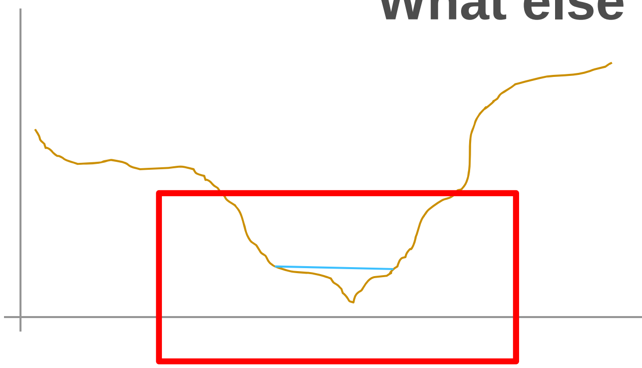
What else can HEC-RAS be used for?



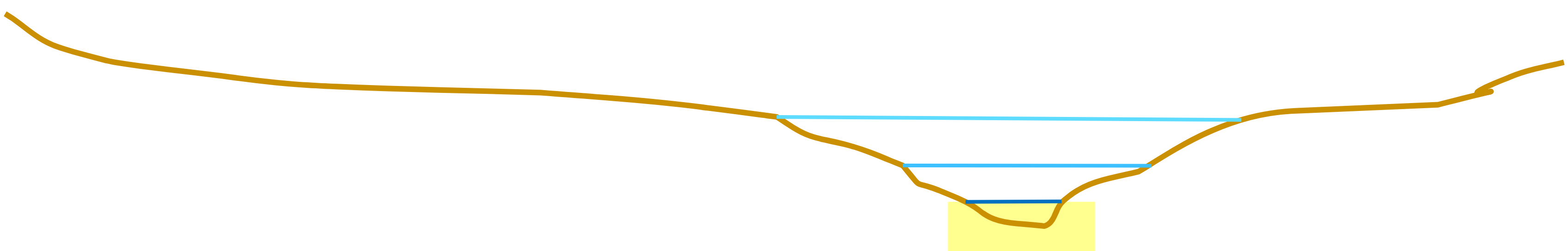
- Downstream release alternatives
- Water quality
- Water Use
- Erosion
- Aquatic Resources
- Wildlife and Terrestrial Resources
- Recreation Resources
- Cultural Resources



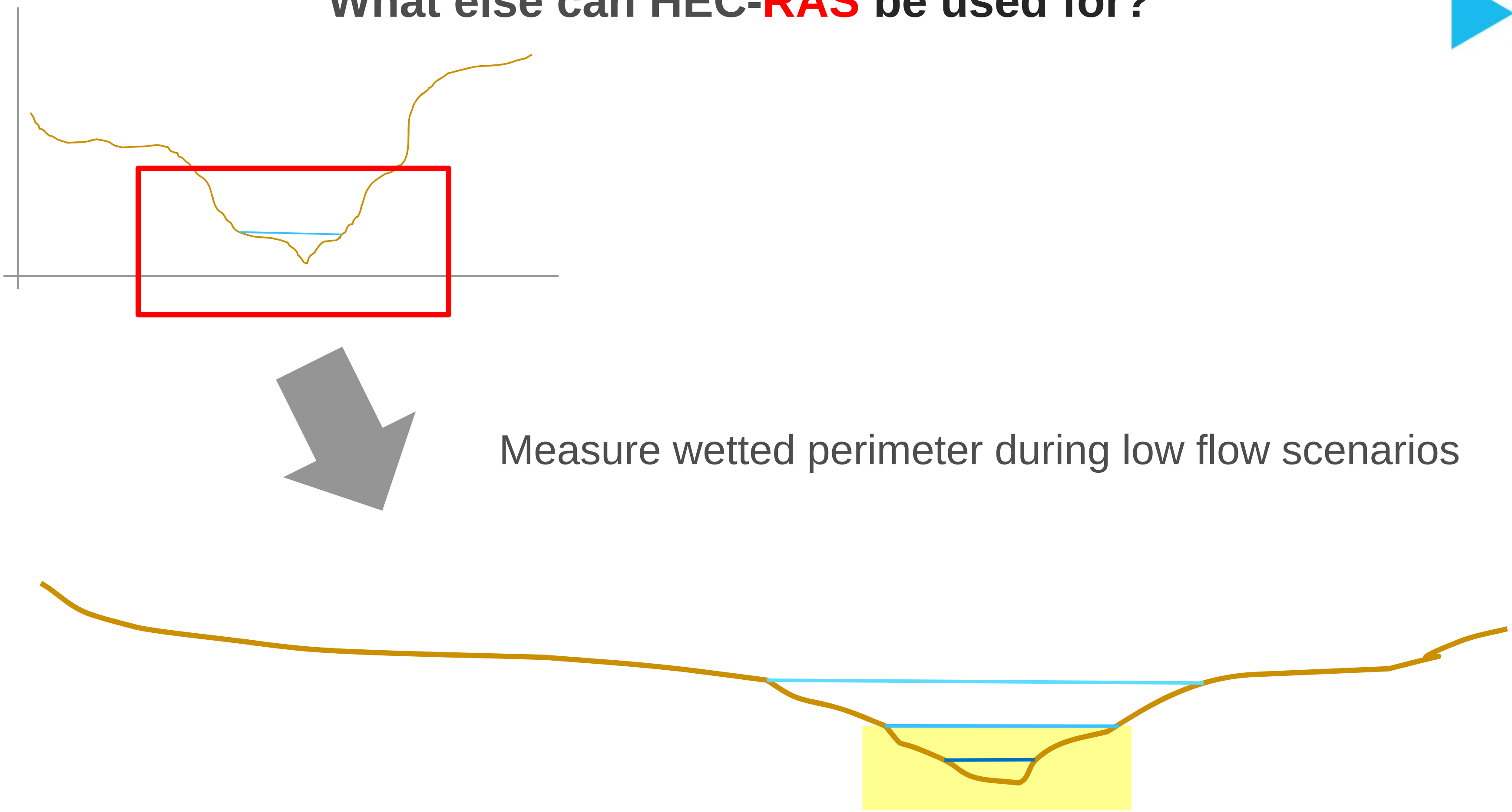
What else can HEC-RAS be used for?



Measure wetted perimeter during low flow scenarios

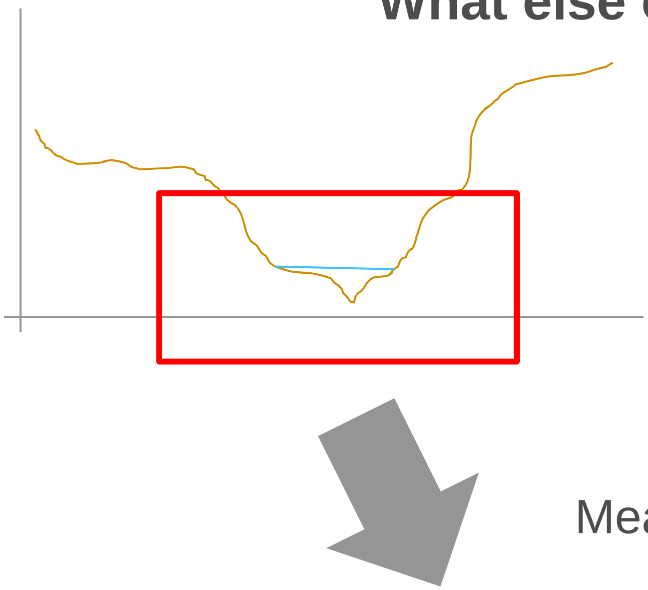


What else can HEC-RAS be used for?

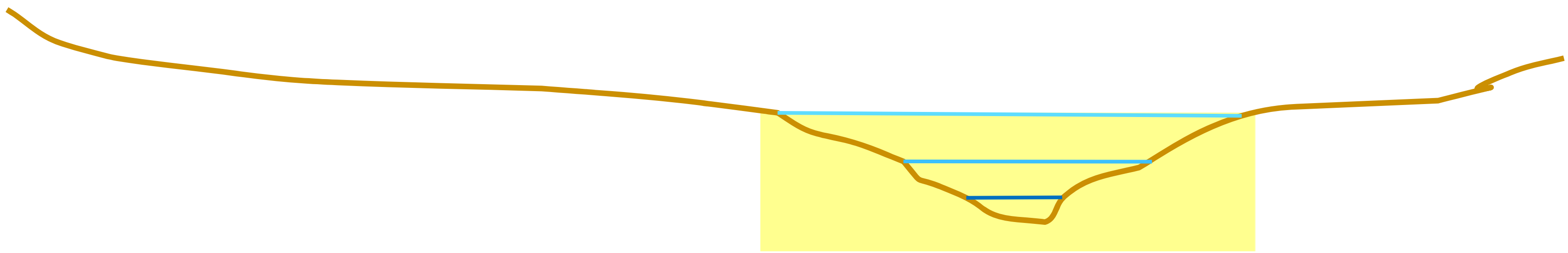


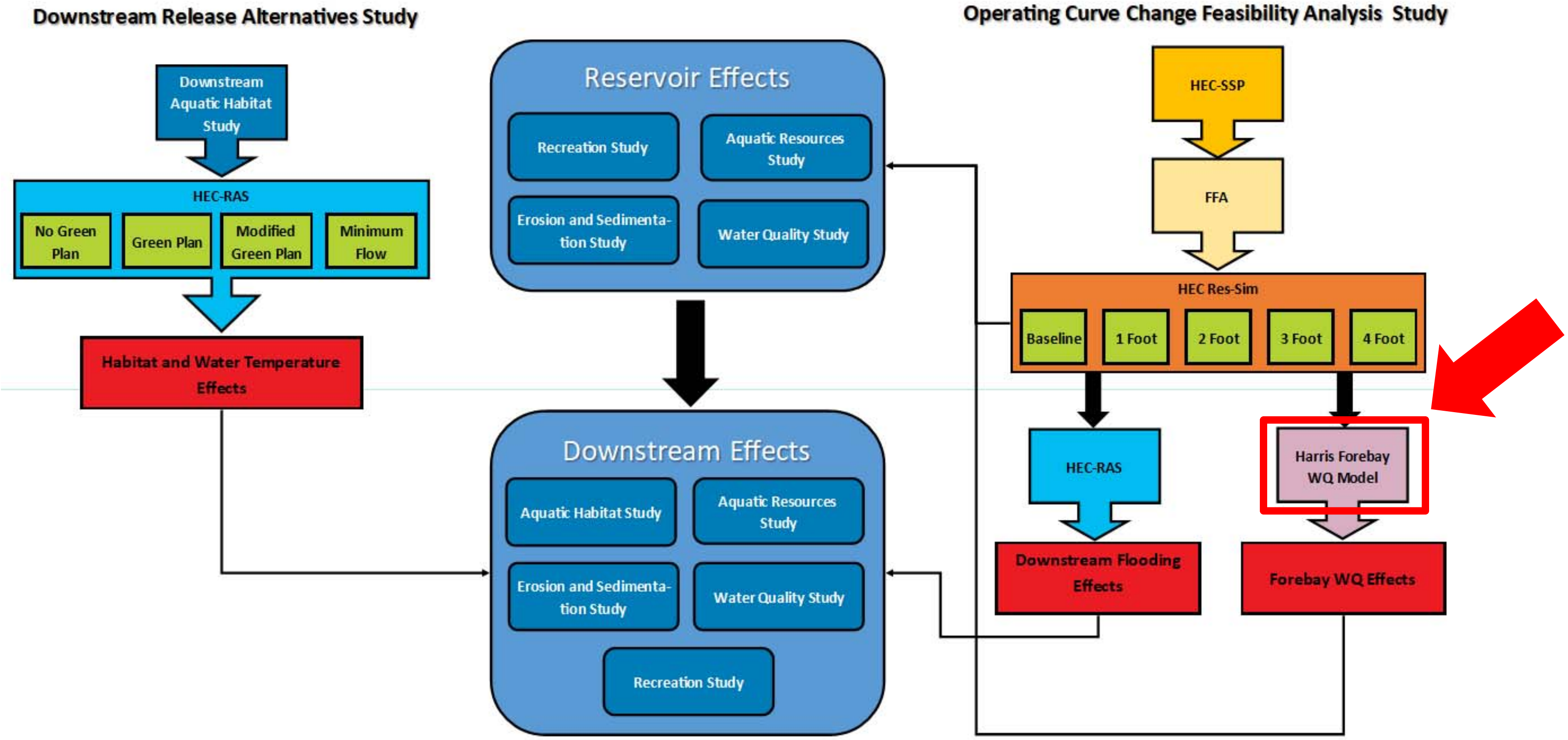
Measure wetted perimeter during low flow scenarios

What else can HEC-RAS be used for?



Measure wetted perimeter during low flow scenarios





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Harris Forebay WQ Model

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Environmental Fluid Dynamics Code (EFDC)

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

From:	APC Harris Relicensing
To:	"harrisrelicensing@southernco.com"
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

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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

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
>
>
>
> 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

Alabama Power

600 North 18th Street
Hydro Services 16N-8180
Birmingham, AL 35203
205 257 2251 tel
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April 10, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Initial Study 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 (SPD)[1] 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 is filing herein the Harris Project Initial Study Report (ISR) (Attachment). The enclosed ISR describes Alabama Power's overall progress to-date in implementing the study plan and schedule, a summary of the data, and any variances from the study plan and schedule. The ISR also includes modifications, if applicable, to ongoing studies. Alabama Power is not proposing any new studies.

Concurrent with this ISR filing, Alabama Power is filing six study reports and two cultural resources documents, including the consultation record for each of these six reports, which includes correspondence from May 2019 through March 2020. Table 1 outlines each study, the respective Harris Action Team (HAT), and the status of the study report. For those studies where a Draft Study Report is not due at the time of filing this ISR, the draft study report due date is noted.

---

[1] Accession Number 20190412-3000

[2] Accession Number 20191030-5053

Table 1 – Summary of the Harris Studies and Study Reports Filed with FERC Concurrent with the ISR

Study Name	Harris Action Team (HAT)	Draft Study Report Filed Concurrent with ISR (YES/NO)
Operating Curve Change Feasibility Analysis	HAT 1	YES – Draft Report with consultation filed with FERC
Downstream Release Alternatives Study	HAT 1	YES – Draft Report with consultation filed with FERC
Erosion and Sedimentation Study	HAT 2	YES – Draft Report with consultation filed with FERC
Water Quality Study	HAT 2	YES – Draft Report with consultation filed with FERC
Aquatic Resources Study	HAT 3	NO – Draft Report due July 2020
Downstream Aquatic Habitat Study	HAT 3	NO – Draft Report due June 2020
Threatened and Endangered Species Study	HAT 3	YES – Draft Desktop Assessment with consultation filed with FERC
Project Lands Evaluation	HAT 4	YES – Draft Phase 1 Study Report with consultation filed with FERC
Recreation Evaluation Study	HAT 5	NO – Draft Report due June 2020 (requesting variance to August 2020)
Cultural Resources Programmatic Agreement and Historic Properties Management Plan Study	HAT 6	YES – Inadvertent Discovery Plan; Traditional Cultural Properties Identification Plan; consultation filed with FERC; No – Area of Potential Effect (due April 2020; requesting variance to June 2020)

The SPD schedule for the HAT 1, HAT 3, and HAT 5 studies included hosting HAT meetings in March 2020. Due to COVID-19 and related travel and public gathering restrictions, and statewide office closures, Alabama Power did not host these HAT meetings.

Alabama Power is requesting a schedule variance for the following studies:

1) Water Quality Study – Alabama Power stated that it would submit a Section 401 Water Quality Certification (WQC) to ADEM in 2020; however, following discussions with ADEM, Alabama Power intends to submit the 401 WQC application to ADEM in April 2021.

2) Draft Recreation Evaluation Study Report - Alabama Power added the Tallapoosa River Downstream Landowner Survey and the Tallapoosa River Recreation User Survey in 2020[3]. Due to the additional study elements and extended deadline for landowners and the public to participate in the surveys, Alabama Power will file the Draft Recreation Evaluation Study Report in August 2020 rather than June

[3] Accession Number 20191219-5186

2020. Alabama Power is not requesting a schedule variance for the Final Recreation Evaluation Study Report due November 2020.

3) The Area of Potential Effect (APE) – Alabama Power is continuing consultation with the Alabama Historical Commission to finalize the APE as part of the Cultural Resources Study; therefore, Alabama Power will file the APE and associated consultation in June 2020.

Pursuant to 18 CFR §5.15(c)(2), Alabama Power will host the Initial Study Report Meeting (Meeting) with stakeholders and FERC on April 28, 2020 by conference call ([205] 257-2663 **or** [404] 460-0605, conference ID 489472). Note that Alabama Power consulted with FERC staff on hosting this Meeting one day later than the date required by the ILP schedule due to a state holiday on April 27, 2020, and to provide stakeholders adequate time to review the ISR prior to the Meeting. The Meeting will begin at 9:00 AM and conclude by 4:00 PM. The purpose of the Meeting is to provide an opportunity to review the contents of the ISR and to discuss the study results and proposals to modify the study plan, if any, in light of the progress of the studies and data collected.

Alabama Power will file the Initial Study Report Meeting Summary by May 12, 2020. Stakeholders will have until June 11, 2020, to file comments on the ISR and Meeting Summary with FERC.

Stakeholders may access the ISR and the individual 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.

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 – Initial Study Report

cc: Harris Stakeholder List

Attachment
Initial Study Report

INITIAL STUDY REPORT

R. L. HARRIS PROJECT
FERC NO. 2628

Prepared by:

ALABAMA POWER COMPANY
BIRMINGHAM, ALABAMA

APRIL 2020

INITIAL STUDY REPORT

R. L. HARRIS PROJECT
FERC NO. 2628

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INITIAL STUDY REPORT

R. L. HARRIS PROJECT
FERC NO. 2628

1.0 INTRODUCTION

Alabama Power Company (Alabama Power) owns and operates the R.L. Harris Project (FERC Project No. 2628) (Harris Project), licensed by the Federal Energy Regulatory Commission (FERC or Commission). Alabama Power is relicensing of the 135-megawatt Harris Project, and the existing license expires in 2023. 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. These structures, lands, and water are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir (Harris Reservoir) created by the R.L. Harris Dam (Harris Dam). Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary. This includes land to 795-feet mean sea level (msl)[1], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA) located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan. These lands are leased to, and managed

[1] Also includes a scenic easement (to 800-feet msl or 50-horizontal-feet from 793-feet msl, whichever is less, but never less than 795-feet msl).

by, the State of Alabama for wildlife management and public hunting and are part of the Skyline WMA.

For the purposes of this report, “Lake Harris” refers to the 9,870-acre reservoir, the adjacent 7,392 acres of Project land, and the dam, spillway, and powerhouse. “Skyline” refers to the 15,063 acres of Project land within the Skyline WMA in Jackson County. “Harris Project” refers to all the lands, waters, and structures enclosed within the FERC Project Boundary, which includes both Lake Harris and Skyline. Harris Reservoir refers to the 9,870-acre reservoir only; Harris Dam refers to the dam, spillway, and powerhouse. The Project Area refers to the land and water in the Project Boundary and immediate geographic area adjacent to the Project Boundary.

Commonly used acronyms and abbreviations that may appear in this Initial Study Report (ISR) are included in Appendix A.

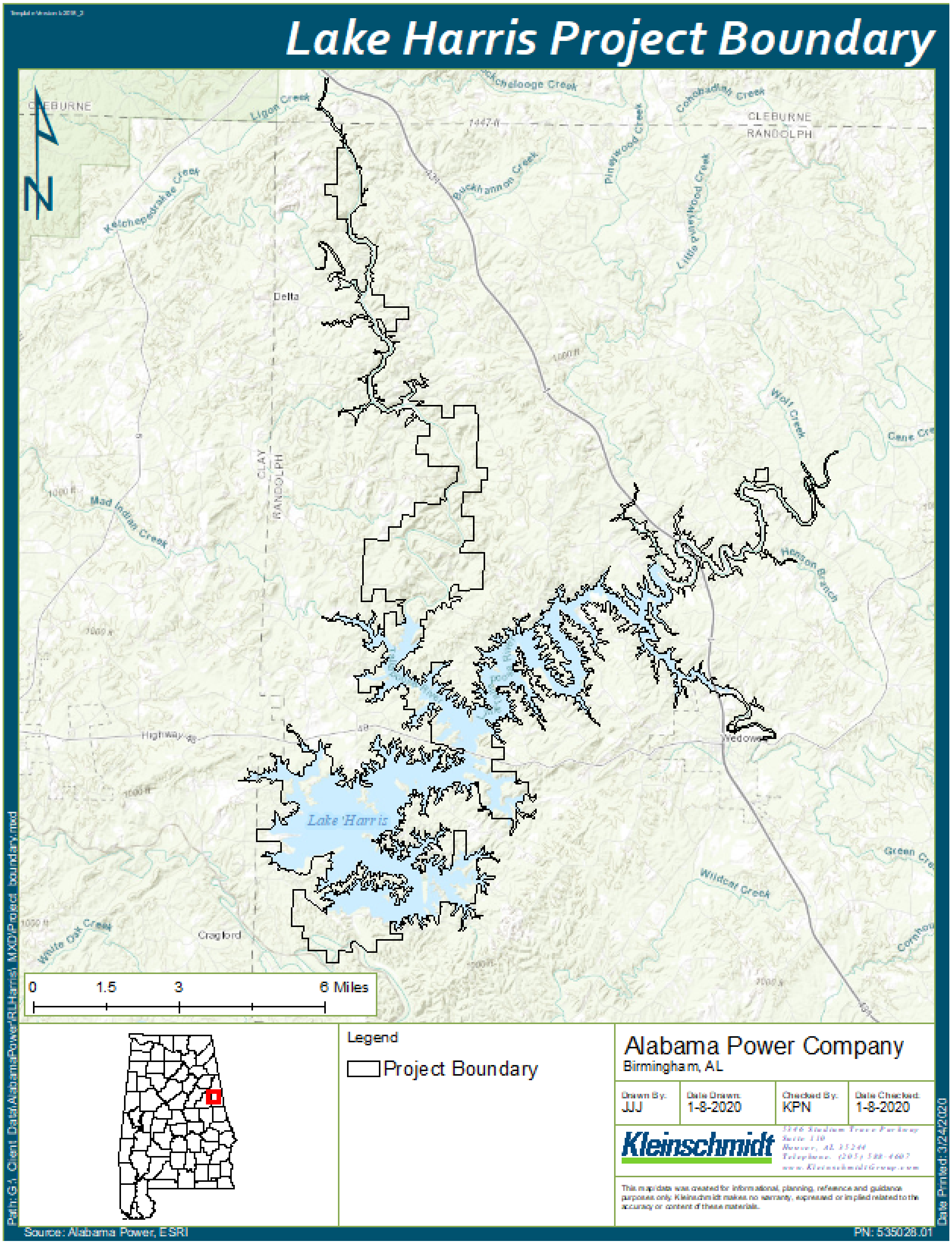

FIGURE 1 LAKE HARRIS PROJECT BOUNDARY

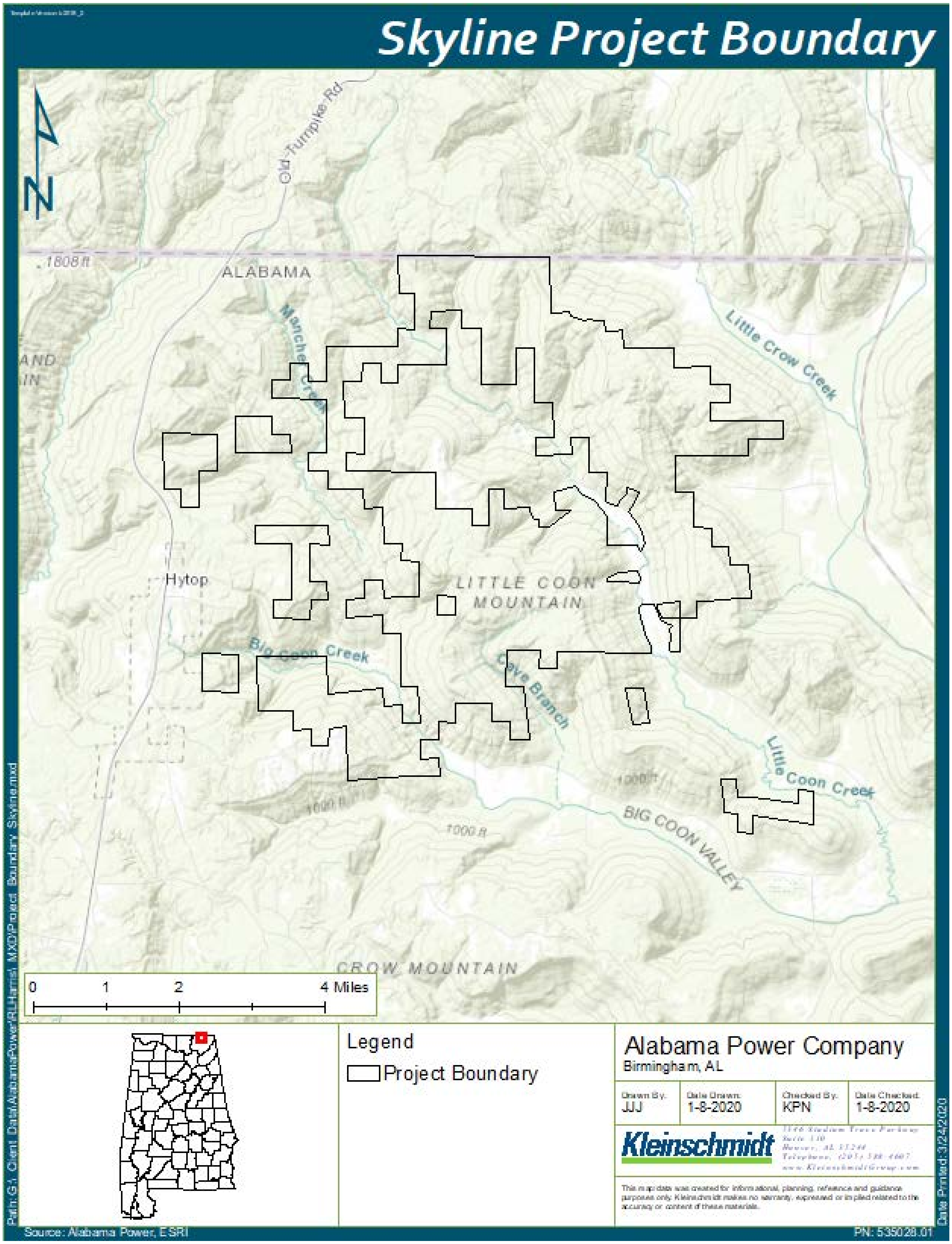

FIGURE 2 SKYLINE PROJECT BOUNDARY

2.0 HARRIS STUDY PLAN OVERVIEW

During the October 19, 2017 Issue Identification Workshop, stakeholders provided information on resources that may be affected by the Harris Project. On August 28 and 29, 2018, FERC held Harris Project Scoping Meetings[2] to provide additional opportunities for stakeholders and the public to present and discuss any issues related to the Harris Project relicensing. On November 13, 2018, Alabama Power filed the following 10 proposed study plans for the Harris Project.

- Operating Curve Change Feasibility Analysis Study
- Downstream Release Alternatives Study
- Erosion and Sedimentation Study
- Water Quality Study
- Aquatic Resources Study
- Downstream Aquatic Habitat Study
- Threatened and Endangered (T&E) Species Study
- Project Lands Evaluation Study
- Recreation Evaluation Study
- Cultural Resources Programmatic Agreement and Historic Properties Management Plan Study

Based on comments filed by stakeholders, Alabama Power filed revised study plans on March 13, 2019. FERC issued a Study Plan Determination (SPD)[3] on April 12, 2019, which approved Alabama Power's study plans and included FERC staff recommendations. Alabama Power incorporated FERC's recommendations and filed the Final Study Plans with FERC on May 13, 2019[4]. According to the FERC's process plan and schedule for the Harris Project, Alabama Power's ISR is due to FERC on or before April 12, 2020.

Alabama Power formed the Harris Action Teams (HATs) to provide stakeholders an opportunity to work on the issues of most importance to them and, in the case of federal and state agencies, those issues where it has regulatory or statutory responsibility. The HATs include:

- HAT 1 – Project Operations
- HAT 2 – Water Quality and Use

[2] Accession Nos. 20181010-4002 and 20181010-4003
[3] Accession No. 20190412-3000
[4] Accession No. 20190513-5093

- HAT 3 – Fish and Wildlife
- HAT 4 – Project Lands
- HAT 5 – Recreation
- HAT 6 – Cultural Resources

The HATs met throughout 2019 and into 2020 to discuss the various studies and to provide input regarding the study process.

Pursuant to FERC's SPD, Alabama Power is filing six draft study reports and two cultural resources documents concurrently with the ISR filing. These include:

- Draft Operating Curve Change Feasibility Analysis Phase 1 Report
- Draft Downstream Release Alternatives Phase 1 Report
- Draft Erosion and Sedimentation Study Report
- Draft Water Quality Report
- Draft Threatened and Endangered Species Desktop Assessment
- Draft Phase 1 Project Lands Evaluation Study Report
- Inadvertent Discovery Plan (IDP)
- Traditional Cultural Properties (TCP) Identification Plan

The filings containing the draft study reports and the cultural resources documents include HAT meeting summaries and presentations, and documentation of consultation between May 2019 through March 2020. Alabama Power will file with FERC the study reports for the Aquatic Resources and Downstream Aquatic Habitat studies according to the due date in the FERC SPD. Alabama Power will file the Draft Recreation Evaluation study report in August 2020[5]. The filing containing these draft study reports will include documentation of consultation from May 2019 to the date the respective study reports are filed with FERC.

Sections 3 through 12 of this ISR summarize the 10 FERC-approved studies in accordance with 18 Code of Federal Regulations (CFR), Section 5.15, including 1) the purpose of the study and summary of methods; 2) the study progress, including data collected; 3) any variance from the

[5] This is a variance in the schedule from the June 2020 date in the FERC SPD.

FERC SPD and schedule; and 4) remaining activities and any modifications to the existing study or new studies proposed by Alabama Power.

3.0 OPERATING CURVE CHANGE FEASIBILITY ANALYSIS STUDY

3.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Operating Curve Change Feasibility Analysis Study evaluates, in increments of 1 foot from 786 feet msl to 789 feet msl (i.e., 786, 787, 788, and 789 feet msl; collectively "winter pool alternatives" or "alternatives"), Alabama Power's ability to increase the winter pool elevation and continue to meet Project purposes. Any changes to the Harris Project operating curve could have the potential to impact downstream communities and, therefore, downstream impacts must be identified in the analysis.

This study is divided into two phases: During Phase 1, Alabama Power performed extensive modeling and analysis of the hydrologic record and baseline information for the Project to identify potential impacts of a winter operating curve change on hydropower generation, flood control, navigation, drought operations, Green Plan flows,[6] and downstream release alternatives. In Phase 2, Alabama Power will conduct qualitative and quantitative evaluations of potential resource impacts (water quality; water use; erosion and sedimentation, including invasive species; aquatic resources; wildlife, threatened and endangered species; terrestrial wetlands; recreation; and cultural resources).

Phase 1 study methods included using existing data (hydrologic record and baseline information) 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 provided the tools needed to identify impacts to operational parameters and resources.

The study methods also included calibrating the models and defining the model boundaries. These methods and models are described in detail in Sections 1 through 4 of the Draft Operating Curve Change Feasibility Phase 1 Report.

[6] See Section 4.2.1.1 of the Draft Operating Curve Change Feasibility Analysis Phase 1 Report for discussion of the Green Plan.

3.2 STUDY PROGRESS

Alabama Power formed HAT 1 to provide stakeholders an opportunity to participate in issues related to Project operations. Alabama Power presented the models and assumptions to HAT 1 on September 11, 2019. As noted in Section 2.0, the Draft Operating Curve Change Feasibility Analysis Phase 1 Report is being filed concurrently with the ISR and the filing contains the relevant HAT 1 meeting summaries, presentations, and documentation of consultation. The Phase 1 draft report presents results for seven operational parameters: hydropower generation, flood control, navigation, drought operations, Green Plan flows, Harris Reservoir levels, and downstream release alternatives.

The Phase 1 Hydrologic Engineering Center-River Analysis System (HEC-RAS) modeling using the Hydrologic Engineering Center-Reservoir System Simulation (HEC-ResSim) model output indicates that any 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.

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.

Using the HydroBudget model, Alabama Power determined that each of the four operating curve alternatives resulted in a loss in hydropower generation. While the greatest annual economic loss occurs in the + 4-foot (789-feet msl) winter pool alternative, this loss represents a relatively small decrease in hydropower generation for the Alabama Power hydroelectric system as a whole.

The four alternatives had no effect, compared to baseline, on Alabama Power’s ability to maintain the Harris Reservoir levels, implement drought operations, or support navigation downstream. Finally, the four alternatives did not affect Alabama Power's ability to release the downstream release alternatives being evaluated in the Downstream Release Alternatives Study Plan.

3.3 Variance from the Study Plan and Schedule

Alabama Power conducted the Operating Curve Change Feasibility Analysis Phase 1 Study in full conformance with FERC's SPD; however, Alabama Power's schedule included hosting a HAT 1 meeting in March 2020. Due to COVID-19 and related travel and public gathering restrictions, and statewide office closures, Alabama Power did not host this meeting.

3.4 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional studies beyond those in the FERC SPD.

Remaining activities include:

- Review comments on the Draft Operating Curve Change Feasibility Analysis Phase 1 Report and modify the Final Report, as appropriate. For any comments not addressed in the Final Report, Alabama Power will provide an explanation of why these comments were not incorporated.
- Alabama Power will use the information in the Phase 1 Final Report along with FERC-approved relicensing study results and existing information to conduct the Phase 2 analysis to determine potential resource impacts on water quality, water use, erosion and sedimentation (including invasive species), aquatic resources, wildlife, T&E species, terrestrial wetlands, recreation resources, and cultural resources.
- In Phase 2, Alabama Power will analyze how the proposed operating curve alternatives could potentially affect existing structures (houses, barns, sheds, etc.) downstream of Harris Dam during flood events. Analysis will include identifying structures inundated under the various alternatives, including depth of inundation and duration.
- The modeling results combined with other environmental study analyses will result in a final recommendation from Alabama Power on any change in the operating curve at Harris.

4.0 DOWNSTREAM RELEASE ALTERNATIVES STUDY

4.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Downstream Release Alternatives Study evaluates the effects of pre- and post-implementation of the Green Plan operations, a continuous minimum flow of 150 cfs (which is roughly the equivalent daily volume of three ten-minute pulses), and an alternative/modified Green Plan operation[7] (i.e., changing the time of day in which Green Plan pulses are released) on Project resources.

This study is being conducted in two phases. In Phase 1, Alabama Power used models developed in other Harris Project FERC-approved studies and conducted modeling simulations using specific methods, tools, and processes (as described in the FERC-approved Study Plan) to evaluate impacts to existing operational parameters, including reservoir levels, hydropower generation, flood control, navigation, and drought operations. In Phase 2, Alabama Power will analyze the effects of the downstream release alternatives on other resources, including water quality, water use, erosion and sedimentation (including invasive species), downstream aquatic resources (temperature and habitat), wildlife and terrestrial resources, T&E species, recreation, and cultural resources.

Study methods included using existing data (hydrologic record and baseline information) to develop the appropriate simulation models to conduct the analysis of the downstream release alternatives. The primary tool for this study is HEC-RAS; however, Alabama Power used other HEC models to address the effects of downstream release alternatives. Tools included: 1) Alabama-Coosa-Tallapoosa (ACT) unimpaired flow database and other U.S. Geological Survey (USGS), U.S. Army Corps of Engineers (USACE), and Alabama Power records; 2) HEC-RAS; HEC-ResSim; Hydrologic Engineering Center- Data Storage System and Viewer (HEC-DSSVue); and Alabama Power's HydroBudget. These models are described in detail in Section 4 of the Draft Downstream Release Alternatives Phase 1 Report.

Impacts to the Harris Project were evaluated by modeling the current operations combined with each downstream release alternative through the daily HEC Res-Sim for the ACT Basin. During

[7] The alternative/modified Green Plan operation downstream release alternative will be evaluated as part of Phase 2. Results from the other three scenarios as well as from the Aquatic Resources Study are needed to design the alternative to be studied.

Phase 2 of this study, the outflow hydrographs from HEC-ResSim will be routed downstream using HEC-RAS to assess effects on alternative release scenarios on Project resources.

4.2 STUDY PROGRESS

Alabama Power formed HAT 1 to provide stakeholders an opportunity to participate in issues related to Project operations. Alabama Power presented the Phase 1 Downstream Release Alternatives models and assumptions to HAT 1 on September 11, 2019. As noted in Section 2.0, the Draft Downstream Release Alternatives Study Phase 1 Report is being filed concurrently with the ISR and the filing contains the relevant HAT 1 meeting summaries, presentations, and documentation of consultation.

The Phase 1 HEC-RAS modeling using the HEC-ResSim output indicates that Pre-Green Plan, Green Plan, and 150 cfs continuous minimum flow have no effect on Harris Reservoir levels, flood control, navigation, or drought operations. Comparing the Pre-Green Plan and Green Plan using HydroBudget shows that returning to Pre-Green Plan operations would result in an annual economic gain to Alabama Power customers from a hydropower generation perspective because all hydropower generation would occur during peak times rather than a portion of generation occurring during off-peak pulsing operations. In evaluating the 150 cfs minimum flow alternative, there are too many unknowns at this time to generate reliable/accurate HydroBudget results; however, if the 150 cfs minimum flow is provided through a non-generation mechanism, the impact to hydropower generation will be the same or slightly worse than the impact from Green Plan operations. The capital and operation and maintenance costs associated with a generating or non-generating mechanism for providing a 150 cfs minimum flow will be considered in other economic analyses required by the relicensing process if it is part of Alabama Power's proposal.

4.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

Alabama Power conducted the Downstream Release Alternatives Study in full conformance with FERC's SPD; however, Alabama Power's schedule included hosting a HAT 1 meeting in March 2020. Due to COVID-19 and related travel and public gathering restrictions, and statewide office closures, Alabama Power did not host this meeting.

4.4 REMAINING ACTIVITIES/MODIFICATIONS OR OTHER PROPOSED STUDIES

Alabama Power does not propose any additional studies beyond those in the FERC SPD**.**

Remaining Activities include:

- Review comments on the Draft Downstream Release Alternatives Study Phase 1 Report and modify the Final Report, as applicable. For any comments not addressed in the Final Report, Alabama Power will provide an explanation why these comments were not incorporated.
- Alabama Power will use the information in the Phase 1 Final Report along with FERC-approved relicensing study results and existing information to conduct the Phase 2 analysis to determine potential resource impacts on water quality, water use, downstream erosion, aquatic resources, wildlife, terrestrial, and T&E resources, recreation, and cultural resources.
- The modeling results combined with other environmental study analyses will result in a final recommendation from Alabama Power on any downstream release at Harris.

5.0 WATER QUALITY STUDY

5.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Draft Water Quality Study Report supplements information included in the 2016 Baseline Water Quality Report. Data sources include Alabama Power, Alabama Department of Environmental Management (ADEM), and Alabama Water Watch (AWW). AWW data was not available to Alabama Power to include in the 2016 Baseline Water Quality Report. Therefore, this study report summarizes data collected from 2017 through 2019 with the exception of AWW data which also includes years prior to 2017. No additional data than what was included in the 2016 Baseline Water Quality Report were available for streams at Skyline. Because the current 303(d) list includes a section of Little Coon Creek at Skyline as impaired due to siltation, it is addressed in the Draft Erosion and Sedimentation Report.

In an effort to support obtaining the required 401 Water Quality Certification (WQC), Alabama Power conducted dissolved oxygen and temperature monitoring in the tailrace at a location previously approved by ADEM, approximately 800-feet-downstream of the Harris Dam on the west bank of the river, from June 1 through October 31 (2017 through 2019). Measurements of dissolved oxygen and temperature were recorded continuously at 15-minute intervals during generation. Alabama Power also collected monthly vertical profiles of temperature and dissolved oxygen in the Harris Reservoir forebay between March and October of 2018 and 2019 for comparison to historic profiles.

In addition to the monitoring to support the 401 WQC, Alabama Power monitored dissolved oxygen and temperature approximately 0.5 mile downstream of Harris Dam. Data were recorded continuously at 15-minute intervals beginning March 1 through October 31, 2019. Alabama Power provided discharge data during the March 1 through October 31 monitoring period to allow for data comparison.

Additionally, Alabama Power worked with HAT 2 participants to identify areas of water quality concern (areas believed to have degraded water quality conditions) and determined if identified areas warrant further examination as well as compiled available water quality information for those areas.

5.2 STUDY PROGRESS

Alabama Power developed HAT 2 to provide stakeholders an opportunity to participate in issues related to water quality. Alabama Power held a HAT 2 meeting on September 11, 2019 and distributed the Draft Water Quality Study Report to HAT 2 participants on March 9, 2020. The Draft Water Quality Report presented results on water quality parameters in the Harris Reservoir as well as in the Tallapoosa River downstream of the Harris Dam. As noted in Section 2.0, the Draft Water Quality Study Report is being filed concurrently with the ISR and the filing contains the relevant HAT 2 meeting summaries, presentations, and documentation of consultation.

Alabama Power collected dissolved oxygen and temperature data as described in the study methods at two locations downstream of the dam, in addition to the monthly vertical profiles collected in the Harris Reservoir forebay.

HAT 2 stakeholders identified one location, the Foster’s Bridge area at Lake Harris, as an area of water quality concern with regard to potential nutrient enrichment and associated impacts. Alabama Power used existing and historical data to assess the Foster’s Bridge area.

Data collected during generation immediately downstream of Harris Dam in 2018 and 2019 indicated dissolved oxygen was greater than 5 milligrams per liter (mg/L) for 94 percent of all measurements (91 percent in 2018 and 99.6 percent in 2019). Data from the continuous monitoring station that recorded data during both generation and non-generation in 2019 indicated dissolved oxygen levels were greater than 5 mg/L for 99.9 percent of all measurements. Monitoring data collected by Alabama Power in 2017 showed numerous events where dissolved oxygen was less than 5 mg/L. The low dissolved oxygen events in 2017 may be attributed to conditions in the Harris Reservoir that were impacted by severe drought in the summer and fall of 2016, where inflows to the lake were at historic lows. A variance that allowed for the lake to be filled two feet above the normal rule curve earlier in the year was likely another contributing factor. Harris Reservoir became more strongly stratified earlier in the year compared to other years. Dissolved oxygen levels at depths below 20 feet in the lake were hypoxic/anoxic from June through October 2017.

Data collected by ADEM on the Tallapoosa River at Harris Dam, Wadley, and Horseshoe Bend showed dissolved oxygen levels were well above 5 mg/L during each of their sampling events.

Data from the recently installed continuous monitor at Malone indicated that dissolved oxygen levels were greater than 5 mg/L for 99 percent of the monitoring period.

5.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

Alabama Power conducted the Water Quality Study in full conformance with FERC's SPD; however, following discussions with ADEM, Alabama Power intends to submit an application to ADEM for the 401 WQC in April 2021, not in April 2020 as noted in the FERC SPD.

5.4 REMAINING ACTIVITIES/MODIFICATIONS OR OTHER PROPOSED STUDIES

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Remaining Activities include:

- Review comments on the Draft Water Quality Study Report and modify the Final Report, as applicable. For any comments not addressed in the Final Report, Alabama Power will provide an explanation why these comments were not incorporated.
- Alabama Power will prepare the 401 WQC application and submit to ADEM in April 2021.

6.0 EROSION AND SEDIMENTATION STUDY

6.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Erosion and Sedimentation Study identified problematic erosion sites and sedimentation areas at the Harris Project and downstream of Harris Dam to Horseshoe Bend and determined the likely causes. Erosion and sedimentation sites were solicited from HAT 2 participants.

Methods for evaluating erosion sites on Lake Harris and the Tallapoosa River downstream of Harris Dam included photographing, georeferencing, and examining each site identified by HAT 2 participants, either in the field or via aerial imagery analysis, to determine the cause of the erosion (i.e., Harris Project operations, land disturbance [development], or natural processes). Additionally, a High Definition Stream Survey (HDSS) was conducted to evaluate streambank conditions on the Tallapoosa River downstream of Harris Dam to Horseshoe Bend. Regarding sedimentation areas, light, detection and ranging (LIDAR) and available satellite imagery/aerial photography were used to examine identified areas. The analysis of both erosion and sedimentation areas was supported by field observations. The identified sedimentation areas will be surveyed for nuisance aquatic vegetation.

Little Coon Creek, which flows through portions of the Project Boundary at Skyline, is currently listed as impaired by ADEM due to siltation. The sources of this impairment include non-irrigated crop production and pasture grazing. Study methods included a GIS analysis of land use classifications within the Project Boundary at Skyline to assess the impact of agriculture on Little Coon Creek. Land use data was provided by the multi-resolution land characteristics (MRLC) consortium.

6.2 STUDY PROGRESS

Alabama Power developed HAT 2 to provide stakeholders an opportunity to participate in issues related to erosion and sedimentation. During the October 19, 2017 issue identification workshop, several stakeholders noted the location of possible erosion and sedimentation areas. Alabama Power distributed an email on May 1, 2019 to HAT 2 participants providing maps of erosion and sedimentation areas previously identified for evaluation and requesting identification of additional areas of erosion and sedimentation concerns. Alabama Power held a HAT 2 meeting on September 11, 2019 where it presented geographic information system (GIS) overlays and maps of erosion and sedimentation sites that would be included in the field assessment. Following the September 11, 2019 HAT 2 meeting, a stakeholder requested, and Alabama Power agreed, to include an additional erosion site in the field assessment. On March 17, 2020, Alabama Power distributed the Draft Erosion and Sedimentation Study Report to HAT 2. As noted in Section 2.0, the Draft Erosion and Sedimentation Study Report is being filed concurrently with the ISR and the filing contains the relevant HAT 2 meeting summaries, presentations, and documentation of consultation.

6.2.1 Lake Harris

Twenty-four erosion sites were identified for field assessment; field assessments were conducted in December 2019 during the winter drawdown when the sites were dewatered and could be fully assessed. Each site was photographed and examined to determine the cause of erosion. No significant signs of active erosion were present at 8 of the 24 sites.

Nine sedimentation areas were identified by stakeholders and by examining available satellite imagery/aerial photography and LIDAR data using GIS. The identified sedimentation areas were limited to areas exposed during the winter pool drawdown due to limitations of LIDAR in measuring below water surfaces. Therefore, approximate surface area for each identified sedimentation area was measured using contours established in a 2015 LIDAR survey of the lake during the drawdown. Limited aerial imagery of the lake during winter draw down and historic LIDAR data for the reservoir did not allow for a comparison to historic conditions. On December 4, 2019, Alabama Power visited all sedimentation areas that were accessible via boat to conduct field verification.

Sedimentation areas on Lake Harris are primarily concentrated in the Little Tallapoosa arm where riverine flows enter the impoundment zone created by Lake Harris. To assess potential causes for sediment introduction to the system, land use classifications were analyzed for the Little Tallapoosa River Basin in 2001 and compared to 2016. Twenty-five percent of the Little Tallapoosa River Basin has been converted to hay/pasture fields. Land clearing and conversion to agricultural fields is a significant contributing factor of sedimentation in the Little Tallapoosa arm of Lake Harris.

6.2.2 TALLAPOOSA RIVER DOWNSTREAM OF HARRIS DAM

Streambank condition point data collected during the downstream HDSS was averaged into 0.1-mile segments to help facilitate finding any failing streambank areas. Using these data, a ranking system was developed to understand specific areas of failing streambanks on the Tallapoosa River and to identify any significantly impaired areas. Notably, only one area scored as impaired to non-functional (located on the right bank between river mile [RM] 16.3 to 16.9).

The downstream HDSS results were also used to assess the condition of identified erosion sites 22 and 23. These sites were assessed using the same criteria as the erosion sites located within Lake Harris. Both sites were confirmed to have areas of erosion primarily caused by adjacent land use/clearing and natural riverine processes.

6.2.3 SKYLINE

A GIS analysis of land use classifications within the Project Boundary at Skyline was used to assess the impact of agriculture on Little Coon Creek. A comparison of land use within the watershed boundary of Little Coon Creek was conducted using the earliest available MRLC landcover dataset (2001) and the most recent (2016). This analysis indicated that 8.8 percent of the land within the watershed is used for agriculture (i.e. cultivated crops and hay/pasture), increasing from 2001 to 2016. The proximity of these areas to Little Coon Creek more easily allows for soils loosened due to tilling or other agricultural practices to be washed into Little Coon Creek, resulting in sedimentation of the creek bottom.

6.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

There are no variances from the study plan or schedule.

Alabama Power conducted the Erosion and Sedimentation Study in full conformance with FERC's SPD.

6.4 REMAINING ACTIVITIES/MODIFICATIONS OR OTHER PROPOSED STUDIES

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Remaining Activities include:

- Alabama Power will perform additional reconnaissance at identified sedimentation sites on Lake Harris during full (summer) pool conditions to determine if any nuisance aquatic vegetation is present and provide the results of that assessment to HAT 2 in the form of a technical memorandum.
- Review comments on the Draft Erosion and Sedimentation Study Report and modify the Final Report, as applicable. For any comments not addressed in the Final Report, Alabama Power will provide an explanation why these comments were not incorporated.

7.0 AQUATIC RESOURCES STUDY

7.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Aquatic Resources Study evaluates the effects of the Harris Project on aquatic resources. Monitoring conducted since the initiation of the Green Plan[8] indicated a positive fish community response and increased shoal habitat availability; however, little information exists characterizing the extent that the Green Plan enhanced the aquatic habitat from Harris Dam downstream through Horseshoe Bend. Furthermore, the Alabama Department of Conservation and Natural Resources (ADCNR) noted the abundance of some species is below expected levels, which could be due to several factors including sampling methodologies, thermal regime, flow regime, and/or nutrient availability.

Stakeholders noted that stream temperatures in the Tallapoosa River downstream of Harris Dam are generally cooler than other unregulated streams in the same geographic area, and this portion of the Tallapoosa River experiences temperature fluctuations due to peaking operations at Harris Dam. There is concern that the lower stream temperatures and temperature fluctuations are impacting the aquatic resources (especially fish) downstream of Harris Dam. ADCNR recommended use of a bioenergetics model to evaluate the potential effects of temperature fluctuations due to current Project operations on fish downstream of Harris Dam.

Questions have also been raised regarding potential effects the Harris Project may have on other aquatic fauna within the Project Area, including macroinvertebrates such as mollusks and crayfish. Alabama Power is investigating the effects of the Harris Project on these aquatic species and is performing an assessment of the Harris Project's potential effects on species mobility and population health.

These study tasks are being accomplished through desktop assessments, field studies, and laboratory studies. Alabama Power has been compiling and summarizing data from existing information sources to provide a comprehensive characterization of aquatic resources within the Project Area. Alabama Power is also working with Auburn University to conduct field and

[8] Generally, the Green Plan specifies short (10 to 30 minute) pulses from Harris Dam, with the pulse duration determined by conditions at a gage on an unregulated section of the Tallapoosa River upstream of Harris Reservoir. The purpose of the Green Plan was to reduce the effects of peaking operations on the aquatic community downstream.

laboratory studies of the fish populations in the Tallapoosa River downstream of Harris Dam through Horseshoe Bend to determine how Harris Dam may be affecting the fish community in this reach.

7.2 Study Progress

Alabama Power developed HAT 3 to provide stakeholders an opportunity to participate in issues related to fish and wildlife resources. Alabama Power is performing a desktop assessment summarizing relevant current and historic information characterizing aquatic resources at the Harris Project. Sources of information include reservoir fisheries management reports, scientific literature from aquatic resource studies conducted in the Study Area, ADCNR Natural Heritage Database data, Alabama Power faunal survey data, and state and federal faunal survey data.

Currently, Alabama Power is finalizing this desktop assessment and will include it in the Draft Aquatic Study Report to be filed with FERC in July 2020.

A literature review of temperature requirements of target species (Redbreast Sunfish, Channel Catfish, Tallapoosa Bass, and Alabama Bass) is being conducted by Auburn University. Because the Alabama Bass is recently described, there is little information on its temperature requirements; therefore, temperature data for the spotted bass, a closely related species, is being used. Alabama Power and USGS have provided Auburn University with historic temperature data to incorporate into its analysis.

Auburn University has been sampling the fish community at four sites: Horseshoe Bend, Wadley, Lee’s Bridge (control site), and the Harris Dam tailrace. Sampling was conducted in April, May, July, September, November 2019, and January 2020, with six, 10-minute sampling transects occurring each sampling day. Individual fish were weighed, measured, sexed, had gonads removed and weighed, had diets removed from stomachs and preserved, and had otoliths removed and stored to be evaluated. To date, all diets have been quantified, all prey items identified, and a subsample measured, and all diet data have been entered into a databank for evaluation.

Representative specimens of the target fish collected at the four sites are being used in intermittent flow static respirometry tests to assess their baseline, or resting, metabolic rates under multiple temperatures. The metabolic rates will be used in bioenergetics models for each target species at each of the four sites. Swimming respirometry is also being used to quantify both performance capabilities of fish and their active metabolic rates. Diet, size distributions, and growth rates are currently being estimated for bioenergetics model simulations.

As noted in Section 2.0, Alabama Power will file the Draft Aquatic Resources Study Report with consultation documentation in July 2020.

7.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

To date, Alabama Power has conducted the Aquatic Resources Study in full conformance with FERC's SPD; however, Alabama Power's schedule included hosting a HAT 3 meeting in March 2020. Due to COVID-19 and related travel and public gathering restrictions, and statewide office closures, Alabama Power did not host this meeting.

Auburn University is exploring alternatives to electromyogram radio tags because of their limited ability to quantify fish swimming energetic costs and the relatively large size of these tags. Acoustic/radio (CART) tags are being considered, and the study plan will be revised if needed, to track the activity of individual fish from small watercraft and to detect their position.

7.4 REMAINING ACTIVITIES/MODIFICATIONS OR OTHER PROPOSED STUDIES

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Remaining tasks include**:**

- Incorporate the Aquatic Resources Desktop Assessment into the Draft Aquatic Resources Study Report.
- Obtain temperature data at the USGS and Alabama Power monitors and the 20 temperature and level loggers stationed downstream of Harris Dam (recording through July 2020 or later). Temperatures recorded from 2019 and 2020 will be consolidated with historical data.
- Gather and review literature and any available information on temperature tolerances, preferences, or optima for target species.
- Continue fish sampling at each site every other month, conditions permitting, through November 2020.
- Consider an alternative "control" site upstream of the reservoir because the flow regime at the current upstream site (Lee's Bridge) appears to be more closely affected by dam operations than expected.

- Tag and track fish with CART tags during summer of 2020.
- Continue static respirometry tests and complete at both 10 degrees Centigrade (10ºC) and 21°C in 2020.
- Continue to measure active metabolic rates using a combination of increasing water velocity and decreasing water temperature.
- Incorporate the necessary physiological parameters into the bioenergetics model to conduct simulations needed to test potential influence of water temperature and flow on growth rates of fishes below Harris Dam. Auburn University will estimate annual growth of the target fish species using temperature regimes and diets observed in upstream control sites compared to downstream treatment sites along more impacted sections of the Tallapoosa River.
- Alabama Power will distribute the Draft Aquatic Resources Study Report and file with FERC in July 2020. Alabama Power will review comments on the Draft Aquatic Resources Study Report and modify the Final Report, as applicable. For any comments not addressed in the Final Report, Alabama Power will provide an explanation why these comments were not incorporated.

8.0 DOWNSTREAM AQUATIC HABITAT STUDY

8.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Downstream Aquatic Habitat Study describes the relationship between Project operations and aquatic habitat in the Tallapoosa River from Harris Dam through Horseshoe Bend. This study includes the following:

- **Mesohabitat Analysis** - A desktop analysis of the types of available habitat in the Tallapoosa River using GIS, aerial imagery, and visual observations.
- **Hydrologic Data Collection and Analysis –** Collection and analysis of water level, river channel, and water temperature data.
- **Modeling –** Development of a HEC-RAS model to evaluate the effect of current operations on the amount and persistence of wetted aquatic habitat, especially shoal/shallow-water habitat.

8.2 STUDY PROGRESS

Alabama Power developed HAT 3 to provide stakeholders an opportunity to participate in issues related to fish and wildlife resources. Alabama Power held a HAT 3 meeting on December 11, 2019, to review methods for calculating the habitat types using HEC-RAS. Due to low attendance in December 2019, Alabama Power held an additional HAT 3 meeting on February 20, 2020. Alabama Power will file the Draft Downstream Aquatic Habitat Study Report, along with the relevant documentation of consultation, with FERC in June 2020.

The desktop mesohabitat analysis concluded that the 47-mile reach of the Tallapoosa River below Harris Dam is comprised of approximately 46 percent pool habitat, 44 percent riffle habitat, and 10 percent run habitat with current operations. The analysis indicated these habitat types are relatively evenly distributed along the reach, except for a reach between 7 miles and 14 miles downstream of Harris Dam where the amount of riffle habitat per mile is nearly twice that of other reaches.

Water level loggers installed at twenty locations in the Tallapoosa River below Harris Dam began recording water level and water temperature at 15-minute intervals in April 2019 and will continue through June 2020. During deployment and subsequent visits to perform maintenance and download logger data, technicians performed bathymetric surveys at approximately 200 cross-sections to acquire accurate riverbed elevation data for use in the hydraulic model.

The existing HEC-RAS model[9] terrain was updated using newly collected riverbed elevation and LIDAR data. Based on the USACE's unimpaired flow data set for the Tallapoosa River, 2001 was selected as an "average" water year for modeling purposes. Alabama Power ran simulations using hydrographs created with Harris Dam operations data for 2001. Alabama Power is currently analyzing the results to determine the effects on downstream aquatic habitat.

8.3 Variance from the Study Plan and Schedule

To date, Alabama Power has conducted the Downstream Aquatic Habitat Study in full conformance with FERC's SPD; however, Alabama Power's schedule included hosting a HAT 3 meeting in March 2020. Due to COVID-19 and related travel and public gathering restrictions, and statewide office closures, Alabama Power did not host this meeting.

8.4 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Remaining activities include:

- Continue analyzing the results of Green Plan model simulations based on input and recommendations. Note that effects on downstream aquatic habitat from modifications to current operations are addressed in the Phase 2 of the Downstream Release Alternatives Study.
- Continue collecting level logger data through June 2020.
- Alabama Power will distribute a Draft Downstream Aquatic Habitat Report in June 2020. Alabama Power will review comments on the Draft Aquatic Resources Study Report and modify the Final Report, as applicable. For any comments not addressed in the Final Report, Alabama Power will provide an explanation why these comments were not incorporated.

[9] The HEC-RAS model developed for the Operating Curve Change Feasibility Analysis and the Downstream Release Alternatives Study was used for this downstream aquatic habitat study.

9.0 THREATENED AND ENDANGERED SPECIES STUDY

9.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Threatened and Endangered Species Study assesses the probability of populations of currently listed federal and/or state protected species and/or their critical habitat occurring within the Harris Project Boundary or Project Area and determine if there are Project related impacts.

The study methods include conducting a desktop analysis of habitat information and maps, compiling a list of federally and state protected T&E species, and identifying critical habitats that occur within the Harris Project Vicinity and the downstream reach of the Tallapoosa River from the Harris Dam through Horseshoe Bend. This study includes reviewing habitat requirements and range of existing and extirpated species and identifying environmental factors potentially affecting each species.

9.2 STUDY PROGRESS

Alabama Power developed HAT 3 to provide stakeholders an opportunity to participate in issues related to fish and wildlife resources. Alabama Power held a HAT 3 meeting on August 27, 2019 to discuss the T&E Species Study Plan and methods. Alabama Power and the USFWS met on November 21, 2019 to survey for fine-lined pocketbook on an approximate 3.75-mile stretch of the Tallapoosa River starting from the County 36 bridge and extending to the shoal below the Highway 431 bridge. The USFWS and Alabama Power agreed to conduct additional surveys on the fine-lined pocketbook in Spring 2020.[10]

Alabama Power distributed the Draft Threatened and Endangered Species Desktop Assessment to stakeholders on February 21, 2020. As noted in Section 2.0, the Draft Threatened and Endangered Species Desktop Assessment is being filed concurrently with the ISR and the filing contains the relevant HAT 3 meeting summaries, presentations, and consultation records.

The draft desktop assessment determined the probability of populations of currently listed T&E species and/or their critical habitat occurring within the Harris Project Boundary or Project Area. A list of species potentially occurring in Alabama counties in the Project Vicinity was compiled

[10] The date of survey may be modified due to COVID-19 restrictions. Alabama Power will consult with the USFWS on survey dates.

from the T&E species list using ADCNR, USFWS, and Alabama Natural Heritage Program databases.

Results and maps were obtained and summarized from USFWS Recovery Plans and 5-Year Reviews, the Federal Register Listings and Critical Habitat Designations, and USFWS Environmental Conservation Online System (ECOS). Maps depicting current species ranges and critical habitats were developed using GIS data available on the USFWS' ECOS online system. This information was used to determine whether further assessments of identified species and habitat are necessary.

The Alabama counties in the vicinity of the Harris Project overlap with the habitat range, critical habitat, and extant populations of 20 federal and state protected T&E species. Nine of these species have habitat ranges intersecting with the Project Boundaries, five of which have a range occurring in the Project Boundary at Skyline, and six of which have a range occurring in the Project Boundary at Lake Harris. Additionally, the USFWS has designated critical habitat for 6 of the 20 total species identified (finelined pocketbook, Indiana bat, rabbitsfoot, slabside pearlymussel, southern pigtoe, and spotfin chub). In addition to critical habitat ranges, specific extant populations were identified for ten species. Seven of the ten listed mussels (Alabama lampmussel, fine-rayed pigtoe, pale lilliput, rabbitsfoot, snuffbox, shiny pigtoe, and slabside pearlymussel), and one of the two listed fish (palezone shiner) have extant populations in the Paint Rock River, which is located 3.9 linear miles from the closest Project Boundary at Skyline. The desktop review of federally listed species and their habitats identified potential habitat for three bat species, two mussels species, two plant species, and a bird that may have habitat within the Project Boundary at Lake Harris and Skyline.

9.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

To date, Alabama Power has conducted the Threatened & Endangered Species Study in full conformance with FERC's SPD; however, Alabama Power's schedule included hosting a HAT 3 meeting in March 2020. Due to COVID-19 and related travel and public gathering restrictions, and statewide office closures, Alabama Power did not host this meeting.

9.4 REMAINING ACTIVITIES/MODIFICATIONS OR OTHER PROPOSED STUDIES

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Remaining Activities include:

- Review comments on the Draft Threatened and Endangered Species Desktop Assessment and modify the Final Assessment, as applicable. For any comments not included in the Final Assessment, Alabama Power will provide an explanation why these comments were not incorporated.
- Alabama Power will continue working with USFWS to complete field surveys at Harris and Skyline WMA to determine if T&E species are located within the Harris Project Boundary. Species to be surveyed in Spring/Summer 2020[11] include: the palezone shiner at Skyline WMA and the fine-lined pocketbook mussel upstream of Harris Dam.
- The Final T&E Species Study Report will include the Desktop Assessment, the results of all field investigations, and other tasks described in the FERC SPD T&E Species Study Plan.

[11] The date of survey may be modified due to COVID-19 restrictions. Alabama Power will consult with the USFWS on survey dates.

10.0 PROJECT LANDS EVALUATION STUDY

10.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Harris Project Lands Evaluation identifies lands around Lake Harris and at Skyline that are needed for Harris Project purposes and classifies these lands based upon use. Alabama Power evaluated the land use classifications for the Harris Project and determined changes needed to conform to Alabama Power's current land classification system and other Alabama Power FERC-approved Shoreline Management Plans (SMP). This Phase 1 portion of the study identified lands to be added to, or removed from, the current Harris Project Boundary and/or be reclassified. Phase 2 will use the results of Phase 1 and other Harris relicensing studies to develop a Wildlife Management Program (WMP) and a SMP.

The process and methods for Phase 1 included: meeting with HAT 4 members to discuss potential changes to the Harris Project lands (add, delete, or reclassify); a desktop analysis utilizing GIS data such as T&E species, wetlands, and cultural resources (i.e., "Sensitive Areas"), timber management tracts and current practices, and ADEM's data on impaired waters; and developing a draft map using GIS to show all proposed changes to Harris Project lands.

Phase 2 includes development of a SMP (Phase 2A) and a WMP (Phase 2B) to file with the final license application. In addition to the results from the Phase 1 Project Lands Evaluation, Alabama Power will incorporate information collected during other relicensing studies (e.g., T&E, water quality, and recreation studies), as appropriate, to the SMP and WMP. Specific activities for developing the SMP and WMP are included in FERC's SPD.

10.2 STUDY PROGRESS

Alabama Power developed HAT 4 to provide stakeholders an opportunity to participate in issues related to Project lands, the WMP, and SMP. Alabama Power held a HAT 4 meeting on September 11, 2019, to review proposed land use changes, including lands to be added to the Project Boundary, lands to be removed from the Project Boundary, and proposed changes in land use classifications of existing Project lands. Alabama Power presented the proposed changes in GIS overlays. Following the September 11, 2019 HAT 4 meeting, Alabama Power solicited feedback from HAT 4 regarding the Project Lands proposal. As noted in Section 2.0, the Draft Phase 1 Project Lands Evaluation Study Report is being filed concurrently with the ISR and the filing contains the relevant HAT 4 meeting summaries, presentations, and documentation of consultation.

Alabama Power identified lands around Lake Harris and at Skyline that are needed for Harris Project purposes and classified these lands based upon use. In addition, Alabama Power evaluated acreage at Skyline to determine availability of suitable bobwhite quail habitat and prepared the Draft Phase 1 Project Lands Evaluation Study Report. Finally, Samford University conducted a botanical inventory of a 20-acre parcel at Flat Rock Park.

10.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

There are no variances from the study plan or schedule.

Alabama Power conducted the Project Lands Evaluation in full conformance with FERC's SPD.

10.4 REMAINING ACTIVITIES/MODIFICATIONS OR OTHER PROPOSED STUDIES

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Remaining activities include:

- Alabama Power will review comments on the Draft Phase 1 Project Lands Evaluation Study Report and modify the Final Report, as applicable. For any comments not addressed in the Final Report, Alabama Power will provide an explanation of why these comments were not incorporated.
- Samford University will conduct a botanical survey on an additional 21 acres of land adjacent to the previously surveyed area.
- Complete the Project Lands Evaluation Study Plan methods for Phase 2 SMP and WMP.

11.0 RECREATION EVALUATION STUDY

11.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Harris Recreation Evaluation Study Plan and subsequent relevant FERC filings contain several components to determine potential recreational impact of the Harris Project: 1) recreational use of the Harris Project (Lake Harris Public Access); 2) recreational use of the Tallapoosa River below Harris Dam (Tallapoosa River User); and, 3) as introduced in the December 19, 2019 FERC filing, the Tallapoosa River Landowner Survey Research Plan[12].

The Lake Harris Public Access component includes gathering baseline information on existing Project recreation facilities, existing Project recreational use and capacity, and estimated future demand and needs at the Harris Project. For this component, Alabama Power has completed the following:

- Reviewed existing information and inventoried and mapped (using GIS) existing Project recreation sites and access areas within the Project Boundary;
- Summarized who owns, operates, and maintains each Project recreation site;
- Evaluated the condition of the Harris Project recreation sites and facilities within the Project Boundary; and
- Estimated current recreation use and the current and projected use capacity at Harris Project recreation sites[13].

To determine how flows in the Tallapoosa River downstream of Harris Dam affect recreational users and their activity, Alabama Power has completed the following:

- Calculated total visitation (effort) and daily effort levels by user groups during the study period (May 1, 2019 to October 31, 2019);
- Measured user attitudes/perceptions about instream flow and trip satisfaction on the day they were intercepted during this period;
- Obtained catch information from anglers intercepted during this period; and

[12] Accession No. 20191219-5186.
[13] Alabama Power worked with Southwick Associates on this component of the study and as of April 2020, this information is still preliminary and will be presented to stakeholders in the Draft Recreation Evaluation Report.

- Determined how instream flow affected a) overall effort, b) daily effort by each user group, c) perception of instream flow and trip satisfaction by user group, and d) species of fish targeted, caught, and retained[14].

Alabama Power is also surveying landowners downstream of Harris Dam[15] as well as recreational users of the Tallapoosa River regarding their recreation use of the Tallapoosa River. Alabama Power:

- Reviewed county tax records to identify residential, vacation, forestry, agricultural, or vacant land adjacent to the Tallapoosa River in Randolph, Chambers, or Tallapoosa Counties that could be used for river-related recreation and obtained their mailing address;
- Developed a survey instrument to collect information from downstream landowners on their recreational use of the Tallapoosa River, use by others they may provide access to on their property, landowner perception of instream flow, and their attitudes about recreation and other resource issues on the Tallapoosa River downstream of Harris Dam to Jaybird Landing Boat Ramp; and
- Sent landowners an introductory pre-survey letter via first-class mail informing them of the study, followed one week later with a first-class mailing with a request to participate in study. This mailing included a paper copy of the survey, including a self-addressed stamped envelope for return, and also provided directions to fill out the survey online.

11.2 STUDY PROGRESS

Alabama Power developed HAT 5 to provide stakeholders an opportunity to participate in issues related to recreation. Alabama Power held a HAT 5 meeting on December 11, 2019, to discuss the Tallapoosa River Landowner Survey Research Plan. Alabama Power will file the Draft Downstream Recreation Evaluation Study Report, along with the relevant documentation of consultation, with FERC in August 2020.

Alabama Power conducted Lake Harris Public Access questionnaires and counts from March to December 2019 (counts were conducted almost daily and employed nine recreation clerks who conducted 1,357 questionnaires) [16]. Alabama Power also conducted Tallapoosa River User Surveys and counts from May to October 2019 (40 count days with approximately 200 surveys).

[14] Alabama Power worked with Dr. Kevin Hunt on this component of the survey and as of April 2020, this information is still preliminary and will be presented to stakeholders in the Draft Recreation Evaluation Report.
[15] As described in the December 19, 2019 Tallapoosa River Landowner Survey Research Plan.
[16] The start date for the counts was March 11, 2019. The survey questionnaire started on May 10, 2019. The last date for both was December 15, 2019.

Additionally, ADCNR provided data on recreation use at the Skyline WMA (man-days hunted and harvest estimates were conveyed in August 2019). In October 2019, Alabama Power inventoried recreation facilities at the Lake Harris Public Access sites (12 Harris Project Recreation sites[17], Lakeside Marina, and Wedowee Marine).

At the conclusion of the Tallapoosa River User Survey, researchers noted a lack of information from downstream landowners. To supplement data collected at public recreation sites on the Tallapoosa River downstream of the Project, Alabama Power developed a survey for downstream landowners regarding river-related recreation. Alabama Power facilitated a HAT 5 meeting on December 11, 2019, to provide stakeholders the opportunity to comment on the proposed Tallapoosa River Downstream Landowner Survey. Alabama Power incorporated several comments from HAT 5 members into the Tallapoosa River Landowner Survey Research Plan (including distributing a paper copy of the survey and delaying the start of the survey). Per stakeholder suggestions at the December 2019 HAT meeting, Alabama Power added an anonymous internet survey (Tallapoosa River Recreation User Survey) for river users to express opinions regarding their recreation experience on the Tallapoosa River. Initially, Alabama Power was only assessing landowners who owned residential, vacation, agricultural land that may be used as a residence, or non-industrial vacant land that was tied to an individual landowner. Alabama Power expanded the landowner categories to include forest landowners (known businesses in this category were removed so that only private individuals remained) and extended the response deadline for the Tallapoosa River Downstream Landowner Survey to April 15, 2020 (original deadline was March 31, 2020).

11.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

To date, Alabama Power conducted the Recreation Evaluation Study in full accordance with the methods and schedule described in the FERC SPD with the exception of the following variances:

- Alabama Power added the Tallapoosa River Downstream Landowner Survey and Tallapoosa River Recreation User Survey described above.
- Alabama Power will file the Draft Harris Project Recreation Evaluation report in August 2020 (rather than June 2020) due to the additional study elements and extended

[17] Lee's Bridge Boat Ramp; Foster's Bridge Boat Ramp; Swagg Boat Ramp; Lonnie White Boat Ramp; Crescent Crest Boat Ramp; Highway 48 Bridge Boat Ramp; Wedowee Marine South Marina; Little Fox Creek Boat Ramp Big Fox Creek Boat Ramp; Flat Rock Park Day Use Park; R. L. Harris Management Area; and Harris Tailrace Fishing Platform.

participation deadlines. Alabama Power will keep with the schedule and file the Final Harris Project Recreation Evaluation report in November 2020.

Alabama Power's schedule included hosting a HAT 5 meeting in March 2020. Due to COVID-19 and related travel and public gathering restrictions, and statewide office closures, Alabama Power did not host this meeting.

11.4 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Due to the additional surveys and subsequent processing and analysis of the data, Alabama Power will file the Draft Recreation Evaluation Study Report in August 2020 rather than in June 2020. Alabama Power is not proposing to change the Final Report due date in November 2020.

Remaining activities include:

- Use information collected from the Tallapoosa River Downstream Landowner Survey and Tallapoosa River Recreation User Survey to characterize use of the Tallapoosa River downstream of Harris Dam to Jaybird Landing Boat Ramp.
- Use information on river flow to determine how instream flow affects landowner recreational use and satisfaction on the Tallapoosa River downstream of Harris Dam.
- Combine Tallapoosa River Downstream Landowner Survey and Tallapoosa River Recreation User Survey with data gathered at public recreation sites in 2019.
- In August 2020, Alabama Power will distribute a Draft Recreation Evaluation Study Report. Alabama Power will review comments on the Draft Recreation Evaluation Study Report and modify the Final Report, as applicable. For any comments not addressed in the Final Report, Alabama Power will provide an explanation why these comments were not incorporated.

12.0 CULTURAL RESOURCES STUDY

12.1 STUDY PURPOSE AND SUMMARY OF METHODS

The Harris Project Cultural Resources[18] Programmatic Agreement and Historic Properties Management Plan Study Plan involves collecting and summarizing existing cultural resources baseline information and developing a plan to assess cultural resources identified in the Harris Project Area of Potential Effect (APE).

Alabama Power will develop a Historic Properties Management Plan (HPMP) for the Harris Project. The HPMP will describe the Harris Project, APE, anticipated effects, and Alabama Power's proposed measures to protect historic properties.

As part of this study, Alabama Power will determine the need for, and if required, develop a draft Programmatic Agreement (PA) (among FERC, the State Historic Preservation Office [SHPO], Alabama Power, and applicable federally recognized tribes[19]) for managing historic properties that may be affected by a new license issued to Alabama Power for the continued operation of the Harris Project. FERC will issue the draft PA with any draft National Environmental Policy Act (NEPA) documents (Environmental Assessment or Environmental Impact Statement) and then issue the final PA with the final NEPA analysis.

12.2 STUDY PROGRESS

Alabama Power formed HAT 6 to provide stakeholders an opportunity to participate in issues related to cultural resources. Alabama Power has conducted several HAT 6 meetings in 2019 and 2020. These meetings covered numerous topics, summarized below:

- May 22, 2019 - Sites Selected for Further Evaluation, TCP Identification Plan, APE, HPMP outline
- July 9, 2019 - Sites Selected for Further Evaluation

[18] FERC has the responsibility to consult with the Advisory Council on Historic Preservation (Advisory Council) and the Alabama Historical Commission (AHC or State Historic Preservation Office [SHPO]) pursuant to the Advisory Council's regulations (36 U.S. Code of Federal Regulation [C.F.R.] part 800) implementing the National Historic Preservation Act (NHPA) (54 U.S. States Code [U.S.C.] 306108; hereinafter, "Section 106".

[19] Applicable tribes as of March 2019- Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Coushatta Tribe of Louisiana, Kialegee Tribal Town, Muscogee (Creek) Nation, Poarch Band of Creek Indians, and Thlopthlocco Tribal Town.

- November 6, 2019 - Muscogee August 19, 2019 Letter, Fish Weir Information, Final Determination of Lake Harris Sites for Further Evaluation, Lake Harris Survey Schedule, Lake Harris Site Evaluation Methods, Skyline Site Selection and Evaluation Methods, HPMP, IDP, and TCP Identification Plan outline discussion
- March 2, 2020 - Draft IDP, Draft TCP Identification Plan, Proposed APE

Alabama Power and the Office of Archeological Research (OAR) reviewed existing information on the 330 previously recorded archeological sites and identified sites for further evaluation. Of the 96 sites identified for preliminary archeological assessments, 79 were identified through OAR research and 17 additional sites were requested by the Muscogee (Creek) Nation[20]. Per the OAR, the preliminary archaeological assessment was intended to determine the general disposition of previously recorded archaeological sites selected in concert with consulting parties that were considered potentially significant cultural resources. The preliminary archeological assessment was conducted to determine the location, setting, and general condition of the sites. It involved both a literature/records search and, if needed, an on-site field reconnaissance. In addition, Alabama Power and OAR performed cultural resources assessments[21] at several sites at Skyline (previous surveys identified 141 sites as Undetermined in regard to their National Register of Historic Places [National Register] status in the Alabama State Site File). Finally, Alabama Power and OAR evaluated a sample of the 236 known caves recorded in Skyline (13 caves were investigated by using digital photography, mapping rock art locations, and documenting other utilization)[22].

The FERC SPD specified that “Alabama Power should also include both a written description of the APE, a map clearly identifying the APE and its relationship to the Harris Project Boundary, and concurrence from, the Alabama SHPO on the APE prior to conducting fieldwork (5.9(b)(6).” Beginning in May 2019, Alabama Power consulted with stakeholders to establish the Harris Project APE and Alabama Power is continuing to work with Alabama SHPO to finalize the APE.

[20] Filed on August 16, 2019.

[21] Cultural Resource Assessments conducted at Skyline and those to be conducted around Lake Harris comply with the Alabama SHPO guidelines. Methods for both the preliminary archeological assessments and cultural resources assessments were shared with appropriate HAT 6 members following the November 6, 2019 meeting.

[22] These investigations were led by Scott Shaw. Scott did the initial assessment of the caves and bat populations prior to field crews entering to conduct documentation. Scott made efforts to avoid large hibernating populations and record any bat species encountered within each visited cave. This information was shared with Alabama Power for dissemination as appropriate to USFWS and ADCNR.

In addition, Alabama Power worked with HAT 6 to develop the IDP and the TCP Identification Plan.

Per section 304 of the National Historic Preservation Act (NHPA), as amended, and 36 CFR 800.11(c), Alabama Power will "withhold any information about the location, character, or ownership of a historic property from public disclosure when disclosure may cause a significant invasion of privacy, risk harm to the historic property, or impede the use of a traditional religious site by practitioners." Alabama Power will file all such information collected to date as "privileged."

As noted in Section 2.0, the cultural documents filed concurrently with this ISR contain HAT 6 meeting summaries, presentations, and documentation of consultation.

12.3 VARIANCE FROM THE STUDY PLAN AND SCHEDULE

Alabama Power conducted the Cultural Resources Programmatic Agreement and Historic Properties Management Plan Study in full conformance with FERC's SPD.

Alabama Power continues to work with the Alabama SHPO for concurrence regarding the Harris APE and plans to file the final APE (with maps) by June 30, 2020.

12.4 REMAINING ACTIVITIES/MODIFICATIONS OR OTHER PROPOSED STUDIES

Alabama Power does not propose any additional studies beyond that in FERC's SPD.

Remaining Activities include:

- Alabama Power will complete consultation and determine the final Harris APE.
- Alabama Power will complete survey work and TCP identification by February 2021 and complete eligibility assessments for known cultural resources by July 2021.
- Alabama Power will conduct a cultural resources assessment for the sites identified during the Lake Harris preliminary archeological assessment.
- Alabama Power will begin drafting an HPMP, which will include provisions for future National Register eligibility evaluation of the Harris Project facilities in 2033, when the Project would reach an age of 50 years.
- Alabama Power will continue to determine and document the presence of cultural resources within the Project's APE; evaluate any known cultural resources for National Register eligibility (including the piers at Miller Covered Bridge); and determine if

authorized use of the Harris Project, including any proposed changes in Project operation proposed under a new license, would cause changes in the character or use of historic properties, if such properties exist.

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

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leon.m.cromartie@usace.army.mil; leopoldo_miranda@fws.gov; lewis.c.sumner@usace.army.mil; lgallen@balch.com; lgarland68@aol.com; lindastone2012@gmail.com; llangley@coushattatribela.org; lovvornt@randolphcountyalabama.gov; lswinsto@southernco.com; lth0002@auburn.edu; mark@americanwhitewater.org; matt.brooks@alea.gov; matthew.marshall@dcnr.alabama.gov; mayo.lydia@epa.gov; mcoker@southernco.com; mcw0061@aces.edu; mdollar48@gmail.com; meredith.h.ladart@usace.army.mil; mhpwedowee@gmail.com; mhunter@alabamarivers.org; michael.w.creswell@usace.army.mil; midwaytreasures@bellsouth.net; mike.holley@dcnr.alabama.gov; mitchell.reid@tnc.org; mlen@adem.alabama.gov; mnedd@blm.gov; monte.terhaar@ferc.gov; mooretn@auburn.edu; mprandolphwater@gmail.com; nancyburnes@centurylink.net; nanferebee@juno.com; nathan.aycock@dcnr.alabama.gov; orr.chauncey@epa.gov; pace.wilber@noaa.gov; partnersinfo@wwfus.org; patti.powell@dcnr.alabama.gov; patty@ten-o.com; paul.trudine@gmail.com; ptrammell@reddyice.com; publicaffairs@doc.gov; rachel.mcnamara@ferc.gov; raebutler@mcn-nsn.gov; rancococ@teleclipse.net; randall.b.harvey@usace.army.mil; randy@randyrogerslaw.com; randy@wedoweemarine.com; rbmorris222@gmail.com; rcodydeal@hotmail.com; reuteem@auburn.edu; richardburnes3@gmail.com; rick.oates@forestry.alabama.gov; rickmcwhorter723@icloud.com; rifraft2@aol.com; rjdavis8346@gmail.com; robert.a.allen@usace.army.mil; roger.mcneil@noaa.gov; ron@lakewedowee.org; rosoweka@mcn-nsn.gov; russtown@nc-cherokee.com; ryan.prince@forestry.alabama.gov; sabrinawood@live.com; sandnfrench@gmail.com; sarah.salazar@ferc.gov; sbryan@pci-nsn.gov; scsmith@southernco.com; section106@mcn-nsn.gov; sforehand@russelllands.com; sgraham@southernco.com; sherry.bradley@adph.state.al.us; sidney.hare@gmail.com; simsthe@aces.edu; snelson@nelsonandco.com; sonjahollomon@gmail.com; steve.bryant@dcnr.alabama.gov; stewartjack12@bellsouth.net; straylor426@bellsouth.net; sueagnew52@yahoo.com; tdadunaway@gmail.com; thpo@pci-nsn.gov; thpo@tttown.org; timguffey@jcch.net; tlamberth@russelllands.com; tlmills@southernco.com; todd.fobian@dcnr.alabama.gov; tom.diggs@ung.edu; tom.lettieri47@gmail.com; tom.littlepage@adeca.alabama.gov; tpfreema@southernco.com; trayjim@bellsouth.net; triciastearns@gmail.com; twstjohn@southernco.com; variscom506@gmail.com; walker.mary@epa.gov; william.puckett@swcc.alabama.gov; wmcampbell218@gmail.com; wrighr2@aces.edu; wsgardne@southernco.com; wtanders@southernco.com

Subject: Harris Relicensing - Initial Study Report
Date: Friday, April 10, 2020 2:59:07 PM

Harris relicensing stakeholders,

Pursuant to FERC's Integrated Licensing Process, Alabama Power filed its Harris Project Initial Study Report (ISR) today. Concurrent with the ISR filing, Alabama Power filed six draft study reports and two cultural resources documents, including consultation records for each. Stakeholders may access the ISR and the draft 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.

The Initial Study Report meeting will be held on **April 28, 2020**. Please hold this date from 9:00 am to 4:00 pm central time. A few days before the meeting I will send final call-in information and instructions, the agenda, and the presentations we will be reviewing during the meeting.

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Comments on the draft study reports should be submitted to Alabama Power at harrisrelicensing@southernco.com by **June 11, 2020**.

Thanks,

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

From:	Anderegg, Angela Segars
To:	Hathorn, James E Jr SAM
Cc:	Peeples, Alan L.; Odom, Kenneth; Graham, Stacey A.
Subject:	FW: Corps presentation
Date:	Tuesday, April 14, 2020 10:54:12 AM
Attachments:	Harris Relicensing Corps Meeting Res-Sim results 2020-03-17 final.pptx

Hi James,

Attached is the presentation from our March 17th conference call. The Initial Study Report for Harris relicensing, along with the draft Operating Curve Change Feasibility Analysis Report was filed with FERC last Friday. The Initial Study Report meeting is coming up on April 28th. Hope you can join us.

Thanks,

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

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Thanks,

Angie Anderegg
Hydro Services

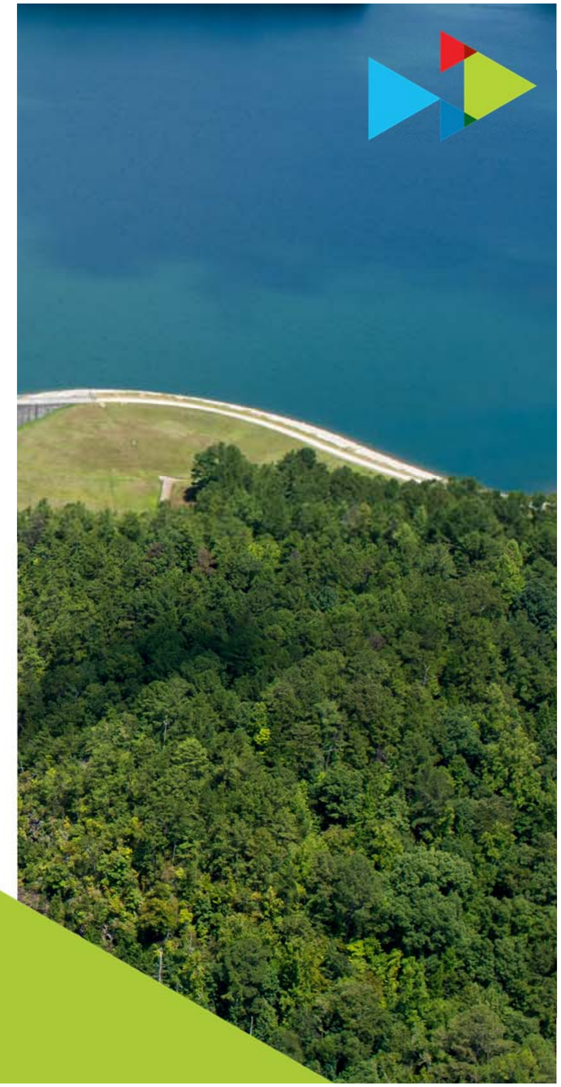
(205)257-2251
arsegars@southernco.com

Alabama Power

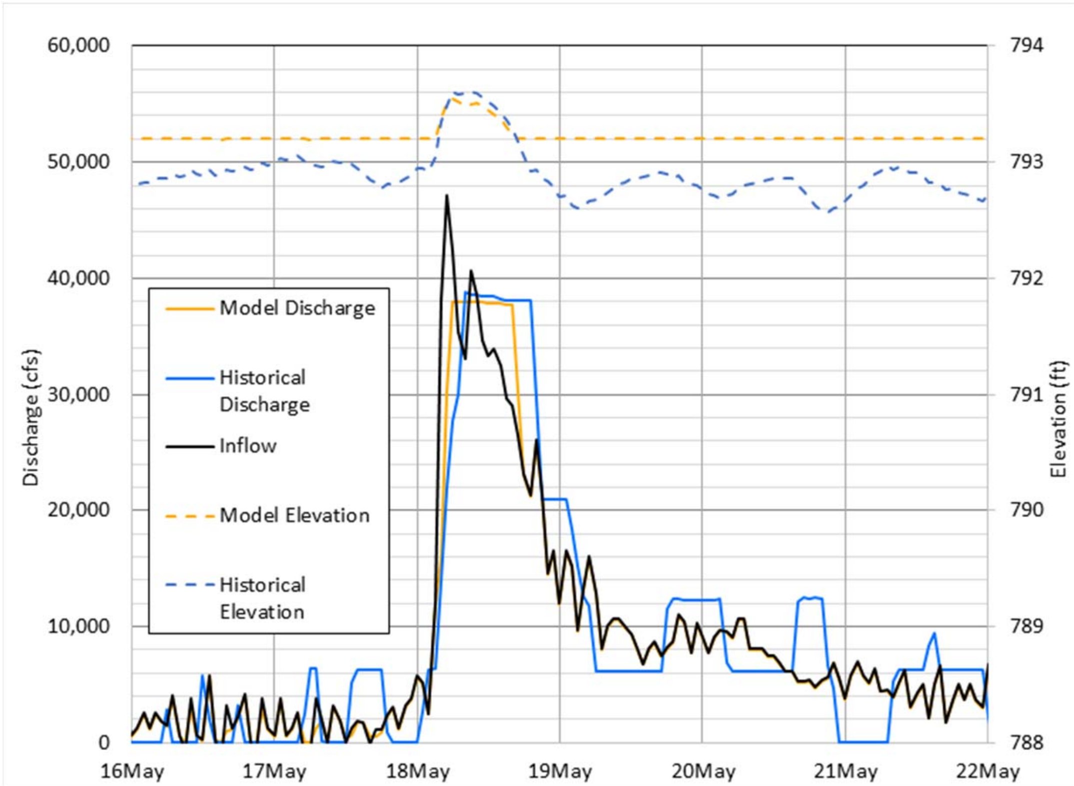
Harris Dam Relicensing

Project Operations – HAT 1

Res-Sim Results



Res-Sim Calibration



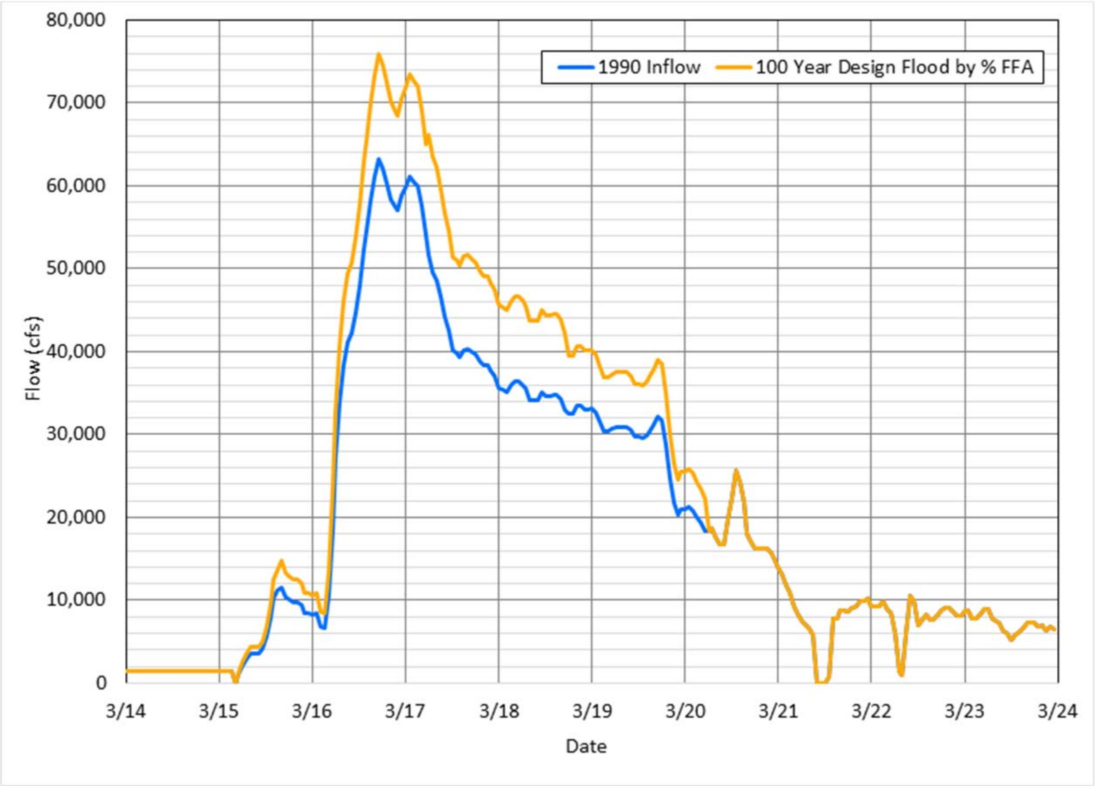
Hydrograph Results for 100-yr Design Flood for Harris Dam

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

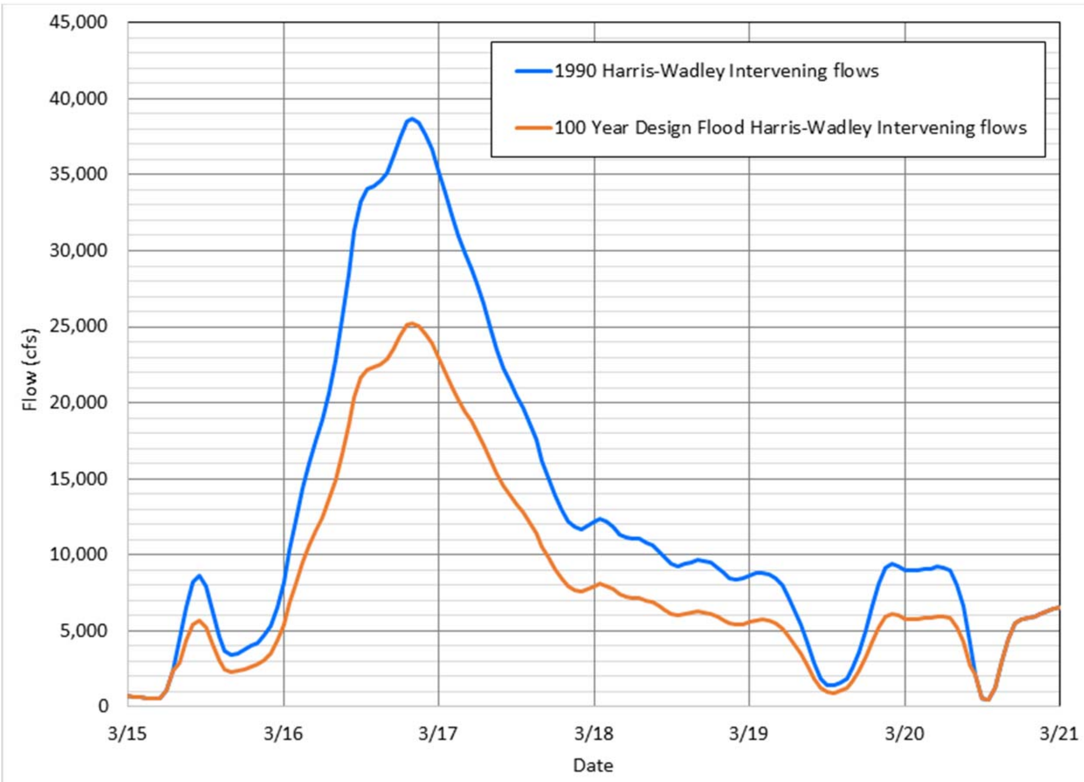
Hydrograph Results for 100-yr Design Flood Intervening Flows for Harris-Wadley Reach

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

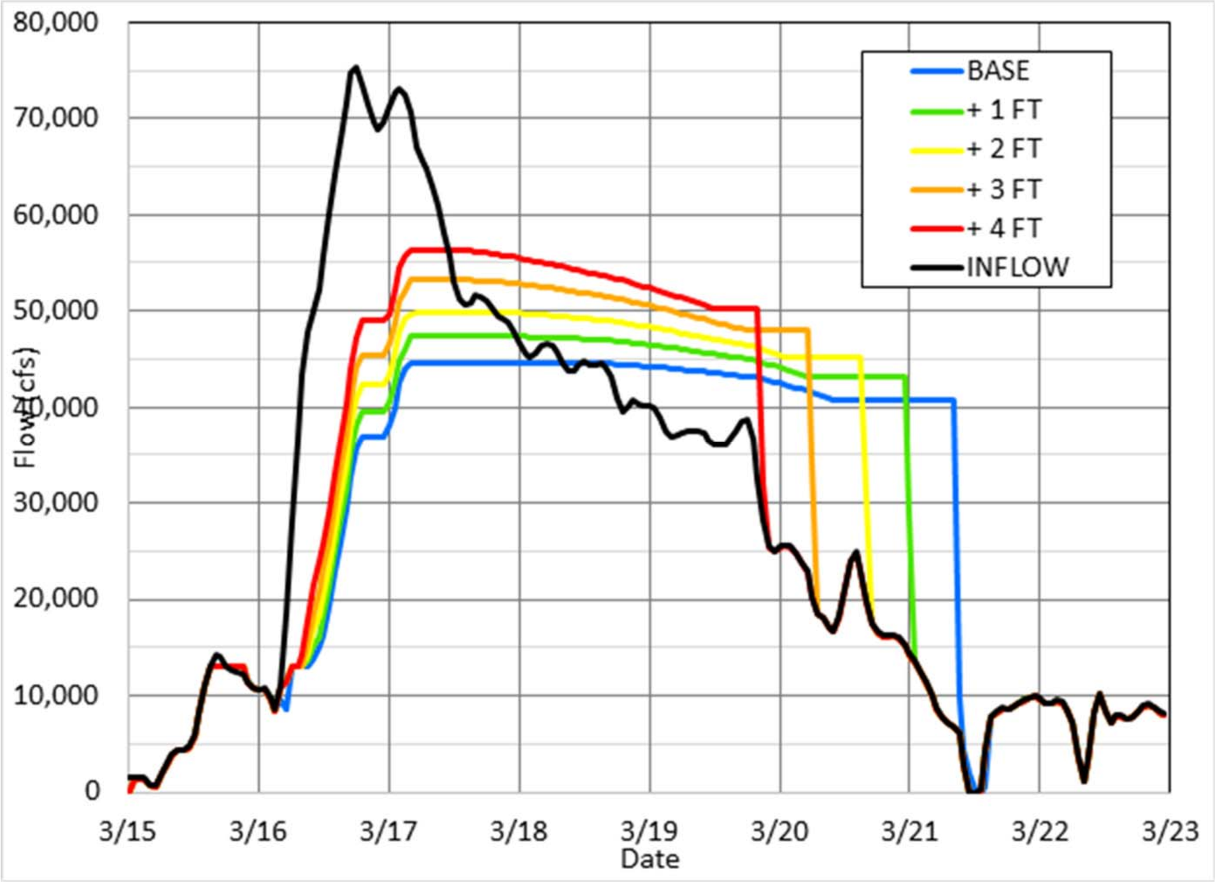
Inflows at Harris Reservoir for 100-yr Design Flood for Harris Dam



Intervening Flows at Wadley for 100-yr Design Flood for Harris Dam



100-year Design Flood Outflows



Downstream Results Locations

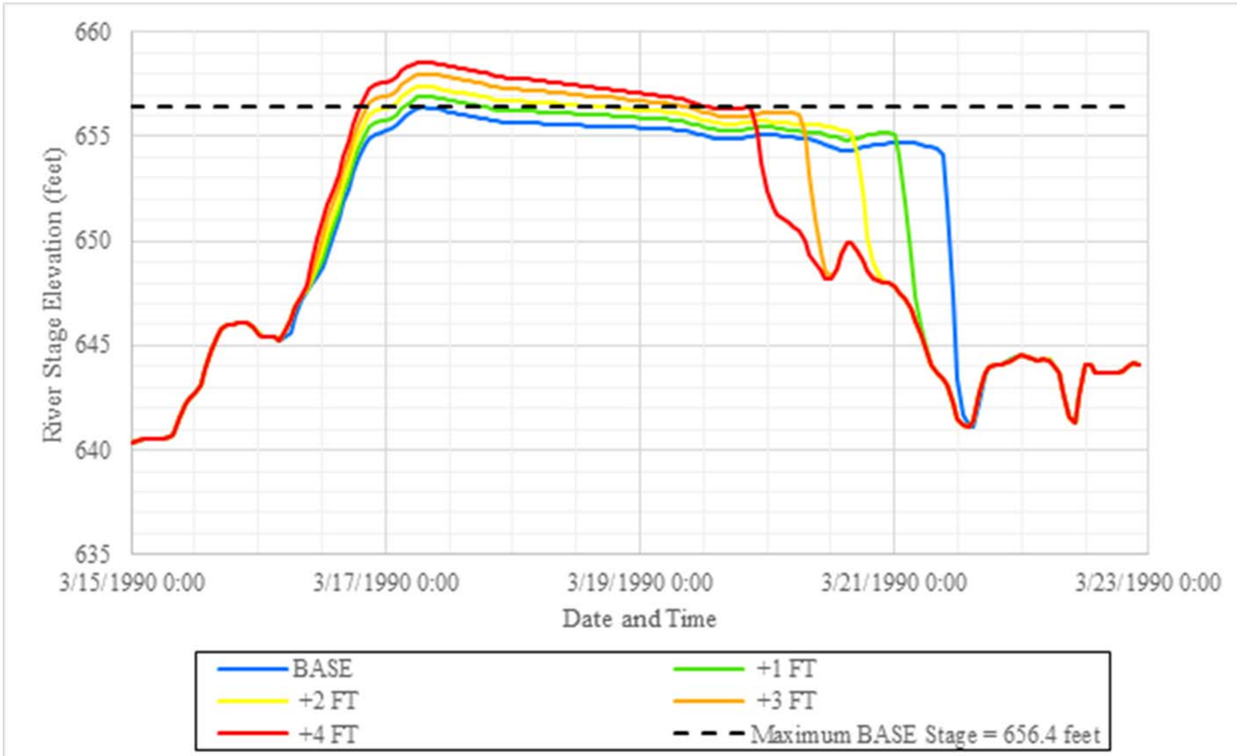
Changes in Water Surface Elevation

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

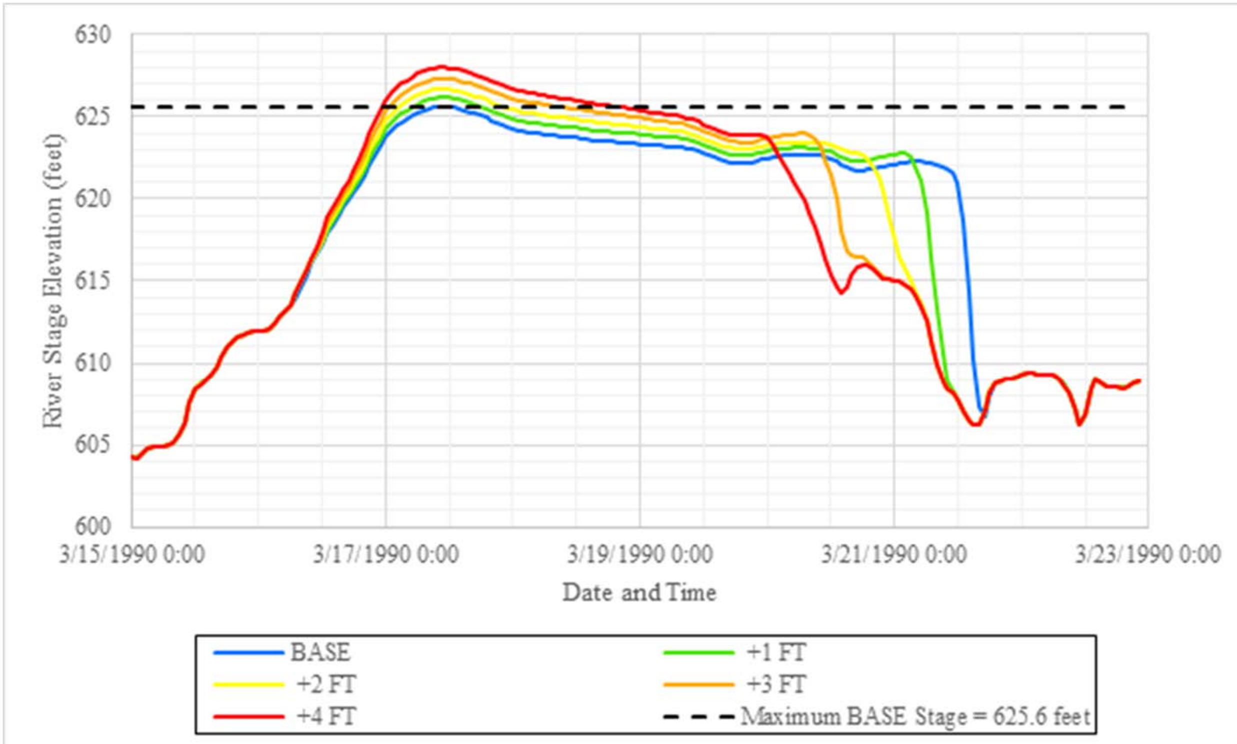
Changes in Flood Duration

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

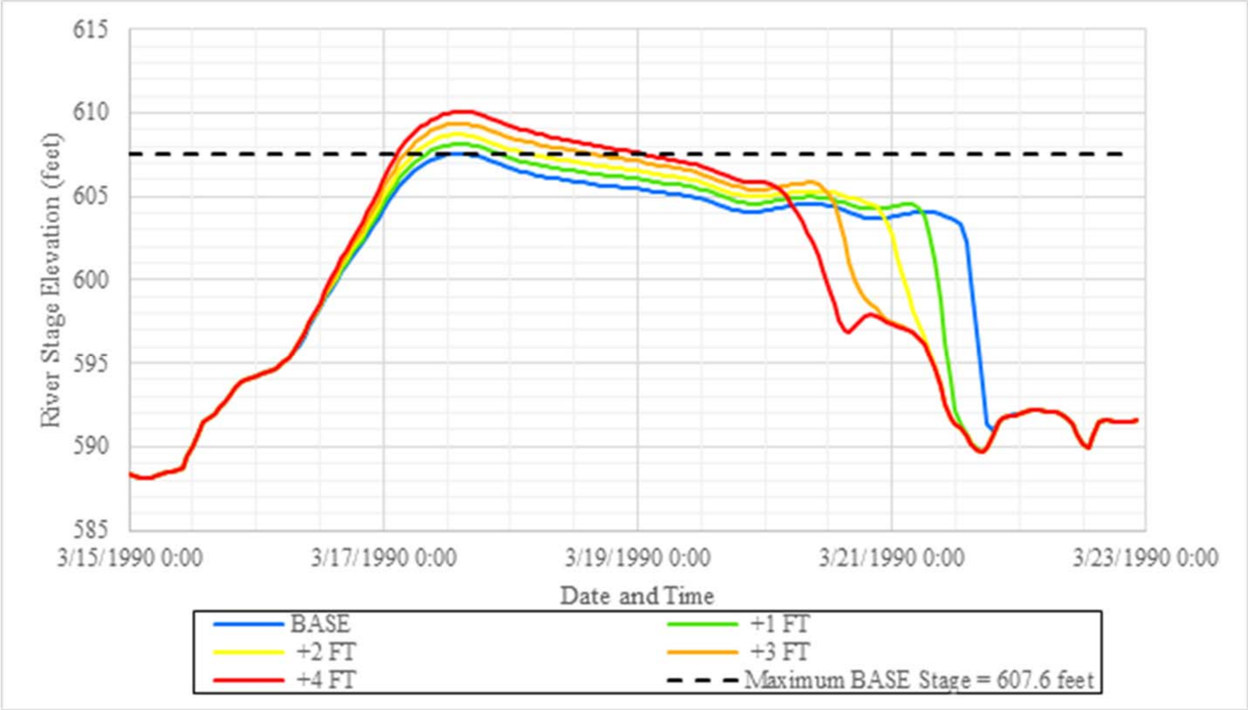
Malone (RM 129.7)



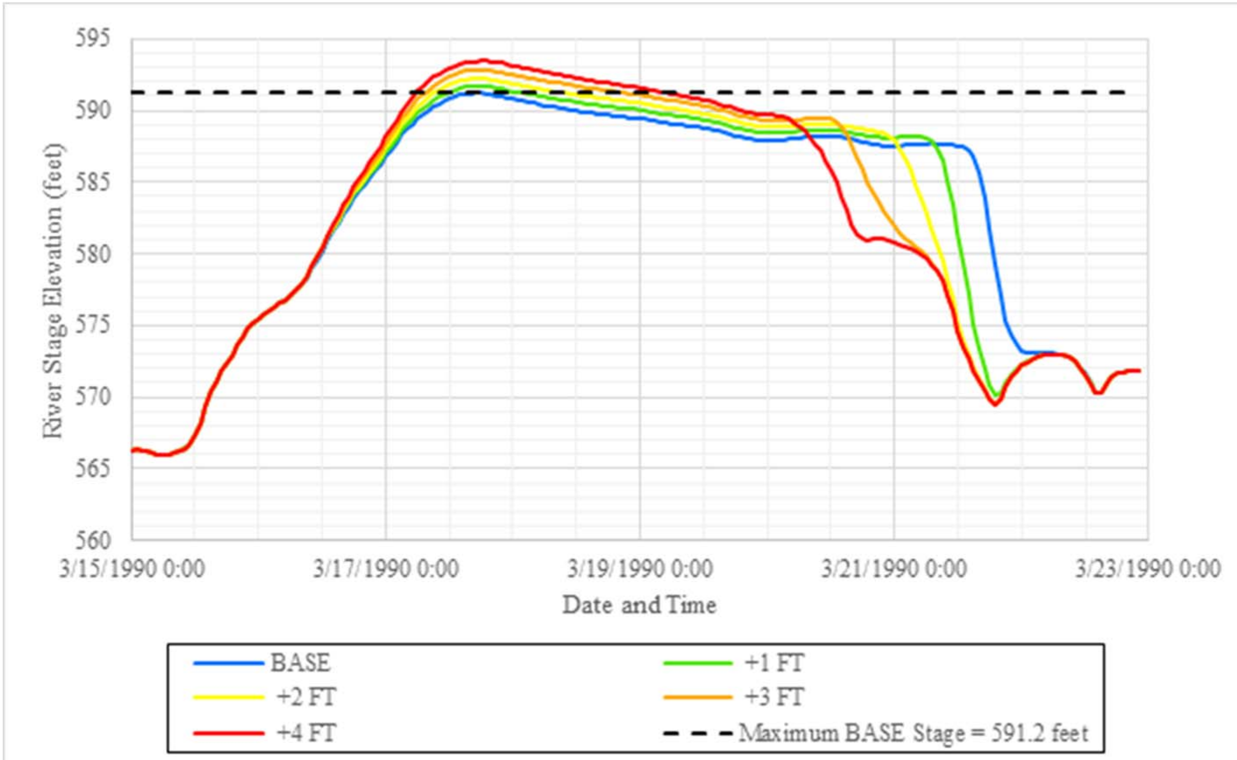
Wadley (RM 122.7)



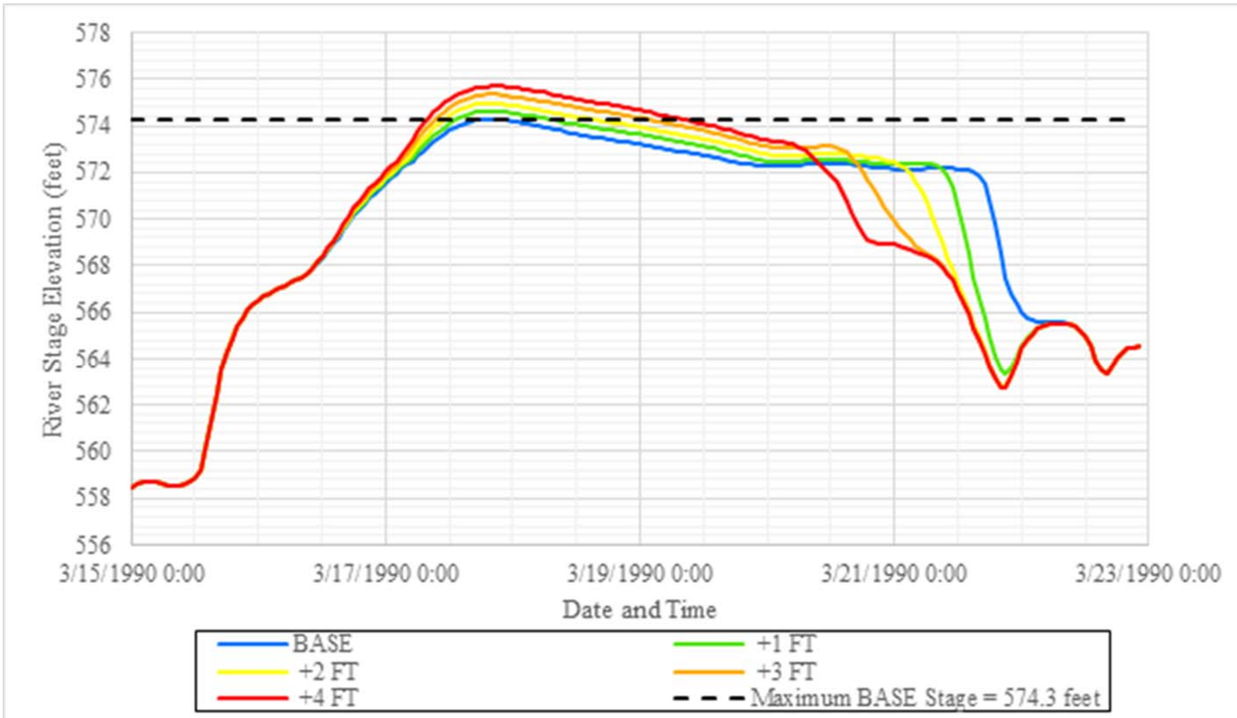
Between Wadley and Horseshoe Bend (RM 115.7)



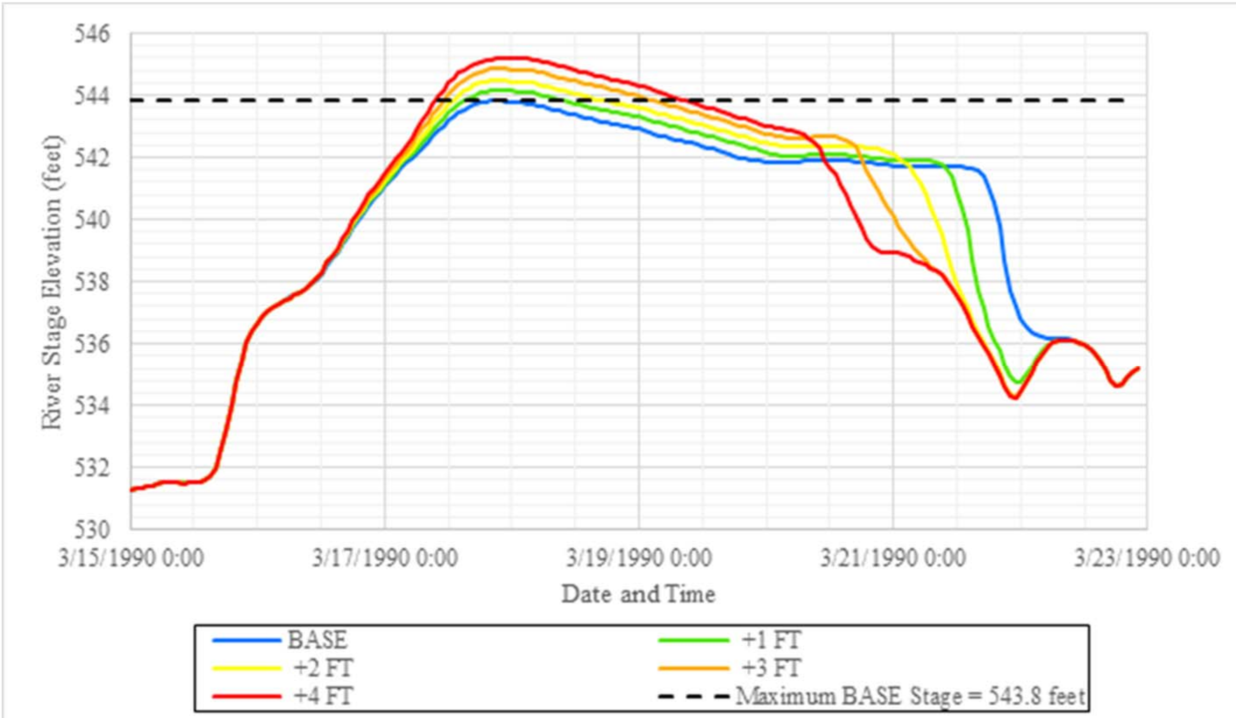
Between Wadley and Horseshoe Bend (RM108.7)



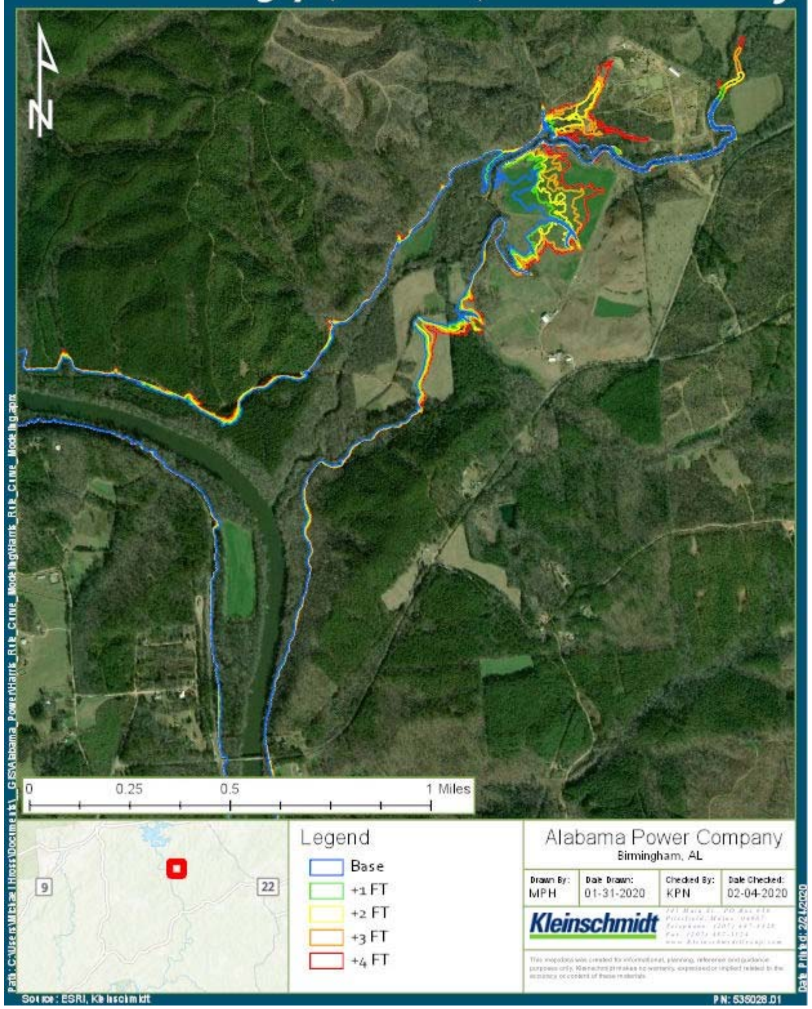
Between Wadley and Horseshoe Bend (RM 101.7)



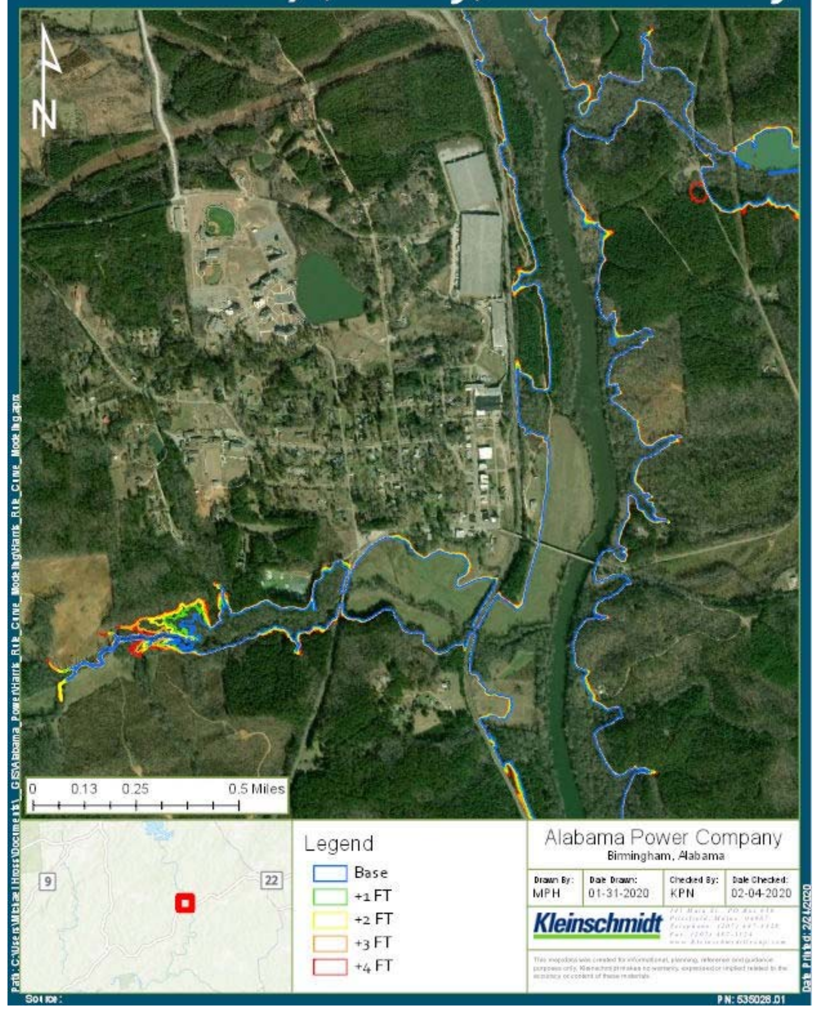
Horseshoe Bend (RM 93.7)

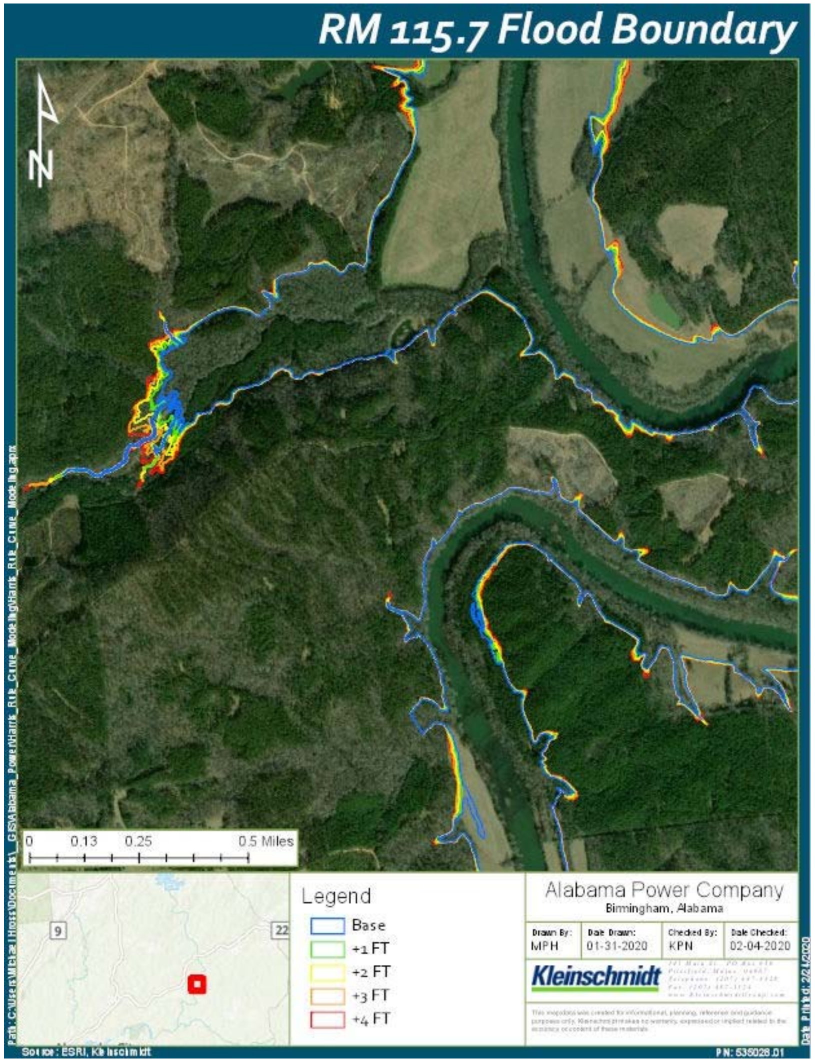


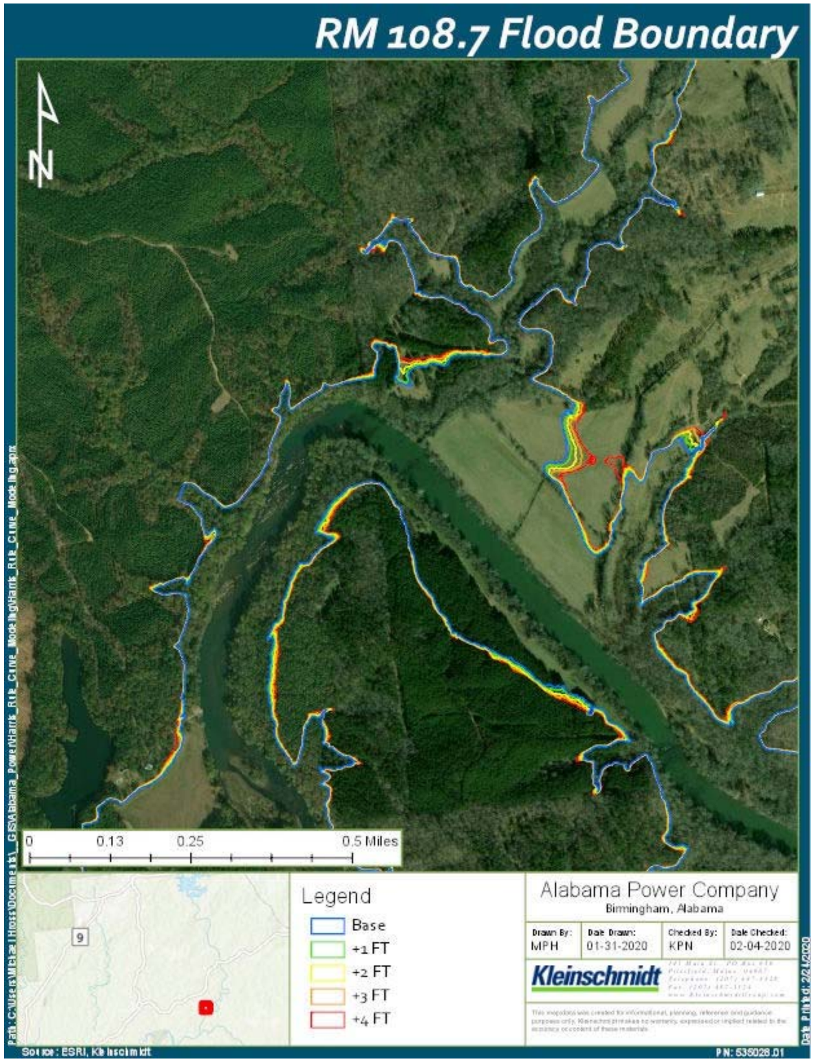
RM 129.7 (Malone) Flood Boundary



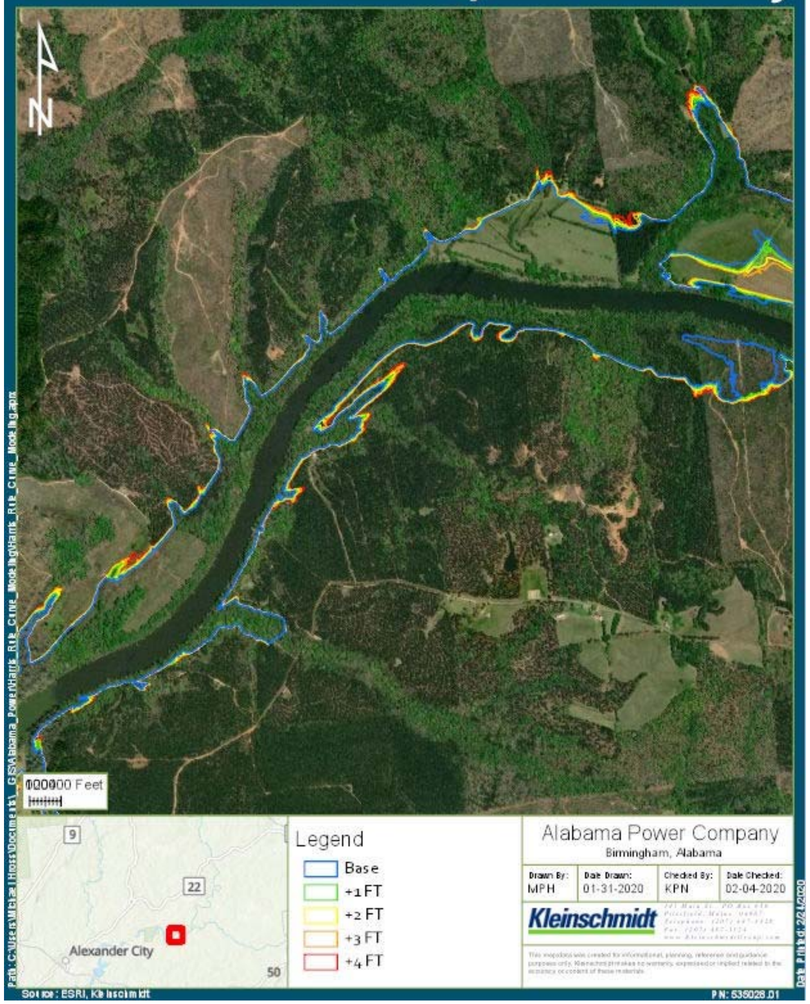
RM 122.7 (Wadley) Flood Boundary



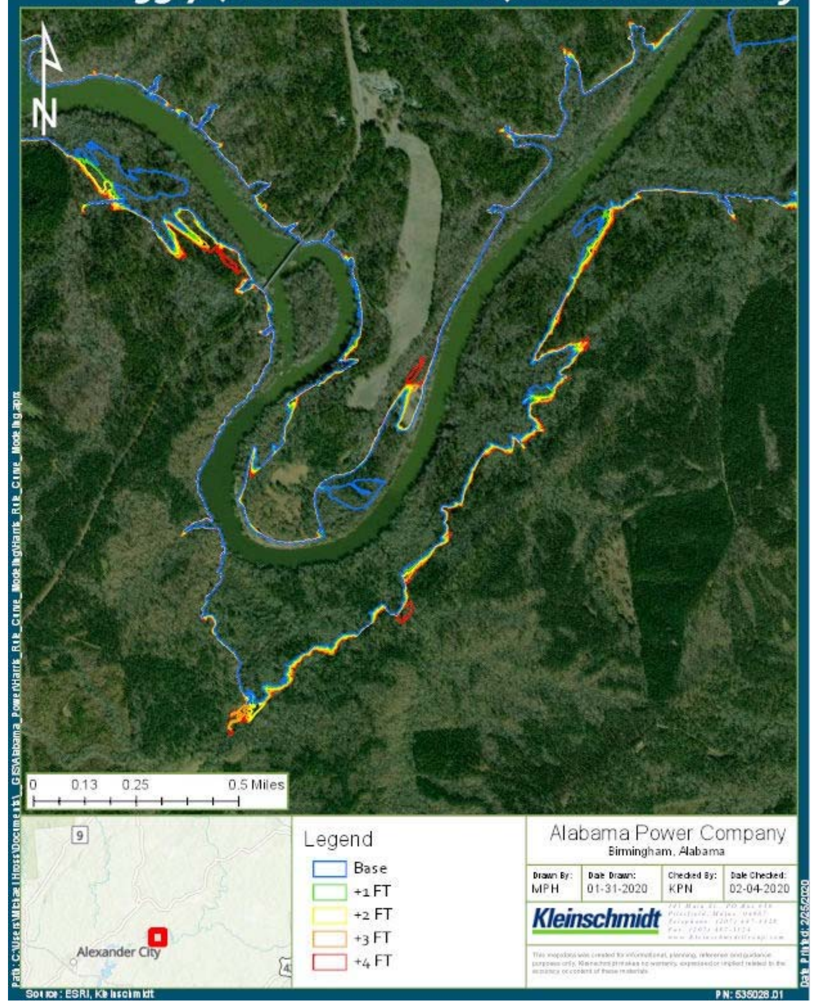

RM 115.7 Flood Boundary
0 0.13 0.25 0.5 Miles
Legend
Base
+1 FT
+2 FT
+3 FT
+4 FT
Alabama Power Company
Birmingham, Alabama
Drawn By: MPH
Date Drawn: 01-31-2020
Checked By: KPN
Date Checked: 02-04-2020
Kleinschmidt
Source: ESRI, Kleinschmidt
PN: 535028.01


RM 108.7 Flood Boundary
0 0.13 0.25 0.5 Miles
Legend
Base
+1 FT
+2 FT
+3 FT
+4 FT
Alabama Power Company
Birmingham, Alabama
Drawn By: MPH
Date Drawn: 01-31-2020
Checked By: KPN
Date Checked: 02-04-2020
Kleinschmidt
Source: ESRI, Kleinschmidt
PN: 535028.01

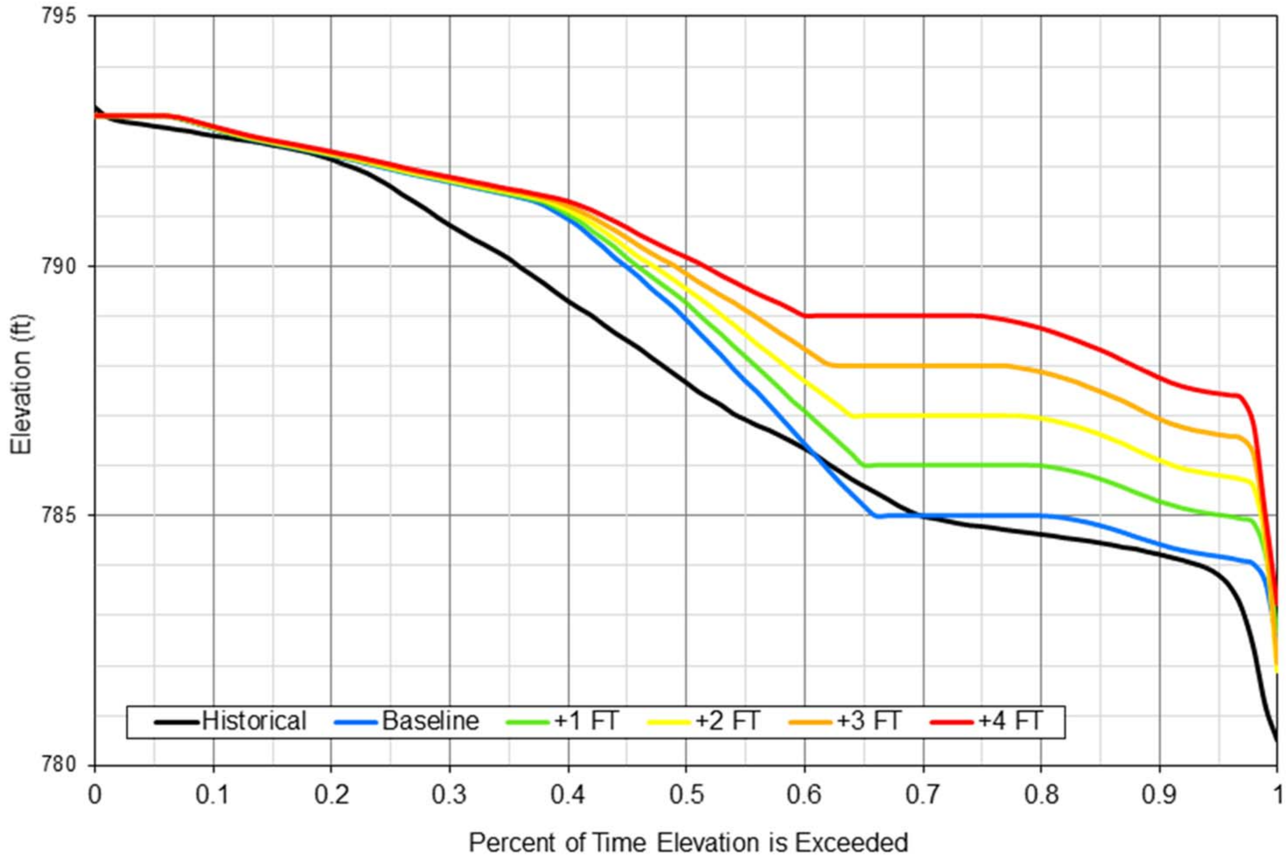
RM 101.7 Flood Boundary



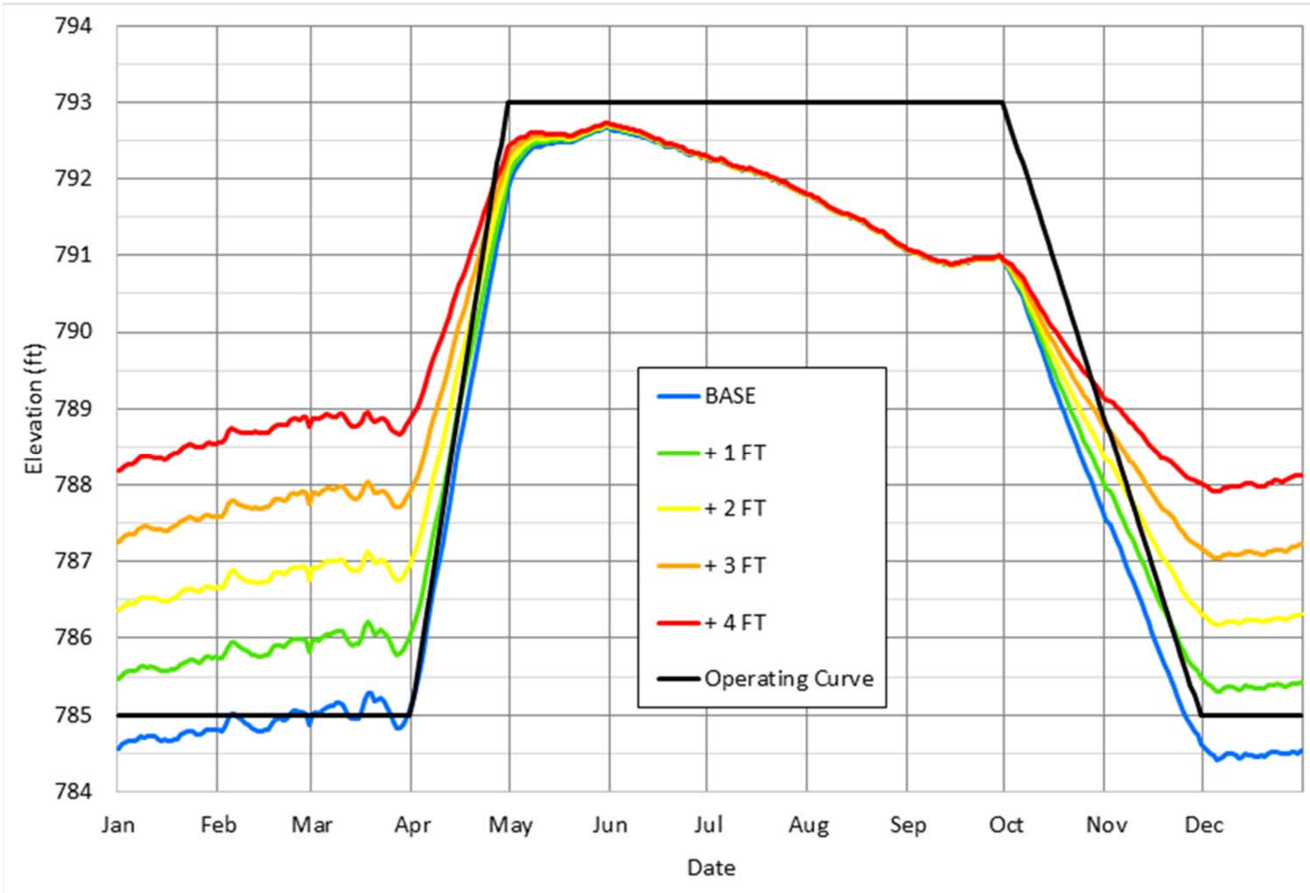
RM 93.7 (Horseshoe Bend) Flood Boundary



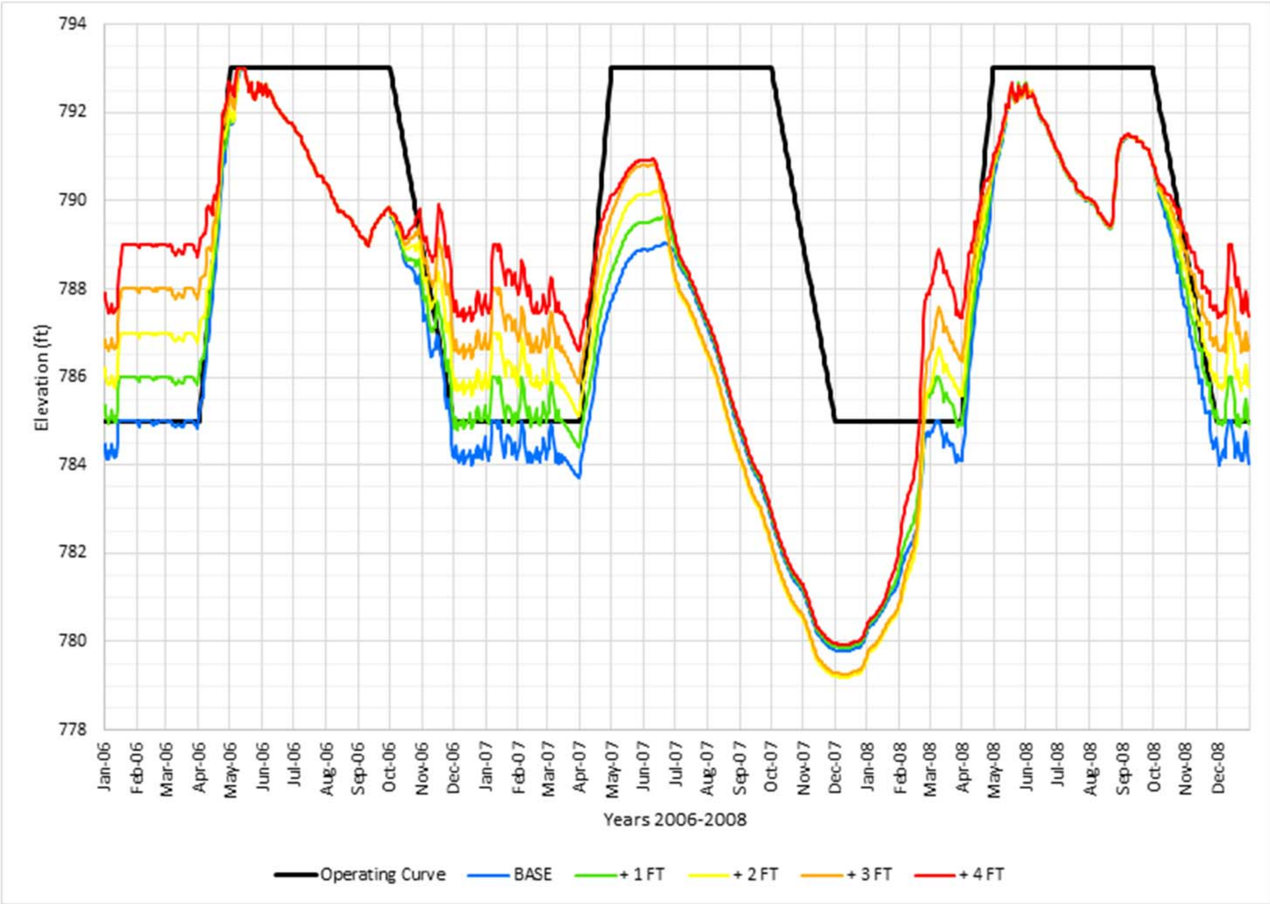
Annual stage duration-frequency curve



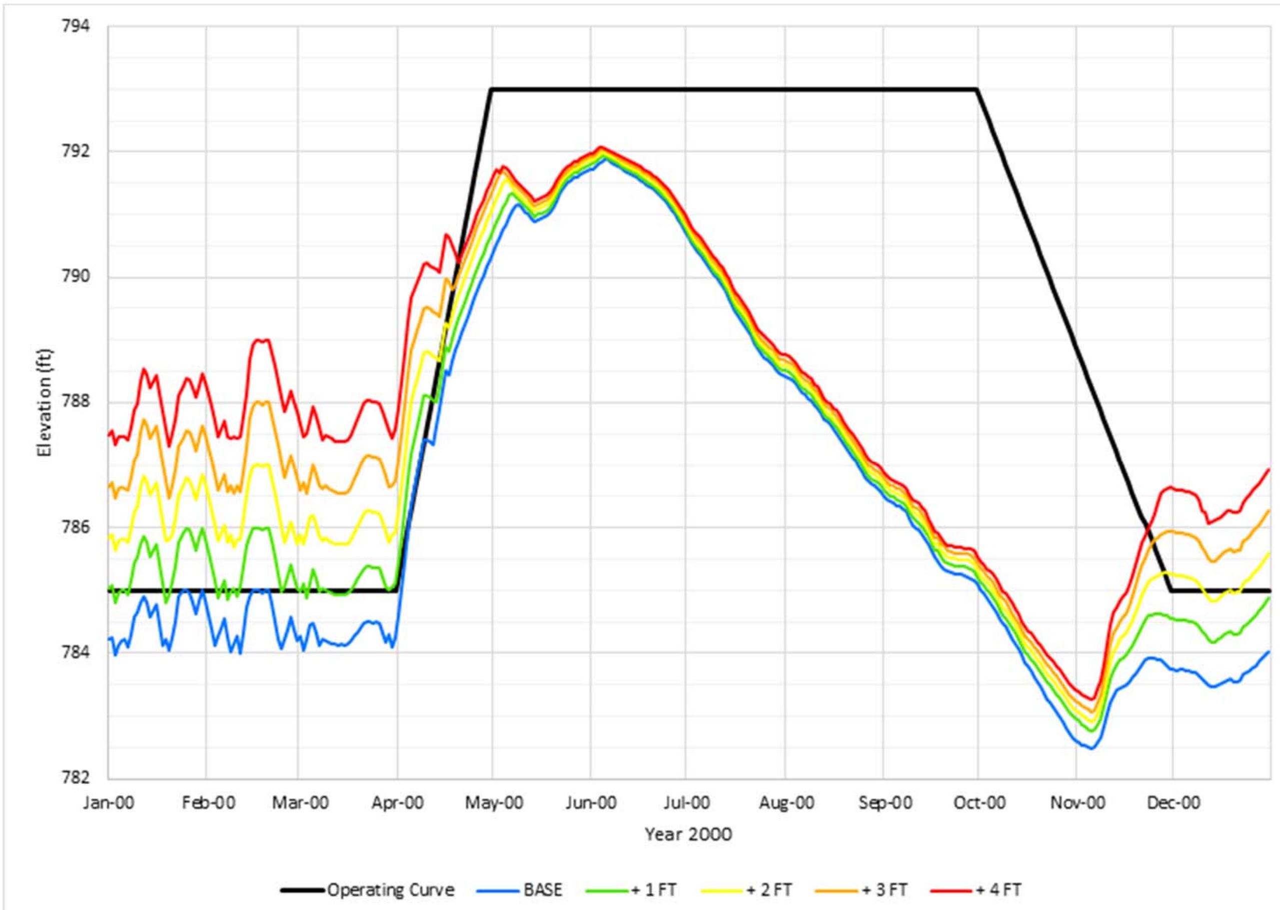
Average Daily Elevations



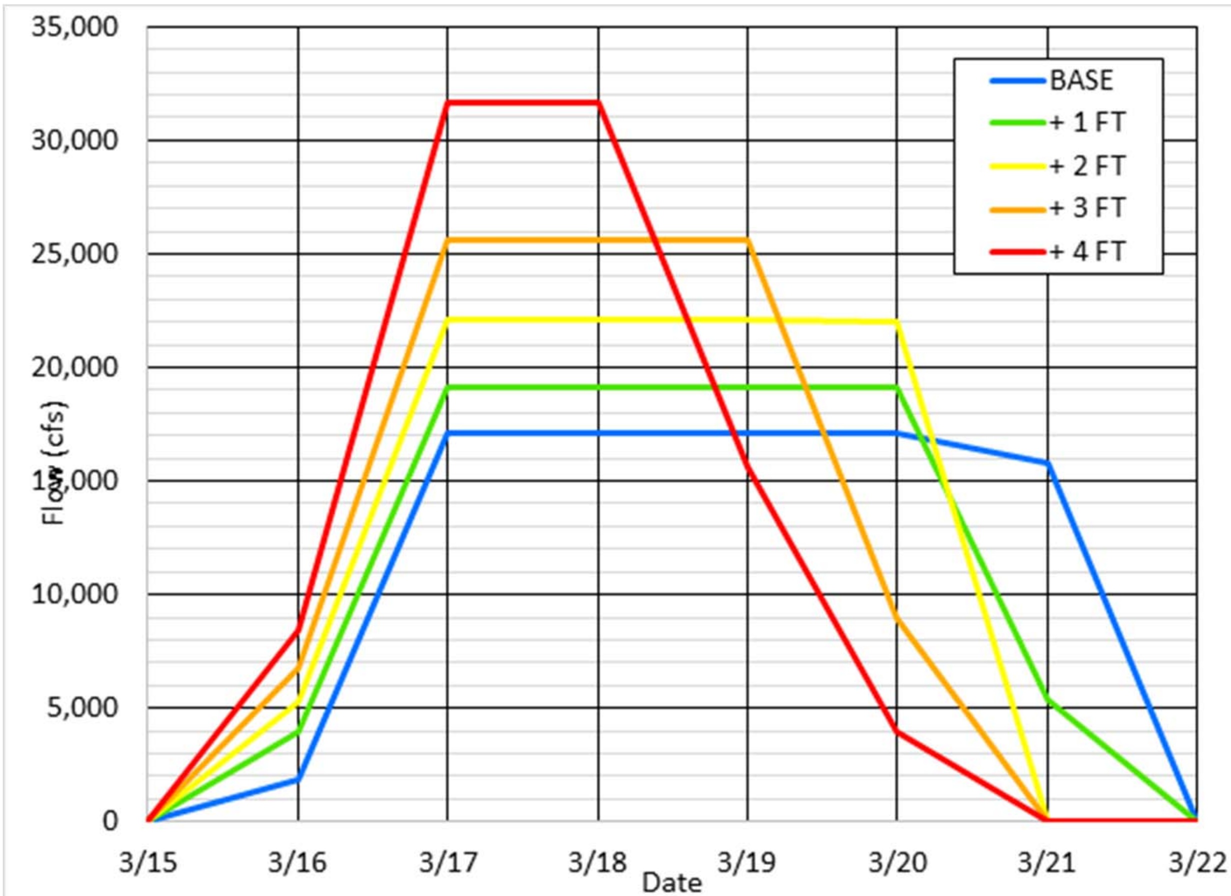
?????? (still working on this one) Drought



Effects of winter pool increases in 2000



Change in magnitude and duration of release for modeled 1990 spill event



Effects on Navigation

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%

Effects on Drought Operations

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%

Effects on Downstream Release and Green Plan Flows

-- changes are negligible

Alabama Power

From:	Hathorn, James E Jr CIV USARMY CESAM (US)
To:	Anderegg, Angela Segars
Cc:	Peeples, Alan L.; Odom, Kenneth; Graham, Stacey A.; Harvey, Randall B CIV USARMY CESAM (USA)
Subject:	RE: Corps presentation
Date:	Thursday, April 16, 2020 1:59:33 PM

EXTERNAL MAIL: Caution Opening Links or Files

Hey Angie,

Thank you for the responses and additional information. I will let you know if I have any follow-up questions or data request.

Have a great day!

James

From: Anderegg, Angela Segars [mailto:ARSEGARS@southernco.com]
Sent: Thursday, April 16, 2020 1:05 PM
To: Hathorn, James E Jr CIV USARMY CESAM (US) <James.E.Hathorn.Jr@usace.army.mil>
Cc: Peeples, Alan L. <ALPEEPLE@southernco.com>; Odom, Kenneth <KODOM@SOUTHERNCO.COM>; Graham, Stacey A. <SGRAHAM@SOUTHERNCO.COM>; Harvey, Randall B CIV USARMY CESAM (USA) <Randall.B.Harvey@usace.army.mil>
Subject: [Non-DoD Source] RE: Corps presentation

Hi James,

Below are answers for your questions. Please let me know if you have anything else.

Thanks!

Slide 2 – What is the year of the calibration? This is from the May 2013 event.

Slide 16, 17, 18 – Is it possible to add APC flowage easement and the FEMA 100yr & 500yr FIRM mapping layers? Alabama Power does not have any easements or flowage rights below Harris Dam (not until you get to the top of Martin). The 100-year flood elevation downstream of Harris Dam is an approximation. No hydraulic study has been performed and no base flood elevations or flood depths are shown on the FEMA maps. There is also no defined 500-year flood elevation downstream of Harris to include in the mapping layers.

Will USACE have an opportunity to review the ResSim/RAS hourly and daily models along with the output? Yes, the models and output will be made available to all stakeholders.

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

From: Hathorn, James E Jr CIV USARMY CESAM (US) <James.E.Hathorn.Jr@usace.army.mil>
Sent: Tuesday, April 14, 2020 6:41 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Cc: Peeples, Alan L. <ALPEEPLE@southernco.com>; Odom, Kenneth <KODOM@SOUTHERNCO.COM>; Graham, Stacey A. <SGRAHAM@SOUTHERNCO.COM>; Harvey, Randall B CIV USARMY CESAM (USA) <Randall.B.Harvey@usace.army.mil>
Subject: RE: Corps presentation

EXTERNAL MAIL: Caution Opening Links or Files

Hey Angie,

I have a few questions regarding the presentation.

Slide 2 – What is the year of the calibration?
Slide 16, 17, 18 – Is it possible to add APC flowage easement and the FEMA 100yr & 500yr FIRM mapping layers?

Will USACE have an opportunity to review the ResSim/RAS hourly and daily models along with the output?

James Hathorn, Jr
Chief, Water Management Section
US Army Corps of Engineers, Mobile District
Office: 251-690-2730
Cell: 251-509-5368
Email: james.e.hathorn.jr@usace.army.mil
Web: Blockedwww.sam.usace.army.mil [sam.usace.army.mil]

Essayons!

From: Anderegg, Angela Segars [mailto:ARSEGARS@southernco.com]
Sent: Tuesday, April 14, 2020 10:54 AM
To: Hathorn, James E Jr CIV USARMY CESAM (US) <James.E.Hathorn.Jr@usace.army.mil>
Cc: Peeples, Alan L. <ALPEEPLE@southernco.com>; Odom, Kenneth <KODOM@SOUTHERNCO.COM>; Graham, Stacey A. <SGRAHAM@SOUTHERNCO.COM>
Subject: [Non-DoD Source] FW: Corps presentation

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

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Thanks,

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

From:	Sarah Salazar
To:	Anderegg, Angela Segars
Cc:	Allan Creamer; Rachel McNamara; Monte Terhaar (CTR)
Subject:	RE: Harris Relicensing - Initial Study Report meeting agenda and call-in details
Date:	Monday, April 27, 2020 5:21:04 PM
Attachments:	FERC-prelim-ISR-Comments+Questions_4-27-20.docx

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

Thanks for the information below about the Skype option for the meeting and for the call back today. As I mentioned, I'm forwarding the attached list of some preliminary (informal) questions we put together for the ISR mtg. tomorrow. We didn't label whose questions they were, but they are generally grouped by study report/topic. So for the most part the questions originate from our team member who is covering that resource area during relicensing. Feel free to call me tomorrow before the meeting if you have any follow-up questions or concerns.

Thanks again,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863* ♻ ***Please consider the environment before printing this email.***

From: APC Harris Relicensing <g2apchr@southernco.com>
Sent: Monday, April 27, 2020 10:51 AM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: FW: Harris Relicensing - Initial Study Report meeting agenda and call-in details

Good morning,

Attached is the presentation for tomorrow's Initial Study Report meeting. This presentation can also be found on the relicensing website: www.harrisrelicensing.com [harrisrelicensing.com].

Thanks,

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

From: APC Harris Relicensing
Sent: Friday, April 24, 2020 10:24 AM
To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Subject: Harris Relicensing - Initial Study Report meeting agenda and call-in details

Good morning

Please join us for the Initial Study Report (ISR) meeting on **April 28, 2020, starting at 9 am central time**. The agenda for the meeting is attached. On Monday April 27th, the presentation will be made available on our website (www.harrisrelicensing.com [harrisrelicensing.com]) and distributed to stakeholders as a pdf.

If you have questions regarding the ISR that you would like Alabama Power to address during the meeting, please send your questions to harrisrelicensing@southernco.com by 4 pm on April 27th. There will also be an opportunity to ask questions during the meeting.

Below is the Skype link and call in instructions. Participating via the Skype link is preferred in order to reduce audio issues. However, if you don't have access to Skype, you can call the number below and follow along with the presentation we'll send out on April 27th.

Join Skype Meeting

To join the ISR Meeting via phone, please call (205) 257-2663 OR (404) 460-0605. At the prompt, enter conference ID 489472 followed by the pound (#) sign.

When you join the call, you will be in the virtual lobby and directed that you are waiting on the leader to admit you. As you are admitted, you will be instructed that you are now joining the meeting and that the meeting has been locked. As soon as everyone has joined, we will conduct a roll call of attendees by organization (for example, I will ask who is on the call from the Alabama Department of Conservation and Natural Resources, etc.). If you do not belong to an organization, you will be given a chance at the end of the roll call to state your name and affiliation. Once the roll call is over, your phone will be muted and the first presentation will begin. As noted above, Alabama Power will take questions following each study review and will unmute participants during that time. Once the phones are unmuted, you will have to press star 6 (*6) in order to be heard.

Please let me know if you have any questions.

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

4/27/20

R.L. Harris Initial Study Report (ISR):

FERC Licensing Team's Preliminary Comments and Questions

General Comments and Questions:

1. Comments on all the studies should be filed with the Commission by 6/11/20, as stated in the cover letter of the ISR, and not (solely) sent directly to Alabama Power via email, as stated in the cover letters of the Draft Downstream Release Alternatives Phase 1 Report, Draft Operating Curve Change Feasibility Analysis Phase 1 Report, Draft Erosion and Sedimentation Study Report, Draft Water Quality Study Report, Draft T&E Species Assessment, Draft Phase 1 Project Lands Evaluation Study Report, and the Traditional Cultural Properties Identification Plan and Inadvertent Discovery Plan.

2. Several of the studies reference the use of Geographic Information System (GIS) data. To facilitate stakeholder review and analysis of the study results it would be helpful if all GIS data collected or developed as part of the studies is filed with the study reports.

3. Please describe whether you have experienced or anticipate any delays to studies as a result of COVID-19 related closures or social distancing measures.

Draft Operating Curve Change Feasibility Analysis (Phase 1) Report:

1. As we understand it, downstream effects with regard to flooding were assessed for a 100-year design flood. However, the relationship between the downstream flow alternative analysis and the Harris Reservoir winter flood pool analysis is not clear under alternative flood scenarios. What would happen in a scenario other that a 100-year flood? Would operations at Harris Dam under the alternative flood scenario, including different flow release scenarios, have any impact on the Harris Reservoir winter pool analysis, or vice versa?

2. Table 5-2, page 51 of the report…What is it about RM 115.7 that appears to create a hydraulic control, such that the maximum increase in depth under any winter pool elevation scenario occur about mid-way down the Tallapoosa River?

3. Figures 5-20 and 5-21 appear incomplete, as they only show the results for one alternative…baseline (? based on color). Please address this apparent omission.

Draft Downstream Release Alternatives (Phase 1) Report:

1. Modeling scenarios…as it stands now, the report presents the results for three downstream release alternatives: Pre-Green Plan operation, Green Plan operation, and Pre-Green Plan operation with a 150 cfs continuous minimum flow. Why was modelling of minimum flow limited to 150 cfs? Also, have you considered modeling Green Plan releases with continuous minimum flow scenarios? On what basis did you choose not to do so?

Draft Erosion and Sedimentation Report:

1. Section 5.0, Discussion and Conclusions states that at some sites, "land clearing and landscaping, and other construction activities affecting runoff towards the reservoir" cause erosion. Is it possible to provide areal images showing the areas of active erosion in relation to the project boundary as part of the final study report?

2. Appendix D – photos…it would be helpful if the captions for the photos included better location descriptors (e.g., Harris Reservoir, Harris Reservoir-?? Embayment, Harris Reservoir-?? River Arm, Tallapoosa River, etc.). For the Harris Reservoir sites, it would be helpful if the contours within which peaking operations occur (lake fluctuation zone) could be identified.

3. Could you make the video footage that was collected as part of this study available for stakeholders to view?

4. Will the nuisance aquatic vegetation surveys still be possible to conduct in Lake Harris this summer?

5. On page 24, in section 3.2, the report includes the following statement: "A total of 20 sites, rather than 15 sites, were provided for the left bank segments as many segments were tied with a score of (slightly impaired)." Please explain what is meant by many of the streambank segments being "tied with a score of (slightly impaired" and clarify the relationship between the number of streambank segments/sites and the bank condition score.

6. On page 25, in Table 3-2, shouldn't the heading/label of the first column of the table be "Site Number" instead of "Rank" given that the rank options are only 1 through 5 (according to Table 3-1) and there appear to be 20 sites?

7. On page 11, of the Tallapoosa River High Definition Stream Survey Final Report (Appendix E of the Erosion and Sedimentation Study Report), it states that prior to the survey, flows were monitored to ensure relatively normal flow conditions

during the survey. For clarity, what were the "relatively normal flow conditions" during the survey? Were they slightly higher or lower than average?

8. In Figures 13 and 16 of the Tallapoosa River High Definition Stream Survey Final Report, the scale is small and so it appears that most of the riverbanks are unmodified and the modified banks identified on the individual site surveys are not visible. It would be helpful if the figures in the report showed labeled points for the erosion/sedimentation sites that are identified in the report.

9. Page 20 of Tallapoosa River High Definition Stream Survey Final Report states that a confidence rating was used to indicate the clarity of the streambanks in the video and figures 14 and 17 of that report show areas where the video clarity was impaired and therefore the confidence in the accuracy of the streambank conditions/classifications is lower. As stated above, it would be helpful if the figures in the report showed labeled points for the erosion/sedimentation sites that are identified in the report. Do any of the areas with impaired video clarity coincide with areas that stakeholders identified as erosion/sedimentation sites or other sites that Alabama Power identified as part of this study? Do you intend to take any steps to deal with the impaired clarity data? Is so, how?

10. In Figure 18 of the Tallapoosa River High Definition Stream Survey Final Report, there appears to be a missing ranking at river mile 37 for the right streambank. Could you explain this gap in the ranking?

11. For Figures 20 through 23 of the Tallapoosa River High Definition Stream Survey Final Report, please label the river mile ranges on the maps to help reviewers understand the starting and ending points of the study area and which segments of river are included.

12. In Figure 26 of the Tallapoosa River High Definition Stream Survey Final Report, please move the scale bar and sources so that they are not covering the river segment and bank conditions at the bottom of the map.

13. Can you identify where peaking pulses are attenuated downstream from Harris Dam under the current operating regime and volume of typical downstream releases? If so, are there any patterns in the downstream streambank conditions and observed levels of erosion along the segments of streambanks within the attenuation zone? Where are the identified erosion sites in relation to the length of the attenuation zone?

Draft Water Quality Report:

1. Page 18…figure 3-8…please explain what is happening with the vertical DO profiles where DO increases in May, June, July, and August, where otherwise the DO should be declining.

2. Page 23 discusses Alabama DEM monitoring data for the Harris Dam tailrace (i.e., immediately downstream from Harris Dam). Was this data collected during generation, or does it also reflect non-generation periods?

3. Pages 39-41 present DO and temperature data for downstream continuous water quality monitoring station. On page 16 of the ISR, Alabama Power is not proposing any additional monitoring beyond what was approved in the Commission's SPD. Why is there not a second year of monitoring for the downstream continuous monitoring station? How confident are Alabama Power and the HAT2 members that 1 year of monitoring at the downstream station includes a worst-case scenario?

Draft T&E Species Report:

1. Have the GIS overlays of T&E species habitat information and maps been completed (i.e., the map figures in Appendix B of the draft T&E species study report)? Or are there still steps to complete this component of the study?

   We suggest including project features, recreation areas, and other managed areas (e.g., timber harvest areas, wildlife management areas, etc.) on the T&E species maps in order to help determine the proximity of species ranges/habitats to project-related activities and identify the need for species-specific field surveys.

2. While the draft T&E species study report indicates that additional field surveys for the fine-lined pocketbook freshwater mussel are planned for May 2020, the report does not include a description of the criteria used to determine which of the species on FWS's official (IPaC) list of T&E species would be surveyed in the field. Please describe which species will be surveyed in the field and explain how and why they were selected. In addition, please describe any correspondence Alabama Power has had with FWS and state agencies regarding the T&E species selected for additional field surveys.

3. Page 7 lists the sources for the ESA species information. The sources included FWS's Environmental Conservation Online System (ECOS) but did not include IPaC. The official list is obtained through the IPaC report. Has an IPaC report been downloaded or are you using the IPaC report filed to the record by FERC staff?

4. Page 8 states that the existing land use data is not specific enough to determine if the 3,068 acres of coniferous forest within the project boundary at Lake Harris would be suitable for red cockaded woodpecker. How do you propose assess the suitability for red cockaded woodpecker?

5. On pages 3, 10, and 26 there is mention of additional fieldwork planned for two mussel species (i.e., fine-lined pocketbook and Southern pigtoe) for May 2020. Please elaborate on the details of the additional survey work (e.g., survey location(s), sampling protocols and methodologies employed, and clarify which species will be included in the May 2020 assessment, etc.).

6. The descriptions of Alabama lampmussel and rabbitsfoot mussel on pages 11, 13, and 14 do not provide these species' host fish species. Are the host fish species currently unknown, or was this an inadvertent omission?

7. There appears to be a typo on page 16, in the description of southern pigtoe mussel. The middle of the first paragraph refers to the glochidia of the finelined pocketbook mussel. Is this sentence misplaced, or does the information pertain to the southern pigtoe mussel (the subject of section 3.12)? Please clarify.

8. On page 19, in the first paragraph about the northern long-eared bat (NLEB), it is unclear why the discussion includes the statement about a low occurrence of this species in the "…southwestern region of Alabama" given that the project areas are located in the northeastern and mid-eastern portions of Alabama. Please clarify or correct this statement.

9. The draft T&E species study report states that there are no known NLEB hibernacula or maternity roost trees *within the project boundary*. However, it does not include information on known NLEB hibernacula *within 0.25 mile of the project boundary* and known NLEB maternity roosts *within 150 feet of the project boundary* (i.e., at Harris Lake and Skyline). In addition, the report mentions a couple of best management practices (BMPs), protective of some bat species, that Alabama Power implements during timber harvest activities and states that the BMPs have been expanded but not incorporated in the existing license. However, the report does not include the locations of Alabama Power's timber harvesting and other tree removal activities, or detailed descriptions of timber harvesting protocols and BMPs currently implemented within the project boundary. This information is important to understanding the affected environment for Indiana bat, NLEB, and/or other T&E species. This information could also be used for the streamlined consultation option for analyzing the potential project effects on NLEB (including within the buffer areas for hibernacula and maternity roost trees).

Please complete the FWS's NLEB streamlined consultation form and include it in the final T&E species study report. This form can be found at: https://www.fws.gov/southeast/pdf/guidelines/northern-long-eared-bat-streamlined-checklist.pdf. We recommend using FWS's definition of "tree removal" to guide your responses on the form (i.e., "cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats").[1]

Also, please update figures 3.14-1, 3.14-2, 3.14-3, 3.15-1, 3.15-2, and 3.15-3 which currently show "forested area" or "karst landscape" in relation to NLEB and Indiana bat habitats, to show Alabama Power's timber management areas within the project boundary, and other proposed managed areas (e.g., new/improved recreation areas, new quail management areas). This type of information is needed to meet another component of this study (i.e., "determine if [T&E species habitat at the project] are potentially impacted by Harris Project operations", as described on slide 5 of the Aug. 27, 2019, HAT 3 meeting).

10. On page 21 and 22, in section 3.17, the discussion mentions an occurrence of little amphianthus within the project boundary at Lake Harris (Flat Rock Park) that was documented in 1995 and may be extirpated. Did the botanical surveys in that area of the project target that species? The top of page 22, states that "Vernal pools were not identified due to a lack of available data." Did the botanical surveys identify vernal pools in this area?

11. On page 22, in section 3.18, the report states that the National Wetland Inventory data is not detailed enough to identify wetlands within the project area that contain white fringeless orchid's unique wetland habitat characteristics. Do you propose collecting more data on this subject?

12. On page 23, in section 3.19, the report states that the 16 extant populations of Prices' potato bean in Jackson County, occur on Sauta Cave National Wildlife Refuge, and near Little Coon Creek in the Skyline WMA. Please clarify whether or not any of the 16 populations occur within the project boundary at Skyline WMA.

13. In Appendix B, figure 3.19, showing Price's potato-bean habitat range, there is a 100-foot Stream Buffer within the Limestone Landscape layer shown on the map and legend. Please explain the significance of this buffer, including any regulatory

[1] 81 Fed. Reg. 1902 (January 14, 2016).

requirements associated with this buffer. Please include this information in the final T&E species study report.

14. In the August 27, 2019, HAT 3 meeting summary, please clarify the following:
    a. How does Alabama Power define terms such as “sensitive time periods” in the context of timber harvesting?
    b. Evan Collins, of FWS, stated that the palezone shiner may be present in some of the lower reaches of the Tennessee River tributaries. Please clarify where these tributaries are located in relation to the project boundary.

Draft Lands Evaluation (Phase 1) Report:

1. On page 9, the proposed definition for the “Recreation” classification includes a reference to permitting processes for various types of recreations activities. Will the permitting processes be updated as part of the revised SMP?

2. On page 9, the proposed definition of the “Hunting” classification includes a reference to the existing Harris Project Wildlife Mitigation Plan. How do you envision the existing Project Wildlife Mitigation Plan relating to the proposed Wildlife Management Plan that is to be developed as part of Phase 2 of the Lands Evaluation?

3. On page 9, the proposed definition of the “Natural/Undeveloped” classification mentions that one of the allowable uses would be "normal forestry management practices." Please clarify what these practices would include.

4. On page 10, there are descriptions of two new proposed land use classifications, including “Flood Storage” which would include lands between the 793 ft and 795 ft msl contours, and “Scenic Buffer Zone” which would include lands between the 795 ft and 800 ft msl contours. Would these classifications overlap with other land use classifications? Also, are there any buildings/structures currently within these elevation bands around Lake Harris?

5. Page 11 discusses the results of the desktop evaluation and site visit to identify any suitable bobwhite quail habitat within the project boundary at Skyline WMA. Could you elaborate on the methods for evaluating the availability of bobwhite quail habitat and how it was determined that no suitable habitat occurred within the project boundary at Skyline WMA? Also, could the report include a figure showing a map of the 7 locations in the Skyline WMA where Alabama DCNR conducts spring/fall quail call surveys, and has documented quails, relative to the project boundary at Skyline WMA?

6. Appendix B provides maps and general descriptions of proposed changes in land use classifications at Lake Harris that were also discussed during the 9/11/19 HAT 4 meeting. It would be helpful if the maps of the proposed changes in land use classifications included legends to identify the various classifications, as well as north arrows and scale bars to facilitate orientation and review.

   In addition, during the 9/11/19 HAT 4 meeting, we (FERC staff) asked if terrestrial and cultural resource surveys were being conducted on lands proposed for removal from the project boundary and Alabama Power staff responded that they were. Could you provide descriptions of the terrestrial and riparian habitat types for areas that you are proposing to remove from the project boundary. Could you also describe the terrestrial and riparian habitat types for area "RC4" that you propose to reclassify from "Recreation" to "Commercial Recreation"? Do these areas contain suitable habitat for any of the T&E species that may occur at the Harris Lake portion of the project? What were the results of the cultural resource surveys for areas proposed to be removed from the project boundary?

   Also, it would be helpful if the map of area A6 included the existing birding trail and the proposed extension of the trail.

7. Appendix C provides the Anniston Museum of Natural History's Flat Rock Botanical Inventory (inventory) report and the consultation record includes the Anniston Museum of Natural History's letter transmitting the report, Ken Wills' (Coordinator of the Alabama Glade Conservation Coalition) emails, along with several additional observations and recommendations from them.

   Approximately 365 plant species, including some rare species were documented at the site during the botanical inventory. The surveyors, Ken Wills, and FERC staff observed damages caused by vehicles traversing the site (SUV observed by surveyors; ATVs tire marks on granite outcrops observed by Ken Wills and FERC staff during scoping/environmental site review). The consultation record for this study includes recommendations from Anniston Museum of Natural History and Ken Wills' to manage/preserve/restore the site. The proposed definition of the "Natural/Undeveloped" classification, proposed for the rare plant site, does not indicate what types of recreation activities/vehicle access would be prohibited or how Alabama Power would manage such a site. Considering all of this, do you think that Alabama Power's proposed definition of "Natural/Undeveloped" would be effective in protecting this site? Could the definition of this classification be expanded/more detailed, or would you consider another, more protective land use classification type/designation for this site?

   Also, what has Alabama Power done to protect the rare plants that were identified during the inventory and were subsequently damaged by ongoing ATV use observed by Ken Wills? Can vehicles be excluded from these sensitive areas to protect rare plants while the relicensing process proceeds?

8. Has the request from Randolph County regarding the proposed water treatment intake/plant been resolved/processed?

Draft Inadvertent Discovery Protocol (IDP)

1. Section 2.3.1 of the IDP includes provisions for previously unidentified human remains and or historic properties.

    a. Staff recommend changing the term "historic properties" to "cultural resources" because at the time a previously-undocumented resource is discovered, it has not been assessed for eligibility for the National Register of Historic Places, and cannot, by definition, be considered a "historic property" until its eligibility is determined.

    b. Item 2.3.1(b) seems to indicate that at some point after discovery, an evaluation of eligibility for a newly discovered cultural resource will occur. The process for determining National Register-eligibility should be outlined in the plan.

Draft Traditional Cultural Property Identification Plan

2. No specific comments.

Alabama Power

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May 12, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Initial Study Report Meeting Summary

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 utilizing the Federal Energy Regulatory Commission's (FERC) Integrated Licensing Process (ILP) to complete the relicensing process for the Harris Hydroelectric Project (FERC No. 2628-065). On April 28, 2020, Alabama Power held an Initial Study Report Meeting pursuant to 18 C.F.R. Section 5.15 (c) of the ILP. Due to concerns with COVID-19, Alabama Power held the Initial Study Report meeting via conference call.

The meeting summary, including a list of attendees and the meeting presentation, is attached.

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

Sincerely,

Angie Anderegg

Angie Anderegg
Harris Relicensing Project Manager

Attachment - Initial Study Report Meeting Summary

cc: Harris Stakeholder List

Meeting Summary

Initial Study Report Meeting via Conference Call

April 28, 2020 ~ 9:00 AM to 4 PM

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APPENDICES

1 OVERVIEW

Angie Anderegg (Alabama Power) opened the Harris Project (FERC No. 2628) (Project) Initial Study Report (ISR) meeting and reviewed the ISR meeting purpose. Angie conducted a roll call, reviewed phone etiquette, and presented a safety moment. A list of participants is included in Appendix A[1]. Alabama Power presented information on the progress of each study, which included applicable study results, requested variances, and any additional studies or requested study modifications. The ISR presentation was made available to all participants on the Harris Relicensing website (www.harrisrelicensing.com) prior to the meeting and is included in this report as Appendix B.

In this ISR Meeting Summary, Alabama Power presents the questions and comments that were provided prior to and during the ISR meeting[2]. Each question or comment is followed by Alabama Power's responses and discussion in **bold** text. FERC staff as well as three stakeholders submitted written questions/comments in advance of the ISR meeting via email. Where appropriate, Alabama Power provides a full response. However, many responses to the questions will be addressed in the applicable Final Study Reports and in additional analyses (Phase 2) to be conducted in 2020/2021.

FERC staff raised three general questions in its April 27, 2020 email to Alabama Power. Alabama Power's responses to FERC's general questions are provided below.

1.1 FERC's Questions submitted in advance of the meeting

- Q1 - Comments on all the studies should be filed with the Commission by 6/11/20, as stated in the cover letter of the ISR, and not (solely) sent directly to Alabama Power via email, as stated in the cover letters of the Draft Downstream Release Alternatives Phase 1 Report, Draft Operating Curve Change Feasibility Analysis Phase 1 Report, Draft Erosion and Sedimentation Study Report, Draft Water Quality Study Report, Draft T&E Species Assessment, Draft Phase 1 Project Lands Evaluation Study Report, and the Traditional Cultural Properties Identification Plan and Inadvertent Discovery Plan.

  Alabama Power emphasized that all stakeholders should file comments with FERC on the Harris Project (P-2628-065) on or before June 11, 2020. Alabama Power also noted that if any stakeholder has a question about filing comments with FERC, they could email those questions to harrisrelicensing@southernco.com.

- Q2 - Several of the studies reference the use of Geographic Information System (GIS) data. To facilitate stakeholder review and analysis of the study results it would be helpful if all GIS data collected or developed as part of the studies is filed with the study reports.

[1] Because this meeting was conducted over Skype, there may be participants who joined after the roll call and are not listed in Appendix A.

[2] These notes summarize the major items discussed during the meeting and are not intended to be a transcript or analysis of the meeting.

Alabama Power will file GIS data, as applicable, with the Final Study reports.

- Q3 - Please describe whether you have experienced or anticipate any delays to studies as a result of COVID-19 related closures or social distancing measures.

  Alabama Power has experienced delays conducting field work and meeting with the Harris Action Teams (HATs) due to COVID-19 closures and restrictions. Alabama Power anticipates that it may be months before HATs can meet in person. However, meetings can still occur using teleconferencing.

2 CULTURAL RESOURCES PROGRAMMATIC AGREEMENT AND HISTORIC PROPERTIES MANAGEMENT PLAN STUDY

Amanda Fleming (Kleinschmidt) presented the Cultural Resources documents that were filed with the ISR: the Inadvertent Discovery Plan (IDP) and the Traditional Cultural Properties (TCP) Identification Plan. Amanda reviewed the study purpose, data collection to date, initial results, and a variance request to file the Area of Potential Effects (APE) in June 2020.

2.1 FERC's Questions submitted in advance of the meeting

- Q1 - Staff recommend changing the term "historic properties" to "cultural resources" because at the time a previously-undocumented resource is discovered, it has not been assessed for eligibility for the National Register of Historic Places, and cannot, by definition, be considered a "historic property" until its eligibility is determined.

  Alabama Power will make adjustments to the term "historic properties" and will include both the Inadvertent Discovery Plan (IDP) and Traditional Cultural Properties (TCP) Identification Plan as appendices to the Historic Properties Management Plan (HPMP).

- Q2 - Item 2.3.1(b) seems to indicate that at some point after discovery, an evaluation of eligibility for a newly discovered cultural resource will occur. The process for determining National Register-eligibility should be outlined in the plan.

  Alabama Power will add this process to the IDP. The National Register-eligibility process will also be addressed in the Historic Properties Management Plan (HPMP) being developed by Alabama Power.

- Q3 - Rachel McNamara asked about defining the area of potential effects (APE) and the possibility of extending the APE downstream. Rachel stated there is a need for more discussion.

  Alabama Power noted that it intends to schedule a Harris Action Team (HAT) 6 meeting in May to further discuss the APE.

2.2 Carol Knight's Questions submitted in advance of the meeting

- Q4 - How far down river from the dam does Alabama Power have responsibility for the river?

  Alabama Power's responsibility downstream of Harris dam is the Harris Project Boundary below the dam.

- Q5 - How far up each side of the bank does Alabama Power have below the dam?

The State of Alabama owns the river channel, and the riverbanks are private property.

- Q6 - How do they (Alabama Power) enforce their responsibilities?

  Alabama Power follows all guidelines and regulations for lands and waters within the Harris Project Boundary.

- Q7 - Are they [Alabama Power] aware of archaeological sites that are endangered below the dam? That each time they open the flood gates, erosion occurs washing away cultural remains?

  Alabama Power is reviewing potential effects of Harris Project operations on cultural resources downstream of the dam in the Tallapoosa River. However, Alabama Power cannot enforce preservation policies on private lands. If a landowner encounters a burial site, they should report it immediately to the State Historic Preservation Officer (SHPO)/Alabama Historical Commission (AHC). The SHPO or AHC can provide additional details on regulations and authority regarding archaeological properties or cultural remains.

- Q8 - Are they [Alabama Power] aware of the destruction of the fish weirs down river?

  Alabama Power is reviewing potential effects of Harris Project operations on cultural resources downstream of the dam in the Tallapoosa River. In addition, Alabama Power may work with stakeholders to develop best management practices related to cultural resources.

2.3 Participant Questions

- Q9 - Elizabeth Toombs (Cherokee Nation) **–** Do the HPMP, TCP Identification Plan, and IDP documents apply to the Skyline portion of the Project or is this limited to the reservoir?

  Yes, all of the cultural resources documents and procedures apply to all lands within the Harris Project Boundary.

3 RECREATION EVALUATION STUDY

Amanda Fleming (Kleinschmidt) presented the Recreation Evaluation Study progress. Amanda reviewed the study purpose, data collection to date, initial results, and a variance request to file the draft Recreation Evaluation Study Report in August 2020 instead of June 2020.

3.1 Donna Matthews' Questions submitted in advance of the meeting

- Q1 - Increased downstream, Alabama Power managed, public access. An impediment to public use of the river to swim, fish or float is lack of access. What plans are underway to correct this omission?

  Alabama Power is evaluating downstream use as part of the recreation study, and any additional access needs will be discussed with HAT 5 and addressed in the licensing proposal.

- Q2 - Safety from Rapid Water Level Rises. Over the last 40 years, even locals have been dissuaded from using their river because of erratic and dramatic variations in water levels. Completely aside from the issue of how unnaturally the river is distended from pre-dam normals on an hour by hour basis remains the unaddressed danger to humans recreating in/on the river during episodes of rapid water level rise. The potential threat is created by water release at the dam. APC must alert downstream subscribers of planned and imminent water release. Current cell phone technology is well suited to send safety alerts.

  Alabama Power is evaluating downstream flows and recreation use as part of the recreation evaluation study as well as gathering information/input from public access sites, downstream landowners, and Tallapoosa River users.

  Alabama Power uses the Smart Lakes App and the Alabama Power website to inform stakeholders of water releases. There are times, however, that system demands require a change in the generation schedule. Prior to any generation releases, Alabama Power sounds a notification siren. The generating units will not load unless the siren activates.

3.2 Participant Questions

- Q3 - Ken Wills (Alabama Glade Conservation Coalition) - Why was the operating schedule reduced for Flat Rock and will the operating schedule be modified in 2020 due to COVID-19?

  The operating schedule in August 2019 was condensed based on low attendance. Last year's schedule is not indicative of the 2020 summer schedule. Currently, no changes from the normal operating schedule are proposed, and the goal is to open

by Memorial Day. Alabama Power will follow all state and federal guidelines related to COVID-19.

- Q4 - Several questions and comments were raised by participants about flood control operations and water releases downstream.

  Alabama Power addresses operational questions in Section 6 of this meeting summary.

- Q5 - Keith Henderson, Alabama Department of Conservation and Natural Resources (ADCNR) - Why did the Lake Harris questionnaires start in May 2019 (rather than March 2019) and what were the four survey questions?

  In its April 2019 Study Plan Determination, FERC requested that Alabama Power add the Lake Harris questionnaire. Therefore, Alabama Power started those surveys in May 2019. The study questions are listed in Appendix C to the Recreation Evaluation Study Plan, which can be found at www.harrisrelicensing.com.

4 PROJECT LANDS EVALUATION STUDY

Kelly Schaeffer (Kleinschmidt) presented the Project Lands Phase 1 Evaluation Study Report progress. Kelly reviewed the study purpose and data collection to date, which included the development of maps showing Alabama Power's proposal to add, remove, or modify lands in the Project Boundary. Kelly also reviewed the remaining activities in this study, which include the use of other relicensing studies to develop the Phase 2 Wildlife Management Program (WMP) and the Shoreline Management Plan (SMP). Kelly noted that no variances to this study plan are requested. Alabama Power distributed the Draft Phase 1 Project Lands Evaluation Report to stakeholders in April 2020, concurrently with filing the ISR.

4.1 FERC's Questions submitted in advance of the meeting

- Q1 - On page 9, the proposed definition for the "Recreation" classification includes a reference to permitting processes for various types of recreations activities. Will the permitting processes be updated as part of the revised Shoreline Management Plan (SMP)?

  Alabama Power will review the existing permitting processes during development of the SMP and determine if any updates are needed.

- Q2 - On page 9, the proposed definition of the "Hunting" classification includes a reference to the existing Harris Project Wildlife Mitigation Plan. How do you envision the existing Project Wildlife Mitigation Plan relating to the proposed Wildlife Management Plan that is to be developed as part of Phase 2 of the Lands Evaluation?

  Any existing information (i.e., the existing Wildlife Mitigation Plan) will be reviewed to determine if any portion of the plan might apply to the new WMP, which would be implemented in the next license term.

- Q3 - On page 9, the proposed definition of the "Natural/Undeveloped" classification mentions that one of the allowable uses would be "normal forestry management practices." Please clarify what these practices would include.

  All forestry practices that would be allowable in the Natural/Undeveloped land use classification will be included in the WMP, which will be filed with the final license proposal.

- Q4 - Rachel McNamara (FERC) - Some lands classified as "Recreation" are proposed to be changed to "Natural/Undeveloped". She noted that it may be helpful in the final report for Alabama Power to be very clear about the project purpose in retaining those lands rather than removing from the project boundary.

  Alabama Power intends to clearly state the project purpose of all lands proposed to be reclassified in the Final Licensing Proposal.

- Q5 - On page 10, there are descriptions of two new proposed land use classifications, including "Flood Storage" which would include lands between the 793 ft and 795 ft msl contours, and "Scenic Buffer Zone" which would include lands between the 795 ft and 800 ft msl contours. Would these classifications overlap with other land use classifications? Also, are there any buildings/structures currently within these elevation bands around Lake Harris?

The land use classifications will not overlap. In areas where the lands above the 800 ft msl contour (i.e. "back acreage") are project lands, the project lands below the 800 ft msl contour would be classified to match the back acreage. In areas where the lands above the 800 ft msl contour are non-project lands, the lands below the 800 ft msl contour would consist of these two classifications. However, the classifications would not overlap but would be adjacent (one band in front of the other). Alabama Power could not confirm at the meeting whether any buildings or structures currently exist within those contours, but current permitting practices allow property owners to build piers, etc. in these bands.

- Q6 - Page 11 discusses the results of the desktop evaluation and site visit to identify any suitable bobwhite quail habitat within the project boundary at Skyline WMA. Could you elaborate on the methods for evaluating the availability of bobwhite quail habitat and how it was determined that no suitable habitat occurred within the project boundary at Skyline WMA? Also, could the report include a figure showing a map of the 7 locations in the Skyline WMA where Alabama DCNR conducts spring/fall quail call surveys, and has documented quail, relative to the project boundary at Skyline WMA?

  The Final Phase 1 Project Lands Evaluation Report will contain detailed methods for the evaluation of suitable bobwhite quail habitat at Skyline. Alabama Power will also include a figure showing the ADCNR's quail call survey locations.

- Q7 - Appendix B provides maps and general descriptions of proposed changes in land use classifications at Lake Harris that were also discussed during the 9/11/19 HAT 4 meeting. It would be helpful if the maps of the proposed changes in land use classifications included legends to identify the various classifications, as well as north arrows and scale bars to facilitate orientation and review.

  Alabama Power will add a legend, north arrows, and a scale bar to the final maps in the Final Phase 1 Project Lands Evaluation Report.

- Q8 - In addition, during the 9/11/19 HAT 4 meeting, we (FERC staff) asked if terrestrial and cultural resource surveys were being conducted on lands proposed for removal from the project boundary and Alabama Power staff responded that they were. Could you provide descriptions of the terrestrial and riparian habitat types for areas that you are proposing to remove from the project boundary. Could you also describe the terrestrial and riparian habitat types for area "RC4" that you propose to reclassify from "Recreation" to "Commercial Recreation"? Do these areas contain suitable habitat for any of the T&E species that may occur at the Harris Lake portion of the project? What were the results of the cultural resource surveys for areas proposed to be removed from the project boundary?

Many other resource studies are being conducted concurrently with the development of the Project lands proposal. Alabama Power intends to use information from other relicensing studies to inform the final decision on the Project lands proposal, which will be included in the final licensing proposal. Additionally, Alabama Power will include within its final licensing proposal descriptions of the terrestrial and riparian habitat types for all areas proposed to be removed from the Project as well as the area "RC4" proposed to be reclassified to "Commercial Recreation".

- Q9 - Sarah Salazar (FERC) - Alabama Power needs to be sure to get information on the record so that FERC can use that information to inform their decision on the project related effects. The Final Phase 1 Project Lands Evaluation should explain the rationale for adding, removing or reclassifying lands in the Project Boundary. Also, it would be helpful if the map of area A6 included the existing birding trail and the proposed extension of the trail.

  The project purpose for the lands to be removed, added, or reclassified will be included in the final licensing proposal. Alabama Power will also add the birding trail and trail extension on the respective map as included in the Final Phase 1 Project Lands Evaluation Report.

- Q10 - Appendix C provides the Anniston Museum of Natural History's Flat Rock Botanical Inventory (inventory) report and the consultation record includes the Anniston Museum of Natural History's letter transmitting the report, Ken Wills' (Coordinator of the Alabama Glade Conservation Coalition) emails, along with several additional observations and recommendations from them.

  Approximately 365 plant species, including some rare species were documented at the site during the botanical inventory. The surveyors, Ken Wills, and FERC staff observed damages caused by vehicles traversing the site (SUV observed by surveyors; ATVs tire marks on granite outcrops observed by Ken Wills and FERC staff during scoping/environmental site review). The consultation record for this study includes recommendations from Anniston Museum of Natural History and Ken Wills' to manage/preserve/restore the site. The proposed definition of the "Natural/Undeveloped" classification, proposed for the rare plant site, does not indicate what types of recreation activities/vehicle access would be prohibited or how Alabama Power would manage such a site. Considering all of this, do you think that Alabama Power's proposed definition of "Natural/Undeveloped" would be effective in protecting this site? Could the definition of this classification be expanded/more detailed, or would you consider another, more protective land use classification type/designation for this site?

  Also, what has Alabama Power done to protect the rare plants that were identified during the inventory and were subsequently damaged by ongoing ATV use observed by Ken Wills? Can vehicles be excluded from these sensitive areas to protect rare plants while the relicensing process proceeds?

Alabama Power noted that that it has SMPs for its other projects that contain different classifications because of unique areas and circumstances. Therefore, the Natural/Undeveloped land use classification may need to be modified to address the rare plants at Flat Rock Park. Alabama Power will work with the HAT on reviewing the classifications and their definitions.

Sheila Smith (Alabama Power) noted that Alabama Power has been working with a contractor to barricade the area to prevent vehicle traffic. The barricade work has been completed. Alabama Power plans to continue monitoring the site to discourage vehicle and all-terrain vehicle (ATV) access.

- Q11 - Sarah Salazar (FERC) asked if the area also gets a lot of mountain bike use?

  Ken Wills (AGCA) noted that vehicles are the primary issue in that area and that mountain biking would not likely cause the effects they are seeing. He also noted that in the rural areas, ATVs were much more common.

- Q12 - Has the request from Randolph County regarding the proposed water treatment intake/plant been resolved/processed?

  Alabama Power is working with Randolph County to find an acceptable site that is similar to their original request. Alabama Power intends to file a land use variance request with FERC's Division of Hydropower Administration and Compliance, and, therefore, this request would not be a part of the relicensing process.

4.2 Participant Questions

- Q13 - Maria Clarke (EPA): It was my understanding there was a court case that involved Skyline Property. What happened? Why was the Skyline property reduced? Is this case closed?

  Alabama Power filed an application with FERC to amend its current Harris Project Boundary at Skyline (Accession No. 20200302-5424), which would add 13.1 acres of land and remove 62.2 acres of land, all within the approximately 15,063 acres of the Harris Project Boundary at Skyline.

5 OPERATING CURVE CHANGE FEASIBILITY ANALYSIS STUDY

Kelly Schaeffer (Kleinschmidt) presented the Operating Curve Change Feasibility Analysis Phase 1 Report progress. Kelly reviewed the study purpose and data collected to date, which included the development of models and the initial modeling results. Kelly also reviewed the remaining activities for this study, including the use of other relicensing studies to conduct the Phase 2 analyses. Kelly noted that no variances to this study plan are requested. Alabama Power distributed the Draft Operating Curve Change Feasibility Analysis Phase 1 Report to stakeholders in April 2020, concurrently with filing the ISR.

5.1 FERC's Questions submitted in advance of the meeting

- Q1 - As we understand it, downstream effects with regard to flooding were assessed for a 100-year design flood. However, the relationship between the downstream flow alternative analysis and the Harris Reservoir winter flood pool analysis is not clear under alternative flood scenarios. What would happen in a scenario other that a 100-year flood? Would operations at Harris Dam under the alternative flood scenario, including different flow release scenarios, have any impact on the Harris Reservoir winter pool analysis, or vice versa?

  The "100-year flood" scenario used for modeling is based on an actual local storm event in the Tallapoosa River basin that is scaled up to equal a 100-year flood event. Other flood flow scenarios would likely have downstream flooding effects but at a smaller amount and duration. Alabama Power evaluated the effects of the 100-year flood, because FEMA uses the 100-year flood for its analysis and is the "gold standard". This is also consistent with modeling efforts that Alabama Power has conducted in previous relicensing processes. Kenneth Odom (Alabama Power) explained that if a 50-year flood scenario is used, there will still be downstream flooding. It will just result in less of an impact than the 100-year scenario. If Alabama Power used a 25-year flood, there would be fewer impacts than the 50-year flood scenario. Ultimately, reducing the flood frequency interval reduces the total amount of flow. However, there is no way to determine the differences in the total amount of flow downstream without modeling.

- Q2 - Table 5-2, page 51 of the report…What is it about RM 115.7 that appears to create a hydraulic control, such that the maximum increase in depth under any winter pool elevation scenario occur about mid-way down the Tallapoosa River?

  The surveyed bathymetric transects of the river indicate that the channel bottom rises at RM 113.63 and RM 114.5, constricting the channel area and creating a hydraulic control. Examination of aerial imagery shows what appears to be a shoal across the river at RM 114.5 and a shoal and island complex at RM 113.63.

- Q3 - Figures 5-20 and 5-21 appear incomplete, as they only show the results for one alternative…baseline (? based on color). Please address this apparent omission.

These figures are complete. However, Alabama Power will review them to determine if the information can be presented with more clarity. The Y axis shows the different winter curve change alternative elevations (+1 is 786 ft, +2 is 787 ft, etc.). For example, at the 786 ft msl winter pool elevation, there are 12 additional days of spill over baseline. Figure 5-21 is similar but includes the additional days of capacity operations for each alternative.

5.2 Participant Questions

- Q4 - Jimmy Traylor, Donna Matthews, and Albert Eiland (Downstream Landowners) expressed concern regarding how Alabama Power is operating the Harris Project, particularly during high flow events. All expressed that flood control has been worse since the dam has been in place. There were specific comments regarding various dates where flow conditions were a concern including February 6, 11, and 13, 2020. There were also questions regarding operations and use of flood gates on April 9, 2020. This discussion on operations during high flow events transitioned to comments and questions on the efficiency of the turbines at Harris and whether Alabama Power ever evaluated the efficiency of the turbines. Does raising the winter pool help with the generation efficiency, or are there any studies ongoing to improve the efficiency of generation for the dam? What about the dam turbines or equipment upgrades?

  Alabama Power operates Harris in accordance with U.S. Army Corps of Engineers flood control procedures provided in the Harris Reservoir Regulation Manual. Alabama Power follows these procedures and cannot evacuate water in anticipation of a high flow event. Kenneth Odom (Alabama Power) explained that raising the winter pool to the levels being evaluated in this study does not appreciably affect the efficiency of generation. Turbine or powerhouse equipment upgrades have a much greater impact on efficiency. However, the order of magnitude for total generation capacity for Harris would remain the same regardless of any equipment upgrades. Kenneth noted that the efficiency of the turbines is addressed during a turbine upgrade, which typically occurs at the end of the useful life of the turbine. There are no planned turbine upgrades during this relicensing.

  Additionally, Kenneth Odom reviewed the reservoir levels that were raised by a stakeholder earlier in the meeting. He noted that on February 6, 2020, the reservoir level was 785 ft msl. A large rain event had occurred, and both units were generating at best gate. The reservoir's elevation rose to 790 ft msl (5 feet above winter curve) on February 11, 2020 and both units began operating at full gate. The reservoir continued to rise. On February 13, 2020, the Harris reservoir was 6.5 feet above the winter curve elevation of 785 ft msl. In accordance with Harris flood control procedures, Alabama Power opened flood gates. Kenneth further confirmed that Alabama Power was not using any flood gates to pass water downstream of Harris Dam on April 9, 2020.

- Q5 - Donna Matthews (Downstream Landowner): Is the public ever involved in discussions regarding turbine or equipment upgrades; why not consider using the HEC-RAS modeling to redesign the turbines? Could you find the optimal solution to turbine design and flow scenarios to solve those issues? How do we know what to ask for if all the possible solutions aren't offered for us to consider?

Angie Anderegg (Alabama Power) stated that the public is not usually involved with discussions on equipment upgrades. She noted that there seemed to be confusion between the turbine design/efficiency versus the downstream flow scenarios. The two existing turbines have a specific capacity and generate a finite number of megawatts with the amount of water that passes through them, which is inherent in the design of the turbines. When it is time to upgrade, Alabama Power desires to achieve more power with less water, creating an increase in efficiency. It is not possible to completely redesign the turbines, because the Harris Project was originally designed to generate a certain number of megawatts using a certain amount of water at specific times (i.e., peak) to support system operations. Angie gave an example of the system peak that happens during a hot summer afternoon and how hydropower is used to meet the system demand. As part of the downstream release alternatives study, the benefit or impact of providing a continuous minimum flow are being analyzed (a continuous minimum flow would also ideally produce power). Angie reiterated that the results from this study, as well as the other studies, will be analyzed together to develop the best proposal.

Kenneth Odom (Alabama Power) added that a redesign of the turbines or new "runners" would focus on improving the efficiency but deliver the same general number of megawatts.

FERC staff stated that, if a licensee determines that upgrades are necessary, it must file a license amendment application with FERC. She explained that license amendment applications are subject to the NEPA process, and depending on the potential for environmental effects, FERC would issue a public notice and solicit public input.

- Q6 - Donna Matthews: Who controls the amount of number of megawatts generated? What if the number of megawatts is too much for the river? Why can't you change it?

  The number of megawatts that a project is authorized to generate is set by FERC, as described in the original license order. Changing the generating capacity would affect the energy grid beyond Harris, because Alabama Power is required to supply a certain amount of power across the entire system. There is a reliability factor from the Harris Project that supports the entire power grid.

- Q7 - Question from Instant Messenger, Martha Hunter (Alabama Rivers Alliance): Wasn't there a turbine upgrade a few years ago?

  No, a turbine upgrade has not been completed at the Harris Project.

- Q8 - James Hathorn (USACE): How were the intervening flows considered in the Harris model?

The intervening flow hydrograph for the contributions to the Tallapoosa River from the drainage area between Harris and Wadley was calculated by Alabama Power, as described in Section 4.4 of the study report. The hydrograph was included in the model as a uniform lateral hydrograph entering the river between RM 136.6 and 122.97. Kleinschmidt developed an intervening flow hydrograph for the contributions to the river from the drainage area between Wadley and Horseshoe Bend by comparing the daily flood hydrographs from the Wadley and Horseshoe Bend gages for the March 1990 event. A comparison of the daily average flow hydrographs gages showed a similar shape for both gages. The hourly hydrograph for the Wadley intervening flow, calculated by Alabama Power, 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. The development of the hydrograph is described in Section 4.5.3 of the report.

- Q9 - James Hathorn: What types of structures will be analyzed in the phase 2 structure study? Will there be any crop/farmland analysis?

  Alabama Power has not conducted a full economic analysis of each structure, land type, or property type. Crop or farmland analysis is not currently in the FERC-approved methodology.

- Q10- James Hathorn: For the HEC-RAS modeling, it only uses a 100-year design flood, or different types of storms?

  Alabama Power has not proposed to model other storm events. However, if FERC needs this information for its analysis, Alabama Power can model other storm events.

  Angie Anderegg (Alabama Power) explained that the 100-year flood has been used as the standard by FEMA. To move forward with other flood scenarios, Alabama Power will need to know exactly which additional floods need to be modeled.

  Sarah Salazar (FERC) reiterated that the process is in the information gathering stage, and no decisions are being made right now. However, we do want to know all of the alternatives that are possible moving forward in order to make the best decision later. She encouraged all stakeholders to file comments on or before June 11, 2020.

- Q11 - Alan Creamer (FERC) - Regarding the flood design, what would the downstream flows look like using a 50-year or 25-year flood scenario? I know the worst-case scenario is the 100-year flood. I'm wondering if it would present as a straight line, or a curve in terms of how it presents downstream? Maybe the 100-year flood isn't the end–all.

Kelly Schaeffer (Kleinschmidt) asked if FERC was requesting that Alabama Power add specific flood events other than the 100-year flood to the study plan (the 25 and 50-year flood scenarios).

Alan Creamer (FERC) answered that he thought it would be helpful to see how the flows would work under different scenarios.

Kelly Schaeffer responded that if there are additional modeling requests, Alabama Power would need to know those scenarios as soon as possible to avoid getting to December 2020 (after completing the majority of the Phase 2 analysis) and have to re-run the model for additional flood events and revisit the Phase 2 analyses.

Kenneth Odom (Alabama Power) explained that the "100-year flood" scenario that Alabama Power uses for modeling is based on a local storm event in the Tallapoosa River basin, but it is scaled up to equal a 100-year flood event. If it is a 50-year flood scenario, downstream flooding will still occur. It is just less impact than the 100-year scenario. If Alabama Power used a 25-year flood, there would be fewer impacts than the 50-year flood scenario. FEMA bases its flood maps on the 100-year flood. Other storms can be examined, but ultimately, reducing the flood frequency interval reduces the total amount of flow. However, there is no way to determine what the differences would be in the total amount of flow downstream without modeling.

Angie Anderegg (Alabama Power) commented that Alabama Power's intent is to use the 100-year flood to determine whether it will propose a lake level change.

- Q12 - Regarding the 100-year flood, are they taking climate change into account when they're looking at these scenarios? Martha Hunter also added that along with additional rains we are seeing we need to anticipate the different droughts that are coming and wants that to be part of the decision for how the river is operated in the next 50 years.

  Alan Creamer (FERC) stated that he did not recall that climate change was part of the study design or approved study plan.

- Q13 - Maria Clark (EPA) noted that that the EPA, U.S. Geological Survey, and FEMA have been working together to address data shortfalls on climate information. She noted that the 100-year event may not be appropriate at this point or if Alabama Power does use the 100-year, they should also supplement with local events. Maria plans to pass along this information from EPA.

  Kelly Schaeffer (Kleinschmidt) asked if Maria could include that information or provide a reference in its comments on the ISR. Kenneth Odom (Alabama Power) also noted that the 100-year design flood used in the Harris modeling was based on an actual storm event that was scaled up to equal a 100-year event.

- Q14 – Charles Denman via email following the meeting: I believe a comparison of historical (pre-dam) and recent flooding downstream of the dam would help stakeholders understand the effectiveness of the Dam for flood control. Also include a model with same parameters (land use, storm intensity and duration, etc.) but without the dam attenuation. This would help downstream stakeholders understand what effects the Dam has on flooding downstream. Are the original studies and permitting materials available for stakeholders to review?

The Harris Project, as it exists today, is considered baseline with regard to FERC analyses and is used in FERC's decision whether to issue a new operating license and under what conditions. Alabama Power structured this study to review and analyze flood conditions with the Harris Dam in place, consistent with FERC's guidance on existing projects and the evaluation of pre-project conditions. FERC approved this study plan in April 2019. All Harris Relicensing study plans, meeting documentation, and other permitting materials are available to stakeholders at www.harrisrelicensing.com. These documents may also be provided upon request if needed.

6 DOWNSTREAM RELEASE ALTERNATIVES STUDY

Kelly Schaeffer (Kleinschmidt) presented the Draft Downstream Release Alternatives Phase 1 Study Report progress. Kelly reviewed the study purpose and the data collected to date, which included the development of models and initial modeling results. Kelly also reviewed the remaining activities for this study, including the use of other relicensing studies to conduct the Phase 2 analyses. Kelly noted that no variances to this study plan are requested. Alabama Power distributed the Draft Downstream Release Alternatives Phase 1 Report to stakeholders in April 2020, concurrently with filing the ISR.

6.1 FERC's Questions submitted in advance of the meeting

- Q1 - Modeling scenarios…as it stands now, the report presents the results for three downstream release alternatives: Pre-Green Plan operation, Green Plan operation, and Pre-Green Plan operation with a 150 cfs continuous minimum flow. Why was modelling of minimum flow limited to 150 cfs? Also, have you considered modeling Green Plan releases with continuous minimum flow scenarios? On what basis did you choose not to do so?

  Alabama Power proposed these three modeling scenarios for downstream releases in the study plan. These scenarios have been discussed for at least 18 months with stakeholders and were developed in the study plan process and approved by FERC in its April 12, 2019 Study Plan Determination.

6.2 Alabama Rivers Alliance's Questions submitted in advance of the meeting

- Q2 - Why is the only continuous minimum flow regime being studied a 150 cfs flow? Why was this particular value chosen? Previous commenters have encouraged the study of a wide variety of flow conditions and operational scenarios. Does Alabama Power plan to study a broader range of continuous minimum flows?

  As noted above, the various flow scenarios were determined in the development of the study plan. The 150 cfs minimum flow is equal to the same daily volume as three 10-minute Green Plan pulses. If stakeholders desire additional flow conditions and operational scenarios, they need to request additional modeling per the FERC study plan modification process. Kelly Schaeffer (Kleinschmidt) explained that the modeling is resource intensive and while the HEC-RAS model is built and functioning, the process to review other flow scenarios is resource intensive.

- Q3 - The study report states that with full power storage available, Harris is programmed to generate 3.84 hours per day. Is all of that peaking generation, or is some percentage of the programmed operation for non-peaking generation?

  Yes, that number is in the daily Res-SIM model. It is really an average of all the plants in Alabama Power's system at full pool. That number is not connected to peaking operations.

- Q4 - In the Green Plan Release Criteria attached as Exhibit B, item 4 concerns Spawning Windows and states that "Spring and Fall spawning windows will be scheduled as conditions permit. The operational criteria during spawning windows will supersede the above criteria." Can you elaborate on when "conditions permit" for scheduling spawning windows?

  It is dependent on where the reservoir elevation is in relation to its rule curve and what flows are coming into the reservoir to provide stable operations. Keith Chandler (Alabama Power) gave an example: Alabama Power tried to hold a spawning window and only ran 10-minute pulses to see what it would do downstream. By going by the criteria (three 10-minute pulses) Alabama Power wanted to see if it would create a spawning window for the downstream fishery.

- Q5 - Jack West (Alabama Rivers Alliance) asked if Alabama Power had data that permitted for the spawning windows.

  There is some data. Alabama Power's Reservoir Management group has summaries of each year, and the effort in the most recent year is summarized in the baseline report included with the Pre-Application Document (PAD). A portion of this analysis is being done as part of the aquatic resources study and will be detailed in the Draft Aquatic Resources Report.

6.3 Participant Questions

- Q6 - Lisa Gordon (EPA) asked if she could be directed to the 3 downstream release alternative scenarios to find the document where the analysis occurred to model 150 cfs continuous minimum flow. So continuous minimum flow means there is no pulsing?

  Correct; there will not be pulsing with a continuous minimum flow. The flow scenarios are documented in the meeting summaries from December 2018, as well as meetings and filings in 2019 prior to the FERC Study Plan Determination (April 12, 2019). Angie Anderegg (Alabama Power) noted that all the meeting summaries and presentations (from PAD to present) are available on the Harris relicensing website.

- Q7 - Lisa Gordon asked if flows would be adaptively managed. Would these be set, locked in flows, or would there be modified flows when needed?

  Alabama Power is evaluating a continuous minimum flow with no variations or modifications; however, Alabama Power is currently in the data gathering and analysis phase. With this information, a decision about flows can be made. What Alabama Power has been doing in the years leading up to relicensing is an adaptive management process. Alabama Power also has another project that flows are being adaptively managed in a bypassed reach.

- Q8 - Sarah Salazar recalls during the study plan meeting that we discussed alternatives and the stakeholders generally didn't feel comfortable proposing alternatives at that point but said they would once they saw results from the three modeled scenarios included in

Alabama Power's study plan. The information gathering stage does not last forever so now is the time to propose other flow scenarios for modeling. Alabama Power needs those flow scenarios now.

- Q9 - Alan Creamer (FERC) said he agreed with Sarah's summary. Alan would like to see an operating scenario that includes the Green Plan with minimum flows. Alan acknowledged that the fisheries studies have not been completed, so stakeholders do not currently have that information. Once all the studies are complete and reports are available, Alan noted that there should be another opportunity for stakeholders to revisit phase 1 in terms of modeling and not simply go to phase 2 once all the information is presented to stakeholders. Also, what does the 150 cfs represent in terms of percentage of average annual flow? Where does it fall on flow duration curve?

  Alabama Power is in the process of getting that additional information by conducting the FERC approved studies. However, Alabama Power needs to hear from stakeholders now—based on the extensive amount of data currently available on the project—regarding alternative flow scenarios. Any additional scenarios are needed now. Once the phase 2 portions of the operations studies begin, any need to come back to modeling various flow scenarios may result in delays and an incomplete application, which is not acceptable to Alabama Power. There is a lot of data on the Harris Project that has been compiled and presented, and Alabama Power wants stakeholders to meet halfway with regard to putting forward additional flow alternatives to analyze.

- Q10 - Alan Creamer agreed but also reiterated that he doesn't believe we have complete information and that stakeholders should have the opportunity to modify the study plan after receiving and reviewing the study results. Alan noted that there are three studies that are not complete, and FERC and Alabama Power will have to work through this issue so that there is an additional opportunity. Normally at an ISR, Alan stated that all the first-year studies are done. In this case, there are still outstanding studies. He indicated that he doesn't think there is adequate information for stakeholders to make suggestions on alternative flow scenarios.

  The due dates in the studies were approved by FERC. Alabama Power and FERC discussed the draft study reports that were not scheduled to be included in the ISR and discussed the two studies for which Alabama Power is requesting a variance. Angie Anderegg (Alabama Power) noted that the Recreation Evaluation Draft Report is delayed, because Alabama Power incorporated a stakeholder request for an additional survey, which was just completed in April. However, the original due date approved by FERC for the Draft Recreation Evaluation Report was June 2020. Alabama Power stated that there are some reports that were not scheduled to be filed as part of the ISR. The ILP may anticipate that studies will be completed in one year and reports filed as part of the ISR, but that is not a requirement of the ILP or the ISR.

- Q11 - Sarah said that in Alabama Power's proposed and revised study plan that the schedule listed the ISR as a milestone and FERC interpreted that to mean that all the first phases of the study would be complete by then. Any other milestone that went beyond that phase would be a follow up of that report. FERC sets up the study seasons for one year. There are usually two study seasons in each ILP, and she noted that perhaps this accounts for the disparity between FERC and Alabama Power's understanding of where we should be at this moment. Maybe we need to have another discussion.

Six study reports are available for review and comment. If there is disagreement after stakeholder review and comment of the remaining three reports and cultural documents, Alabama Power would enlist FERC for a dispute resolution. Alabama Power desires that everyone has the opportunity to comment on these study reports. Angie Anderegg (Alabama Power) referred to the study schedule and noted that Alabama Power has met the ILP obligations and, where necessary, Alabama Power has asked for a variance on two studies (Recreation and Cultural APE document).

- Q12 - Rachel McNamara agreed with Alabama Power's characterization of the Recreation Evaluation and understood the rationale for modifying the schedule. For the Recreation Evaluation Draft Report, Rachel emphasized that there's need for adequate time for stakeholders to comment on the draft report and that all comments be filed with FERC. There are ways we [FERC] can handle the comment period and I think FERC staff needs to discuss that and figure out the best strategy to address comments and study plan modifications.

  Angie Anderegg (Alabama Power) assured the participants that they would have ample time to comment on the remaining draft study reports (Recreation, Aquatic Resources, Downstream Aquatic Habitat, and the Cultural APE document).

- Q13 - Jimmy Traylor raised the issue of the downstream temperature and the relationship with the minimum flow. He noted that the Tallapoosa River below Harris Dam is not supposed to be a cold-water fishery. If Alabama Power is going to release a 150 cfs continuous minimum flow, it has to be at a temperature that more like that of a warm water fishery.

  Angie Anderegg (Alabama Power) indicated that temperature would be addressed in the aquatic resources' studies (HAT 3) and requested that this question be addressed later in the meeting.

- Q14 - Barry Morris (LWPOA) asked if he was right in assuming these alternative releases would have no impacts on the lake level. Barry asked if 150 cfs was equivalent to the Green Plan flow, would it be twice as much water?

  Based on the model, a 150 cfs minimum flow would not affect the lake level. However, a larger continuous minimum flow could impact lake levels. Regarding the amount of water, Kenneth Odom (Alabama Power) stated that in response to Barry's second question, no, it is not twice as much water. Kenneth stated that the part of generation that is now used solely for Green Plan flows would be replaced by 150 cfs continuous flow. Alabama Power would not pass a continuous minimum flow and continue to pulse.

- Q15 - Rachel asked if you are generating with minimum flow.

  Yes, ideally the minimum flow would be generating, not spill. Chris Goodman (Alabama Power) said that a 150 cfs minimum flow would not affect lake levels but would constrain Alabama Power's ability to peak with the same flexibility as they currently have.

- Q16 - Maria Clark (EPA) encouraged Alabama Power to review their March 2019 comments on this issue. She asked why 2001 was selected as an average year.

  2001 was an average or normal water year determined by the Flood Frequency Analysis study for the Tallapoosa. Additionally, 2001 was pre-Green Plan, which provided pre-Green Plan operations and hourly data to run through HEC-RAS model.

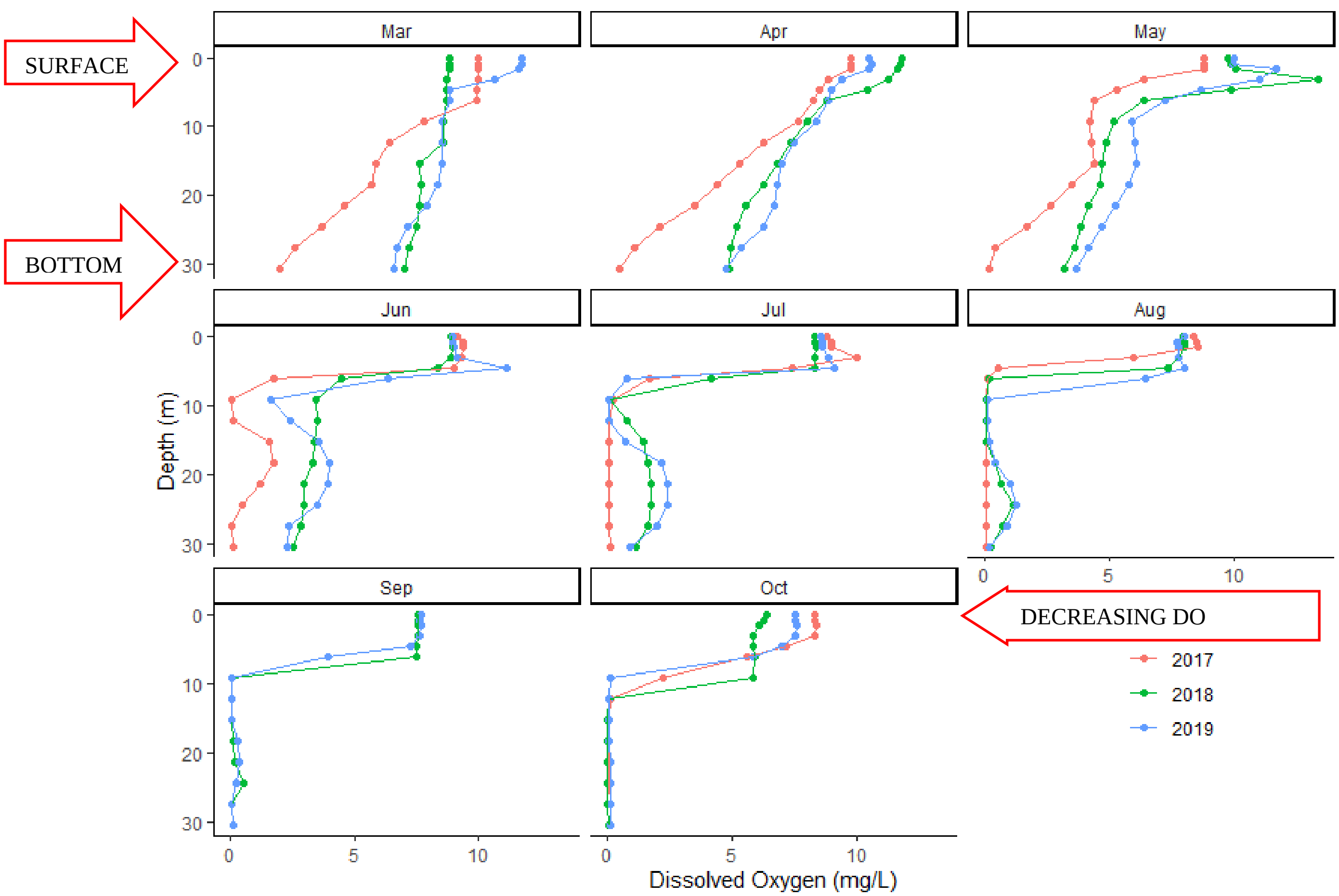
7 WATER QUALITY STUDY

Jason Moak (Kleinschmidt) presented the progress on the Draft Water Quality Study, which included the study purpose, data and activities collected to date, and remaining activities. Jason noted that no variances to this study plan are requested. However, the schedule has been updated to reflect Alabama Power's plan to file the 401 Water Quality Certification application in April 2021. Alabama Power distributed the Draft Water Quality Study report to stakeholders on March 9, 2020, and also in April 2020, concurrently with filing the ISR.

7.1 FERC's Questions submitted in advance of the meeting

- Q1 - Page 18…figure 3-8…please explain what is happening with the vertical DO profiles where DO increases in May, June, July, and August, where otherwise the DO should be declining.

  Jason Moak (Kleinschmidt) said it could be how the graphs are interpreted. The data shows the reservoir stratifying as expected in a reservoir during the warmer months of the year. Jason recommended an offline discussion but stated that Alabama Power will also try to clarify in the Final Water Quality Study Report.



- Q2 - Page 23 discusses Alabama DEM monitoring data for the Harris Dam tailrace (i.e., immediately downstream from Harris Dam). Was this data collected during generation, or does it also reflect non-generation periods?

  These were events when ADEM went out monthly and took a grab sample. All samples were completed during non-generation. Alabama Power will clarify this in the Final Water Quality Study Report.

- Q3 - Pages 39-41 present DO and temperature data for downstream continuous water quality monitoring station. On page 16 of the ISR, Alabama Power is not proposing any additional monitoring beyond what was approved in the Commission's SPD. Why is there not a second year of monitoring for the downstream continuous monitoring station? How confident are Alabama Power and the HAT 2 members that 1 year of monitoring at the downstream station includes a worst-case scenario?

  A second year of monitoring was not included in the FERC-approved study plan. Alabama Power is confident in the data collected thus far. Regarding a worst-case scenario, Alabama Power could monitor for 5 years and may not see a worst-case scenario. Although 2017 may have been a bad year, Alabama Power missed that opportunity to collect a continuous data set at the approved location in the study plan.

7.2 <u>Alabama Rivers Alliance's Questions submitted in advance of the meeting</u>

- Q4 - Previous data from 2017-2019 mentioned in Table 1-1 is not continuous, year-round data. Is Alabama Power now collecting continuous, year-round data at multiple locations?

  No. The study plan approved collecting continuous data at the downstream monitor during 2019.

- Q5 - The Alabama Power data listed on Table 1-1 shows monitoring during generation only. Is data during non-generation periods available prior to 2019?

  No.

- Q6 - The report states that a continuous monitor was "recently installed" at Malone. Was it installed on March 12, 2019 corresponding to the "Downstream Monitor 2019" tab of the WQ data excel spreadsheet?

  The monitor at Malone is owned and operated by ADEM. Data from the Malone monitor was not included in the spreadsheet. However, Alabama Power can add it to the Final Water Quality Report.

- Q7 - Is there only the one continuous monitoring station downstream from Harris Dam at Malone?

  Yes.

- Q8 - The Draft Water Quality Study Report contains significant water temperature data, but the discussion and conclusions focus almost exclusively on dissolved oxygen levels, and do not discuss temperature. Will the effects of temperature be discussed in the final report or reported on in the Aquatic Habitat or Aquatic Resources study reports?

  The effects of temperature on aquatic resources will be addressed in the Aquatic Resources Report.

- Q9 - Is Alabama Power studying, or planning to study, methods to account for low water temperatures, including using an alternative intake structure that would allow for mixing of warmer and cooler water to raise average temperatures or withdrawing water from a higher depth in the reservoir to allow for warmer releases?

  Alabama Power intends to study technologies that can address temperature, as needed, once a temperature issue has been determined and defined through on-going study and data analyses.

7.3 Participant Questions

- Q10 - Alan Creamer (FERC) noted that there was only one year of continuous monitoring data. How confident is Alabama Power that the data represents what could be a worst-case drought or is truly reflective of the worst water quality could be? Also, Alan asked why Alabama Power couldn't get more than one year of continuous data? If stakeholders want to look at this and want to know how confident Alabama Power is in this data and that it truly represents a drought period.

  Jason Moak (Kleinschmidt) said he does not think 2019 was a worst-case scenario and that it is not known if 2020 would be either. Angie Anderegg (Alabama Power) said that Alabama Power proposed one year of monitoring in the study plan, which was approved. Angie also noted that it is time consuming and expensive to service the continuous monitor but that will not prevent further monitoring should it be required.

  Alan stated that when FERC approved the Water Quality Study Plan, it was with the intent that collectively, we would use year one data to determine if additional data were needed. Angie Anderegg (Alabama Power) asked if FERC sees a need for an additional year. Alan said there are instances where we drop below what we are trying to achieve, so if this is not the worst-case scenario, you could have more years where the DO drops below that criteria. Alan further stated that it is hard to make decisions on just one year. Alan also pointed out that the one year included in the report was not one that could be considered a drought, so in a drought Alabama Power may only meet water quality criteria 90% of the time. Angie noted that because Alabama Power is filing the 401 application in 2021, Alabama Power is collecting data at the tailrace monitor in 2020, resulting in an additional year of data. Alan Creamer noted that the tailrace monitor is only capturing generation. He indicated that FERC wants to know what happens to water quality during both generation and non-generation.

Keith Chandler (Alabama Power) noted that 2019 was not a drought year, but it was a hot year and that ADEM is continuing to collect data downstream. Keith further said Alabama Power ran only green plan flows a lot of the time during the monitoring season.

Alan Creamer said the most important part of this is what is happening right below Harris Dam or less than half a mile downstream. The other gages further downstream are also accounting for other influence. In reading this report Alabama Power met the criteria near 100% of the time but that may not be reflective of what's happening closer to the dam.

- Q11 - Jimmy Traylor (Downstream Landowner) asked if anyone has identified the sulfur smell in released water? Jimmy said he noticed it in the summer especially during the first 45 minutes or so of generation. Near Malone you get a foul smell. Seems to go hand-in-hand with drought conditions. As you get further into the summer months, it worsens.

  Alabama Power is not aware of a sulfur smell in the water. Jason Moak (Kleinschmidt) asked if there was a time of year that the smell is worse. Jason said he has noticed that smell at other hydro projects and said it probably had something to do with natural lake stratification and biological processes that occur on the lake bottom.

- Q12 - Sarah Salazar (FERC) asked if the Draft Water Quality Report covered where in the water column that Alabama Power is drawing water from in Lake Harris? This would be helpful to include in the report.

  The intake at Harris has a movable sill. Alabama Power will add this information to the Final Water Quality Report.

- Q13 - Albert Eiland (Downstream Landowner) asked to please summarize the conversation between him and Jason Moak about mercury. Has the content changed in the reservoir? How bad is it in the lake?

  Jason Moak (Kleinschmidt) said he was not sure. It could be coming from atmospheric deposition in the lake. Jason noted it is a widespread issue among reservoirs all over the country and an issue with large bodies of water and fish.

- Q14 - Maria Clark mentioned a Georgia Project where they do maintenance in the intake because a lot of debris accumulates, and they let the water run which causes the debris to mix into the water that is being released. Clearing that helped alleviate the smell. This was a smaller dam.

  Jason Moak (Kleinschmidt) said there is not much of a debris issue due to the size of the Harris Dam.

8 EROSION AND SEDIMENTATION STUDY

Jason Moak (Kleinschmidt) presented the progress on the Draft Erosion and Sedimentation Study, which included the study purpose, data and activities collected to date, and remaining activities. Jason noted that no variances to this study plan are requested. Alabama Power distributed the Draft Study report to stakeholders on March 17, 2020, and also in April 2020, concurrently with filing the ISR.

8.1 FERC's Questions submitted in advance of the meeting

- Q1 - Section 5.0, Discussion and Conclusions states that at some sites, "land clearing and landscaping, and other construction activities affecting runoff towards the reservoir" cause erosion. Is it possible to provide areal images showing the areas of active erosion in relation to the project boundary as part of the final study report?

  Yes. Alabama Power will add aerial photos showing the project boundary, winter pool, and summer pool contours.

- Q2 - Appendix D – photos…it would be helpful if the captions for the photos included better location descriptors (e.g., Harris Reservoir, Harris Reservoir-?? Embayment, Harris Reservoir-?? River Arm, Tallapoosa River, etc.). For the Harris Reservoir sites, it would be helpful if the contours within which peaking operations occur (lake fluctuation zone) could be identified.

  Alabama Power will add captions with location descriptors to the photos in Appendix D. Because Harris is a storage reservoir, there are no daily fluctuations in reservoir level, only seasonal fluctuations in accordance with the operating curve.

- Q3 - Could you make the video footage that was collected as part of this study available for stakeholders to view?

  Yes, Alabama Power is investigating how to make the video footage available.

- Q4 - Will the nuisance aquatic vegetation surveys still be possible to conduct in Lake Harris this summer?

  Yes, the nuisance aquatic vegetation surveys are scheduled for summer 2020.

- Q5 - On page 24, in section 3.2, the report includes the following statement: "A total of 20 sites, rather than 15 sites, were provided for the left bank segments as many segments were tied with a score of (slightly impaired)." Please explain what is meant by many of the streambank segments being "tied with a score of slightly impaired" and clarify the relationship between the number of streambank segments/sites and the bank condition score.

Alabama Power will edit the text to make this section clearer. All assessed streambank segments (each 0.1 mi of the study reach) were sorted based on their condition score, from lowest to highest. Sites with the 15 worst scores (i.e., ranked 1 through 15) were presented in Table 3-2. Since 14 of the left bank segments in the list had the same score for condition (3.0), they were included in the list.

- Q6 - On page 25, in Table 3-2, shouldn't the heading/label of the first column of the table be "Site Number" instead of "Rank" given that the rank options are only 1 through 5 (according to Table 3-1) and there appear to be 20 sites?

  Please see the response to Q5 above. Alabama Power understands that this table is confusing and will rework it to make the results clearer in the Final Erosion and Sedimentation Study Report.

- Q7 - On page 11, of the Tallapoosa River High Definition Stream Survey Final Report (Appendix E of the Erosion and Sedimentation Study Report), it states that prior to the survey, flows were monitored to ensure relatively normal flow conditions during the survey. For clarity, what were the "relatively normal flow conditions" during the survey? Were they slightly higher or lower than average?

  As seen in the graphs of discharge on page 12 of Appendix E, flows during the study were very close to the long-term median value.

- Q8 - In Figures 13 and 16 of the Tallapoosa River High Definition Stream Survey Final Report, the scale is small and so it appears that most of the riverbanks are unmodified and the modified banks identified on the individual site surveys are not visible. It would be helpful if the figures in the report showed labeled points for the erosion/sedimentation sites that are identified in the report.

  Alabama Power will provide figures with a larger scale and with labeled erosion sites in the Final Report.

- Q9 - Page 20 of Tallapoosa River High Definition Stream Survey Final Report states that a confidence rating was used to indicate the clarity of the streambanks in the video and figures 14 and 17 of that report show areas where the video clarity was impaired and therefore the confidence in the accuracy of the streambank conditions/classifications is lower. As stated above, it would be helpful if the figures in the report showed labeled points for the erosion/sedimentation sites that are identified in the report. Do any of the areas with impaired video clarity coincide with areas that stakeholders identified as erosion/sedimentation sites or other sites that Alabama Power identified as part of this study? Do you intend to take any steps to deal with the impaired clarity data? Is so, how?

  Alabama Power will reexamine these areas to determine if sites with lower confidence coincided with identified erosion sites. If so, we will perform targeted surveys of these areas and update the Final Report accordingly.

- Q10 - In Figure 18 of the Tallapoosa River High Definition Stream Survey Final Report, there appears to be a missing ranking at river mile 37 for the right streambank. Could you explain this gap in the ranking?

  Alabama Power is reexamining this area and will include rankings in the Final Report.

- Q11 - For Figures 20 through 23 of the Tallapoosa River High Definition Stream Survey Final Report, please label the river mile ranges on the maps to help reviewers understand the starting and ending points of the study area and which segments of river are included.

  In Figure 26 of the Tallapoosa River High Definition Stream Survey Final Report, please move the scale bar and sources so that they are not covering the river segment and bank conditions at the bottom of the map.

  Alabama Power will revise this figure accordingly.

- Q12 - Can you identify where peaking pulses are attenuated downstream from Harris Dam under the current operating regime and volume of typical downstream releases? If so, are there any patterns in the downstream streambank conditions and observed levels of erosion along the segments of streambanks within the attenuation zone? Where are the identified erosion sites in relation to the length of the attenuation zone?

  Alabama Power will incorporate a discussion of water level fluctuations and any potential correlations with streambank erosion into the discussion section of the Final Report.

8.2 <u>Alabama Rivers Alliance's Questions submitted in advance of the meeting</u>

- Q13 - Will we have access to the High Definition Stream Survey video created by Trutta Environmental Solution as part of the Downstream Bank Stability Report?

  Yes, Alabama Power is investigating how to make the video footage available.

- Q14 - Table 3-2 shows streambank scored for the 15 most impaired areas downstream of Harris Dam. How was the Average Combination Bank Condition score (final column) computed? It does not appear to be an average of the "Average Left Bank Condition" and "Average Right Bank Condition" scores, which would yield a lower average scored. The averages showing for the left and right banks are mostly 3.0 or higher while the average combined bank condition scores are mostly below 3.0.

  Jason Moak (Kleinschmidt) noted that one column looks only at left bank and the other the only right bank. Every tenth mile those scores were averaged and ranked. Jack West (Alabama Rivers Alliance) said it still doesn't make sense why you have larger averages on both sides, and they are reduced in combination. Sarah Salazar (FERC) said that part of the table was confusing as well, and she is not certain that last column is informative. Jason said he agrees and was thinking that it may only make sense when there are impacts on both sides, like a transmission line crossing.

- Q15 - The report concludes in Section 5.0 that "None of the erosion sites surveyed were the result of fluctuations due to project operations." This conclusion seems in conflict with the assessment in the HDSS that impairment areas "were due to the fluctuating flows eroding the streambank within a few feet of the water surface and streambank interface." (Pg. 43 of Trutta Report).

  This statement refers to the reservoir. Because Harris is a storage reservoir, most of the erosion occurring in the reservoir is due to wave action from boats or winds.

- Q16 - Is Alabama Power completing a total suspended sediment analysis during the pre-pulse, pulse, and post-pulse time periods to see what sediment is getting moved from and to various locations?

  No, Alabama Power is not completing a total suspended sediment analysis.

- Q17 - Is Alabama Power conducting a historical, cumulative effects study of erosion since the dam's construction?

  Alabama Power is not performing a cumulative effects study.

- Q18 - Is Alabama Power assessing whether having a continuous minimum flow downstream may help with erosion and sedimentation problems?

  Yes. Alabama Power will use the model outputs to assess the difference in water level fluctuations.

- Q19 - Jack West asked why it seems that none of the erosion sites are due to operations.

  Most of the erosion issues downstream are not due exclusively to operations. For example, areas where trees and vegetation are being cleared are not due exclusively to operations, but water fluctuations could exacerbate erosion.

8.3 Donna Matthews' Questions submitted in advance of the meeting

- Q20 - Better Visualization of Erosion over the Past 50 Years: Do the erosion studies conducted during this permitting period compare pre-dam (baseline) river shape/contour with the current status of the river? Pre-dam analog photographs exist for comparison to current satellite imagery.

  Alabama Power has not compared pre-dam conditions to current conditions. Historical photographs may provide useful information for the cumulative impacts section of the license application and for FERC's use.

8.4 Participant Questions

- Q21 - Jimmy Traylor (Downstream Landowner) said he has no trees on the bank at his property and has little bank remaining. He asked Jason what he would consider that? Mr. Traylor noted that his trees have been falling in and steps that his grandfather built are disappearing since the dam was built and operation.

Jason Moak said he would locate Mr. Traylor's property on the data file to see how that area was scored. Jimmy Traylor responded that the Draft Erosion and Sedimentation Report says, "not much erosion" at his property. Mr. Traylor also noted that there is significant sedimentation in areas like Cornhouse Creek and No Business Creek where the water backs up during generation. He characterized it as "a mud pit" and this has significantly affected these tributaries. He believes Alabama Power is missing the mark on erosion. Mr. Traylor also noted that since the inception of the Green Plan, erosion has decreased. He noted that a continuous minimum flow would also help reduce erosion. Jack West (ARA) asked about data Alabama Power may have regarding bank conditions and erosion from the 1980s (pre-project and just after project was constructed), 1990s, and in the 2000s to do a cumulative effects study. If there is data, he asked that Alabama Power make it available so we can assess the impacts on a larger scale.

Carol Knight concurs with Jimmy Traylor and Albert Eiland can give anecdotal evidence of how the banks have eroded. Carol indicated that she has old maps from 40s and 50s of conditions during that time to compare what it is now. Those trees weren't necessarily clear cut. People downstream know what it used to be, and they know what it is now. She noted that they are having a hard time reconciling these things. There is significant erosion. It is not just because somebody is cutting trees or that they are letting cows access the river.

Jason Moak (Kleinschmidt) explained that he was not suggesting that where erosion occurs it is the landowners' fault. Jason emphasized that it is very important for downstream property owners to comment on any areas that downstream property owners believe the Draft Erosion and Sedimentation Report has mischaracterized the erosion and source of the erosion.

Maria Clark wanted to know why not do a GIS study. We have a lot of data, including the areas that are impaired. We have pictures. What I can see by following the data you have looks like the erosion is mostly in the river bends. With other projects, we have seen landowners have a lot to do with it by cutting trees for their river view. If we analyze with GIS what happened when the dam was built and 50 years later, we will be able to see the development. It is important to bring this information out for Alabama Power to show more clearly these project impacts using GIS.

Donna Matthews said she's been playing with maps and someone took old aerial photos and coordinates from landowners when they came to a meeting and shared erosion hot spots. One set is from 1964 and one set is from the 1940s. Donna indicated that if anyone is interested, they can overlay the google earth pictures. There are certain markers that local people have put together.

Jimmy Traylor said that his land is undeveloped except for maybe 200 yards and said they have never cut the timber, one of the last virgin hardwood bottoms around. Losing trees and losing bank. That is erosion.

Albert Eiland noted he lives about 2 miles below Jimmy Traylor and is on the outside of a natural curve, which will experience more damage than an inside curve. Mr. Eiland noted that historically there were 7-8 islands in the Tallapoosa River. Those old maps will show that. There is only one island left. Jimmy asked if it's Hodge's island. Albert said the island is on an inside curve, that's why it's still there. In spring of 2017 we experienced a lot of flooding. I lost 2 big trees. Has been losing trees and the bank. We have hauled a lot of rocks in there to keep it from washing away. Would be eroded away without the rocks.

Relevant to this discussion, Carol Knight submitted a comment via IM from a participant that had to drop off the meeting conference call. Her issue is that there are serious erosion issue and has gotten worse this year with all the rain and the river fluctuating up and down. Several places have large holes in the banks and many of the trees have washed away. She indicated that the water is extremely high even if there isn't a scheduled release.

- Q29 - Lake Watch: Has there been assessment/consideration of sedimentation in the Tallapoosa where it enters Lake Martin, where the bulk of the sediment settles out as the river current declines, as seen by large sediment bars that have formed below where Hillabee Creek enters the river?

  An assessment has not been done in that area. The Study Area extends through Horseshoe Bend. It is likely that bedload sediment naturally transported down Hillabee Creek settles out as it enters the upper reaches of Lake Martin, similar to what happens in the Little Tallapoosa River at the headwaters of Lake Harris.

- Q30 - Rachel asked about erosion areas on the lake that are anthropogenically attributed: She recommended that Alabama Power include in the Final Study Report the shoreline management classifications in the area where it appears erosion is occurring. Rachel noted that FERC identified erosion and sedimentation as something they would analyze for cumulative effects. There is a sense that the license application will need information on cumulative effects. Some of this will be anecdotal and this information may go into the analysis. FERC does look at cumulative effects, but it may not be something addressed directly by study report.

  Summer and winter pool contours would also be helpful for cumulative effects analysis, and Alabama Power will add the suggested information to the Final Report.

- Q31 – Charles Denman via email following the meeting: I agree with other participants that a comparison of historical photos with current conditions of the river would help to understand the flushing effects operations of the dam have on downstream erosion.

9 THREATENED AND ENDANGERED SPECIES STUDY

Jason Moak (Kleinschmidt) presented the progress on the Draft Threatened and Endangered Species study, which included the study purpose, data and activities collected to date, and remaining activities. Additional fieldwork is planned for summer 2020 for this study. Jason noted that no variances to this study plan are requested. Alabama Power distributed the Draft Desktop Assessment Report to stakeholders in April 2020, concurrently with filing the ISR.

9.1 FERC's questions submitted in advance of the meeting

- Q1 - Have the GIS overlays of T&E species habitat information and maps been completed (i.e., the map figures in Appendix B of the draft T&E species study report)? Or are there still steps to complete this component of the study? We suggest including project features, recreation areas, and other managed areas (e.g., timber harvest areas, wildlife management areas, etc.) on the T&E species maps in order to help determine the proximity of species ranges/habitats to project-related activities and identify the need for species-specific field surveys.

  Those maps are completed. Alabama Power will consider making the suggested additions.

- Q2 - While the draft T&E species study report indicates that additional field surveys for the fine-lined pocketbook freshwater mussel are planned for May 2020, the report does not include a description of the criteria used to determine which of the species on USFWS's official (IPaC) list of T&E species would be surveyed in the field. Please describe which species will be surveyed in the field and explain how and why they were selected. In addition, please describe any correspondence Alabama Power has had with FWS and state agencies regarding the T&E species selected for additional field surveys.

  Alabama Power is consulting with USFWS to determine which species have known historical occurrences or critical habitat intersecting the Project boundary or could reasonably be found within the Project boundary. Surveys will be performed for the palezone shiner due to information from USFWS regarding the possibility of existence in some tributaries within Skyline. Surveys of fine-lined pocketbook are being performed due to existing critical habitat in the upper Tallapoosa River above Lake Harris. Correspondence between Alabama Power and USFWS and state agencies as of the ISR filing is included as Attachment 2 of the Draft Threatened and Endangered Species Desktop Assessment.

- Q3 - Page 7 lists the sources for the ESA species information. The sources included USFWS's Environmental Conservation Online System (ECOS) but did not include IPaC. The official list is obtained through the IPaC report. Has an IPaC report been downloaded or are you using the IPaC report filed to the record by FERC staff?

The ECOS website was used as a source for life history, habitat, and range information in preparation of the desktop assessment. The IPaC list was used to identify species to include in the desktop assessment and potential field surveys.

- Q4 - Page 8 states that the existing land use data is not specific enough to determine if the 3,068 acres of coniferous forest within the Project Boundary at Lake Harris would be suitable for red-cockaded woodpecker. How do you propose to assess the suitability for red-cockaded woodpecker?

  Field observation at these coniferous forests could determine whether these areas contain suitable habitat. Specifically, Alabama Power would look for areas with little or no hardwood mid-story and over-story trees. Alabama Power would also look for larger, older longleaf pines, which make ideal cavity trees for this species in areas that were lacking hardwood mid-story and over-story. Alabama Power will perform this field observation if USFWS deems it necessary.

- Q5 - On pages 3, 10, and 26 there is mention of additional fieldwork planned for two mussel species (i.e., fine-lined pocketbook and Southern pigtoe) for May 2020. Please elaborate on the details of the additional survey work (e.g., survey location(s), sampling protocols and methodologies employed, and clarify which species will be included in the May 2020 assessment, etc.).

  In November 2019, surveys were conducted for fine-lined pocketbook on a 3.75 mile stretch of the Tallapoosa River where critical habitat is known to occur from the County 36 bridge to a shoal below the Highway 431 bridge. This endpoint was chosen, because only pool habitat was available another half mile downstream of this bridge. Six surveyors including USFWS, Alabama Power, and Kleinschmidt searched for the target species in 20-minute to one-hour segments at areas containing critical habitat and searched for additional areas with suitable habitat. Silty areas and piles of shells left by muskrats and raccoons were also searched. The introduced *Corbicula fluminea* (Asian clam) was the only bi-valve species observed in these piles. Because high water impeded the search in some areas and the cold weather may have caused mussels to burrow out of site, USFWS suggested another effort be made in the spring. Surveyors will search for fine-lined pocketbook and suitable habitat again in late spring/summer 2020, pending any COVID-19 restrictions. Southern pigtoe is not a species that we would reasonably expect to find in the Project boundary. It is known to occur in Cleburne County, which overlaps the Project boundary. However, documented historical range in that county exists exclusively in the Coosa River drainage basin. The Lake Harris Project Area does not contain any critical habitat areas for Southern pigtoe identified by the USFWS.

- Q6 - The descriptions of Alabama lampmussel and rabbitsfoot mussel on pages 11, 13, and 14 do not provide these species' host fish species. Are the host fish species currently unknown, or was this an inadvertent omission?

  The host fish species are currently unknown. Suitable hosts for rabbitsfoot populations west of the Mississippi River are shiner species such as blacktail shiner, cardinal shiner, red shiner, spotfin shiner, and bluntface shiner. There is not much

available information about rabbitsfoot host fishes east of the Mississippi River. Research has shown that lampmussels can successfully utilize rock bass, green sunfish, bluegill, smallmouth bass, spotted bass, largemouth bass, and redeye bass as host fish. It has also been reported that banded sculpin are potential host fish for lampmussels.

- Q7 - There appears to be a typo on page 16, in the description of Southern pigtoe mussel. The middle of the first paragraph refers to the glochidia of the finelined pocketbook mussel. Is this sentence misplaced, or does the information pertain to the southern pigtoe mussel (the subject of section 3.12)? Please clarify.

  This is a typo, and the information refers to the Southern pigtoe. The host fishes are accurate.

- Q8 - On page 19, in the first paragraph about the northern long-eared bat (NLEB), it is unclear why the discussion includes the statement about a low occurrence of this species in the "…southwestern region of Alabama" given that the project areas are located in the northeastern and mid-eastern portions of Alabama. Please clarify or correct this statement.

  This information is correct. The sentence is intended to describe the general distribution of the species in Alabama.

- Q9 - The draft T&E species study report states that there are no known NLEB hibernacula or maternity roost trees *within the Project Boundary*. However, it does not include information on known NLEB hibernacula *within 0.25 mile of the Project Boundary* and known NLEB maternity roosts *within 150 feet of the Project Boundary* (i.e., at Harris Lake and Skyline). In addition, the report mentions a couple of best management practices (BMPs), protective of some bat species, that Alabama Power implements during timber harvest activities and states that the BMPs have been expanded but not incorporated in the existing license. However, the report does not include the locations of Alabama Power's timber harvesting and other tree removal activities, or detailed descriptions of timber harvesting protocols and BMPs currently implemented within the Project Boundary. This information is important to understanding the affected environment for Indiana bat, NLEB, and/or other T&E species. This information could also be used for the streamlined consultation option for analyzing the potential project effects on NLEB (including within the buffer areas for hibernacula and maternity roost trees).

  Please complete the USFWS's NLEB streamlined consultation form and include it in the final T&E species study report. This form can be found at: https://www.fws.gov/southeast/pdf/guidelines/northern-long-eared-bat-streamlined-checklist.pdf. We recommend using FWS's definition of "tree removal" to guide your responses on the form (i.e., "cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats").[3]

Also, please update figures 3.14-1, 3.14-2, 3.14-3, 3.15-1, 3.15-2, and 3.15-3 which currently show "forested area" or "karst landscape" in relation to NLEB and Indiana bat habitats, to show Alabama Power's timber management areas within the Project Boundary, and other proposed managed areas (e.g., new/improved recreation areas, new quail management areas). This type of information is needed to meet another component of this study (i.e., "determine if [T&E species habitat at the project] are potentially impacted by Harris Project operations", as described on slide 5 of the Aug. 27, 2019, HAT 3 meeting).

Alabama Power will complete the NLEB streamlined consultation form to be included in the Final T&E Species Report and update the requested figures.

- Q10 - On page 21 and 22, in section 3.17, the discussion mentions an occurrence of little amphianthus within the Project Boundary at Lake Harris (Flat Rock Park) that was documented in 1995 and may be extirpated. Did the botanical surveys in that area of the project target that species? The top of page 22, states that "Vernal pools were not identified due to a lack of available data." Did the botanical surveys identify vernal pools in this area?

  The botanical inventory targeted all plant species existing within the Inventory Area, which is defined as the Blake's Ferry Pluton and is located adjacent to Flat Rock Park. Of the 365 plant species documented in the Inventory Area. Vernal pools were observed during surveys performed in 2019, however little amphianthus was not found in any of the pools.

- Q11 - On page 22, in section 3.18, the report states that the National Wetland Inventory data is not detailed enough to identify wetlands within the project area that contain white fringeless orchid's unique wetland habitat characteristics. Do you propose collecting more data on this subject?

  Alabama Power is consulting with USFWS and Alabama Natural Heritage Program experts to determine if these habitats are present within the Project Boundary.

- Q12 - On page 23, in section 3.19, the report states that the 16 extant populations of Prices' potato bean in Jackson County, occur on Sauta Cave National Wildlife Refuge, and near Little Coon Creek in the Skyline WMA. Please clarify whether or not any of the 16 populations occur within the Project Boundary at Skyline WMA.

  One extant population intersects the Project Boundary at Skyline and comprises 11 percent of the extant population occurring at Little Coon Creek. However, 89 percent of this single population occurs outside of the Project Boundary.

[3] 81 Fed. Reg. 1902 (January 14, 2016).

- Q13 - In Appendix B, figure 3.19, showing Price's potato bean habitat range, there is a 100-foot Stream Buffer within the Limestone Landscape layer shown on the map and legend. Please explain the significance of this buffer, including any regulatory requirements associated with this buffer. Please include this information in the Final T&E Species Study Report.

  Price's potato bean is known to exist in Little Coon Creek. This species seems to prefer low areas along near or along the banks of streams and rivers. The buffer indicated on the figure is not regulatory. It is meant to depict areas where this species could potentially occur based on known habitat preferences. We will include this information in the final report.

- Q14 - In the August 27, 2019, HAT 3 meeting summary, please clarify the following: How does Alabama Power define terms such as "sensitive time periods" in the context of timber harvesting? Evan Collins, of FWS, stated that the palezone shiner may be present in some of the lower reaches of the Tennessee River tributaries. Please clarify where these tributaries are located in relation to the Project Boundary.

  Alabama Power will include its timber harvesting BMPs as an appendix to the Final T&E species study report. Alabama Power is consulting with USFWS to perform an assessment to determine if palezone shiner are present in Little Coon Creek, which flows through portions of the Project Boundary at Skyline.

9.2 Alabama Rivers Alliance's Questions submitted in advance of the meeting

- Q15 - Is the additional fieldwork to identify mussels scheduled for May being pushed back or proceeding on schedule?

  The mussel identification fieldwork is proceeding on schedule; however, fieldwork dates are subject to change due to COVID-19 restrictions. Alabama Power will proceed with fieldwork at the earliest possible date during the spring/summer 2020.

9.3 Participant Questions

- Q16 - Ken Wills (Alabama Glade Conservation Association) - Are the 138.4 acres of granite geology west of the Project Boundary on Alabama Power land, other private land, or public land? How much is public and private land and how much is Flat Rock?

  There are private property outcroppings in that area. The Flat Rock Park itself is approximately 25 acres.

- Q17 - Jimmy Traylor asked why there are no [Threatened and Endangered Species] studies below the dam and how Skyline effects water below the dam.

  Based on consultation with USFWS, no threatened or endangered species have been identified below the dam. Skyline does not affect the water below the dam.

- Q18 - Sarah Salazar (Federal Energy Regulatory Commission (FERC) asked if Alabama Power could elaborate on how they decided which species to perform field surveys for. How was the list of species being surveyed narrowed down with USFWS?

  Determining which species to search for in the field is an ongoing process. The consultation details will be in the final report. This desktop assessment is being used as an initial step toward determining which species to focus on in the field.

- Q19 - Sarah asked if IPaC was being used to determine which threatened or endangered species were in the Project Boundary. If USFWS makes any changes to the inventory of listed species in the Project Boundary, that needs to be considered.

  The ECOS website was used as a source for life history, habitat, and range information in preparation of the desktop assessment. The IPaC list was used to identify species to include in the desktop assessment and potential field surveys.

- Q20 - Sarah said that additional information is needed for a streamlined consultation on the Northern long-eared bat. The buffer zones, which are within 0.25 miles of a hibernaculum at any time or within 150 feet of a known occupied maternity roost tree from June through July, were not included in the report. The report seems to be focused on what has been reported in the Project Boundary, but the effects of tree removal need to be analyzed.

  Consultation on the Northern long-eared bat is ongoing.

- Q21 - Evan Collins (USFWS) said he does not have a copy of the best management practices for consultation on bats and that information would be beneficial to mapping the buffer zone.

  Alabama Power has this information and will provide it to Evan Collins.

- Q22 - Jimmy Traylor asked why no federally listed species below the dam are being studied.

  No listed species have been documented in the Tallapoosa River below the Harris Dam.

10 DOWNSTREAM AQUATIC HABITAT STUDY

Jason Moak (Kleinschmidt) presented the progress on the Downstream Aquatic Habitat Study, which included the study purpose, data and activities collected to date, and remaining activities. Jason noted that no variances to this study plan are requested, and the Draft Study Report will be distributed to stakeholders in June 2020.

10.1 Participant Questions

- Q1 - Jimmy Traylor (Downstream Landowner) asked if the temperature component would be included in the draft report? Jimmy commented that 3 months of data will not provide enough information.

  Depending upon the timeframe for date processing, Alabama Power may be able to include the temperature component in the draft report. Jason Moak (Kleinschmidt) clarified that the level loggers have been operational since June 2019 and will continue to gather data through June 2020.

- Q2 - Alan Creamer (FERC) stated that only a limited number of alternatives are being tested and that there may be additional scenarios that stakeholders would like to see modeled based on the outcomes of these studies. Alan suggested that FERC may need to meet with Alabama Power to decide how best to approach this study and decide whether a modified study plan is needed.

  Jason Moak (Kleinschmidt) indicated that once the model is complete, it would be possible to run different operational scenarios.

- Q3 - Donna Matthews asked if the completed model could analyze optimal conditions, or what would be needed to achieve optimal conditions. Could the model be adjusted to see the effects of change on the outputs?

  Alan Creamer (FERC) suggested that FERC may need to meet with Alabama Power to decide how best to approach this study and decide whether a modified study plan is needed.

- Q4 - Jimmy Traylor (Downstream Landowner) asked if Elise Irwin's studies are being considered.

  The previous studies conducted by Elise Irwin are being used in the Aquatic Resources study and in the desktop assessment.

11 AQUATIC RESOURCES STUDY

Jason Moak (Kleinschmidt) presented the progress on the Aquatic Resources Study, which included the study purpose, data and activities collected to date, and remaining activities. Auburn University has a primary role in conducting this study, which includes fieldwork and laboratory testing (i.e., bioenergetics). Jason noted that no variances to this study plan are requested, and the Draft Study Report will be distributed to stakeholders in July 2020.

11.1 Participant Questions

- Q1 - Ken Wills asked if there were any dates set for our next electronic meeting.

  Angie Anderegg said meetings have not been scheduled to-date, but Alabama Power will let the HAT participants know as soon as dates are selected.

12 NEXT STEPS IN THE ILP

Kelly Schaeffer reviewed the next steps in the ILP. She noted that participants should file their comments on the ISR meeting summary and the draft study reports with FERC no later than June 11, 2020.

- Q1 - Maria Clark asked if the questions or comments would be posted on the website?

  Alabama Power will file the ISR meeting summary with FERC on May 12, 2020, and the document will also be posted on the Harris relicensing website (www.harrisrelicensing.com).

APPENDIX A

ISR Meeting Participants

Harris Relicensing Initial Study Report Meeting
April 28, 2020

Attendees:

Alabama Department of Conservation and Natural Resources
Damon Abernethy
Todd Fobian
Keith Gauldin
Keith Henderson
Matt Marshall
Amy Silvano
Chris Smith

Alabama Department of Economic and Community Affairs, Office of Water Resources
Brian Atkins
Dow Johnston

Alabama Department of Environmental Management
Jennifer Haslbauer
Fred Leslie
David Moore

Alabama Glade Conservation Coalition
Ken Wills

Alabama Historical Commission
Amanda McBride
Eric Sipes

Alabama Power
Angie Anderegg
Dave Anderson
Wes Anderson
Jeff Baker
Jason Carlee
Keith Chandler
Jim Crew
William Gardner
Mike Godfrey
Chris Goodman
Stacey Graham
Rodger Jennings
Ashley McVicar
Tina Mills

Alabama Power (continued)
Kenneth Odom
Courtenay O'Mara (Georgia Power)
Alan Peeples
Jennifer Rasberry
Shelia Smith
Thomas St. John

Alabama Rivers Alliance
Martha Hunter
Jack West

Auburn University
Dennis Devries
Ehlana Stell
Rusty Wright

Cherokee Nation
Elizabeth Toombs

Downstream Property Owners
David Chandler, Historian
Albert Eiland, Wadley
Carol Knight, Wadley
Donna Matthews, Wedowee
Jimmy Traylor, Malone
Melissa Willis, Clay County Extension

Environmental Protection Agency
Maria Clark
Lisa Perras Gordon
Lydia Mayo

Federal Energy Regulatory Commission
Allan Creamer
Danielle Elefritz
Rachel McNamara
Sarah Salazar
Monte Terhaar

General Stakeholders
Charles Denman
Matthew Stryker

Kleinschmidt
Kate Cosnahan
Colin Dinken
Amanda Fleming
Mike Hross
Jason Moak
Kevin Nebiolo
Kelly Schaeffer
Dr. Kevin Hunt - Recreation Subconsultant

Lake Martin Resource Association
Steve Forehand
John Thompson

Lake Wedowee Property Owners Association
Barry Morris

Muscogee (Creek) Nation
RaeLynn Butler
Turner Hunt
LeeAnn Wendt

National Park Service
Jeff Duncan

U.S. Army Corps of Engineers
Cindy Donald
James Hathorn

U.S. Fish and Wildlife Service
Evan Collins

U.S. Geological Survey
Elise Irwin

APPENDIX B

ISR Meeting Presentation

R.L. Harris Dam Relicensing
FERC No. 2628

Initial Study Report Meeting
April 28, 2020

HARRIS DAM
RELICENSING

Welcome and Roll Call

Roll Call by Organization

Phone Etiquette

- ❑Be patient with any technology issues
- ❑Follow the facilitator’s instructions
- ❑Phones will be muted during presentations
- ❑Follow along with PDF of presentations
- ❑Write down any questions you have for the designated question section
- ❑Clearly state name and organization when asking questions
- ❑Facilitator will ask for participant questions following each section of the presentation

HARRIS DAM RELICENSING

Agenda

- ❑ 9 AM Introduction/Roll Call/Safety Moment
- ❑ Initial Study Report Overview
  - Cultural Resources (HAT 6)
  - Recreation Evaluation (HAT 5)
  - Project Lands Evaluation (HAT 4)
  - Operating Curve Feasibility Analysis and Downstream Release Alternatives (HAT 1)
  - Water Quality and Erosion and Sedimentation (HAT 2)
  - Threatened and Endangered Species; Downstream Aquatic Habitat; Aquatic Resources (HAT 3)
- ❑ Next Steps in the FERC Process

HARRIS DAM
RELICENSING

HAT 6 Cultural Resources

Cultural Resources Programmatic Agreement and Historic Properties Management Plan

Study Purpose and Methods Summary

- Develop Historic Properties Management Plan and Programmatic Agreement.

Study Progress

- Identify Sites for Further Evaluation and Initial Evaluation Methods
- Propose Historic Properties Management Plan Outline
- Five HAT Meetings, including one Site Visit
- Inadvertent Discovery Plan, Traditional Cultural Properties Identification Plan Filed in April 2020

Cultural Resources Programmatic Agreement and Historic Properties Management Plan

Variance from Study Plan and Schedule

- Alabama Power continues to work with the Alabama SHPO for concurrence regarding the Harris APE
- File the final APE (with maps) by June 30, 2020

Remaining Activities /Modifications/Other Proposed Studies

- Survey of Sites Identified for Further Evaluation (96 sites)
- Finalize Area of Potential Effects (June 2020)
- Continue developing Historic Properties Management Plan
- Complete survey work and TCP identification (February 2021)
- Complete eligibility assessments for known cultural resources (July 2021)
- Issue determination of effect on historic properties (July 2021)
- Draft HPMP (July 2021)
- No additional studies have been proposed beyond that in FERC's SPD

HARRIS DAM RELICENSING

QUESTIONS?

HAT 5 Recreation Evaluation

HARRIS DAM
RELICENSING

RECREATION EVALUATION

Study Purpose and Summary of Methods

❑ Evaluate baseline recreation at the Harris Project and downstream

- Gather baseline information on existing Project recreation facilities, existing Project recreational use and capacity, and estimated future demand and needs at the Harris Project
- Determine how flows in the Tallapoosa River downstream of Harris Dam affect recreational users and their activity

Study Progress

- ❑ Lake Harris Public Access User Counts – March to December 2019
- ❑ Lake Harris Public Access Questionnaires – May to December 2019
- ❑ Tallapoosa River User and Surveys – May to October 2019
- ❑ Skyline Use Data from ADCNR – August 2019
- ❑ Recreation Facilities Inventory – October 2019
- ❑ HAT 5 Meeting to discuss Tallapoosa River Landowner Survey Research Plan (Research Plan) - December 11, 2019
- ❑ Downstream Landowner and Anonymous User Surveys – February – April 2020

HARRIS DAM RELICENSING

RECREATION EVALUATION –DETAILS OF LAKE HARRIS PUBLIC ACCESS, USER COUNTS

- 1,368 Shifts
- Paper Forms Vehicle and Activity Counts
- "Instantaneous Count"
- Reduced Flat Rock Park Schedule
- Daylight Savings Time
- Data Cleaning
- Data Analysis

HARRIS DAM
RELICENSING

RECREATION EVALUATION –DETAILS OF LAKE HARRIS PUBLIC ACCESS, QUESTIONNAIRES

- 1,357 Completed
- Majority Collected at Highway 48, Flat Rock Park, and Big Fox Creek
- Four Questions
- Intercept Technique
- Paper Forms

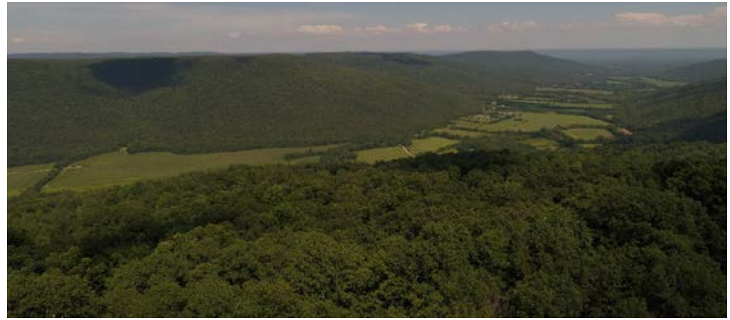
HARRIS DAM
RELICENSING

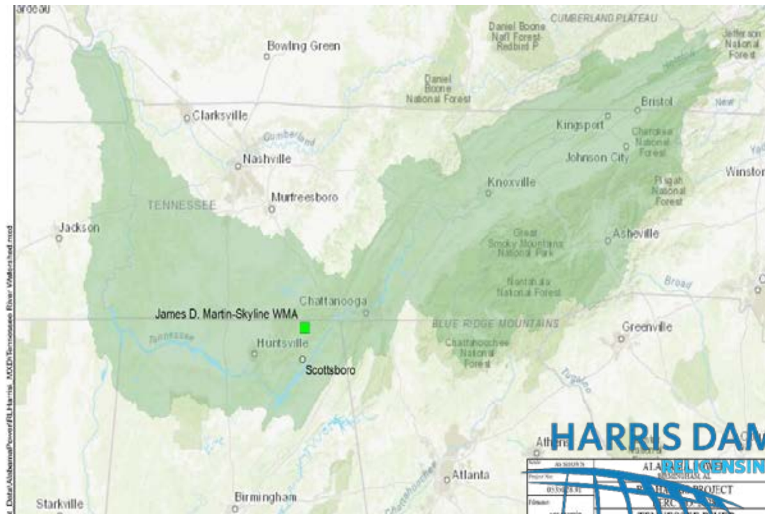
Recreation Evaluation – Tallapoosa River User, Methods

- Calculated Total Visitation (Effort) and Daily Use
- Measured User Attitudes/Perceptions About Instream Flow and Trip Satisfaction
- Obtained Catch Information from Anglers
- Determined How Instream Flow Affected Effort, Perception of Instream Flow and Trip Satisfaction, and Species of Fish Targeted, Caught, and Retained

HARRIS DAM
RELICENSING

Recreation Evaluation- Skyline Use Data (ADCNR)





HARRIS DAM RELICENSING

RECREATION EVALUATION –DETAILS OF LAKE HARRIS PUBLIC ACCESS, INVENTORY

- Inventoried and Mapped
- Summarized Who Owns, Operates, and Manages
- Evaluated the Condition of the Recreation Sites and Facilities
  - Opportunities for Persons with Disabilities to Participate in Recreation, Where Feasible
  - Public Safety Features

HARRIS DAM RELICENSING

RECREATION EVALUATION – TALLAPOOSA RIVER LANDOWNERS SURVEY RESEARCH PLAN

- Downstream Landowners
- Recreational Users
- December 11, 2019 HAT 5 Meeting
- December 19, 2019 Tallapoosa River Landowner Survey Research Plan

HARRIS DAM
RELICENSING

PREVIEW- DRAFT RECREATION EVALUATION REPORT

- Introduction
- Background
- Methods
  - Data Collection
  - Analysis
- Results
  - Existing Use
  - Future Use
  - Needs
- Conclusions
- References
- Appendices

HARRIS DAM RELICENSING

Recreation Evaluation

Variance from the Study Plan and Schedule

- Added the Tallapoosa River Downstream Landowner Survey and Tallapoosa River Recreation User Survey
- File the Draft Harris Project Recreation Evaluation report in August 2020 (rather than June 2020)
- March 2020 HAT 1 meeting cancelled due to COVID-19

Remaining Activities/Modifications/Other Proposed Studies

- Recreation Data Reports from Subcontractors
- Draft Recreation Evaluation Study Report
- No additional studies have been proposed beyond that in FERC's SPD

HARRIS DAM RELICENSING

QUESTIONS?

HAT 4 Project Lands Evaluation

PROJECT LANDS EVALUATION

Study Purpose and Methods Summary

- ❑ **Phase I**: Identified lands to be added to, removed from, or reclassified within the current Harris Project Boundary.
  - HAT 4 meeting, desktop analysis, draft map of changes
- ❑ **Phase II**: develop a Wildlife Management Program (WMP) and a Shoreline Management Plan (SMP) to be filed with License Application.
  - Utilizes results from Phase I evaluation, incorporation of study data

Study Progress

- ❑ Presented proposed land changes, including tract by tract description and maps
- ❑ HAT 4 meeting to discuss proposed changes (09/11/2019)
- ❑ Requested feedback from HAT 4 regarding the Project Lands proposal
- ❑ Evaluated acreage at Skyline to determine suitability for bobwhite quail habitat
- ❑ Prepared Draft Phase 1 Project Lands Evaluation Study Report
- ❑ Conducted a botanical inventory of a 20-acre parcel at Flat Rock (field work & final report complete)

HARRIS DAM RELICENSING

PROJECT LANDS EVALUATION

Variance from the Study Plan and Schedule

- ❑ No variance from the study plan or schedule.

Remaining Activities/Modification/Other Proposed Studies

- ❑ Review comments on Draft Phase 1 Project Lands Study Report and modify Final Report, as applicable
- ❑ Conduct the botanical inventory survey on additional 21 acres adjacent to previously surveyed area at Flat Rock Park (Spring and Fall 2020; report in January 2021)
- ❑ Complete Phase 2 methods and develop draft Wildlife Management Plan and Shoreline Management Plan
- ❑ No additional studies have been proposed beyond that in FERC's SPD

QUESTIONS?

HARRIS DAM RELICENSING

HAT 1 Project Operations

- ❑Operating Curve Change Feasibility Analysis
- ❑Downstream Release Alternatives

HARRIS DAM
RELICENSING

Operating Curve Change Feasibility Analysis

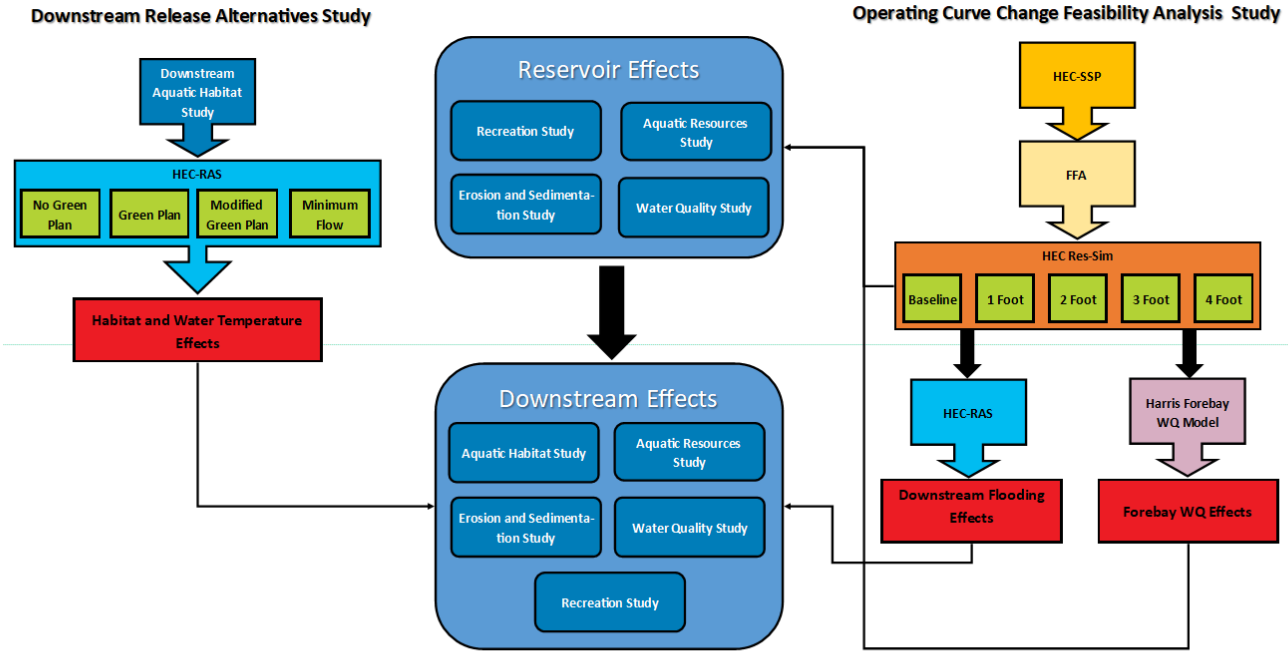
Study Purpose and Methods Summary

- 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

Study Progress

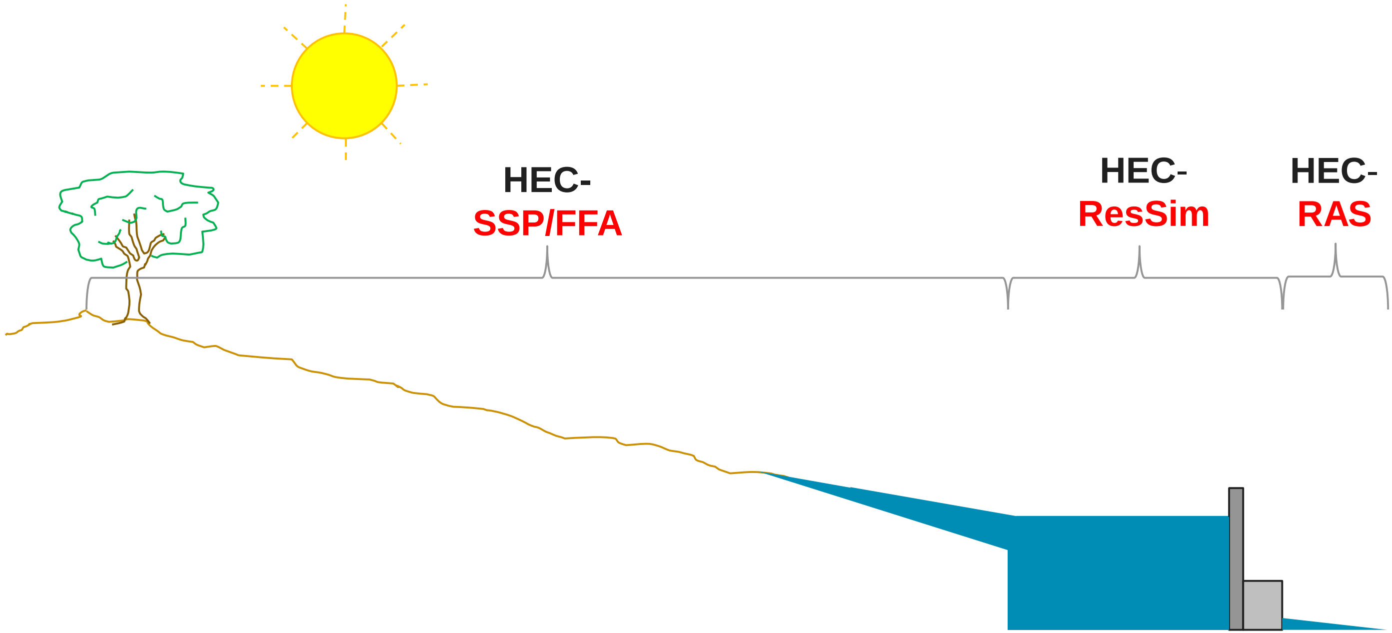
- RES-Sim outflow hydrographs developed
- HEC-RAS model complete; all four winter curve changes have been modeled with design flood
- Navigation, ADROP and Hydrobudget analyses
- Flood frequency analysis
- Draft report distributed to stakeholders

HARRIS DAM RELICENSING



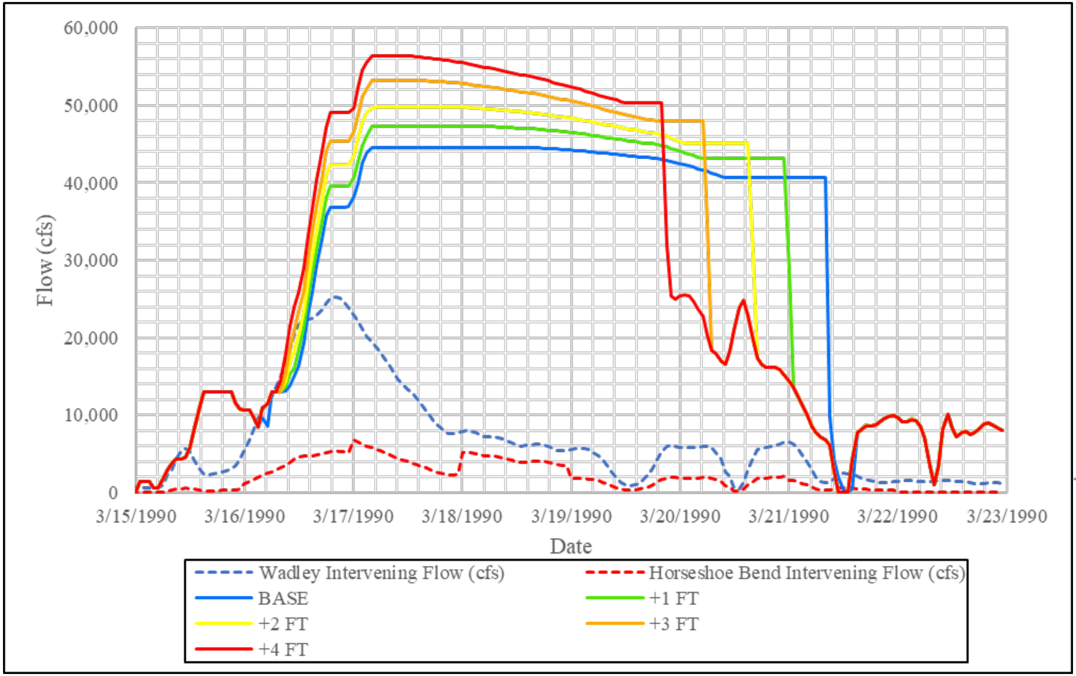
HARRIS DAM RELICENSING

Where the models are used…



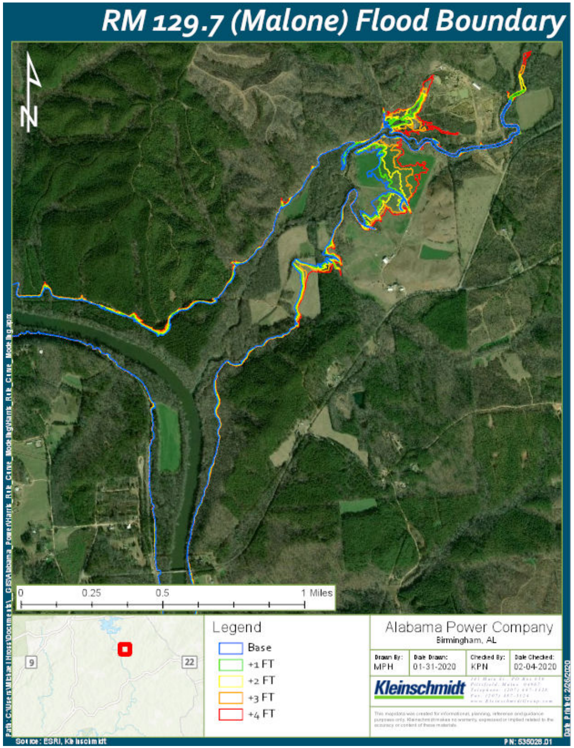
HEC-RAS – MODELED FLOWS

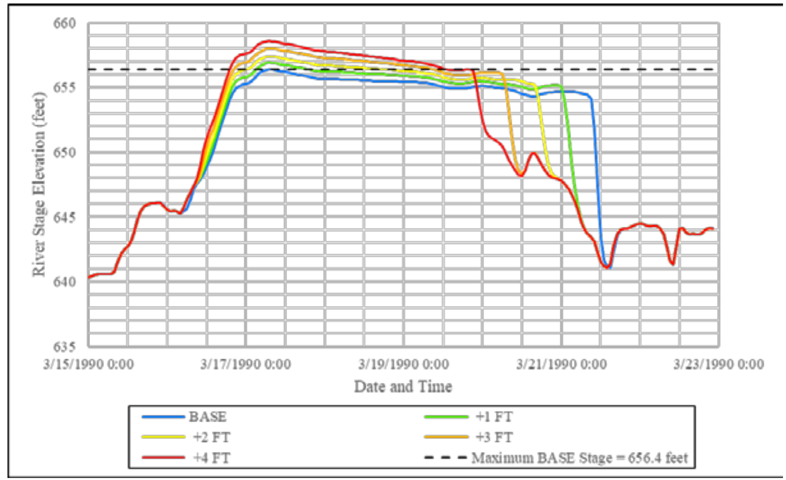
- Base scenario (i.e., existing) and 4 rule curve simulations
  - +1 ft, +2 ft, +3 ft, +4ft
- Intervening flows included in model
  - Flows contributed to river by watershed downstream of the dam
  - Between Harris Dam and Wadley, AL
  - Between Wadley, AL and Horseshoe Bend



HARRIS DAM RELICENSING

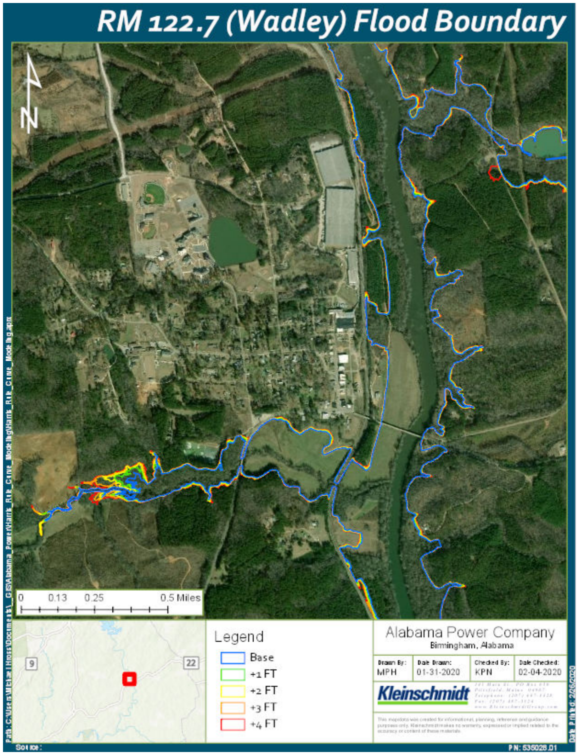
HEC-RAS – MODELING RESULTS

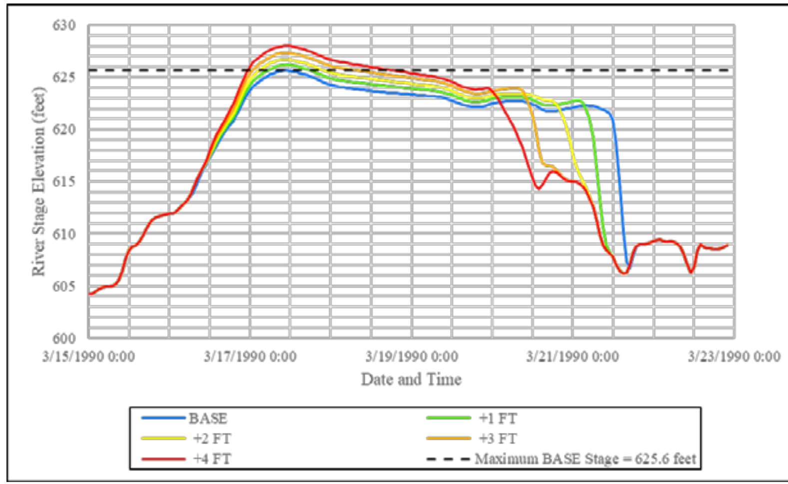




HARRIS DAM
RELICENSING

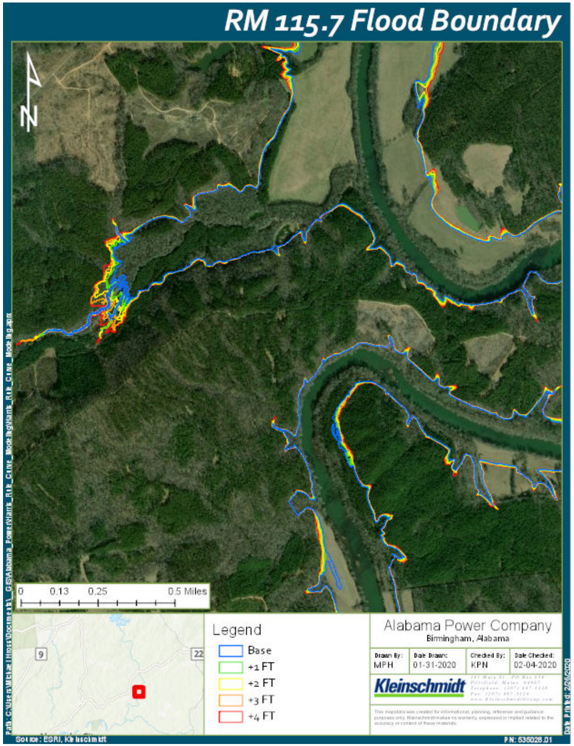
HEC-RAS – MODELING RESULTS

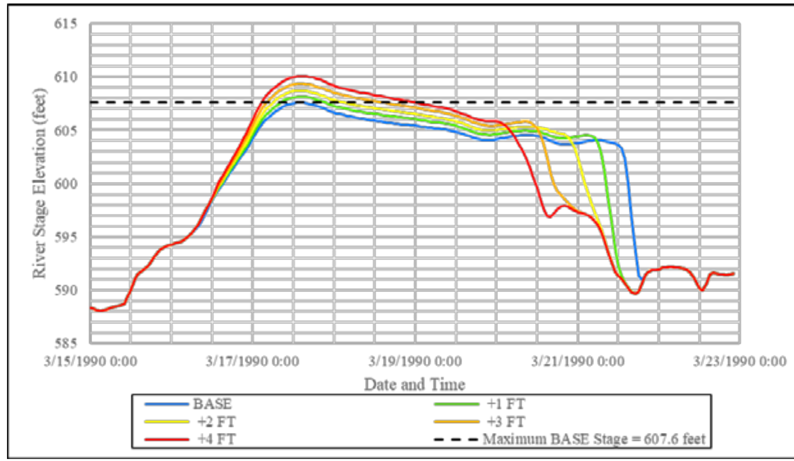




HARRIS DAM
RELICENSING

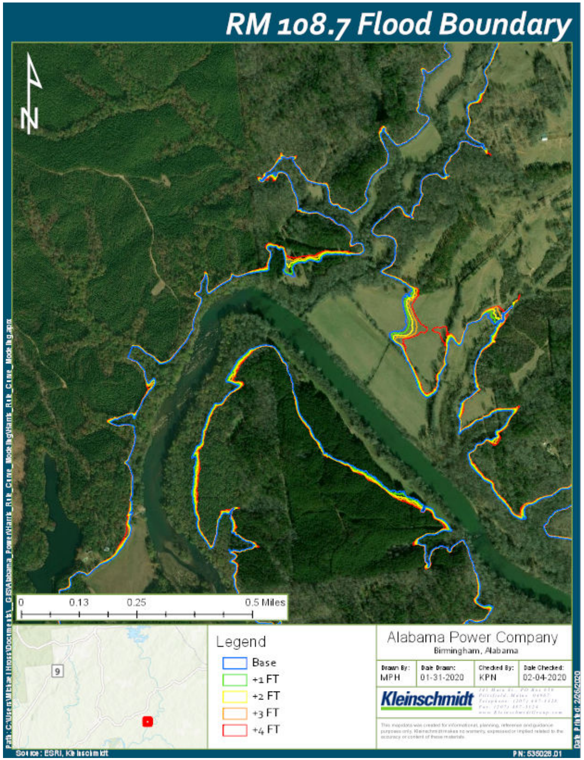
HEC-RAS – MODELING RESULTS

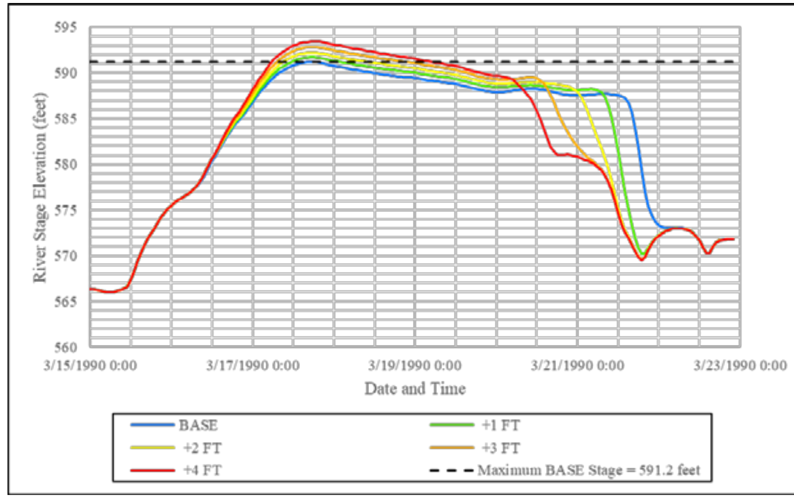




HARRIS DAM RELICENSING

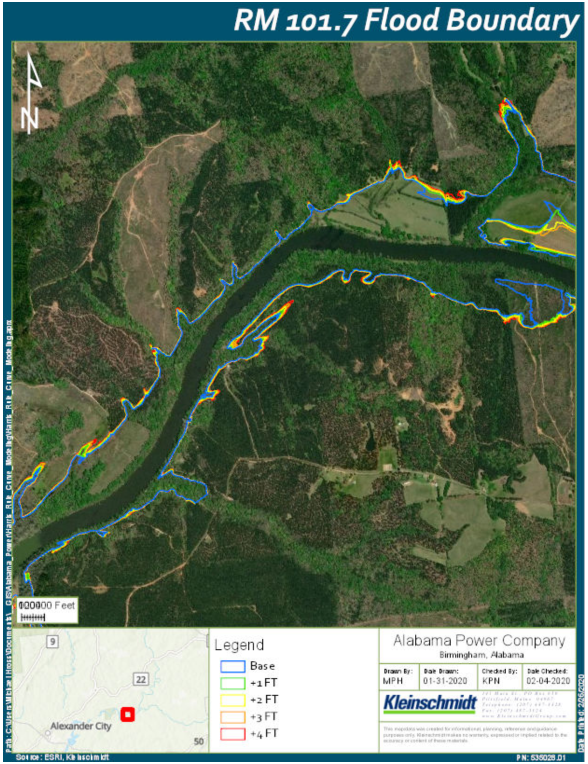
HEC-RAS – MODELING RESULTS

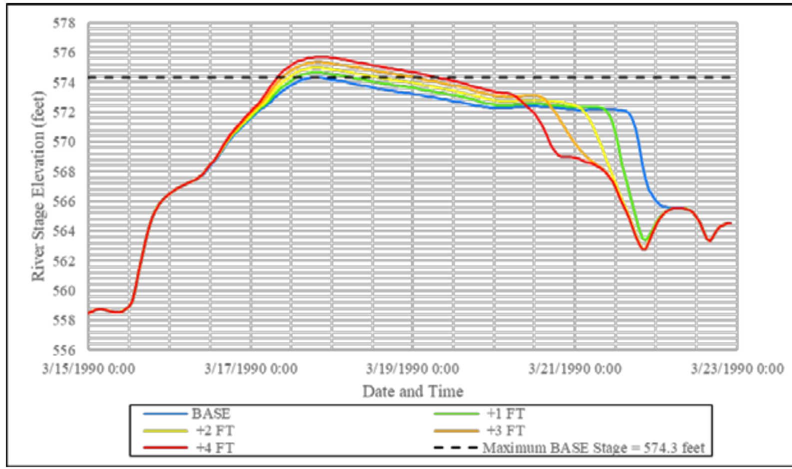




HARRIS DAM RELICENSING

HEC-RAS – MODELING RESULTS





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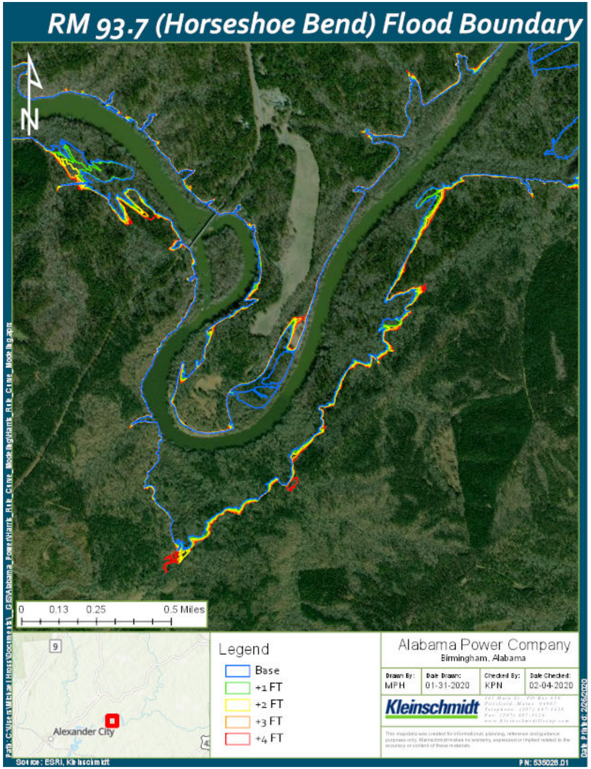
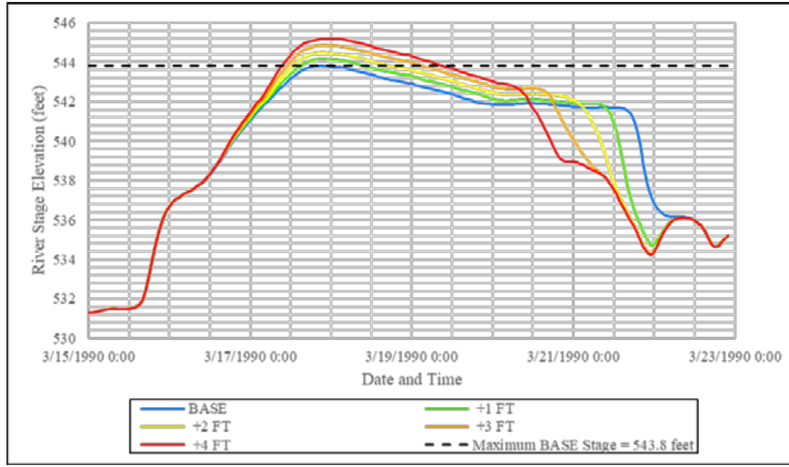
HEC-RAS – MODELING RESULTS





HARRIS DAM RELICENSING

HEC-RAS – MODEL RESULTS

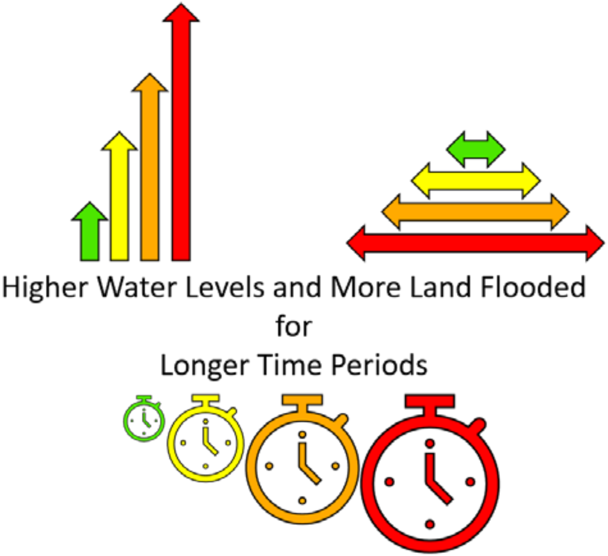
Location	Distance from Dam (miles)	Max Water Surface Rise (feet)			
		+ 1 foot	+ 2 feet	+ 3 feet	+ 4 feet
RM 129.7 (Malone, AL)	7	0.5	1.0	1.6	2.2
RM 122.7 (Wadley, AL)	14	0.5	1.1	1.7	2.4
RM 115.7	21	0.6	1.1	1.8	2.5
RM 108.7	28	0.5	1.0	1.6	2.2
RM 101.7	35	0.4	0.7	1.1	1.4
RM 93.7 (Horseshoe Bend)	43	0.3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

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

HARRIS DAM RELICENSING

HEC-RAS - SUMMARY

- Any change in the operating curve causes:
  - increased maximum stage
  - increase in inundation,
  - increase in duration
- Most flooding occurs where tributaries enter Tallapoosa River
- Will need to evaluate effects on downstream structures



HARRIS DAM RELICENSING

Operating Curve Change Feasibility Analysis

Variance from Study Plan and Schedule

- ❑ March 2020 HAT 1 meeting cancelled due to COVID-19

Remaining Activities/Modification/Other Proposed Studies

- ❑ Draft Phase 1 study report comments due June 11, 2020
- ❑ Begin Phase 2 analysis on effects of winter operating curve on other resources
- ❑ Present methods for the Lake Recreation Structure Usability at Winter Pool Alternatives phase 2 analysis to HAT 1 and HAT 5
- ❑ Present methods for evaluating effects on inundated structures downstream of Harris Dam
- ❑ No additional studies have been proposed beyond that in FERC's SPD

QUESTIONS?

HARRIS DAM
RELICENSING

Downstream Release Alternatives

Study Purpose and Methods Summary

- To evaluate the effects of pre- and post- implementation of Green Plan operations, a continuous minimum flow of 150 cfs, and an alternative/modified Green Plan operation on Project resources.

Study Progress

- RES-Sim outflow hydrographs developed
- HEC-RAS model complete;
- Navigation, ADROP and Hydrobudget analyses
- Draft report distributed to stakeholders

HARRIS DAM RELICENSING

HEC-RAS – MODELED SCENARIOS

- 3 Downstream Release Alternative Plans
  - Pre-Green
  - Green Plan
  - 150 cfs Continuous Minimum Flow
- 2001 Selected as an average year
  - Intervening flows included in model
    - Flows contributed to river by watershed downstream of the dam
    - Between Harris Dam and Wadley, AL
    - Between Wadley, AL and Horseshoe Bend
  - Intervening flow data from USGS gages at Wadley, 02414500 and near Horseshoe Bend, 02414715

HARRIS DAM RELICENSING

PHASE 1 MODELING RESULTS

- ❑Lake Level Impacts: none
- ❑Generation Impacts
  - Pre-Green Plan: + $357,000 per year
  - Green Plan: none (current operation mode)
  - 150 cfs Continuous Minimum Flow: undetermined
- ❑Flood Control Impacts: none
- ❑Navigation Impacts: none
- ❑Drought Operation Impacts: none

HARRIS DAM
RELICENSING

DOWNSTREAM RELEASE ALTERNATIVES

Variance from Study Plan and Schedule

- March 2020 HAT 1 meeting cancelled due to COVID-19

Remaining Activities/Modification/Other Proposed Studies

- Draft Phase 1 study report comments due June 11, 2020
- Begin Phase 2 analysis on effects of downstream release alternatives on other resources
- No additional studies have been proposed beyond that in FERC's SPD

QUESTIONS?

HARRIS DAM
RELICENSING

HAT 2 Water Quality and Use

- ❑ Water Quality Study
- ❑ Erosion and Sedimentation Study

HARRIS DAM
RELICENSING

WATER QUALITY

Study Purpose and Methods Summary

- Summarizes data collected from 2017 through 2019 from Alabama Power, Alabama Department of Environmental Management (ADEM), and Alabama Water Watch (AWW)
- Supports the required 401 Water Quality Certification by conducting dissolved oxygen and water temperature monitoring in the tailrace and Harris Reservoir forebay
- Identifies any possible areas of water quality concern by HAT 2 participants

Study Progress

- Held HAT 2 meeting on September 11, 2019
- HAT 2 stakeholders identified one location of water quality concern: the Foster's Bridge area at Lake Harris
- Distributed Draft Water Quality Report March 9, 2020
- Collected dissolved oxygen (DO) and temperature data at two locations downstream of the dam and monthly vertical profiles in the Harris Reservoir forebay

HARRIS DAM RELICENSING

Water Quality

Data Collection Results

- ❑ Generation data immediately downstream of Harris Dam in 2018 and 2019 had dissolved oxygen (DO) readings greater than 5 milligrams per liter (mg/L) for 94 percent of all measurements
- ❑Continuous monitoring for generation and non-generation in 2019 had DO levels greater than 5 mg/L for 99.9 percent of all measurements
- ❑Several low DO level readings in 2017 can be attributed to severe drought that impacted the Harris Reservoir in the summer and fall of 2016, where inflows to the lake were at historic lows, causing stronger stratification of Lake Harris
- ❑Data collected by ADEM at Harris Dam, Wadley, and Horseshoe Bend had DO levels above 5 mg/L at each sampling event
- ❑Continuous monitoring at Malone indicated that the DO levels were greater than 5 mg/L for 99 percent of the monitoring period

HARRIS DAM RELICENSING

WATER QUALITY

Variance from the Study Plan and Schedule

- ❑Alabama Power intends to submit an application to ADEM for the 401 Water Quality Certification in April 2021, not in April 2020 as noted in the FERC SPD.

Remaining Activities/Modification/Other Proposed Studies

- ❑Comments on Draft Water Quality Study Report due June 11, 2020
- ❑Review comments on the Draft Water Quality Study Report and modify the Final Report, as applicable
- ❑ Prepare the 401 WQC application and submit to ADEM in April 2021
- ❑ No additional studies have been proposed beyond that in FERC's SPD

QUESTIONS?

HARRIS DAM
RELICENSING

EROSION AND SEDIMENTATION

Study Purpose and Methods Summary

- ❑Identify any problematic erosion sites and sedimentation areas and determine the likely causes
  - Identify erosion and sedimentation sites
  - Assess lake erosion sites using a qualified Erosion and Sediment Control Professional
  - Assess bank erosion susceptibility in Tallapoosa River from Harris Dam through Horseshoe Bend
  - Assess sedimentation sites by examining available lake photography and data (LIDAR) and analyzing with Geographic Information System (GIS)

Study Progress

- ❑May 1, 2019 email to HAT 2 members distributed maps of sites identified for assessment and requested additional sites
- ❑September 11, 2019 HAT 2 meeting – Reviewed study plan and last call for erosion and sedimentation sites
- ❑Lake erosion site assessments performed in December 2019
- ❑Bank erosion susceptibility assessment performed in May 2019
- ❑Draft Erosion and Sedimentation Study Report distributed to HAT 2 on March 17, 2020

HARRIS DAM RELICENSING

EROSION AND SEDIMENTATION

Lake Harris Erosion Assessment

❑ 24 sites assessed

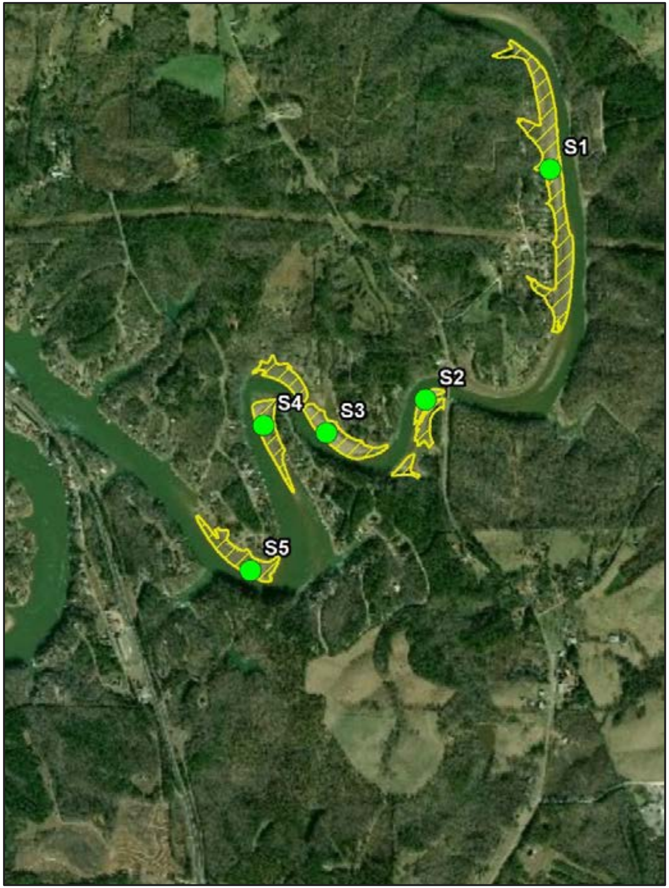
- 8 sites – no erosion
- 16 sites with erosion due to land use (12), anthropogenic (6), and/or natural factors independent of Project operations (8).

HARRIS DAM RELICENSING

Erosion and Sedimentation

Lake Harris Sedimentation Assessment

- 9 sites assessed – most in Little Tallapoosa arm
- GIS analysis estimated 120 acres
- 25% of Little Tallapoosa River basin is hay/pasture fields



EROSION AND SEDIMENTATION

Tallapoosa River Assessment

- High Definition Stream Survey (HDSS)
- Left and right banks scored independently
- Only one area was impaired to non-functional

Bank Condition Score	Bank Condition Class	Description	Erosion Potential	Human Impact
1	Fully Functional	Banks with low erosion potential, such as, bedrock outcroppings, heavily wooded areas with low slopes and good access to flood plain.	Low to High	Low to High
2	Functional	Banks in good condition with minor impacts present, such as, forested with moderate bank angles and adequate access to flood plains.		
3	Slightly Impaired	Banks showing moderate erosion impact or some impact from human development.		
4	Impaired	Surrounding area consists of more than 50% exposed soil with low riparian diversity or surface protection. Obvious impacts from cattle, agriculture, industry, and poorly protected streambanks		
5	Non-functional	Surrounding area consists of short grass or bare soil and steep bank angles. Evidence of active bank failure with very little stabilization from vegetation. Contribution of sediment likely to be very high in these areas.		

HARRIS DAM RELICENSING

Erosion and Sedimentation

1 –Fully Functional

4 – Impaired

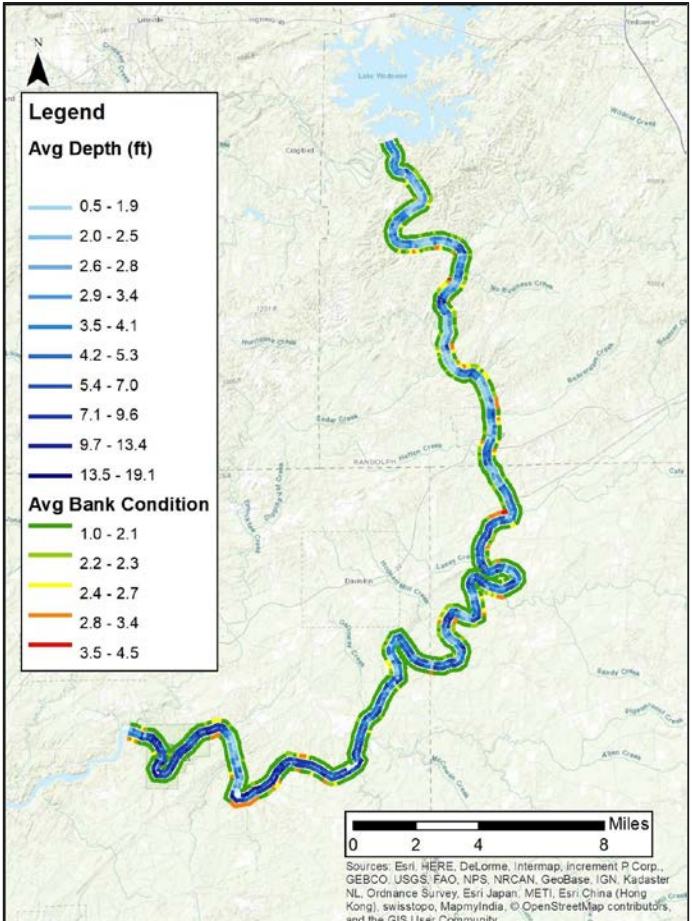
2 –Functional

5 – Non-Functional

3 – Slightly Impaired

HARRIS DAM
RELICENSING

Erosion and Sedimentation



Erosion and Sedimentation

Variance from the Study Plan and Schedule

- ❑ No variance from the study plan or schedule.

Remaining Activities/Modification/Other Proposed Studies

- ❑ Draft Erosion and Sedimentation Study Report comments due June 11, 2020
- ❑ Additional reconnaissance at Lake Harris sedimentation site during full (summer) pool conditions to determine if any nuisance aquatic vegetation is present
- ❑ No additional studies have been proposed beyond that in FERC's SPD

QUESTIONS?

HARRIS DAM
RELICENSING

HAT 3 Fish and Wildlife

- ❑ Threatened and Endangered Species Study
- ❑ Downstream Aquatic Habitat Study
- ❑ Aquatic Resources Study

THREATENED & ENDANGERED SPECIES

Study Purpose and Methods Summary

- ❑Determine if listed species occur in the Project Area and identify potential project impacts
  - Compile a list of T&E species and critical habitats
  - Review literature of agreed upon species to gather habitat requirement data and describe historical range.
  - Identify factors affecting the status of each species.
  - Use GIS to map habitat information to determine possible areas in the geographic scope that T&E species may utilize.
  - Summarize collected data of areas within the geographic scope that provide habitat requirements for T&E species.
  - Determine if these areas are potentially impacted by Harris Project operations.
  - Perform field surveys, as appropriate

Study Progress

- ❑August 27, 2019 – Reviewed Study Plan and discussed need for field surveys
- ❑Surveyed for fine-lined pocketbook (mussel) in Tallapoosa River (November 2019)
- ❑Draft Threatened and Endangered Species Desktop Assessment complete

HARRIS DAM RELICENSING

THREATENED & ENDANGERED DESKTOP STUDY

Federally Threatened and Endangered Species Potentially Occurring in AL Counties within Project Vicinity

- 20 species: 7 threatened, 13 endangered
  - Harris – 7 species
    - Red-cockaded woodpecker
    - Southern pigtoe and fine-lined pocketbook
    - Indiana bat and northern long-eared bat
    - Little amphianthus and white fringeless orchid
  - Skyline – 16 species
    - Palezone shiner and spotfin chub
    - 8 mussel species
    - Indiana bat, northern long-eared bat, and gray bat
    - White fringeless orchid, Price's potato bean, Morefield's leather flower

HARRIS DAM RELICENSING

Threatened & Endangered Desktop Study

	Habitat Occurrence	
Species	Skyline	Lake Harris
Fine-lined pocketbook		✓
Southern pigtoe		✓
Gray bat	✓	
Indiana bat	✓	✓
Northern long-eared bat	✓	✓
Little amphianthus		✓
Price’s potato bean	✓	
White fringeless orchid	✓	✓
Red-cockaded woodpecker		✓

HARRIS DAM RELICENSING

THREATENED & ENDANGERED DESKTOP STUDY

USFWS Designated Critical Habitat

- ❑Fine-lined pocketbook
- ❑Indiana bat
- ❑Rabbitsfoot
- ❑Slabside pearlymussel
- ❑Southern pigtoe
- ❑Spotfin chub

THREATENED & ENDANGERED SPECIES

Variance from the Study Plan and Schedule

- March 2020 HAT 3 meeting was cancelled due to COVID-19

Remaining Activities/Modifications/Other Proposed Studies

- Comments on Draft Threatened and Endangered Species Desktop Assessment due June 11, 2020
- Additional consultation with USFWS as needed
- Additional surveys in spring/summer 2020: palezone shiner and fine-lined pocketbook
- No additional studies have been proposed beyond that in FERC's SPD

QUESTIONS?

HARRIS DAM RELICENSING

DOWNSTREAM AQUATIC HABITAT

Study Purpose and Methods Summary

- ❑To develop a model that describes the relationship between Green Plan operations and aquatic habitat.

Study Progress

- ❑Use HEC-RAS to evaluate the effect of current operations on the amount and persistence of wetted aquatic habitat, especially shoal/shallow-water habitat.
  - Model runs of Green Plan vs Pre-Green Plan operations
- ❑Mesohabitat analysis (classified as riffle, run, or pool) complete
- ❑20 Level/temperature loggers deployed in 2019
- ❑HAT 3 March 20, 2019 Meeting – Reviewed Study Plan and draft mesohabitat analysis
- ❑HAT 3 December 11, 2019 – Reviewed study progress and proposed methodology for analyzing results from HEC-RAS
- ❑February 20, 2020 – HAT 3 Meeting to review proposed analysis methodology and initial results of wetted perimeter analysis

HARRIS DAM RELICENSING

DOWNSTREAM AQUATIC HABITAT

Variance from the Study Plan and Schedule

- ❑March 2020 HAT 3 meeting was cancelled due to COVID-19

Remaining Activities/Modifications/Other Proposed Studies

- ❑Level loggers continue to collect data through June 2020
- ❑Analysis of HEC-RAS results
- ❑Develop temperature component of HEC-RAS model (spring 2020)
- ❑Draft Report in June 2020
- ❑No additional studies have been proposed beyond that in FERC's SPD

QUESTIONS?

HARRIS DAM
RELICENSING

AQUATIC RESOURCES

Study Purpose and Methods Summary

❑Evaluate the effects of the Harris Project on aquatic resources.

Study Progress

❑Desktop Assessment of Aquatic Resources (Kleinschmidt)

❑Downstream Fish Population Research (Auburn)

- Fish Temperature Requirements
- Assessment of Temperature Data from Regulated and Unregulated Reaches
- Fish Community Surveys
  - Wadeable standardized (30+2) sampling
  - Boat Electrofishing
- Bioenergetics Modeling

HARRIS DAM
RELICENSING

Downstream Fish Population Research

- ❑Literature review of temperature requirements of target species: Redbreast Sunfish, Channel Catfish, Tallapoosa Bass, and Alabama Bass
  - Spotted Bass temperature review will be used in place of Alabama Bass
- ❑ Fish sampling at Horseshoe Bend, Wadley, Lee's Bridge (control site), and Harris Dam tailrace
  - Sampling in April, May, July, September, November 2019 and January and March 2020
  - Individual fish weighed, measured, sexed, had gonads removed and weighed, had diets removed from stomachs and preserved, and had otoliths removed and stored to be evaluated
  - To date, all diets quantified, all prey items identified, and all diet data entered into databank
- ❑ Target species specimens being used in respirometry tests
  - Intermittent flow static respirometry tests: data will be used in bioenergetics models
  - Swimming respirometry to quantify performance capabilities of fish

HARRIS DAM RELICENSING

Aquatic Resources

Variance from Study Plan and Schedule

- ❑March 2020 HAT 3 meeting was cancelled due to COVID-19
- ❑Auburn University exploring alternatives to electromyogram radio tags

Remaining Activities/Modifications/Other Proposed Studies

- ❑Desktop Assessment of Aquatic Resources
- ❑Downstream Fish Population Research
  - Fish Temperature Requirements
  - Assessment of Temperature Data from Regulated and Unregulated Reaches
  - Fish Community Surveys
    - Wadeable standardized (30+2) sampling
    - Boat Electrofishing
  - Bioenergetics Modeling
  - Consider Alternative “Control” Site Upstream of Reservoir
  - Tag and Track Fish During Summer 2020
  - Continue Static Respirometry Tests at 10 and 21°C
  - Continue Measuring Active Metabolic Rates (Combination of Increasing Water Velocity and Decreasing Water Temperature)
- ❑Draft Aquatic Resources Study Report in July 2020
- ❑No additional studies have been proposed beyond that in FERC’s SPD

QUESTIONS?

Next Steps

Next Steps

- ❑Alabama Power will file a summary of the ISR meeting on **May 12, 2020**
- ❑Comments on the ISR and ISR meeting summary should be submitted to FERC by **June 11, 2020**
- ❑ Any requests for modifying the FERC approved study plan must follow 18 CFR Section 5.15 (d) and (e)
- ❑Comments on the draft study reports should be submitted to Alabama Power at harrisrelicensing@southernco.com by **June 11, 2020**

HARRIS DAM RELICENSING

Next Steps in Relicensing Process

- ❑Additional HAT meetings (2020-2021)
- ❑Second Study Season/Phase II (2020/2021)
- ❑Progress Update (10/2020)
- ❑File Updated Study Report (4/12/2021)
- ❑ File Updated Study Report Meeting Summary (4/27/2021)
- ❑File Preliminary Licensing Proposal (PLP) (by 7/3/2021)
- ❑Comments on Preliminary Licensing Proposal, Additional Information Request (if necessary) (90 days from issuance of PLP or by 10/1/2021)
- ❑File Final License Application (11/30/2021)

Questions?

HARRIS DAM
RELICENSING

HARRIS DAM

RELICENSING

Alabama Power

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emathews@aces.edu; eric.sipes@ahc.alabama.gov; evan.lawrence@dcnr.alabama.gov; evan_collins@fws.gov; eveham75@gmail.com; fal@adem.alabama.gov; fredcanoes@aol.com; gardenergirl04@yahoo.com; garyprice@centurytel.net; gene@wedoweelakehomes.com; georgettraylor@centurylink.net; gerryknight77@gmail.com; gfhorn@southernco.com; gjobsis@americanrivers.org; gld@adem.alabama.gov; glea@wgsarrell.com; gordon.lisa-perras@epa.gov; goxford@centurylink.net; granddadth@windstream.net; harry.merrill47@gmail.com; helen.greer@att.net; henry.mealing@kleinschmidtgroup.com; holliman.daniel@epa.gov; info@aeconline.com; info@tunica.org; inspector_003@yahoo.com; irapar@centurytel.net; irwiner@auburn.edu; j35sullivan@blm.gov; james.e.hathorn.jr@sam.usace.army.mil; jason.moak@kleinschmidtgroup.com; jcandler7@yahoo.com; jcarlee@southernco.com; jec22641@aol.com; jeddins@achp.gov; jefbaker@southernco.com; jeff_duncan@nps.gov; jeff_powell@fws.gov; jennifer.l.jacobson@usace.army.mil; jennifer_grunewald@fws.gov; jerrelshell@gmail.com; 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rachel.mcnamara@ferc.gov; raebutler@mcn-nsn.gov; rancococ@teleclipse.net; randall.b.harvey@usace.army.mil; randy@randyrogerslaw.com; randy@wedoweemarine.com; rbmorris222@gmail.com; rcodydeal@hotmail.com; reuteem@auburn.edu; richardburnes3@gmail.com; rick.oates@forestry.alabama.gov; rickmcwhorter723@icloud.com; rifraft2@aol.com; rjdavis8346@gmail.com; robert.a.allen@usace.army.mil; robinwaldrep@yahoo.com; roger.mcneil@noaa.gov; ron@lakewedowee.org; rosoweka@mcn-nsn.gov; russtown@nc-cherokee.com; ryan.prince@forestry.alabama.gov; sabrinawood@live.com; sandnfrench@gmail.com; sarah.salazar@ferc.gov; sbryan@pci-nsn.gov; scsmith@southernco.com; section106@mcn-nsn.gov; sforehand@russelllands.com; sgraham@southernco.com; sherry.bradley@adph.state.al.us; sidney.hare@gmail.com; simsthe@aces.edu; snelson@nelsonandco.com; sonjahollomon@gmail.com; steve.bryant@dcnr.alabama.gov; stewartjack12@bellsouth.net; straylor426@bellsouth.net; sueagnew52@yahoo.com; tdadunaway@gmail.com; thpo@pci-nsn.gov; thpo@tttown.org; timguffey@jcch.net; tlamberth@russelllands.com; tlmills@southernco.com; todd.fobian@dcnr.alabama.gov; tom.diggs@ung.edu; tom.lettieri47@gmail.com; tom.littlepage@adeca.alabama.gov; tpfreema@southernco.com; trayjim@bellsouth.net; triciastearns@gmail.com; twstjohn@southernco.com; variscom506@gmail.com; walker.mary@epa.gov; william.puckett@swcc.alabama.gov; wmcampbell218@gmail.com; wrighr2@aces.edu; wsgardne@southernco.com; wtanders@southernco.com

Subject: Harris Relicensing - Initial Study Report Meeting Summary
Date: Tuesday, May 12, 2020 12:16:34 PM
Attachments: 2020-05-12 ISR Meeting Summary.pdf

Harris relicensing stakeholders,

The meeting summary from the April 28th Initial Study Report meeting, including a list of attendees and the meeting presentation, was filed with FERC today. The meeting summary is attached and can also be found at www.harrisrelicensing.com.

Thanks,

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

HAT 1 and HAT 5 meeting - June 4

APC Harris Relicensing <g2apchr@southernco.com>

Wed 5/20/2020 6:45 PM

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Please join us for a HAT 1 and HAT 5 meeting on Thursday, June 4, 2020 from 9 AM-11 AM. This meeting will be a combined HAT meeting because one of the analyses pertains to both the Operations HAT and the Recreation HAT. The two methodologies we will present include:

1. Methodology for analyzing downstream structures that would be affected by increased flooding downstream of Harris Dam as a result of raising the winter operating curve 1-4 feet higher than existing conditions. This analysis will be part of Phase 2 of the Operating Curve Change Feasibility Analysis Study.
2. Methodology for evaluating the private and public structures (i.e., boat ramps, boat docks/courtesy piers, etc.) on Lake Harris that would be useable at each of the four winter operating curve elevations. This analysis is referred to in both the Recreation Evaluation Study and the Operating Curve Change Feasibility Analysis Study.

Participants will have an opportunity to ask questions and comment on these methods.

Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone

+1 (205) 257-2663

Conference ID: 3264749

Thanks,

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

HAT 1 and 5 meeting - tomorrow

APC Harris Relicensing <g2apchr@southernco.com>

Wed 6/3/2020 8:14 PM

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Bcc: damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; todd.fobian@dcnr.alabama.gov <todd.fobian@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>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@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>; wtanders@southernco.com <wtanders@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>

2 attachments (2 MB)

2020-6-4 HAT 1 and 5 meeting - Phase 2 structure analysis.pdf; 2020-6-4 HAT 1 and 5 meeting - downstream structure survey.pdf;

Attached are the presentations for tomorrow's HAT 1 and 5 meeting.

Thanks,

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

Please join us for a HAT 1 and HAT 5 meeting on Thursday, June 4, 2020 from 9 AM-11 AM. This meeting will be a combined HAT meeting because one of the analyses pertains to both the Operations HAT and the Recreation HAT. The two methodologies we will present include:

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Conference ID: 3264749

Thanks,

R.L. Harris Dam Relicensing
FERC No. 2628

HAT 1 Meeting
June 4, 2020

HARRIS DAM
RELICENSING

Operating Curve Change Feasibility Analysis

Phase II Downstream Structure Survey

Phone Etiquette

- ❑Be patient with any technology issues
- ❑Follow the facilitator's instructions
- ❑Phones will be muted during presentations
- ❑Follow along with PDF of presentations
- ❑Write down any questions you have for the designated question section
- ❑Clearly state name and organization when asking questions
- ❑Facilitator will ask for participant questions following each section of the presentation

HARRIS DAM
RELICENSING

Harris Downstream Structure Survey

- An operating curve change may affect areas downstream of Harris Dam
  - Effects are associated with flooding

- Phase 2 of the Operating Curve Change Feasibility Analysis will include:
  - Identifying affected structures
  - # of structures
  - Location
  - Depth & duration of inundation

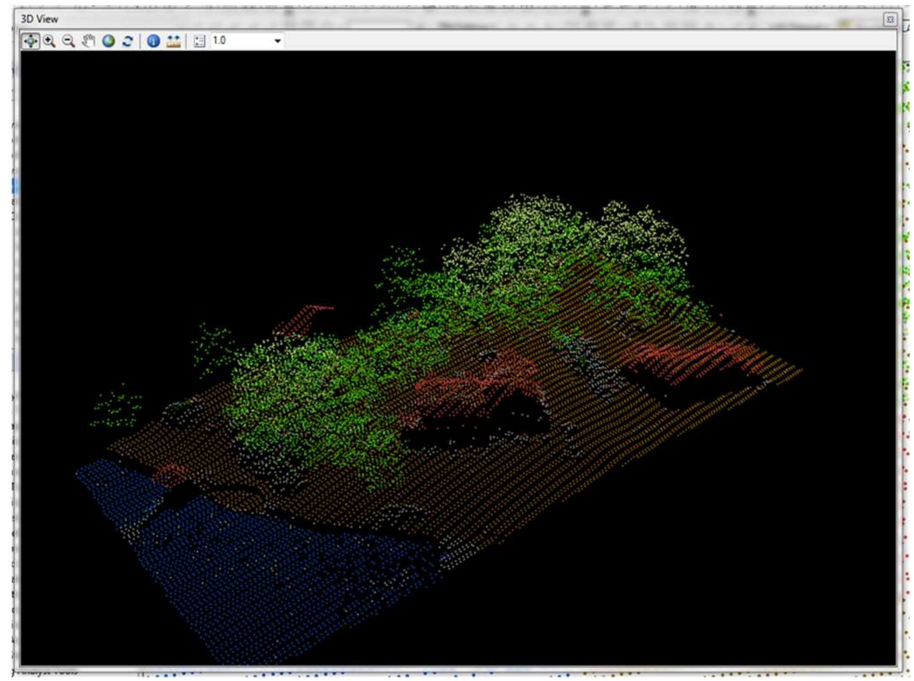
- Identifying structures is no small task

Methods: Remote Sensing

- LiDAR – 4 points per m^2

- 1 m USDA NAIP 4 band image (R, G, B, NiR)

- Classification Workflow:
  - Data management
  - Create training data
  - Classify image pixels
  - QAQC – Confusion Matrix



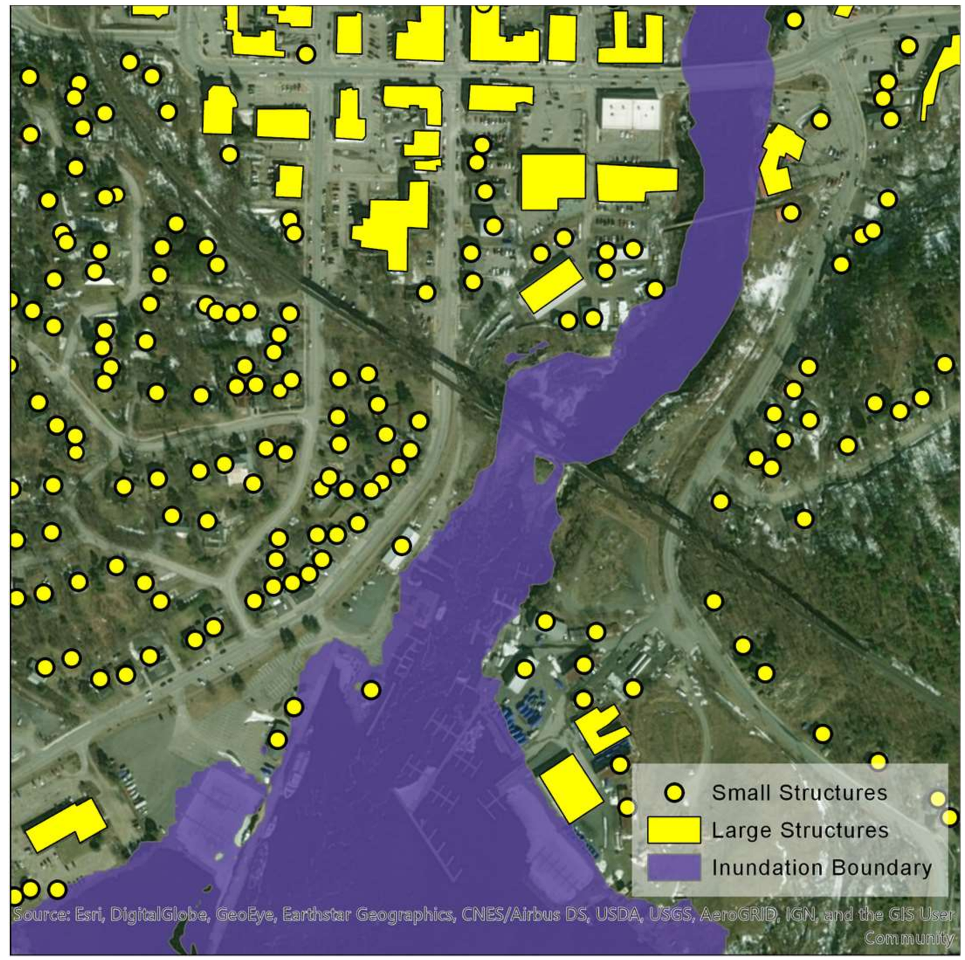
Methods: OBIA

- Object Based Image Analysis in ArcGIS Pro Image Analyst

1. Group pixels into objects - segmentation
2. Create training data
3. Classify Image
4. Assess quality with Confusion Matrix
5. Heads up digitizing
6. Spatial intersection & summarize

Anticipated Output

- Once identified – we will use a GIS to find structures impacted with a spatial intersection
- Series of maps showing location of all structures with symbols for flooded vs. not flooded
- Summary statistics in report
  - # of structures affected by rule curve
  - Min., Avg., Max. depth of inundation
  - Min., Avg., Max. duration of inundation
- Results will be in Phase II Report



R.L. Harris Dam Relicensing
FERC No. 2628

HAT 1 & 5 Meetings
June 4, 2020

HARRIS DAM RELICENSING

Operating Curve Change Feasibility Analysis

Phase II Lake Recreation Structure Usability at Winter Pool Alternatives

Phone Etiquette

- ❑Be patient with any technology issues
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HARRIS DAM RELICENSING

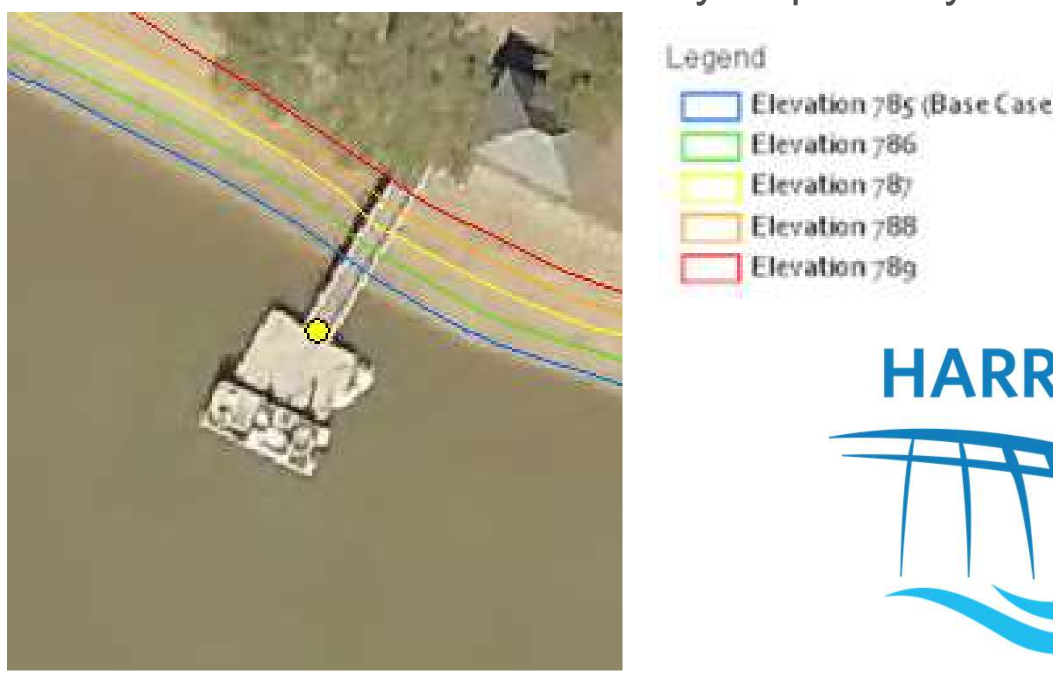
Recreation Structure Usability at Winter Pool Alternatives

<u>Objectives Described in the Study Plan</u>

- Evaluate "…the number of <u>private docks</u> usable during the current winter drawdown and the lowest possible elevation that <u>public boat ramps</u> can be used."
- Private docks defined as <u>boathouses, floats, piers, wet slips, and boardwalks</u>
- Will "…compare the number of access points (both private docks and public boat ramps) available at each 1-foot increment change…"

<u>Methods</u>

- LiDAR used to measure elevation (785, 786, 787, 788, 789 ft msl contours)
- Elevation data used to calculate depth at point
- Depth for points beyond the 785 ft msl contour will be estimated by slope analysis



HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Boathouses

- Point moved to the back of each of these structures
- Structure considered usable with 2 ft of water at the back edge

Recreation Structure Usability at Winter Pool Alternatives

Floats

- Point moved to the back of each of these structures
- Structure considered usable with 2 ft of water at the back edge

Recreation Structure Usability at Winter Pool Alternatives

Piers

- Classified into 3 subcategories:
  - Platform (*bottom left*):
    - Piers with a square-shaped platform on the end
    - Point moved to back edge of the platform
    - Analyzed similarly to floats
  - Mooring (*bottom right*):
    - Straight piers > 30 ft
    - Point moved 30 ft back from front edge
  - Fishing (*right*):
    - Straight piers ≤ 30 ft
    - Point moved halfway back from the front edge
- Depth of 2 ft to be usable

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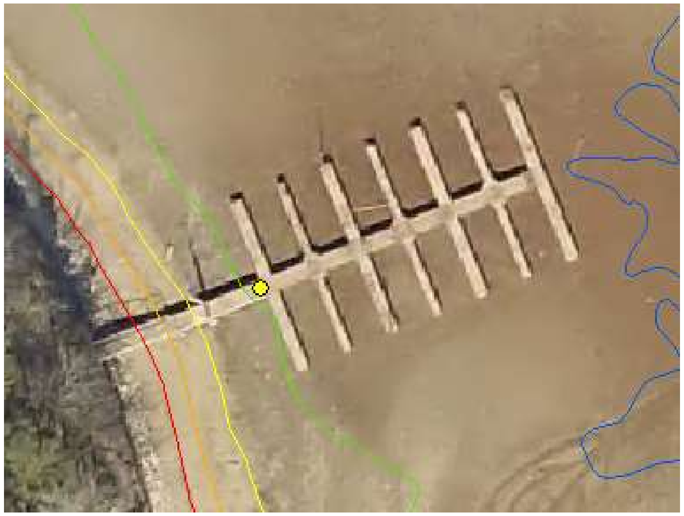
Recreation Structure Usability at Winter Pool Alternatives

Wet Slips

- Some oriented parallel to the bank (*bottom left*) and some perpendicular (*bottom right*)
- The back edge is always the outside edge facing the bank
- Wet slips with multiple slips (*right*) will be considered usable when all slips are usable
- Depth of 2 ft to be usable



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Recreation Structure Usability at Winter Pool Alternatives

Boardwalks

- Point moved to front of structure
- Objective is aesthetics
- Depth of 1 ft at point

Recreation Structure Usability at Winter Pool Alternatives

Public Boat Ramps

- ADCNR typically uses the following criteria for public ramps at low pool:
  - 15% grade at bottom portion of ramp
  - Depth of 4.5 ft at the end of the ramp
  - Able to launch up to 26 ft boat at low pool

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Recreation Structure Usability at Winter Pool Alternatives

Public Boat Ramps

- Highway 48 Bridge:
  - Built using ADCNR standards
  - Usable at 785 ft msl

Recreation Structure Usability at Winter Pool Alternatives

Public Boat Ramps

- Lee's Bridge:
  - Bottom of ramp is ~785.5 ft msl
  - Use a slope analysis to determine the grade
  - Possibly usable ~790.0 ft msl

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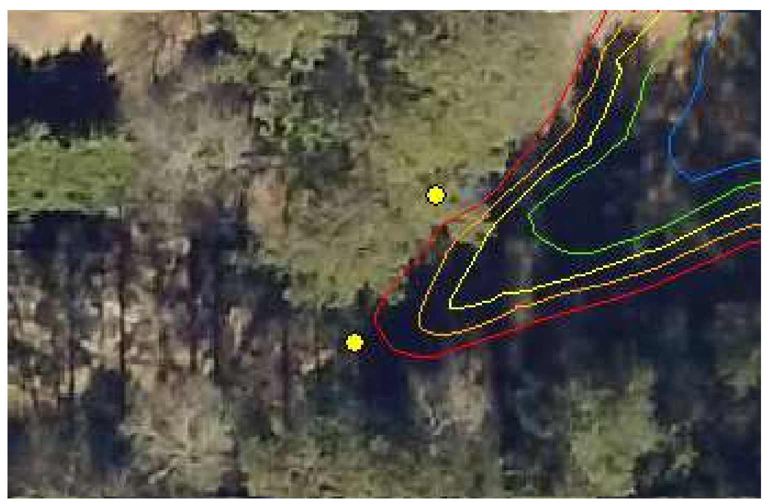
Recreation Structure Usability at Winter Pool Alternatives

Field Observations

- No imagery (*left*):
  - Imagery predates structures
  - ~10.0% of structures
- Not visible (right):
  - Structure obscured by foliage or shadow
  - ~2.5% of structures



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Recreation Structure Usability at Winter Pool Alternatives

Presentation of Data: All Structures

The number and percentage of all usable structures at each winter pool alternative

Winter Pool Elevation (feet msl)	Number of Usable Structures	Percent Usable Structures
785		
786		
787		
788		
789		
>789		

HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Presentation of Data: By Structure

The number and percentage of usable structures by type at each winter pool alternative

Winter Pool Elevation (feet msl)	Number of Usable Structures	Percent Usable Structures
Boardwalks		
785		
786		
787		
788		
789		
>789		
Boathouses		
785		
786		
787		
788		
789		
>789		
Floats		
785		
786		
787		
788		
789		
>789		

HARRIS DAM RELICENSING

Questions?

HARRIS DAM
RELICENSING

Alabama Power

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
June 10, 2020

OFFICE OF ENERGY PROJECTS

Project No. 2628-065 – Alabama
R.L. Harris Hydroelectric Project
Alabama Power Company

VIA FERC Service

Ms. Angie Anderegg
Harris Relicensing Project Manager
Alabama Power Company
600 North 18th Street Birmingham,
AL 35203

Subject: Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Dear Ms. Anderegg:

Staff have reviewed Alabama Power Company's (Alabama Power) Initial Study Report (ISR) and associated draft study reports for the R.L. Harris Hydroelectric Project (Harris Project) filed on April 10, 2020, attended the ISR Meeting held via teleconference on April 28, 2020, and reviewed the ISR Meeting Summary filed on May 12, 2020. Alabama Power filed its ISR two days earlier than the published deadline of April 12, 2020. However, staff is maintaining the original deadline posted in previously issued process plans, June 11, 2020, for filing: comments on the ISR and draft study reports; comments on the ISR Meeting summary; requests for modifications to the approved study plan; and proposals for new studies.

Any stakeholder requests for study plan modifications or new studies should follow the Commission's regulations at 18 C.F.R. § 5.9(b) and 5.15 (2019), which are attached for stakeholder convenience (Attachment B). A copy of the Commission's Integrated Licensing Process (ILP) schedule for the Harris Project pre-filing milestones is attached as a reminder (Attachment C).

Based on a review of the ISR, associated draft study reports, discussions at the ISR Meeting, and a review of the ISR Meeting Summary, staff provide comments and recommended updates on Alabama Power's filings in Attachment A. Unless otherwise noted, please address the comments in Attachment A in the Updated Study Report or the preliminary licensing proposal and license application, as appropriate. Alabama Power's requests for variances to their approved schedules for the Water Quality Study, the Draft Recreation Evaluation Study Report, and the Cultural Resources Study[1] will be addressed after the close of the ISR comment period.

If you have questions please contact Sarah Salazar at (202) 502-6863, or at sarah.salazar@ferc.gov.

Sincerely,

Allan E. Creamer

for Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Enclosures: Attachment A
Attachment B
Attachment C

[1] Alabama Power intends to submit its Clean Water Act section 401 Water Quality Certification application to the Alabama Department of Environmental Management in April 2021 instead of in 2020, as originally proposed. Alabama Power proposes to file its Draft Recreation Evaluation Study Report in August 2020 instead of June 2020 to allow time to complete two new recreation surveys, the Tallapoosa River Downstream Landowner Survey and the Tallapoosa River Recreation User Survey. Alabama Power also proposes to finalize the Area of Potential Effect (APE) for its Cultural Resources Study and file it with documentation of consultation in June 2020.

Attachment A

Staff comments on the Initial Study Report (ISR) and Initial Study Report Meeting Summary

Draft Operating Curve Change Feasibility Analysis (Phase 1) Study Report

1. Figure 5-3, on page 39 of the Draft Operating Curve Change Feasibility Analysis (Phase 1) Study Report, shows how changing the winter pool elevation from the current project operating curve to the +1, +2, +3, and +4-foot winter operating curves could affect reservoir elevations in Lake Harris throughout the year. Moreover, the figure documents the interaction between higher winter pool levels and low-inflow periods. During the period between 2006 and 2008, which encompasses two low-flow periods, the model showed that increasing the winter pool elevation can result in higher reservoir elevations during low-flow years, compared to the existing operating curve. However, Figure 5-3 shows that from about July 2007 through mid-February 2008, modeled reservoir levels for the +2 and +3-foot winter pool curve alternatives were lower than that of the other operating curve alternatives for the same operating period. Please explain what appears to be an anomaly in the modeling result in the final report.

Draft Downstream Release Alternatives (Phase 1) Study Report

2. During the ISR Meeting, Alabama Power requested that stakeholders provide downstream flow alternatives for evaluation in the models developed during Phase 1 of the Downstream Release Alternatives Study. Stakeholders expressed concerns about their ability to propose flow alternatives without having the draft reports for the Aquatic Resources and Downstream Aquatic Habitat Studies, which are scheduled to be available in July 2020 and June 2020, respectively. It is our understanding that during Phase 2 of this study, Alabama Power would run stakeholder-proposed flow alternatives that may be provided with ISR comments, as well as additional flow alternatives that stakeholders may propose after the results for the Aquatic Resources and Downstream Aquatic Habitat Studies are available. Please clarify your intent by July 11, 2020, as part of your response to stakeholder comments on the ISR.

3. According to the approved study plan, the goal of the Downstream Release Alternatives Study is to evaluate the effects of four downstream flow release alternatives on project resources. The four release alternatives are: (1) the Green Plan, or Alabama Power's current pulsing operation; (2) the Pre-Green Plan, or Alabama Power's historic peaking operation; (3) the Pre-Green Plan with a continuous baseflow of 150 cubic feet per second (cfs); and (4) a modified Green Plan. The Phase 1 Report, filed on April 10, 2020, presented complete results for Pre-Green Plan operation and Green Plan operation, partial results for the Pre-Green Plan with a 150-cfs baseflow, and no results for the modified Green-Plan alternative.

During the ISR Meeting, Alabama Power requested that stakeholders identify and propose downstream flow release alternatives so that the proposed alternative's effects on environmental resources can be assessed during Phase 2 of the study. To facilitate modelling of downstream flow release alternatives, we recommend that Alabama Power run base flows of 150 cfs, 350 cfs, 600 cfs, and 800 cfs through its model for each of the three release scenarios (i.e., the Pre-Green Plan, the Green Plan, and the modified Green Plan flow release approach). The low-end flow of 150 cfs was proposed by Alabama Power as equivalent to the daily volume of three 10-minute Green Plan pulses. This flow also is about 15 percent of the average annual flow at the United States Geological Survey's flow gage (#02414500) on the Tallapoosa River at Wadley, Alabama, and represents "poor" to "fair" habitat conditions.[1] We recommend 800 cfs as the upper end of the base flow modeling range because it represents "good" to "excellent" habitat,[2] and is nearly equivalent to the U.S. Fish and Wildlife Service's Aquatic Base Flow guideline for the Tallapoosa River at the Wadley gage.[3] The proposed base flows of 350 cfs and 600 cfs cover the range between 150 cfs and 800 cfs.

In addition, we recommend that the modeling for Alabama Power's Aquatic Resources Study and Downstream Aquatic Habitat Study,[4] as well as any Phase 2

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[1] *See* Tennant, D.L. 1976. Instream flow regimens for fish, wildlife, recreation, and related environmental resources. in Instream flow needs, Volume II: Boise, ID, Proceedings of the symposium and specialty conference on instream flow needs, May 3-6, American Fisheries Society, p. 359-373. Tennant (1976) defines habitat quality (measured by average depth and velocity of flow) as a percentage of the average annual flow. Poor habitat is represented by 0.1 (10 percent of the average annual flow), fair habitat is represented by 0.1 to 0.3 (10 to 30 percent of the average annual flow), and good habitat is represented by 0.3 to 0.4 (30 to 40 percent of the average annual flow), depending on season.

[2] *Id.*

[3] For purposes of this analysis, we assumed an aquatic base flow of 0.5 cubic feet per second per square mile (or cfsm) of drainage area (1,675 square miles at the Wadley gage). *See* U.S. Fish and Wildlife Service. 1981. Interim Regional Policy for New England Streams Flow Recommendations. Region 5. Boston, Massachusetts.

[4] The Aquatic Resources Study involves the use of a bioenergetics model to conduct simulations needed to test potential influence of water temperature and flow on growth rates of fish species downstream from Harris Dam. The Downstream Aquatic Habitat Study involves using a HEC-RAS model to evaluate the effect of alternative operations on the amount and persistence of wetted aquatic habitat in the Tallapoosa River downstream from Harris Dam.

assessment(s) include all the downstream flow release alternatives identified and evaluated as part of the Downstream Flow Release Alternatives Study. The results of all the modeling for the Aquatic Resources Study and Downstream Aquatic Habitat Study should be included in the final study reports and filed with the Updated Study Report, due by April 12, 2021.

4. The Draft Downstream Release Alternatives (Phase 1) Study Report refers to data sets (e.g., topographic and geometric data on pages 12-13 and 17-19) that were used to develop the models. To assist us in interpreting the models, we recommend including in the final study report a table and/or figure that summarizes all of the data sets used in the models and identifies their spatial extents in terms such as watershed segments, river miles (RMs), and square miles covered by each dataset (as appropriate), with reference to other geographic landmarks (e.g., nearest city, dam, bridge, etc.). Please incorporate into the table and/or figure, the stakeholder- and Alabama Power-identified erosion areas of concern. In addition, please provide the metadata for each data set used.

5. Page 14 of the Draft Downstream Release Alternatives (Phase 1) Study Report includes a description of the HEC-ResSim model that was developed for the project. Harris Dam was modeled in HEC-ResSim with both a minimum release requirement and maximum constraint at the downstream gage at Wadley. The draft report states that the minimum release requirement is based on the flow at the upstream Heflin gage, which is located on the Tallapoosa River arm of Harris Reservoir and has 68 years of discharge records. Page 5 of the draft report indicates that there is also a gage (Newell) on the Little Tallapoosa River Arm of the reservoir, which has 45 years of discharge records. It appears that only the Heflin gage was used in developing the minimum release requirement. As part of your response to stakeholder comments on the ISR, please explain the rationale for basing the minimum releases in the HEC-ResSim model only on the flows at the Heflin gage and not also on the flows at the Newell gage.

6. Pages 15 and 16 of the Draft Downstream Release Alternatives (Phase 1) Study Report, state that the drought indicator thresholds, or triggers, are only evaluated on the 1st and the 15th of every month in the model and that once a drought operation is triggered, the drought intensity level can only recover from drought condition at a rate of one level per “period.” Please clarify in the final report if one “period” is equal to 15 days (i.e., the interval for evaluating drought triggers) and if this protocol is used for managing reservoir operations currently, or if it is only a parameter used in the model.

Draft Erosion and Sedimentation Study Report

7. The Erosion and Sedimentation Study in the approved study plan states that Alabama Power would analyze its existing lake photography and Light Detection and Ranging (LIDAR) data using a geographic information system (GIS) to identify elevation or contour changes around the reservoir from historic conditions and quantify changes in

lake surface area to estimate sedimentation rates and volumes within the reservoir. In addition, the approved study plan states that Alabama Power will verify and survey sedimentation areas for nuisance aquatic vegetation. According to the study schedule, Alabama Power will prepare the GIS overlay and maps from June through July 2019 and conduct field verification from fall 2019 through winter 2020.

The Draft Erosion and Sedimentation Study Report does not include a comparison of reservoir contour changes from past conditions or the results of nuisance aquatic vegetation surveys. The report states that limited aerial imagery of the lake during winter draw down and historic LIDAR data for the reservoir did not allow for comparison to historic conditions and that Alabama Power will conduct nuisance aquatic vegetation surveys during the 2020 growing season.

It is unclear why the existing aerial imagery and Alabama Power's LIDAR[5] data did not allow for comparison with past conditions or why the nuisance aquatic vegetation surveys will be conducted during the 2020 growing season instead of during the approved field verifications from fall 2019 to winter 2020. As part of your response to stakeholder comments on the ISR, please clarify what existing aerial imagery and LIDAR data was used and why it was not suitable for comparison with past conditions. Also, please explain the change in timing for conducting the nuisance aquatic vegetation surveys.

Draft Water Quality Report

8. Figure 3-8, on page 18 of the Draft Water Quality Study Report shows dissolved oxygen (DO) profiles for the Harris Project forebay. While much of the data is typical of the DO stratification pattern in a southern reservoir, the figure also shows that in June, July, and August of 2017 and 2019, there was a 2.0 to 3.0 milligram per liter increase in DO concentration at a depth of about 20 to 25 meters in Lake Harris, which is uncommon in such reservoirs. Please include Alabama Power's interpretation of this DO anomaly in the final Water Quality Study Report.

Draft Threatened and Endangered (T&E) Species Study Report

9. The goals of Alabama Power's T&E Species Study are to assess the probability of T&E species populations and/or their critical habitat occurring within the Harris Project boundary or project area and determine if there are project related impacts (i.e., lake fluctuations, downstream flows, recreation and shoreline management activities, timber

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[5] During the June 4, 2020 Harris Action Team #1 and #5 meeting, Alabama Power stated it has LIDAR data sets from different years and would check its records to confirm the number of LIDAR data sets, and for which years the LIDAR data were collected.

management, etc.) to those species and critical habitats. According to the study schedule, Alabama Power would develop the GIS overlays and maps from April through July 2019, and conduct field verifications, if required, from October 2019 through September 2020.

The Draft T&E Species Study Report does not provide information on the presence or absence of potentially suitable habitat within the project boundary for all of the T&E species (e.g., red cockaded woodpecker,[6] northern long-eared bat,[7] pool sprite,[8] and white fringeless orchid[9]) on the official species list for the project.[10] Therefore, Alabama Power was unable to determine whether or not these species are likely to occur within the project boundary or identify a complete list of T&E species that require field surveys.

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[6] Page 8 the report states that land use data is not specific enough to determine if the 3,068 acres of coniferous forest in the project boundary at Lake Harris has the specific habitat characteristics suitable for red-cockaded woodpeckers.

[7] Page 19 of the report states that the Lake Harris and Skyline project boundaries fall within the range of the northern long eared bat and that there are no known hibernacula or summer roost trees within the project boundaries. However, as discussed in the ISR meeting, the report does not state whether any known northern long-eared bat hibernacula occur within a 0.25-mile radius of the project boundaries, or whether known summer roost trees occur within a 150-foot radius of the project boundaries. The report also does not provide information about timber/vegetation management practices within the project boundary. This information is needed in order to determine known occurrences of northern long-eared bats within or adjacent to the project boundaries and to determine potential project effects to this species.

[8] Page 21 of the reports states that pool sprite was documented at Lake Harris in Flat Rock Park in 1995. While subsequent surveys have not detected pool sprite, the report indicates that there are 138.4 acres of granite geology within the project boundary at Lake Harris. However, this species' vernal pool habitat was not identified at the project due to "a lack of available data."

[9] Page 22 the report states that National Wetland Inventory data is not detailed enough to identify potentially suitable habitat for white fringeless orchid within the project boundary.

[10] See FWS's official lists of T&E species within the Harris Project boundaries (i.e., at Lake Harris and Skyline) that were accessed on July 27, 2018, by staff using the FWS's Information for Planning and Conservation website (https://ecos.fws.gov/ipac/) and filed on July 30, 2018.

As part of your response to stakeholder comments on the ISR, please provide: (1) the maps and assessment of the availability of potentially suitable habitat within the project boundary for all of the T&E species on the official species list for the project; (2) documentation of consultation with FWS regarding the species-specific criteria for determining which T&E species on the official species list will be surveyed in the field; (3) a complete list of T&E species that will be surveyed during the 2nd study season as part of the T&E Species Study; and (4) confirmation that Alabama Power will complete the field verification scheduled by September 2020.

Draft Project Lands Evaluation (Phase 1) Report

10. The goals of the Project Lands Evaluation include: (1) identifying and classifying lands at the project that are needed for Harris Project purposes; (2) evaluating existing land use classifications at Lake Harris and determining if any changes are needed to conform to Alabama Power's current land classification system and other Alabama Power Shoreline Management Plans; and (3) identifying lands to be added to, or removed from the current project boundary.

Appendix B of the Draft Project Lands Evaluation (Phase 1) Report includes a small scale map of Lake Harris and the existing shoreline classifications, as well as larger scale maps showing parcels of land within the project boundary for which Alabama Power is considering either changing the existing land use classification, adding parcels to the project boundary, or removing parcels from the project boundary. However, the report does not include large scale maps showing the land use classifications for all of the existing shoreline. To facilitate review of the existing shoreline land use classifications, please file larger scale maps of all the shoreline areas as a supplement to the Draft Project Lands Evaluation Report, as part of your response to stakeholder comments on the ISR. Please include land use classifications on the maps. In addition, if available, please file the GIS data layers of the existing and proposed shoreline land use classifications.

Attachment B

Excerpt from 18 C.F.R. § 5.15

(d) *Criteria for modification of approved study*. Any proposal to modify an ongoing study . . . must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a demonstration that:

(1) Approved studies were not conducted as provided for in the approved study plan; or

(2) The study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.

(e) *Criteria for new study*. Any proposal for new information gathering or studies . . . must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a statement explaining:

(1) Any material changes in the law or regulations applicable to the information request;

(2) Why the goals and objectives of any approved study could not be met with the approved study methodology;

(3) Why the request was not made earlier;

(4) Significant changes in the project proposal or that significant new information material to the study objectives has become available; and

(5) Why the new study request satisfies the study criteria in § 5.9(b).

Excerpt from 18 C.F.R. § 5.9(b)

(b) *Content of study request*. Any information or study request must:

(1) Describe the goals and objectives of each study proposal and the information to be obtained;

(2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;

(3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

(4) Describe existing information concerning the subject of the study proposal, and the need for additional information;

(5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how

the study results would inform the development of license requirements;

(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

(7) Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.

Attachment C

R.L. Harris Process Plan and Schedule for the Integrated Licensing Process (ILP)

(shaded milestones are unnecessary if there are no study disputes; if due date falls on a weekend or holiday, the due date is the following business day)

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§ 5.5(a)	Alabama Power	Filing of NOI and PAD	Actual filing date	6/1/2018
§ 5.7	FERC	Initial Tribal Consultation Meeting	No later than 30 days from NOI and PAD	7/1/2018
§5.8	FERC	FERC Issues Notice of Commencement of Proceeding and Scoping Document (SD1)	Within 60 days of NOI and PAD	7/31/2018
§5.8 (b)(3)(viii)	FERC/ Stakeholders	Public Scoping Meetings and Environmental Site Review	Within 30 days of NOI and PAD notice and issuance of SD1	8/28/2018 - 8/29/2018
§ 5.9	Stakeholders/ FERC	File Comments on PAD, SD1, and Study Requests	Within 60 days of NOI and PAD notice and issuance of SD1	9/29/2018
§5.10	FERC	FERC Issues Scoping Document 2 (SD2), if necessary	Within 45 days of deadline for filing comments on SD1	11/13/2018
§5.11(a)	Alabama Power	File Proposed Study Plans	Within 45 days of deadline for filing comments on SD1	11/13/2018
§5.11(e)	Alabama Power/ Stakeholders	Study Plan Meetings	Within 30 days of deadline for filing proposed Study Plans	12/13/2018
§5.12	Stakeholders	File Comments on Proposed Study Plan	Within 90 days after proposed study plan is filed	2/11/2019
§5.13(a)	Alabama Power	File Revised Study Plan	Within 30 days following the deadline for filing comments on proposed Study Plan	3/13/2019
§5.13(b)	Stakeholders	File Comments on Revised Study Plan (if necessary)	Within 15 days following Revised Study Plan	3/28/2019
§5.13(c)	FERC	FERC Issues Study Plan Determination	Within 30 days following Revised Study Plan	4/12/2019
§5.14(a)	Mandatory Conditioning Agencies	Notice of Formal Study Dispute (if necessary)	Within 20 days of Study Plan determination	5/2/2019
§5.14(l)	FERC	Study Dispute Determination	Within 70 days of notice of formal study dispute	7/11/2019
§5.15(a)	Alabama Power	Conduct First Season Field Studies	Spring/Summer 2019	

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§5.15(c)(1)	Alabama Power	File Initial Study Reports	No later than one year from Study Plan approval	4/12/2020
§5.15(c)(2)	Alabama Power	Initial Study Results Meeting	Within 15 days of Initial Study Report	4/28/2020
§5.15(c)(3)	Alabama Power	File Study Results Meeting Summary	Within 15 days of Study Results Meeting	5/12/2020
§5.15(c)(4)	Stakeholders/ FERC	File Meeting Summary Disagreements/Modifications to Study/Requests for New Studies	Within 30 days of filing Meeting Summary	6/11/2020
§5.15(c)(5)	Alabama Power	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	7/11/2020
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination (if necessary)	Within 30 days of filing responses to disputes	8/10/2020
§5.15	Alabama Power	Conduct Second Season Field Studies	Spring/Summer 2020	
§5.15 (f)	Alabama Power	File Updated Study Reports	No later than two years from Study Plan approval	4/12/2021
§5.15(c)(2)	Alabama Power	Second Study Results Meeting	Within 15 days of Updated Study Report	4/27/2021
§5.15(c)(3)	Alabama Power	File Study Results Meeting Summary	With 15 days of Study Results Meeting	5/12/2021
§5.15(c)(4)	Stakeholders/ FERC	File Meeting Summary Disagreements/ Modifications to Study Requests/Requests for New Studies	Within 30 days of filing Meeting Summary	6/11/2021
§5.15(c)(5)	Alabama Power/ Stakeholders	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	7/11/2021
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination (if necessary)	Within 30 days of filing responses to disagreements	8/10/2021
§5.16(a)	Alabama Power	File Preliminary Licensing Proposal (or Draft License Application) with the FERC and distribute to Stakeholders	Not later than 150 days before final application is filed	7/3/2021
§5.16 (e)	FERC/ Stakeholders	Comments on Alabama Power's Preliminary Licensing Proposal, Additional Information Request (if necessary)	Within 90 days of filing Preliminary Licensing Proposal (or Draft License Application)	10/1/2021
§5.17 (a)	Alabama Power	License Application Filed		11/30/2021

STATE OF ALABAMA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
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DEPUTY COMMISSIONER

The mission of the Wildlife and Freshwater Fisheries Division is to manage, protect, conserve, and enhance the wildlife and aquatic resources of Alabama for the sustainable benefit of the people of Alabama.

CHARLES F. "CHUCK" SYKES
DIRECTOR

FRED R. HARDERS
ASSISTANT DIRECTOR

June 11, 2020

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

RE: Comments on the Harris Project Initial Study Report (ISR) including Project Lands Evaluation, Operating Curve Change Feasibility, Downstream Release Alternatives Study, Water Quality Study, Erosion and Sedimentation Study, Threatened and Endangered Species Desktop Assessment, Cultural Resources Programmatic Agreement and Historic Properties, Management Plan Study, Area of Potential Effects (APE) and Harris Relicensing Initial Study Report Meeting April 28, 2020 for the R. L. Harris Hydroelectric Project (FERC No. 2628).

Dear Ms. Bose:

The Alabama Department of Natural Resources (ADCNR) Division of Wildlife and Freshwater Fisheries (WFF), has reviewed the filed Harris Project Initial Study Report (ISR) in regards to the relicensing of R.L. Harris Hydroelectric Project No. 2628 and submits the following comments and recommendations for your consideration:

Initial Study Report (ISR)

- On page 11, section 4.1 of Initial Study Report, "*i.e.*" ("that is") should be changed to "*e.g.*" ("for example"). The alternative/modified Green Plan operation downstream release alternative will be evaluated as part of Phase 2. Results from the other three scenarios as well as from the Aquatic Resources Study are needed to design the alternative to be studied. Downstream Aquatic Habitat Study and Recreational Evaluation Study results should be included in footnotes in order to fully evaluate and recommend an alternative Green Plan to be modeled and evaluated as a downstream release alternative. Without the ability to fully evaluate the Aquatic Resources Study, Downstream Aquatic Habitat Study and Recreational Evaluation Study results at this time, ADCNR recommends multiple base flow scenarios calculated from available aquatic inflow and base flow records and guidelines representative for the tailwaters downstream to the Horseshoe Bend with Pre-Green Plan, Green Plan and Modified Green Plan be modeled during the evaluation process. All operational changes to downstream releases should evaluate methods for how these flows could be provided while maintaining state dissolved oxygen guidelines and a natural temperature regime, at all times for the sustainable benefit of aquatic resources.

- On page 12, section 4.2 of Initial Study Report, remove the descriptive words "slight" and "worse" when detailing if alternatives will increase or decrease average annual economic costs to Alabama Power customers and provide estimated amount ranges for each alternative. If, "there are currently too many unknowns at this time to generate accurate and reliable Hydro Budget results", please explain how an assumption of whether it will be "same" or "worse" can be made. For comparisons of alternatives, additional details are recommended to provide how a Pre-Green Plan peaking operation with a 150 cfs continuous minimum flow regardless of generation or no generation to produce the minimum flow would not be a significant economic gain, if not evaluating capital and O&M costs into the equation.

- On page 15, section 5.2 of Initial Study Report, remove "well' in statement, "showed dissolved oxygen levels were well above 5 mg/L during each of their sampling events."

- On page 15, section 5.2 of Initial Study Report, additional data, evidence or other alternatives should be provided to make the statement that "The low dissolved oxygen events in 2017 may be attributed to conditions in the Harris Reservoir that were impacted by severe drought in the summer and fall of 2016, where inflows to the lake were at historic lows." On page 17, Figure 3-7 of the Water Quality Study does not indicate that temperature stratification occurred differently in 2017 verses 2018 or 2019. Year 2017 data, on page 37, Figure 4-4, and downstream water quality data on page 46, Figure 6-1 of the Water Quality Study disputes the theory that conditions were caused by previous year conditions. Inflows were above average during 2017, which means discharge was higher. This is another reason low dissolved oxygen could have been more pronounced in 2017. This same scenario has been observed in Lake Martin, where higher spring/summer rainfall leads to increased discharge, which leads to poorer water quality below the thermocline (Sammons and Glover, 2013). If a dam is drawing from the hypolimnion under these conditions, it can lead to a discharge of lower oxygenated water during a high precipitation spring/summer. In addition to evaluating potential causes of the 2017 low dissolved oxygen events, changes and improvements that can be made to detect, adjust and improve operations to prevent another 2017 event from occurring again should be considered and evaluated for the sustained benefit of downstream aquatic resources.

- On page 17, section 6.1 of Initial Study Report delete "likely" and insert, "potential" prior to cause(s).

- On page 18, section 6.2.1 of Initial Study Report, include additional details of how causes of erosion were determined. Methods primarily cover how sites of erosion were identified, not caused.

- On page 18, section 6.2.1 of Initial Study Report, verify and confirm accuracy of statement "Twenty-five percent of the Little Tallapoosa River basin has been converted to hay/pasture fields (MRLC 2019)". Table 2-3, of the Erosion and Sedimentation Study, indicate a net loss of Hay/Pasture in the Little Tallapoosa River Basin of -8,815.1 acres from 2001 to 2016. These two statements appear to be contradictory.

- On page 19, section 6.2.2 of Initial Study Report, it states "Notably, only one area scored as impaired to non-functional (located on the right bank between river mile [RM] 16.3 to 16.9)." On page 33, Figure 21 of Appendix E Downstream Bank Stability Study Report of the Erosion and Sedimentation Study, a red section is downstream of No Business Creek within the 3.5-5 range appears present. Explain and verify that this area is not considered a second impaired site.

- On page 19, section 6.2.2 of Initial Study Report, "primarily caused" should be changed to "potentially caused". Remove "natural riverine processes" and replace with "regulated riverine processes" or define how natural riverine processes are defined in this context and occur below a controlled and regulated tailrace.

- On page 19 section 6.2.2. of Initial Study Report. Providing the dissolved oxygen percent of measurements greater than 5 milligrams per liter is correct but misleading in regards to aquatic resources protection. It is important to note when presenting this data that it only takes a single incident of depleted dissolved oxygen to cause an aquatic species kill event. A caveat or footnote is recommended to address this fact.

- On page 19, section 6.2.2 of Initial Study Report, it states, "Questions have also been raised regarding potential effects the Harris Project may have on other aquatic fauna within the Project Area, including macroinvertebrates such as mollusks and crayfish. Alabama Power is investigating the effects of the Harris

Project on these aquatic species and is performing an assessment of the Harris Project's potential effects on species mobility and population health." There are currently records of mussel species Under Review for federal listing with substantial 90-day findings that occur and occurred historically in the Tallapoosa River and its tributaries. Alabama Spike (*Elliptio arca*) and Delicate Spike (*Ellipto arctata*) are currently state protected species and Under Review by United States Fish and Wildlife Service (USFWS) with a substantial 90-day finding. Threatened and Endangered Species study plan states in the methods that additional species of concern may be added at the request of USFWS and/or ADCNR if determined to be appropriate. Please provide details on what specific mollusks and crayfish species will be evaluated. A list of state protected species currently being evaluated during the relicensing process is recommended.

- Page 27, section 9.1 of Initial Study Report, there are additional state protected species that are not T&E. The final report may not address all state protected species and a statement should be included to clarify. The Initial Study Report plan used the term "and/or".

Draft Phase 1 Project Lands Evaluation Study Report

- Appendix B includes Figure of Maps and Supporting Information of Proposed Changes of the Project Lands Evaluation Study Report. These maps indicate there are several recreational properties which are being re-classified away from recreation (net loss of 600 acres- page 14, Table 6-1). In addition to the acreages provided, it would be beneficial to provide and understand the amount of linear feet of shoreline for each parcel being proposed for addition, re-classification or removal. Undisturbed natural shorelines and shorelines designated for recreational use benefit wildlife and aquatic resources and also provide recreational opportunities for anglers and hunters. Impacts to shoreline habitat in Lake Harris can negatively impact aquatic, semi-aquatic, and terrestrial species. Studies have shown that undeveloped shoreline areas provide the most suitable habitat for maintaining abundance, diversity, and species richness of aquatic, semi-aquatic, and terrestrial species. We recommend that natural vegetated shorelines remain undisturbed as much as possible when evaluating land classifications and future shoreline land use. When evaluating classification changes, linear lake front footage would be a useful metric to provide. ADCNR would like to ensure a suitable site(s) is(are) identified and reserved for future construction of an appropriately sized boating access facility(ies). Future boating demand on Lake Harris is currently unknown for the entire duration of the license, therefore ADCNR continues to request consultation with Alabama Power in the selection of future recreational sites to safeguard they are located in suitable areas for anglers and boaters. The sites need to be large enough to suit any future demand of boaters and anglers and the sites need to meet the engineering requirements for an appropriately sized facility. We recommend any suitable identified property continue to be classified as recreational. The distribution of public boat ramps in the lake should be fully evaluated when considering reclassifying recreation zoned areas. In areas of the lake with few public boating access points or high boat ramp usage, there should be recreational zoned properties for future boat ramp additions available to meet angler demand.

- Appendix B, Figures R1-R6 of the Project Lands Evaluation Study Report, indicates that these acreages are not suitable for recreation due to their location within areas of the lake with limited demand for public recreation opportunities. ADCNR requests the opportunity to evaluate the results from the Recreation Evaluation Study prior to this determination for these zoning reclassifications.

- On page 9, of the Project Lands Evaluation Study Report, the third bullet named Project Operations (formerly titled Prohibited Access) states "For security, the allowable uses in this classification are primarily restricted to Alabama Power personnel; however, in some cases, such as guided public tours, limited public access is available." ADCNR recommends that bank fishing be included in the "some cases" exemptions statement for these areas. Canoe or kayak access points should also be evaluated in these areas during the relicensing process, since they are currently nonexistent.

Draft Operating Curve Change Feasibility Analysis Phase1 Report

- On page 6, section 2.1.1.5 Lower Tallapoosa River of the Operation Curve Change Feasibility Analysis Study discusses downstream gages. Include years of discharge and stage data for these gages, similar to previous gages years of discharge and stage data discussed and included in the document.

- On pages 45-50, Figures 5-7 through 5-12 of the Operation Curve Change Feasibility Analysis Study visually indicate inundation boundaries for the baseline of four winter pool alternatives. Include a Table with calculated totals of inundated acreages for the baseline and four winter pool increase alternatives to assist with the quantitative evaluation of inundation effects downstream of the dam.

Draft Downstream Release Alternatives Phase 1 Report

- The Downstream Release Alternatives Study as is, presents the results for three downstream release alternatives: Pre-Green Plan operation, Green Plan operation, and Pre-Green Plan operation with a 150 cfs continuous minimum flow. Throughout the document the "Pre-Green Plan operation with a 150 cfs continuous minimum flow", is often referenced as "continuous minimum flow of 150 cfs". When referencing this downstream release alternative in the document it would be helpful to use the full "Pre-Green Plan operation with a 150 cfs continuous minimum flow" to clarify and fully identify the alternative. If a modified Green Plan, details pending, is evaluated with a continuous minimum flow, the addition will assist in differentiating the alternatives.

- A fourth Modified Green Plan downstream release alternative was included to be evaluated in the initial Study Plan for the Downstream Release Alternatives Study. ADCNR maintains its recommendation for a fourth alternative Modified Green Plan be fully evaluated. Details and design of a Modified Green Plan alternative are pending results from the Aquatic Resources Study. For a complete Downstream Release Alternative Study comparing four release alternatives, the Modified Green Plan alternative should be completed and included in this study or Phase 2. ADCNR requests the opportunity to provide specific recommendations for the Modified Green Plan alternative after assessing all of the planned study reports. ADCNR has consistently stated and provided published peer reviewed references that support recommendations for downstream flows to mimic a natural flow regime with an adaptive management of flows that follows state dissolved oxygen guidelines and provides natural temperature regimes, at all times for the sustained long term benefit and conservation of aquatic species (See *ADCNR*, P-2628-005 FERC ¶ 20181002-5006).

- On page 1, section 1.0 of the Downstream Release Alternatives Study, replace "However, some stakeholders noted that the temperature of the turbine releases could have potential effects on aquatic resources in the Tallapoosa River below Harris Dam." with "However, some stakeholders noted that the temperature of the turbine releases has documented negative impacts on aquatic resources in the Tallapoosa River below Harris Dam." (See *ADCNR*, P-2628-005 FERC ¶ 20181002-5006).

- On page 2, section 1.1, of the Downstream Release Alternatives Study, change "*i.e.*" to "*e.g.*" It should be "for example" not "that is" if an Aquatic Resources Study is required to evaluate and design the alternative to be studied as stated in footnote of the page. Downstream Aquatic Habitat Study and Recreational Evaluation Study results should be considered as inclusions in the footnote as prerequisites to fully evaluate and recommend an alternative Modified Green Plan to be modeled and evaluated as a downstream release alternative.

- On page 21, section 4.3.3 Model Flow Data of the Downstream Release Alternatives Study, ADCNR recommends re-stating that the Modified Green Plan alternative is not included in this model section pending results from additional studies and will be evaluated in Phase 2. This section states why 2001 data was used and presented but does not specify why the date range of 1/1/01-1/31/01 was specifically selected from the entire year data. ADCNR recommends including why this month was selected and providing additional figures similar to Fig. 4-3. showing a months' worth of data at four 1-month intervals covering spring, summer and fall sample portions of hydrographs to fully illustrate model flow data throughout the year.

- On page 25, section 5.2 of the Downstream Release Alternatives Study, remove the descriptive words "slight" and "worse" when detailing if alternatives will increase or decrease average annual economic costs to Alabama Power customers and provide estimated amount ranges for each alternative. If, "there are currently too many unknowns at this time to generate accurate and reliable Hydro Budget results", please explain how an assumption of whether it will be "same" or "worse" can be made. For comparisons of alternatives, additional details should be provided describing how a Pre-Green Plan peaking operation with a 150 cfs continuous minimum flow, regardless of generation or no generation to produce the minimum flow, would not be a significant economic gain, if not evaluating capital and O&M costs into the equation.

- On page 27, section 6.0 Conclusions of the Downstream Release Alternatives Study, a space between "results indicate" should be included.

Draft Water Quality Study Report

- On pages ii-iv., Table of Contents, of the Water Quality Study, some of the page numbering does not coincide with the document contents. For example, Lake Levels and Hydrology page 7 of Table of Contents is on page 8.

- On page 3, section 1.1, of the Water Quality Study, after "A summary of data sources for this report is provided in" a large space creates and extra page that appears to be unnecessary and should be removed.

- On page 8, section 2.0, of the Water Quality Study "October of 2107" should be changed to 2017.

- On page 9, Figure 2-2 of the Water Quality Study, specify if the 1987-2016 data is a monthly average or long-term average in the figure key or label.

- On page 22, Table 3-2 of the Water Quality Study, include minimum and maximum ranges of data to this Table, if available.

- On page 25, Figure 4-1 of the Water Quality Study, provide major tributary names and periodic river mile markings to aid in location descriptions.

- On page 27, Table 4-3 of the Water Quality Study, include minimum and maximum ranges of data to this Table, if available.

- On page 39, of the Water Quality Study, "Error! Reference source not found?" should be removed or corrected.

- On page 42, Table 4-11 of the Water Quality Study, if available, separate and provide this data into Pre-Green Plan and Post-Green Plan implementation year groupings to further examine if operational differences affect water quality.

- On page 46, section 6.2 of the Water Quality Study, additional data, evidence or other alternatives should be provided to make the statement that "The low dissolved oxygen events in 2017 may be attributed to conditions in Harris Reservoir that were impacted by severe drought in the summer and fall of 2016, where inflows to the lake were at historic lows (Figure 6-1)" On page 17, Figure 3-7 of the Water Quality Study does not indicate that temperature stratification occurred differently in 2017 versus 2018 or 2019. Year 2017 data, on page 37, Figure 4-4, and downstream water quality data on page 46, Figure 6-1 of the Water Quality Study disputes the theory that conditions were caused by previous year conditions. Inflows were above average during 2017, which means discharge was higher. This is another reason low dissolved oxygen could have been more pronounced in 2017. This same scenario has been observed in Lake Martin, where higher spring/summer rainfall leads to increased discharge, which leads to poorer water quality below the thermocline (Sammons and Glover 2013). If a dam is drawing from the hypolimnion under these conditions, it can lead to a discharge of lower oxygenated water during a high precipitation spring/summer. In addition to evaluating potential causes of the 2017 low dissolved oxygen events, changes and improvements that can be made to detect, adjust and improve operations to prevent another 2017 event from occurring again should be considered and evaluated for the sustained benefit of downstream aquatic resources.

Draft Erosion and Sedimentation Study Report

- Throughout the Erosion and Sedimentation Study when referencing “cause of erosion” change to “potential cause(s) of erosion/sedimentation.” On page 2, section 2.0 Goals and Objectives in the Erosion and Sedimentation Study Plan it states, “The goals of this study are to identify any problematic erosion sites and sedimentation areas and determine the likely causes.” “Once areas are identified, Alabama Power will perform assessments and collect additional information, as necessary, to describe and categorize each area according to its severity and potential cause(s).”

- On page 6, section 2.0 Lake Harris, 2.1 Methods in the Erosion and Sedimentation Study, replace, “determine the cause of erosion:” with “determine areas of erosion and potential cause(s):” For the potential cause(s) categories considered, provide a definition of each and additional details into the methods utilized to characterize how each cause was determined and differentiated. The methods described appear to detail how areas of erosion were identified but do not detail how potential cause(s) were determined. A reference to the Erosion and Sedimentation Study Plan Study Plan methods or inclusion of section 4.1 study plan methods should be provided.

- On page 12, section 2.2 Results, 2.2.1 Erosion Survey in the Erosion and Sedimentation Study insert “potential cause(s)” into “Each site was photographed and examined to determine the cause of erosion.”

- On page 20, section, of the Erosion and Sedimentation Study, verify and confirm accuracy that Table 2-3 indicates a net loss of Hay/Pasture in the Little Tallapoosa River Basin of -8,815.1 acres from 2001 to 2016. Text indicates a “Twenty-five percent of the Little Tallapoosa River basin has been converted to hay/pasture fields (MRLC 2019)” These two statements appear to be contradictory.

- On page 24, section 3.2 Results of the Erosion and Sedimentation Study, change “primarily caused” to “potentially caused”. Remove “natural riverine processes” and replace with “regulated riverine processes” or define how natural riverine processes are defined in this context and occur below a controlled and regulated tailrace.

- On page 25, Table 3-2 of the Erosion and Sedimentation Study, add score ranges (minimum and maximum scores) in addition to the means. If previous sites E22 and E23 are included in this Table, provide an asterisk and footnote specifying which ones they are. Include in discussion section how this scoring method compared to the method used at sites E22 and E23.

- On page 26, Figure 3-1 of the Erosion and Sedimentation Study, include site numbers from Table 3-2 into this map or provide incremental river mile markers.

- On page, Table 4-1 of the Erosion and Sedimentation Study indicates a 592.1 acreage increase in deciduous forest. Deciduous forest stream buffers have been shown to reduce nitrogen, phosphorous and sedimentation from surface water runoff into streams, lakes and estuaries. This could be included in the discussion section as a positive observed land use trend in the area (Klapproth and Johnson 2009; Roy *et al.* 2006).

- On page 31, Section 5.0 Discussion and Conclusions of the Erosion and Sedimentation Study, provide additional information on definitions and methodology in how cause(s) were determined before the conclusion that erosion was a result of anthropogenic and/or natural processes independent of project operations. As is, the use of the word "potential" should be included. Provide the current definition of “project operations” for this study and include it prior to other document “project operations” statements. If referring to “fluctuations” from project operations, this should be clearly stated throughout Erosion and Sedimentation Study. Among Study plans there appears to be variations in the provided definition of “Project operations” and “project related impacts”. For example, on page 4 the Erosion and Sedimentation Study Plan states “Project operations” as “(*i.e.*, water level fluctuations or construction/maintenance activities on/at Project facilities or lands)”, but on page 2 of the Threatened and Endangered Species Study Plan it states “project related impacts” as “(*i.e.*, lake fluctuations, downstream flows, recreation and shoreline management activities, timber management, etc.)”. Providing consistency of these definitions among studies would be beneficial during the relicensing evaluation process. In addition, including “etc.” which indicates that “further, similar items are included” after using “*i.e.*” or “that is” is a contradictory use of the terms.

- On page 31, section 5.0 Discussion and Conclusions of the Erosion and Sedimentation Study, replace "extremely small" with "relatively small".

- On page 31, section 5.0 Discussion and Conclusions of the Erosion and Sedimentation Study, insert "potentially" prior to "affected"

- On page 31, section 5.0 Discussion and Conclusions of the Erosion and Sedimentation Study, insert "potentially" prior to "clear-cut". Reword sentence to read: "The observed erosion at the these sites is the potential result of adjacent land use and clearing of riparian plant cover destabilizing soils along the affected banks, although erosion at these sites may have been initially caused or exacerbated as result of altered flow releases from Harris Dam."

- On page 31, section 5.0 Discussion and Conclusions of the Erosion and Sedimentation Study, insert "in the reservoir" after decrease in "Sedimentation in Lake Harris is most pronounced in the Little Tallapoosa River arm where sediment transported from upstream settles out of the water column as water velocities decrease" statement.

- In Appendix E Downstream Bank Stability Study Report of the Erosion and Sedimentation Study, include periodic river mile markers and corresponding segment numbers in figures of the study.

- On page 33, Figure 21 of Appendix E Downstream Bank Stability Study Report of the Erosion and Sedimentation Study, a red section in downstream of No Business Creek within the 3.5-5 range appears present. In results or discussion explain how this area is not included as a second impaired site.

- On page 34, Table 3 of Appendix E Downstream Bank Stability Study Report of the Erosion and Sedimentation Study, if available, include ranges (minimum and maximum scores) with segment data.

- On page 43, Conclusions section of Appendix E Downstream Bank Stability Study Report of the Erosion and Sedimentation Study include a definition and discussion about the potential for head cutting in tributaries due to main river channel operations. Head cutting is a process by which the upstream portion of a stream channel becomes destabilized and erodes progressively in an upstream direction. Accelerated velocities can lead to an increase in head cutting upstream from affected areas (Annear *et al.* 2002).

Draft Threatened and Endangered Species Desktop Assessment

- Throughout the Threatened and Endangered Species Desktop Assessment, capitalize species common names. When a species is first used in the document, include the scientific name in parentheses. The common name can then be used in the remaining sections of the document.

- Range Figures included in the Threatened and Endangered Species Desktop Assessment illustrating aquatic species habitat ranges, include the tributaries and streams names on the maps.

- On page 6, Table 1-1 of the Threatened and Endangered Species Desktop Assessment in Scientific names column change "*Villosa trabalis*" to "*Venustaconcha trabalis*", "*Quadrula cylindrica*" to "*Theliderma cylindrica*". Correct error for scientific name of Shiny Pigtoe to "*Fusconaia cor*" (Williams *et al.* 2017).

- On page 6, Table 1-1 of the Threatened and Endangered Species Desktop Assessment all of the species listed in this table are now State Protected, see Alabama Regulations relating to game, fish and furbearing animals. 2019-2020. Alabama Department of Conservation and Natural Resources, with the exception of the plant species listed, Little Amphianthus, White Fringeless Orchid, Price's Potato-bean and Morefield's Leather Flower.

- On page 6, Table 1-1 of the Threatened and Endangered Species Desktop Assessment change column heading "Occurrence" column to "Recent Documented Occurrence in Harris Project Boundary". Within the document "Recent" should be defined, for example, "In this report any documented occurrence within the past 25 years will be classified as a Recent Documented Occurrence".

- On page 6, Table 1-1 of the Threatened and Endangered Species Desktop Assessment, Williams *et al.* (2008) is cited but this resource is not utilized anywhere else in the document. Recommend including the most up to date resources in the following species descriptions.

- On Page 9, 3.2 Palezone Shiner section of the Threatened and Endangered Species Desktop Assessment if an updated survey is proposed for this species suggest including and discussing or note that it will be included in an additional Phase 2 study report.

- On page 10, 3.4 Finelined Pocketbook section of the Threatened and Endangered Species Desktop Assessment, include "primarily" in the statement, "this mussel lives in large to small streams in habitats "primarily" above the fall line." See Williams *et al.* 2008 distribution map and distribution descriptions.

- On page 10, 3.4 Finelined Pocketbook section of the Threatened and Endangered Species Desktop Assessment, include, if any, the last mussel survey completed in the Tallapoosa Harris Tailrace and tributaries. Include a statement indicating if a mollusk tailrace study has been considered in the study plan development process and why it was not deemed necessary for this species.

- On page 10, 3.4 Finelined Pocketbook section of the Threatened and Endangered Species Desktop Assessment, a statement should be included notifying that ADCNR and USFWS are currently reintroducing the Finelined Pocketbook into suitable historical habitats within the state (USFWS 2019).

- On page 10, 3.4 Finelined Pocketbook section of the Threatened and Endangered Species Desktop Assessment, the reasons for decline could be updated and improved by summarizing statements from USFWS (2019), Nine Mobile River Basin mussels (Finelined Pocketbook (*Hamiota (=Lampsilis) altilis*), Orangenacre Mucket (*Hamiota (=Lampsilis) perovalis*), Alabama Moccasinshell, (*Medionidus acutissimus*), Coosa Moccasinshell (*Medionidus parvulus*), Southern Clubshell (*Pleurobema decisum*), Dark Pigtoe *(Pleurobema furvum*), Southern Pigtoe (*Pleurobema georgianum*), Ovate Clubshell (*Pleurobema perovatum*), Triangular Kidneyshell (*Ptychobranchus greenii*)) 5-year review. This review states that suitable habitats and water quality, free of excessive sedimentation and other pollutants, are required for Finelined Pocketbook. The primary cause of curtailment of range and fragmentation of habitat for these mussel species has been contributed to the historic construction of dams and impoundment of large reaches of major river channels (Federal Register 58 FR 14330). Although most of these actions took place in the past, the impacted conditions and habitat continue to affect the species. In recent years, some improvements have been made to improve riverine conditions. For example, flow improvements have been made below Weiss Dam on the Coosa River that benefit existing populations of Southern Clubshell. Watershed-specific threats continue to negatively impact the species. These threats include: 1) coal mining activities 2) oil and gas exploration 3) water withdrawal 4) hypolimnetic discharges 5) poor water quality due to insufficient releases from dams 6) instream aggregate mining 7) navigation channel maintenance activities (8) agricultural practices that degrade water quality by increasing nutrients, herbicide/surfactant compounds, and hormones in surface waters; (9) hydropeaking dams that alter downstream flow conditions, water temperatures, and dissolved oxygen (10) increasing urban development that degrades water quality and stream geomorphology; and (11) climate change, which is expected to result in more frequent and extreme dry and wet years in the Southeast over the next century.

- On page 10, 3.4 Finelined Pocketbook section of the Threatened and Endangered Species Desktop Assessment, change statement "No populations were identified within the Project Boundary at Lake Harris, but future surveys have been proposed by Alabama Power." to "To date, no populations were identified within the Project Boundary at Lake Harris, but surveys focused on the 3.75 mile stretch of the Tallapoosa River where critical habitat is known to occur from the County 36 bridge to a shoal below the Highway 431 bridge are currently being conducted by Alabama Power and USFWS."

- On page 11, 3.5 Alabama Lampmussel section of the Threatened and Endangered Species Desktop Assessment, a statement should be included notifying that ADCNR and USFWS is currently reintroducing the Alabama Lampmussel into suitable historical habitats within the state (USFWS 2012).

- On page 11, 3.5 Alabama Lampmussel section of the Threatened and Endangered Species Desktop Assessment, reasons for imperilment should be updated and improved summarizing statements from USFWS released a Five-Year Review for the species (USFWS 2012).

- On page 11, 3.5 Alabama Lampmussel section of the Threatened and Endangered Species Desktop Assessment, include that in laboratory trials Alabama Lampmussel glochidia have been found to utilize Rock Bass (*Ambloplites rupestris*), Green Sunfish (*Lepomis cyanellus*), Bluegill (*Lepomis macrochirus*), Smallmouth Bass (*Micropterus dolomieu*), Spotted Bass (*Micropterus punctulatus*), Largemouth Bass (*Micropterus salmoides*), and Redeye Bass (*Micropterus coosae*) as host fish and that Banded Sculpin (Cottus carolinae) appear to be marginal hosts (Williams et. Al. 2008).

- On page 12, 3.6 Cumberland Bean section of the Threatened and Endangered Species Desktop Assessment, a statement should be included notifying that ADCNR and USFWS is currently reintroducing the Cumberland Bean into suitable historical habitats within the state (USFWS 2020).

- On page 12, 3.6 Cumberland Bean section of the Threatened and Endangered Species Desktop Assessment, reasons for imperilment should be updated and improved summarizing statements from USFWS released a Five-Year Review for the species (USFWS 2020).

- On page 12, 3.7 Fine-Rayed Pigtoe section of the Threatened and Endangered Species Desktop Assessment, reasons for species decline should be updated and improved summarizing statements from USFWS released a Five-Year Review for the species (USFWS 2013b).

- On page 13, 3.8 Pale Lilliput section of the Threatened and Endangered Species Desktop Assessment, a statement should be included notifying that ADCNR and USFWS is currently reintroducing the Pale Lilliput Mussel into suitable historical habitats within the state (USFWS 2011).

- On page 13, 3.8 Pale Lilliput section of the Threatened and Endangered Species Desktop Assessment, reasons for imperilment should be updated and improved summarizing statements from USFWS released a Five-Year Review for the species (USFWS 2011).

- On page 13, 3.8 Pale Lilliput section of the Threatened and Endangered Species Desktop Assessment, include, in laboratory trials by ADCNR, Pale Lilliput glochidia have been found to utilize Northern Studfish (*Fundulus catenatus*), Blackspotted Topminnow (*Fundulus olivaceus*) and Blackstripe Topminnow (*Fundulus notatus*) as primary hosts. (Fobian *et al.* 2015)

- On page 13, 3.9 Rabbitsfoot section of the Threatened and Endangered Species Desktop Assessment, a statement should be included notifying that ADCNR and USFWS is currently reintroducing the Rabbitsfoot into suitable historical habitats statewide.

- On page 13, 3.9 Rabbitsfoot section of the Threatened and Endangered Species Desktop Assessment, include, suitable fish hosts for Rabbitsfoot populations west of the Mississippi River include Blacktail Shiner (*Cyprinella venusta*) from the Black and Little rivers and Cardinal Shiner (*Luxilus cardinalis*), Red Shiner (*Cyprinella lutrensis*), Spotfin Shiner (*Cyprinella spiloptera*), and Bluntface Shiner (*Cyprinella camura*) from the Spring River, but host suitability information is lacking for most of the eastern range (Fobian 2007). A host study by ADCNR in 2011, found Scarlet Shiner (*Lythrurus fasciolari*), Whitetail Shiner (*Cyprinella galactura*) and Striped Shiner (*Luxilus chrysocephalus*) to be sympatric hosts with Rabbitsfoot from Paint Rock River, AL. Marginal minnow hosts from studies have included Central Stoneroller (*Campostoma anomalum*), Emerald Shiner (*Notropis atherinoides*), Rosyface Shiner (*Notropis rubellus*), Bullhead Minnow (*Pimephales vigilax*) and Rainbow Darter (*Etheostoma caeruleum*), but not in all stream populations tested (Fobian 2007, Watters *et al.* 2005).

- On page 14, 3.10 Snuffbox section of the Threatened and Endangered Species Desktop Assessment, update and include that in 2019, USFWS released a Five-Year Review for the species (USFWS 2019b). Reasons for imperilment could be added and improved summarizing statements from this document as well.

- On page 15, 3.11 Shiny Pigtoe Mussel section of the Threatened and Endangered Species Desktop Assessment, reasons for imperilment should be updated and improved summarizing statements from USFWS released a Five-Year Review for the species (USFWS 2013c).

- On page 16, 3.12 Southern Pigtoe section of the Threatened and Endangered Species Desktop Assessment, change "finelined pocketbook mussel" to "Southern Pigtoe".

- On page 16, 3.12 Southern Pigtoe section of the Threatened and Endangered Species Desktop Assessment, the reasons for decline could be updated and improved by summarizing statements from USFWS (2019), Nine Mobile River Basin mussels (Finelined Pocketbook (*Hamiota (=Lampsilis) altilis*), Orangenacre Mucket (*Hamiota (=Lampsilis) perovalis*), Alabama Moccasinshell, (*Medionidus acutissimus*), Coosa Moccasinshell (*Medionidus parvulus*), Southern Clubshell (*Pleurobema decisum*), Dark Pigtoe *(Pleurobema furvum*), Southern Pigtoe (*Pleurobema georgianum*), Ovate Clubshell (*Pleurobema perovatum*), Triangular Kidneyshell (*Ptychobranchus greenii*)) 5-year review. This review states that suitable habitats and water quality, free of excessive sedimentation and other pollutants, are required for Southern Pigtoe. The primary cause of curtailment of range and fragmentation of habitat for mussel species has been contributed to the historic construction of dams and impoundment of large reaches of major river channels (Federal Register 58 FR 14330). Although most of these actions took place in the past, the impacted conditions and habitat continue to affect the species. In recent years, some improvements have been made to improve riverine conditions. For example, flow improvements have been made below Weiss Dam on the Coosa River that benefit existing populations of Southern Clubshell. Watershed-specific threats continue to negatively impact the species. These threats include: 1) coal mining activities 2) oil and gas exploration 3) water withdrawal 4) hypolimnetic discharges 5) poor water quality due to insufficient releases from dams 6) instream aggregate mining 7) navigation channel maintenance activities (8) agricultural practices that degrade water quality by increasing nutrients, herbicide/surfactant compounds, and hormones in surface waters; (9) hydropeaking dams that alter downstream flow conditions, water temperatures, and dissolved oxygen (10) increasing urban development that degrades water quality and stream geomorphology; and (11) climate change, which is expected to result in more frequent and extreme dry and wet years in the Southeast over the next century.

- On page 17, 3.13 Slabside Pearlymussel section of the Threatened and Endangered Species Desktop Assessment, include that in 2013, USFWS designated critical habitat for the species (Federal Register 78:59555-59620). A statement similar to the Rabbitsfoot section could be included for consistency.

- On page 25, Discussion and Conclusions: section of the Threatened and Endangered Species Desktop Assessment, include a caveat statement or footnote reiterating that this is a desktop assessment and that to be certain of species occurrence, surveys should be conducted by qualified biologists to determine if a sensitive species occurs within a project area. Species not listed for a specific area does not imply that they do not occur there, only that their occurrence there is as yet unrecorded by state or federal agencies. This assessment is currently under review and reflects only our current understanding of species distributions.

- On page 25, Discussion and Conclusions: section of the Threatened and Endangered Species Desktop Assessment, change "…extant populations of 20 federal and state protected T&E species (Appendix B)." to "….extant populations of 20 federally T&E species of which 16 are state protected (Appendix B)."

- Appendix B Species Habitat Range Maps of the Threatened and Endangered Species Desktop Assessment, all figures with "extant population" shown. change to "Recent Documented Occurrence". In addition, make sure "Current Range" and "Documented Historic Range" terminology is defined in the assessment. As is, all Figure Titles in Appendix B should have "Current" inserted before Habitat Range and after the Species name.

- Figure 3.12-1 Appendix B of the Threatened and Endangered Species Desktop Assessment, Southern Pigtoe does not occur in the Tennessee River system. It does not have critical habitat in the Paint Rock River system. This map appears to be inaccurate and should be deleted.

- Figure 3.13-1 Appendix B of the Threatened and Endangered Species Desktop Assessment, The Paint Rock River has designated critical habitat for this species. See Federal Register 78:59555-59620 for critical habitat details that should be included.

Cultural Resources Programmatic Agreement and Historic Properties, Management Plan Study

- ADCNR has no comments or recommendations at this time.

Area of Potential Effects (APE)

- ADCNR has no comments or recommendations at this time.

Harris Relicensing Initial Study Report Meeting April 28, 2020

- Recreational Evaluation Study discussion. Recreation use data was collected at recreational facilities from March to December 2019, however questionnaires were only filled out from May to December 2019. The Questionnaires missed an active time for anglers. ADCNR is concerned that recreational anglers may not be adequately represented in this data. ADCNR would like to make sure that anglers are adequately represented in the survey since it asks specific questions about specific facilities.

- Downstream Release Alternatives Study discussion. A fourth alternative is proposed in the study plan. It was to be a Modified Green Plan. Aquatic Resources Study is required to evaluate and design the alternative to be studied as stated in the footnotes.

- Erosion and Sedimentation Study discussion. ADCNR recommends including the APC response statement "Most of the erosion issues downstream are not due exclusively to operations. For example, areas where trees and vegetation are being cleared are not due exclusively to operations, but water fluctuations could exacerbate erosion." into the discussion section of the study.

- Threatened and Endangered Species Desktop Assessment discussion. APC stated that "No listed species have been documented in the Tallapoosa River below the Harris Dam." Should be changed to "No listed species have recently been documented in the Tallapoosa River between Harris Dam and Lake Martin." The Documented Historic Range for Finelined Pocketbook includes the Tallapoosa River.

Thank you for the opportunity to comment on the R.L. Harris Hydroelectric Project relicensing filed Harris Project Initial Study Report (ISR). We look forward to continuing our cooperative efforts with the Federal Energy Regulatory Commission, Alabama Power, and other stakeholders during this process.

If you have any questions regarding these comments, please contact me at (334-353-7484) or Todd.Fobian@dcnr.alabama.gov.

Sincerely,

Todd Fobian

Environmental Affairs Supervisor

References:

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Chuck Denman
1810 Oak Grove Road
Titusville Florida
32796

Regarding:Alabama Power Company relicensing for the Harris Hydroelectric Project (FERC No. 2628-065).

Harris Dam additional studies suggested

A general review of historical materials ie newspapers, and other records dealing with the proposals for constructing the Dam. Including comments and conditions provided in initial permitting. With the goal being to determine if the dam has achieved the original benefits expected. Perhaps a score card.

A pre vs post Dam analysis of down stream impacts. Including flooding,erosion and habitat changes to flora and fauna.

1. Flooding :storm runoff model comparing 25,50 and 100 year 24 hour storm events.
2. Erosion : utilizing available remote sensing materials to compare river channel and islands size and shape today and pre dam.
3. Plants: utilize remote sensing materials to map flag grass and invasive plant communities to compare changes from pre Dam.
4. Fisheries: review available materials from locals in the community, fish and game and other resources to determine what effect the Dam has had on down stream fish types and numbers.

June 11,2020

Dear Secretary Bose,

HAT 1.

PROPOSED MODIFICATION TO OPERATING CURVE AND DOWNSTREAM FLOW STUDIES

18 CFR 5.15
For studies using 100 year climate data to model outcomes,

(d) I propose additional modelling based on predictive data from the studies of climate change. It is my understanding Federal Dams do additional modelling to take effects of climate change into account when undergoing licensing. This would include climate change considerations of Operating Curve Rules among others.

This idea was previously presented to FERC in 2019 comments by Maria Clark from the EPA.

Given the long life of the permit, the measurable manifestations of climate change and the Southern Company's goal to shift power generation away from fossil fuels, it seems prudent to take advantage of modelling in preparation to be best able to deal with unexpected situations such as greater reliance on hydro power by APC.

1. To my knowledge climate alternative data has not been modelled
2. Modelling is a very cost effective way to prepare for future events.

P-2628 HAT 2 Comments

Submitted separately are landowner forms reproduced from the study report and completed by landowning downstream stakeholders.They are reporting on erosion at their property sites. They represent lay attempts to recognize and monitor riverfront erosion. Whether or not each geo-located individual completed and submitted a form, each has taken their time to attend at least one meeting to express their grievance with downstream management over the life of the dam.

Also submitted is a screen shot of pinned landowner locations. Additionally, submitted is a page from the Trutta report locating erosion sites. There are correlations with landowner reported erosion and the study map. The Trutta float-the-river erosion survey is baseline information. It is a current day 'snapshot'. It may provide useful data for prospective study. Not being conversant in reading sonar / lidar data, I seek reassurance that riverbank video taken when the river channel is full does not dampen / downplay the classification of erosion sites.
The river's edges evaluated - as landowners experience it - when the water is low may expose more severe erosion than shown on the Trutta video.

Notable is the omission from the report of log/lat data for the sites identified in Figure 3-1 and Table 3-2. (Long/lat data was provided in Table 2-1 Summary of Lake Harris Erosion & Sedimentation)

#1 Request for long/data data for Figure 3-1 and Table 3-2 of the Trutta Report and Request greater resolution image of Figure 3-1

Of major concern to all Harris Project Stakeholders is the Erosion Issue. Foundational to taking steps going forward is looking back to what has been. The University of Alabama maintains an aerial photographic library including images of the Harris Project area beginning in 1942. In existence are digitized prints for 1942, 1950, 1954, 1964, 1973. These are housed at www.alabamamaps.ua.edu. Attached is a mosaic of a portion of the project area as it appeared in 1942. The full sized map is rendered and georeferenced.

#2 Proposed: A New Study of the downstream river using historic images overlaid onto current imagery

18 CFR 5.15 (e)

1. Erosion is a significant and persistent concern. Erosion is problematic for landowners and flora & fauna in and around the river.
2. To my knowledge, this type of GIS comparison using historic data to impact effects of release effects downriver have not been done.
3. At the initial licensing there was no post dam data to compare to compare to the historic data.
4. This is a simple and inexpensive study, using readily available data

18 CFR 5.0(b)

1. The study should look at and provide change analysis for:

a. Analysis of the river bank contour along its length through time. Free flowing rivers are elastic, moving silt and sedimentation from side to side and down its length. A river serving as a channel should show deviations from historic patterns.
b. Any changes in river bank elevation
c. Provide image overlays of historic data onto current imagery with the intent to discover what the data show about the effects of a dam on the downstream river and can be a tool to evaluate effect of future changes made to flow patterns.
d. Begin construction of a detailed GIS map with information relating fish populations, (and a whole host of other parameters) in 3D. That is, not only presence/absence of species along the river length, but presence (where data are available) of species during different decades in time. There are numerous possibilities.
e. APC can gather additional, (say scaled to 1:6000 or the highest resolution feasible) imagery to overlay on the historic public images available at 1:20000. This would provide a baseline for future studies. At our fingertips are 80 years of data.

2. This GIS modeling tool can also be applied to provide opportunity for interagency contribution towards building the most accurate picture of aquatic and other life of the Tallapoosa.

3. Creating the realization of and expounding upon the treasures of the Tallapoosa River is something all parties (APC and stakeholders above/below the dam) can rightly be proud of.

P-2628 HAT5 Comments

#1 Re: NOTIFICATION TO DOWNSTREAM USERS OF WATER RELEASE FROM HARRIS DAM

Downstream rivers users 'don't know what they can't know', They cannot know the mind of market forces determining when the turbines will run. APC and the dam managers have an obligation and responsibility, not to make the river safe for downstream users, but to provide users with accurate, timely and transparent information so users can make informed decisions regarding their own safety. APC must develop an effective way to 'push' dam operation realtime change notifications to those who opt in. Increased river usage as described by riverside landowners, reinforces the need-to-know for downstream users, especially those not already familiar with river level irregularities.

It appears FERC in Atlanta has approved the status quo notification system currently used by APC. The current system provides outdated and insufficient information for downstream users.

Accession Number:	20200317-3033
Description:	Letter order to Alabama Power Company accepting the automated downstream notification system for the Tallapoosa River Projects et al under P-349 et al.

If this issue is not part of the HAT 5 relicensing process, we need to know. When is the proper time to address this recreation / safety issue? Please have APC advise us of the process we need to pursue regarding revamping and modernizing the notification of release operations. This is an important issue, impacting below dam river use at each of APC dam projects.

And…... if this has been addressed and I missed it, I apologize.

PS a copy of the FERC Atlanta office correspondence with APC is sent as a separate PDF.

#2 RE: IMPROVED BELOW THE DAM RIVER ACCESS

As I understand it, part of the initial rational for the APC dam system included a 'give back to the public' component. This is easily realized on the impoundments created by dam construction.

Requiring more effort and thought are ways APC 'gives back' to below-dam river users. The below-the-dam efforts to provide access / ramps are as inherent in the mandate as are the creation of put-ins on the impoundment. To date, I have not seen any APC ideas or proposals put forth regarding downstream access. This is a real public/private partnership opportunity. forIf this is not a relicensing issue, please advise so we can pursue the proper channels. Again, I apologize in advance if I have missed APC correspondence.

Sincerely,

Donna Matthews
Box 1054
105 Woodland Ave E
Wedowee, AL 3278

June 4th HAT 1 and 5 meeting summary

APC Harris Relicensing <g2apchr@southernco.com>

Thu 6/18/2020 10:51 PM

To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Bcc: damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; todd.fobian@dcnr.alabama.gov <todd.fobian@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>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@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>; wtanders@southernco.com <wtanders@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>

1 attachments (3 MB)

2020-06-04 HAT 1 and 5 Meeting Notes and Presentation.pdf;

HATs 1 and 5,

Attached is a summary, along with the presentation, from our meeting on June 4th. This summary is also on our website: www.harrisrelicensing.com.

Thanks,

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

Harris Action Teams 1 & 5 Meeting Summary
June 4, 2020
9:00 am to 11:00 am
Conference Call

Participants:
See Attachment A

Action Items:

- Alabama Power determine what historic LiDAR data are available and provide the information to FERC via email.
- Kevin Nebiolo will revise figures so that inundated and non-inundated structures will be differentiated on the figures and these figures will also include the winter pool level (i.e., 1 ft, 2 ft, etc.).

Meeting Summary:
Angie Anderegg (Alabama Power Company (Alabama Power)) opened the meeting by introducing everyone and stated the purpose of the meeting: 1) to present the methodology for analyzing the number of usable recreation structures on Lake Harris at the current winter operating curve and the winter operating curve alternatives; and 2) to present the methodology for analyzing how structures located downstream of Harris Dam might be affected by a change in the winter operating curve during a 100-year flood event.

Colin Dinken (Kleinschmidt Associates (Kleinschmidt)) presented the methods for analyzing recreation structure (i.e., boat dock, pier, etc.) usability at current winter pool and the proposed operating curve change alternatives. Light detection and ranging (LiDAR) was used to gather elevation data around the reservoir. The elevation data will be used to measure the depth of water at each recreation structure at each of the proposed winter operating curve elevations. Field observations will occur during full pool (summer 2020) to verify a subset of structures on Lake Harris, namely those that are not visible on the aerial imagery used for this analysis.

Barry Morris (Lake Wedowee Property Owners Association) asked if the usability of sloughs at the winter operating curve change alternatives was being assessed or was this analysis only for structures. Colin said he was not looking into the usability of the sloughs and Angie emphasized that slough usability at the winter operating curve alternatives is not in the overall study plan.

Keith Henderson (Alabama Department of Conservation of Natural Resources (ADCNR)) stated that ADCNR was not involved in the construction of all public ramps on the Harris reservoir, so it cannot be assumed that every ramp has a 15 percent grade at the bottom. Colin noted he can generate a slope analysis on any ramp to determine the grade.

Sarah Salazar (Federal Energy Regulatory Commission (FERC)) asked what the collection year is for the LiDAR data used for this analysis and if there was historical LiDAR data for comparison. Jason Moak (Kleinschmidt) said the LiDAR data was from 2015 and that it covers all of the surrounding banks of the Harris reservoir but nothing beneath the water's surface. Sarah asked if there was historical LiDAR to be used for sedimentation analysis. Angie said

Alabama Power will determine what historic LiDAR data are available and provide the year information to FERC and stakeholders.

Albert Eiland (Downstream Property Owner) expressed concern that raising the winter operating curve would result in additional water released downstream and subsequent flooding. He noted that for every foot the lake is raised it would increase inundation of downstream property. Colin explained that Kevin Nebiolo (Kleinschmidt) would present the proposed methods for analyzing how an increase in the winter operating curve would affect downstream structures.

James Hathorn (United States Army Corps of Engineers (USACE)) asked if there would be an analysis on the percent of time structures are useable. Kelly Schaeffer (Kleinschmidt) stated this study is determining structure usability during winter pool.

Kevin presented the methods to evaluate how an increase in the winter operating curve could affect downstream structure inundation.

David Bishop (Downstream River User) asked if this analysis was related to the lake or just downstream. Angie replied that this methodology focuses on the structures downstream of Harris Dam. David asked about the accuracy of the generation schedule. Angie noted that this issue has been brought to Alabama Power's attention and they are looking into the best way to address it.

Sarah asked if different types of structures will be differentiated in this analysis. Kevin said this analysis is for any type of structure, habitable or not. Land use data could potentially be differentiated. Sarah said that some landowners have expressed concern about structures such as stairways. Kevin explained the LiDAR provides four points per square meter, which is accurate enough to detect a shed but not necessarily stairs.

James asked if this downstream structure analysis would extend downstream of Martin. Kevin replied that it is extending to Jaybird Landing, the uppermost hydraulic point for Lake Martin.

Sarah asked if there would be maps showing the location of inundated structures for both the lake and downstream. Angie said Alabama Power is only evaluating impacts downstream for a change in the winter pool; therefore, the impact is limited to inundation during a flood event where Alabama Power would be operating under flood control procedures. Kelly stated that for the Operating Curve Change Feasibility Analysis study, Alabama Power is modeling the 100-year design flood to analyze the effect of that flow on downstream structures <u>IF</u> the Harris reservoir is operating one to four feet higher than existing conditions. Sarah commented that hopefully there will be some additional suggested downstream releases to review. The Downstream Release Alternatives study is separate from the Operating Curve Change Feasibility Study, and those downstream release alternatives in that study are not affected by the 100-year flood. Mike Hross (Kleinschmidt) stated that the range of minimum flows in the Downstream Release Alternatives study would likely have a negligible effect on inundation downstream compared to the flood flow. The HEC-ResSim model could evaluate normal and flood control operations at Harris Dam with other minimum flow alternatives to determine any downstream effects on structures.

James asked if any other high flow events (i.e., 10, 15, 25, 50-year flood events) other than the 100-year flood would be analyzed. Angie explained that the 100-year flood event scenario is used by the Federal Emergency Management Agency (FEMA) and Alabama Power will be using that flood event scenario to make decisions regarding changes in Harris Project operations. If FERC requires additional high flow events for their analysis, Alabama Power will model those additional high flow events. Sarah stated if the USACE or other stakeholders have a high flow event scenario they want Alabama Power to analyze, this request should be filed with comments on the Initial Study Report (ISR) by June 11, 2020. Kelly stated that any requests for additional analysis and/or additional studies need to follow FERC regulations. Sarah agreed and said that if anyone wants to request additional studies or request additional analyses that were not incorporated into the April 12, 2019 FERC-approved study plan, stakeholders should follow 18 CFR §5.15.

Martha Hunter (Alabama Rivers Alliance (ARA)) asked if the 100-year flood was happening more often. Kenneth Odom (Alabama Power) said the 100-year storm is a design storm based on an actual event that was scaled to reflect a 100-year event. Stacey Graham (Alabama Power) noted that the 2003 flood event was closest to a 100-year event during the 60 years of data in the flood frequency analysis. Stacey explained that there was enough data from both dry and wet years in the flood frequency analysis to be confident in the 100-year design flood. James stated the USACE will likely submit comments to analyze other high flow scenarios but may have to wait until an operating curve change is selected. Monte Terhaar (FERC) noted that now is the time to state and evaluate any other modeling scenarios.

Sarah asked about the induced surcharge function and storage areas and if these areas are where erosion is occurring. Mike said the location of storage areas (backwater areas and tributaries) will be defined in the Final Operating Curve Change Feasibility Analysis study report and it is possible to overlay those areas with areas that are of concern with regard to erosion.
Charles Denman (Downstream Property Owner) asked about the duration of the 100-year storm event and whether a map showing the contours, flooded land, and structures would be developed. Stacey noted that both the beginning and the end of an event were captured and Mike explained there was no actual hydrologic simulation, just flow analysis. Kenneth stated Alabama Power uses the duration of the actual storm event rather than a set duration. Angie stated that this information is further described in the Phase 1 Draft Operating Curve Change Feasibility Analysis Report. Kevin noted that during this Phase 2 analysis, Alabama Power will provide maps showing the contours and inundated structures.

Jack West (ARA) asked about the primary benefits of raising the winter operating curve. Angie explained that the primary reason for assessing the winter operating curve change is the potential for increased recreation opportunities during the winter. An operating curve change was requested by stakeholders during 2017 discussions. Alabama Power is evaluating both beneficial and adverse effects of raising the winter operating curve in Phase 2 of this study.

Albert asked how raising the winter pool would affect areas downstream. Kenneth explained that using a 100-year design storm, a one to four-foot increase in winter pool would increase the water surface elevation downstream from the increased releases from Harris Dam. Kelly emphasized that Alabama Power is still gathering information and data from other relicensing studies and that they have not proposed any changes in Harris Project operations at this time.

Linda Allen (Downstream Property Owner) stated that most of the acreage her family owns is an island called Price Island (~19 acres) and asked if it would be evaluated. Angie and Sarah emphasized that the scope of the study is from Harris Dam downstream through Horseshoe Bend.

David asked if there are any studies detailing the difference between a 50-year flood and a 100-year flood. He also asked how similar downstream conditions are (in terms of elevation and inundation) to a 100-year flood when both generators are operating. There is no comparison since normal operations is far less than a 100-year flood event. Angie explained that Alabama Power is assessing modifications to current Harris Project operations, not pre-dam conditions. David asked if Alabama Power was prepared for a 100-year flood event and asked how the project would operate. Angie noted that detailed information on how the project operates and the models used for these studies can be found on the project website (www.harrisrelicensing.com). One meeting that may be particularly helpful to review is the HAT 1 meeting from September 11, 2019. Kenneth added that a 100-year flood basically has a 1 percent chance of occurring in any given year and Alabama Power operates according to flood control guidelines developed and approved by the USACE. Monte stated that in most cases, FERC uses the 100-year flood scenario as their standard, but that does not exclude the analysis of other flood events. Kenneth concluded that Alabama Power works with the National Weather Service and USACE on Harris Project operations during flood events.

Donna Matthews (Downstream Property Owner) asked if basing the model on a 100-year flood potentially reduces the overall impact on downstream resources compared to effects from more frequent but lesser storm events. Kenneth said the 100-year flood analysis does not decrease the effect of smaller events and that smaller events have not been modeled.

Albert mentioned the gage at Wadley and a high flow event in early 2020. Angie stated that this particular question was addressed during the ISR meeting and a response provided in the ISR meeting summary.

Sarah commented that the maps shown in Kevin's presentation identify all structures using the same color regardless of whether they were within the inundation boundary and requested that the final analysis display inundated structures with a different color than non-inundated structures. Kevin said that inundated and non-inundated structures will be differentiated on the figures and these figures will also include the winter pool level (i.e., 1 ft, 2 ft, etc.).

David asked if FERC had ever denied a license for a project as large as Harris. Sarah was not familiar with any but encouraged David to send her an email so she could contact him with that information.

Sarah reviewed the relicensing schedule, reminding everyone the information gathering process is ongoing and Alabama Power's draft proposal for Harris Project operations will be presented in the Preliminary Licensing Proposal. Alabama Power will file their Final License Application in November 2021. The schedule is available in the November 16, 2018 Scoping Document 2. Sarah encouraged everyone to read that document and contact her with any questions.

Angie concluded that the meeting notes will be posted to harrisrelciensing.com and reiterated that comments on the ISR are due June 11, 2020 and should be filed with FERC.

ATTACHMENT A
HARRIS ACTION TEAMS 1 AND 5 MEETING ATTENDEES

Linda Allen – Downstream Property Owner
Angie Anderegg – Alabama Power Company (Alabama Power)
Dave Anderson – Alabama Power
Jeff Baker – Alabama Power
David Bishop – Downstream Property Owner
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Charles Denman – Downstream Property Owner
Colin Dinken – Kleinschmidt Associates (Kleinschmidt)
Albert Eiland – Downstream Property Owner
Amanda Fleming – Kleinschmidt
Todd Fobian – Alabama Department of Conservation of Natural Resources (ADCNR)
Tina Freeman – Alabama Power
Chris Goodman – Alabama Power
Stacey Graham – Alabama Power
James Hathorn – United States Army Corps of Engineers (USACE)
Keith Henderson – ADCNR
Martha Hunter – Alabama Rivers Alliance (ARA)
Mike Hross – Kleinschmidt
Carol Knight – Downstream Property Owner
Fred Leslie – Alabama Department of Environmental Management (ADEM)
Matthew Marshall – ADCNR
Donna Matthews – Downstream Property Owner
Rachel McNamara – FERC
Tina Mills – Alabama Power
Jason Moak – Kleinschmidt
Barry Morris – Lake Wedowee Property Owners Association
Kevin Nebiolo – Kleinschmidt
Kenneth Odom – Alabama Power
Jennifer Rasberry – Alabama Power
Sarah Salazar – FERC
Kelly Schaeffer – Kleinschmidt
Chris Smith – ADCNR
Sheila Smith – Alabama Power
Thomas St. John – Alabama Power
Monte Terhaar – FERC
Jack West – ARA

R.L. Harris Dam Relicensing
FERC No. 2628

HAT 1 & 5 Meetings
June 4, 2020

HARRIS DAM RELICENSING

Operating Curve Change Feasibility Analysis

Phase II Lake Recreation Structure Usability at Winter Pool Alternatives

HARRIS DAM
RELICENSING

Phone Etiquette

- ❑Be patient with any technology issues
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- ❑Phones will be muted during presentations
- ❑Follow along with PDF of presentations
- ❑Write down any questions you have for the designated question section
- ❑Clearly state name and organization when asking questions
- ❑Facilitator will ask for participant questions following each section of the presentation

HARRIS DAM RELICENSING

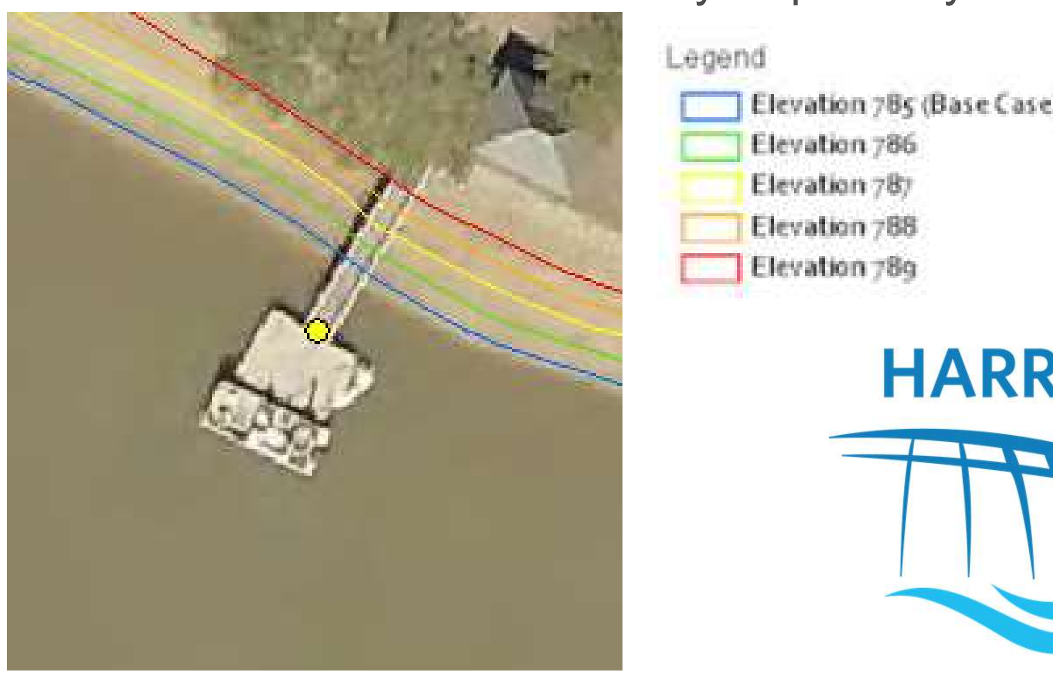
Recreation Structure Usability at Winter Pool Alternatives

<u>Objectives Described in the Study Plan</u>

- Evaluate "…the number of private docks usable during the current winter drawdown and the lowest possible elevation that public boat ramps can be used."
- Private docks defined as boathouses, floats, piers, wet slips, and boardwalks
- Will "…compare the number of access points (both private docks and public boat ramps) available at each 1-foot increment change…"

<u>Methods</u>

- LiDAR used to measure elevation (785, 786, 787, 788, 789 ft msl contours)
- Elevation data used to calculate depth at point
- Depth for points beyond the 785 ft msl contour will be estimated by slope analysis



HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Boathouses

- Point moved to the back of each of these structures
- Structure considered usable with 2 ft of water at the back edge

HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Floats

- Point moved to the back of each of these structures
- Structure considered usable with 2 ft of water at the back edge

HARRIS DAM
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Recreation Structure Usability at Winter Pool Alternatives

Piers

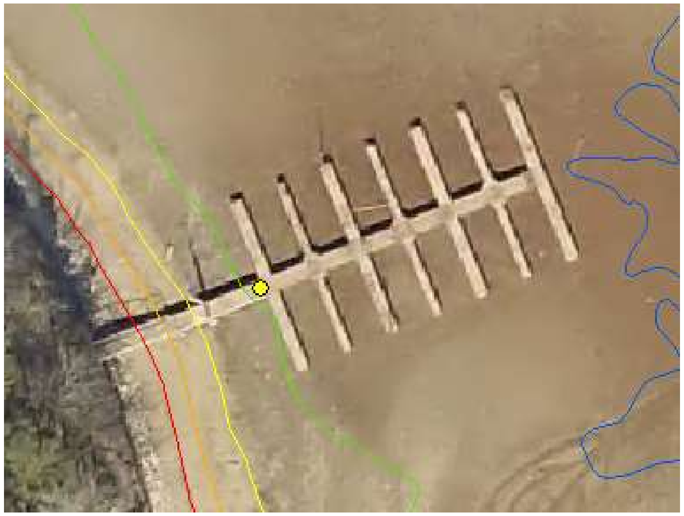
- Classified into 3 subcategories:
  - Platform (*bottom left*):
    - Piers with a square-shaped platform on the end
    - Point moved to back edge of the platform
    - Analyzed similarly to floats
  - Mooring (*bottom right*):
    - Straight piers > 30 ft
    - Point moved 30 ft back from front edge
  - Fishing (*right*):
    - Straight piers ≤ 30 ft
    - Point moved halfway back from the front edge
- Depth of 2 ft to be usable

HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Wet Slips

- Some oriented parallel to the bank (*bottom left*) and some perpendicular (*bottom right*)
- The back edge is always the outside edge facing the bank
- Wet slips with multiple slips (*right*) will be considered usable when all slips are usable
- Depth of 2 ft to be usable



HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Boardwalks

- Point moved to front of structure
- Objective is aesthetics
- Depth of 1 ft at point

Recreation Structure Usability at Winter Pool Alternatives

Public Boat Ramps

- ADCNR typically uses the following criteria for public ramps at low pool:
  - 15% grade at bottom portion of ramp
  - Depth of 4.5 ft at the end of the ramp
  - Able to launch up to 26 ft boat at low pool

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Recreation Structure Usability at Winter Pool Alternatives

Public Boat Ramps

- Highway 48 Bridge:
  - Built using ADCNR standards
  - Usable at 785 ft msl

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Recreation Structure Usability at Winter Pool Alternatives

Public Boat Ramps

- Lee's Bridge:
  - Bottom of ramp is ~785.5 ft msl
  - Use a slope analysis to determine the grade
  - Possibly usable ~790.0 ft msl

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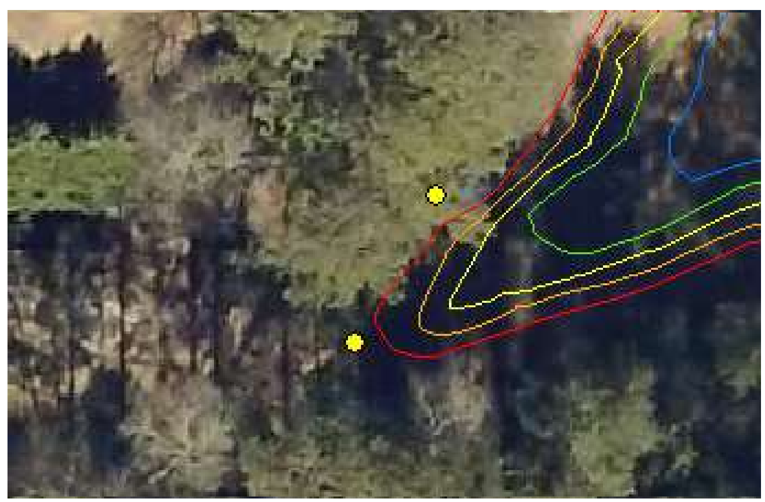
Recreation Structure Usability at Winter Pool Alternatives

Field Observations

- No imagery (*left*):
  - Imagery predates structures
  - ~10.0% of structures
- Not visible (right):
  - Structure obscured by foliage or shadow
  - ~2.5% of structures



HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Presentation of Data: All Structures

The number and percentage of all usable structures at each winter pool alternative

Winter Pool Elevation (feet msl)	Number of Usable Structures	Percent Usable Structures
785		
786		
787		
788		
789		
>789		

HARRIS DAM RELICENSING

Recreation Structure Usability at Winter Pool Alternatives

Presentation of Data: By Structure

The number and percentage of usable structures by type at each winter pool alternative

Winter Pool Elevation (feet msl)	Number of Usable Structures	Percent Usable Structures
Boardwalks		
785		
786		
787		
788		
789		
>789		
Boathouses		
785		
786		
787		
788		
789		
>789		
Floats		
785		
786		
787		
788		
789		
>789		

HARRIS DAM RELICENSING

Questions?

HARRIS DAM
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Alabama Power

R.L. Harris Dam Relicensing
FERC No. 2628

HAT 1 Meeting
June 4, 2020

HARRIS DAM
RELICENSING

Operating Curve Change Feasibility Analysis

Phase II Downstream Structure Survey

HARRIS DAM
RELICENSING

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- ❑Clearly state name and organization when asking questions
- ❑Facilitator will ask for participant questions following each section of the presentation

HARRIS DAM
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Harris Downstream Structure Survey

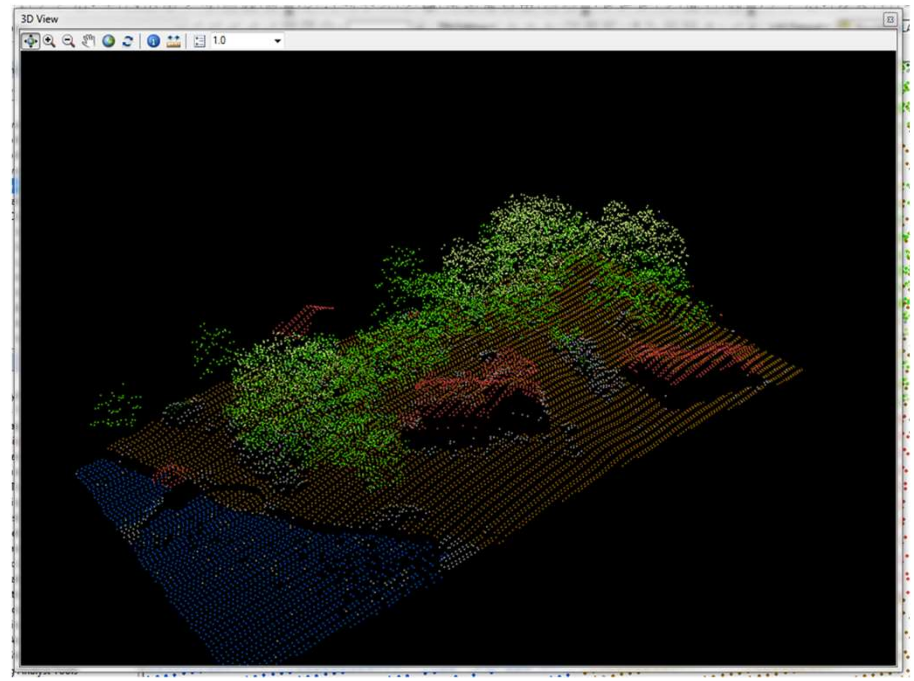
- An operating curve change may affect areas downstream of Harris Dam
  - Effects are associated with flooding

- Phase 2 of the Operating Curve Change Feasibility Analysis will include:
  - Identifying affected structures
  - # of structures
  - Location
  - Depth & duration of inundation

- Identifying structures is no small task

Methods: Remote Sensing

- LiDAR – 4 points per m^2
- 1 m USDA NAIP 4 band image (R, G, B, NiR)
- Classification Workflow:
    - Data management
    - Create training data
    - Classify image pixels
    - QAQC – Confusion Matrix



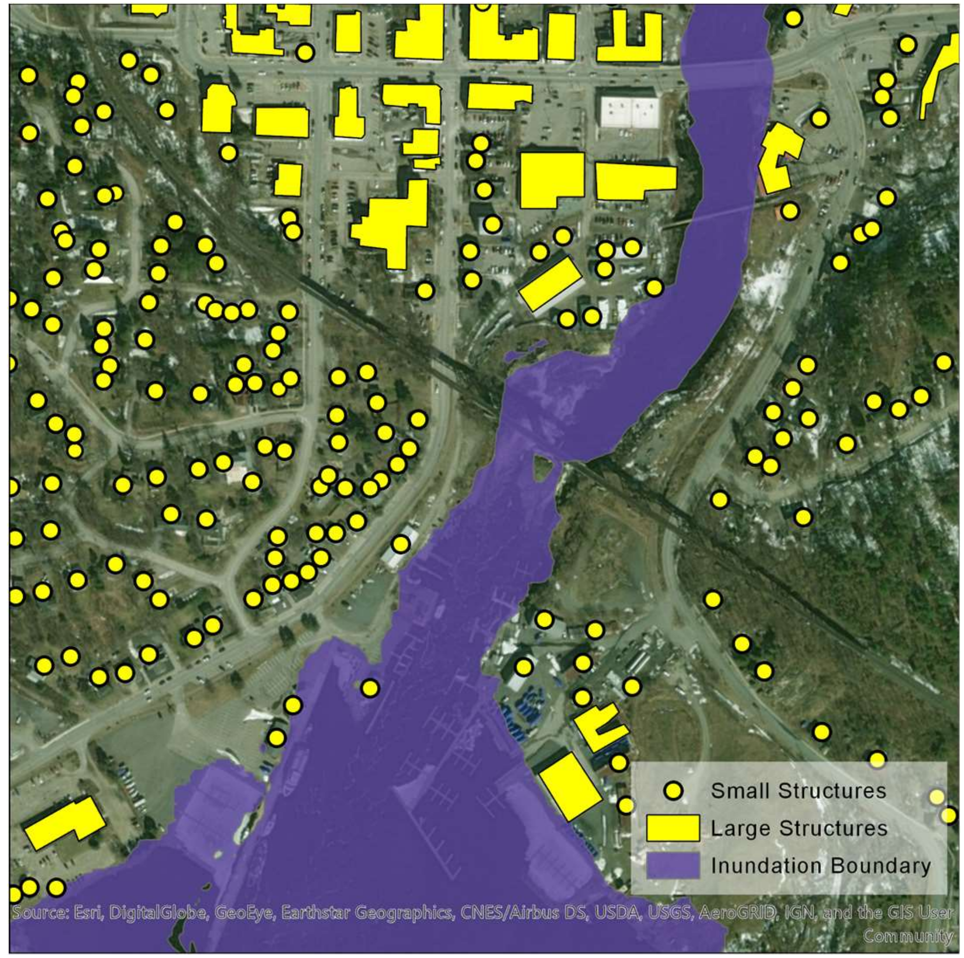
Methods: OBIA

- Object Based Image Analysis in ArcGIS Pro Image Analyst

1. Group pixels into objects - segmentation
2. Create training data
3. Classify Image
4. Assess quality with Confusion Matrix
5. Heads up digitizing
6. Spatial intersection & summarize

Anticipated Output

- Once identified – we will use a GIS to find structures impacted with a spatial intersection
- Series of maps showing location of all structures with symbols for flooded vs. not flooded
- Summary statistics in report
  - # of structures affected by rule curve
  - Min., Avg., Max. depth of inundation
  - Min., Avg., Max. duration of inundation
- Results will be in Phase II Report



APC Harris Relicensing

From: David Smith <inspector_003@yahoo.com>
Sent: Thursday, June 18, 2020 5:55 PM
To: APC Harris Relicensing
Subject: Re: June 4th HAT 1 and 5 meeting summary

Received, thank you.

Sent from Yahoo Mail for iPhone [overview.mail.yahoo.com]

On Thursday, June 18, 2020, 5:53 PM, APC Harris Relicensing <g2apchr@southernco.com> wrote:

HATs 1 and 5,

Attached is a summary, along with the presentation, from our meeting on June 4th. This summary is also on our website: www.harrisrelicensing.com [harrisrelicensing.com].

Thanks,

Angie Anderegg

Hydro Services

(205)257-2251

arsegars@southernco.com

Alabama Power

600 North 18th Street
Hydro Services 16N-8180
Birmingham, AL 35203
205 257 2251 tel
arsegars@southernco.com

July 10, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Response to Initial Study Report (ISR) Disputes or Requests for Modifications of Study Plan

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) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628). On April 10, 2020, Alabama Power filed the Initial Study Report (ISR) along with six Draft Study Reports and two cultural resources documents. Alabama Power held the ISR Meeting with stakeholders and FERC on April 28, 2020. On May 12, 2020, Alabama Power filed the ISR Meeting Summary. Comments on the ISR, draft reports, and ISR Meeting Summary were due on June 11, 2020.

On June 10, 2020, FERC staff provided comments on the ISR and the ISR Meeting Summary.[1] FERC requested that Alabama Power respond to specific comments by July 11, 2020. Attachment A of this filing includes Alabama Power's responses to those questions for which FERC requested a July 11 response.

Stakeholders and FERC provided three Additional Study Requests and two study modifications as part of comments on the ISR and ISR Meeting Summary. Two of the requested studies do not meet the criteria outlined in FERC's regulations at 18 C.F.R. § 5.9(b) and 5.15 and/or address pre-project conditions. Although, the other study request meets FERC's criteria, Alabama Power is not incorporating the study request into the relicensing process for the Harris Project. The complete response to these study requests is in Attachment B.

FERC staff, Alabama Rivers Alliance (ARA)[2], and the U.S. Environmental Protection Agency (EPA)[3] also requested the inclusion of additional downstream flow release alternatives as modifications to Alabama

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[1] Accession No. 20200610-3059.

[2] Accession No. 20200611-5114.

[3] Accession Nos. 20200612-5025 and 20200612-5079.

Power's existing Downstream Release Alternatives Study. Alabama Power's response to the recommended modifications is also provided in Attachment B.

Within preliminary comments on the Draft Water Quality Study Report as well as during the ISR Meeting and within comments on the ISR and ISR Meeting Summary, multiple stakeholders requested that Alabama Power continue monitoring water quality downstream of Harris Dam in 2020 and 2021. To collect dissolved oxygen and water temperature data in 2020, Alabama Power installed the continuous monitor on May 4, following the ISR meeting. The generation monitor was installed on June 1 to align with the monitoring season start date in the Water Quality Study Plan. Alabama Power also agrees to collect water quality data at both locations in 2021 (from March 1 – June 30, 2021 at the continuous monitor and June 1 – June 30, 2021 at the generation monitor) to include in the final license application.

The EPA recommended inclusion of water quality monitoring data with the Water Quality report. Alabama Power notes that the Draft Water Quality Study Report contains an appendix with the 2017 – 2019 water quality monitoring data, and the Final Water Quality Study Report will contain a similar appendix with the complete set of water quality monitoring data (including 2020). Any data collected in 2021 and after the Final Water Quality Study Report is provided will be included within the Final Licensing Proposal.

Alabama Power reviewed FERC and stakeholder comments on the ISR and Draft Study Reports and will address all other comments in any Final Study Reports (filed in 2020 and 2021), the Updated Study Report (USR) (due April 10, 2021), or the Preliminary Licensing Proposal (PLP) (due on or before July 3, 2021).

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 A: Alabama Power's Response to FERC's June 10, 2020 Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project
Attachment B: Alabama Power's Response to Study Modifications and Additional Study Requests Following the May 12, 2020 Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

cc: Harris Stakeholder List

Attachment A

Alabama Power's Response to FERC's June 10, 2020 Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

FERC questions are presented in italic text and the specific information requested is highlighted in yellow; Alabama Power's response follows.

Draft Downstream Release Alternatives (Phase 1) Study Report

Question #2: During the ISR Meeting, Alabama Power requested that stakeholders provide downstream flow alternatives for evaluation in the models developed during Phase 1 of the Downstream Release Alternatives Study. Stakeholders expressed concerns about their ability to propose flow alternatives without having the draft reports for the Aquatic Resources and Downstream Aquatic Habitat Studies, which are scheduled to be available in July 2020 and June 2020, respectively. It is our understanding that during Phase 2 of this study, Alabama Power would run stakeholder-proposed flow alternatives that may be provided with ISR comments, as well as additional flow alternatives that stakeholders may propose after the results for the Aquatic Resources and Downstream Aquatic Habitat Studies are available. Please clarify your intent by July 11, 2020, as part of your response to stakeholder comments on the ISR.

Alabama Power Response:

Alabama Power's response to evaluating additional flow alternatives is discussed in Attachment B.

Regarding the Aquatic Resources and Downstream Aquatic Habitat Studies, it is Alabama Power's intent to provide stakeholders 30 days to review, provide comments, and recommend any additional flow analyses based on the information in the draft reports. It is also Alabama Power's intent to meet with the Harris Action Teams (HATs) between Fall 2020 and Spring 2021 to present preliminary results, including the bioenergetics modeling, and obtain stakeholder input on additional analyses.

Question #5: Page 14 of the Draft Downstream Release Alternatives (Phase 1) Study Report includes a description of the HEC-ResSim model that was developed for the project. Harris Dam was modeled in HEC-ResSim with both a minimum release requirement and maximum constraint at the downstream gage at Wadley. The draft report states that the minimum release requirement is based on the flow at the upstream Heflin gage, which is located on the Tallapoosa River arm of Harris Reservoir and has 68 years of discharge records. Page 5 of the draft report indicates that there is also a gage (Newell) on the Little Tallapoosa River Arm of the reservoir, which has 45 years of discharge records. It appears that only the Heflin gage was used in developing the minimum release requirement. As part of your response to stakeholder comments on the ISR, please explain the rationale for basing the minimum releases in the HEC-ResSim model only on the flows at the Heflin gage and not also on the flows at the Newell gage.

Alabama Power Response:

The HEC-ResSim model bases the releases on the Green Plan, which specifies the use of the Heflin gage. During development of the Green Plan, the Heflin gage was considered the gage that best mimicked the unregulated, natural flow of the Tallapoosa River. Based on available information from stakeholder meetings in early 2000, the Newell gage was not considered. Stakeholders involved in the Green Plan development process did acknowledge that the Heflin gage excluded the flow from Little Tallapoosa River.

Below is a brief summary of the recorded stakeholder discussions that reference the use of the Heflin gage.

- 5/21/2003 Stakeholder Meeting: Stan Cook (Alabama Department of Conservation and Natural Resources (ADCNR)) stated that the Heflin gage is being used to mimic natural events and that the “Big” Tallapoosa River better reflects a larger scale drainage.
- 8/4/2003 Stakeholder Meeting: Elise Irwin presents findings on the models indicate that the Heflin gage is a promising location.
- 11/3/2003 Stakeholder Meeting: Alabama Rivers Alliance (ARA) stated they wanted Alabama Power to evaluate use of a house turbine that would provide capabilities to duplicate the Heflin gage flows. During this meeting, it was mentioned that the Heflin gage does not include flows from the Little Tallapoosa River, and no one stated opposition to use of the Heflin gage.
- 1/1/2006 Stakeholder Meeting: Stakeholders commented that mimicking Heflin flows would allow for some natural variability of flow in the regulated part of the river.

Draft Erosion and Sedimentation Study Report

Question #7: The Erosion and Sedimentation Study in the approved study plan states that Alabama Power would analyze its existing lake photography and Light Detection and Ranging (LIDAR) data using a geographic information system (GIS) to identify elevation or contour changes around the reservoir from historic conditions and quantify changes in lake surface area to estimate sedimentation rates and volumes within the reservoir. In addition, the approved study plan states that Alabama Power will verify and survey sedimentation areas for nuisance aquatic vegetation. According to the study schedule, Alabama Power will prepare the GIS overlay and maps from June through July 2019 and conduct field verification from fall 2019 through winter 2020.

The Draft Erosion and Sedimentation Study Report does not include a comparison of reservoir contour changes from past conditions or the results of nuisance aquatic vegetation surveys. The report states that limited aerial imagery of the lake during winter draw down and historic LIDAR data for the reservoir did not allow for comparison to historic conditions and that Alabama Power will conduct nuisance aquatic vegetation surveys during the 2020 growing season. It is unclear why the existing aerial imagery and Alabama Power's LIDAR data did not allow for comparison with past conditions or why the nuisance aquatic vegetation surveys will be conducted during the 2020 growing season instead of during the approved field verifications from fall 2019 to winter 2020. As part of your response to stakeholder comments on the ISR, please clarify what existing aerial imagery and LIDAR data was used and why it was not suitable for comparison with past conditions.

Alabama Power Response:

Alabama Power has 2007 and 2015 Light Detection and Ranging (LiDAR) data for Lake Harris that it will use to develop a comparison for the Final Erosion and Sedimentation Study Report.

Ms. Donna Matthews proposed a new study of the Tallapoosa River downstream of Harris Dam to use historic images overlaid on current imagery to evaluate changes in the Tallapoosa River.[1] Alabama Power's response to this study request is addressed in Attachment B; however, Ms. Matthews noted in the ISR Meeting that she would share various images of the Tallapoosa River pre-Harris Dam and after construction. Alabama Power intends to facilitate obtaining copies of these images to provide to FERC for its use in addressing cumulative effects, as noted in FERC's November 16, 2018 Scoping Document 2.[2]

Regarding the nuisance aquatic vegetation component of the Erosion and Sedimentation study, the growing season is late spring into summer, which did not correspond with the fall 2019 to winter 2020 in the FERC-approved study plan schedule. Therefore, Alabama Power plans to conduct the nuisance aquatic vegetation survey in summer 2020. These results will be provided to HAT 2 participants as a technical memo to supplement the Draft Erosion and Sedimentation Study Report.

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[1] Accession No. 20200612-5018.

[2] Accession No. 20181116-3065.

Question #9: (comment provided below includes only the information requested by FERC) As part of your response to stakeholder comments on the ISR, please provide:

1) *the maps and assessment of the availability of potentially suitable habitat within the project boundary for all of the T&E species on the official species list for the project;*
2) *documentation of consultation with FWS regarding the species-specific criteria for determining which T&E species on the official species list will be surveyed in the field;*
3) *a complete list of T&E species that will be surveyed during the 2nd study season as part of the T&E Species Study; and*
4) *confirmation that Alabama Power will complete the field verification scheduled by September 2020.*

Alabama Power Response:

1) The maps and assessment of the availability of potentially suitable habitat within the Harris Project Boundary were included in the draft Threatened and Endangered Species Desktop Assessment Report and were prepared based on available sources of information. Any maps and assessments of habitat suitability that could not be resolved in the desktop assessment will be included in the Final Threatened and Endangered Species Study Report. Alabama Power is actively consulting with U.S. Fish and Wildlife Service (USFWS) regarding Threatened and Endangered Species (T&E species) where existing information is insufficient to determine their presence/absence and habitat suitability. Alabama Power plans to continue to work with USFWS and the Alabama Natural Heritage Program (ANHP) to resolve questions about the species and perform field surveys as deemed appropriate.

2) Alabama Power met with HAT 3 participants on August 27, 2019 to discuss species included in the Threatened and Endangered Species Study Plan. As a result of that meeting and based on recommendations from USFWS, Alabama Power conducted surveys for Finelined Pocketbook in the Tallapoosa River and Palezone Shiner in Little Coon Creek. Additional surveys for Finelined Pocketbook in tributaries to Lake Harris are ongoing and should be completed in Summer 2020. Alabama Power is consulting with the USFWS and ANHP to determine the need for additional surveys. If requested, Alabama Power may perform surveys for additional species and/or assessments to determine suitability of habitat that could not be resolved in the Threatened and Endangered Species Desktop Assessment. All consultation regarding this process will be included as an appendix to the Final Threatened and Endangered Species Study Report.

3) Alabama Power plans to conduct additional surveys for Finelined Pocketbook in Summer 2020. Based on ongoing consultation with USFWS and with input from ANHP, Alabama Power may perform surveys for Price's Potato Bean, White Fringeless Orchid, and Little Amphianthus (pool sprite) as well as assessments to determine if suitable habitat exists for Red-cockaded Woodpecker and Little Amphianthus.

4) Alabama Power plans to complete field verifications by September 2020.

Question #10: To facilitate review of the existing shoreline land use classifications, please file larger scale maps of all the shoreline areas as a supplement to the Draft Project Lands Evaluation Report, as part of your response to stakeholder comments on the ISR. Please include land use classifications on the maps. In addition, if available, please file the GIS data layers of the existing and proposed shoreline land use classifications.

Alabama Power Response:

Included with this filing are the larger scale maps, including land classifications, and the GIS files of the existing and proposed shoreline land use classifications.

Attachment B

Alabama Power's Response to Study Modifications and Additional Study Requests Following the May 12, 2020 Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Alabama Power received two recommendations to modify the existing FERC-approved studies and three Additional Study Requests. Alabama Power's response to the study modifications and Additional Study Requests is discussed below.

A. <u>Modifications to Existing Studies</u>

1) FERC Question #3:[1] "To facilitate modelling of downstream flow release alternatives, we recommend that Alabama Power run base flows of 150 cfs, 350 cfs, 600 cfs, and 800 cfs through its model for each of the three release scenarios (i.e., the Pre-Green Plan, the Green Plan, and the modified Green Plan flow release approach). The low-end flow of 150 cfs was proposed by Alabama Power as equivalent to the daily volume of three 10-minute Green Plan pulses. This flow also is about 15 percent of the average annual flow at the United States Geological Survey's flow gage (#02414500) on the Tallapoosa River at Wadley, Alabama, and represents "poor" to "fair" habitat conditions. We recommend 800 cfs as the upper end of the base flow modeling range because it represents "good" to "excellent" habitat and is nearly equivalent to the U.S. Fish and Wildlife Service's Aquatic Base Flow guideline for the Tallapoosa River at the Wadley gage. The proposed base flows of 350 cfs and 600 cfs cover the range between 150 cfs and 800 cfs."

2) ARA's June 11, 2020 comments:[2] "While reserving the right to request other release alternatives be considered once more information is made available to stakeholders, ARA proposes the following study modification request pursuant to 18 C.F.R. § 5.15(d) for additional flow scenarios be analyzed as part of the Downstream Release Alternatives Study:

   (i) A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%;

   (ii) A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;

   (iii) A constant but variable release that matches the flow at the USGS Wadley stream gage to the UGSG Heflin stream gage to mimic natural flow variability, and

   (iv) 300 cfs and 600 cfs minimum flows.

   Some of these flows, particularly items (iii) and (iv) may have been modeled internally by Licensee as part of the original adaptive management process; however, those models are not currently available as part of this relicensing. Studying a wider range of potential flows during the ILP could result in improved diversity and abundance of aquatic life and habitat, more recreation opportunities, decreased erosion and sedimentation, and gains in water quality."

[1] Accession No. 20200610-3059.

[2] Accession No. 20200611-5114.

3) In its June 11, 2020 comments[3], EPA "requests that the flow scenarios include the evaluation of an option including both the pulses of the Green Plan with a minimum flow, and a higher minimum flow.

Alabama Power's Response:

Based on FERC, ARA, and EPA's recommendation to modify the Downstream Release Alternatives study, Alabama Power will model the following additional downstream flow scenarios:

- A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%;
- A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;
- 300 cfs continuous minimum flow;
- 600 cfs continuous minimum flow; and a
- 800 cfs continuous minimum flow.

These recommended flow release alternatives are in addition to Alabama Power's release alternatives in the FERC-approved Study Plan that include:

- Pre-Green Plan (peaking only; no pulsing or continuous minimum flow);
- Green Plan (existing condition);
- Modified Green Plan (changing the time of day in which the Green Plan pulses are released); and
- 150 cfs continuous minimum flow.

Alabama Power has not included ARA's recommended "constant but variable release that matches the flow at the USGS Wadley streamgage to the UGSG Heflin streamgage to mimic natural flow variability", as an alternative to model. This alternative would eliminate peaking operations, which would significantly reduce or eliminate use of the Harris Project for voltage support and system reliability, including black start operations. Alabama Power regards this alternative as a complete change in Project operations (from peaking to run-of-river) that is not consistent with Project purposes.[4]

Furthermore, the units are not capable of adjusting to the extent of simulating natural river flows. The flow through the Harris units varies only to the extent of changes in gross head (the difference between the forebay elevation and tailwater elevation) and the wicket gate opening. Small wicket gate openings lead to excessive pressure drops, which is the primary driver of cavitation[5] initiation. The best way to minimize cavitation and its associated detrimental vibrations is to quickly move the wickets gates from a closed position to the best gate setting. The best gate setting is a permanent setting on the governor system to ensure that the control system will force a fast movement of the wicket gates through the "rough zone" to the best gate position thereby minimizing the time spent in the rough zone. The rough zone is an area on the operating curve where flows that are less than efficient gate cause increased vibrations in the turbine

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[3] Accession Nos. 20200612-5025 and 20200612-5079.

[4] For additional explanation, see Alabama Power's March 13, 2019 letter to FERC (Accession No. 20190313-5060).

[5] Cavitation is a phenomenon in which rapid changes of pressure in a liquid lead to the formation of small vapor-filled cavities in places where the pressure is relatively low.

and cavitation along the low-pressure surfaces of the turbine runner. For these reasons, this is not a viable alternative.

Alabama Power also declines FERC's recommendation to study all of the continuous minimum flows combined with the Pre-Green Plan, Green Plan, and Modified Green Plan. Alabama Power asserts that modeling one combination of a continuous minimum flow AND pulsing (the hybrid Green Plan listed above) is adequate to determine the effect of this downstream release alternative on Project operations and other resources. The eight alternatives Alabama Power will model will provide sufficient information to evaluate the resources of interest, determine any downstream release proposal, and determine protection, mitigation, and enhancement (PM&E) measures to be incorporated into the new license for the Project.

B. <u>Proposed Additional Studies</u>

1) ARA proposed a new study for "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts".

<u>Alabama Power's Response:</u>

While ARA's additional study request appears to conform to FERC's regulations and criteria for additional study requests, Alabama Power respectfully declines to complete this study for the Harris Project relicensing. Our reasons are provided below:

a. ARA notes that there is a data gap around Project ramping rates. The Harris Project units are not capable of ramping; rather they were designed as peaking units to quickly react to electrical grid needs, and as such, the turbines were not designed to operate in a gradually loaded state—or restricted ramping rate—over an extended period of time. In fact, restricted ramping is avoided to prevent damage to hydroturbine machinery. When transitioning from spinning mode to generating mode, the wicket gates are opened over a period of approximately 45 seconds. One reason for this method of operating is so the turbine spends a minimal amount of time in the rough zone.

b. The goal of this study, as outlined by ARA, is to determine whether a battery energy storage system (BESS) could be economically integrated at Harris. This technology is very new and there is no established methodology for integrating BESS at hydropower facilities. The cost of a BESS system with restricted hydraulic ramping is concerning because the cost must include not only the battery but also the cost of replacing both turbine runners and determining the extent of the effect on the balance of plant. Each unit at Harris makes approximately 60 megawatts (MW) at efficient gate. For an example, a 60 MW/60-megawatt hour (MWhr), 1-hour duration, standalone battery including construction and installation, is estimated to cost $36M dollars.[6] This battery would need to be sized to produce up to 60 MW for one hour so that the full capacity of the turbine could be supplemented from battery power. The battery would need this capacity because ramping would essentially begin at zero MWs with a very small wicket gate opening and then gradually open over the period of one hour. A smaller MW battery would not be large enough to make up the lost MWs in a full ramping scenario. For example, if a 5 MW battery

[6] Fu, Remo and Margolis, "2018 U.S. Utility-Scale Photovoltaics-Plus-Energy Storage System Costs Benchmark", National Renewable Energy Laboratory, NREL/TP-6A20-71714.

were used, the unit would have to ramp very quickly, within 30 to 45 seconds, to an output of 55 MW. The 5 MW battery would then make up for the remaining power to reach the original power output of 60 MW. To be clear, a battery smaller than the unit's power at efficient gate does not allow for full ramping because the unit must quickly be brought up to a point where the unit's power plus the battery's power equals 60 MW.

The cost of $36M would be doubled to $72M since there are two units at Harris Dam and peaking requires the availability of both units. Additionally, this is a one-hour battery, so the unit(s) must be at efficient gate at one hour past the start of generation. If a longer ramping rate was desired, the battery would likely need to be even larger. The cost to upgrade the turbine runners in order to have a much wider operating range would also need to be considered. It is also important to note that it is undetermined, due to the site-specific conditions and the geometry of the water passages in the powerhouse, if a suitable turbine runner with a wide operating range can even be produced.

c. While information and access to battery storage technology is increasing, as ARA notes, integrating BESS at hydropower projects is a relatively new field with no established methodology. This is especially true for the size of BESS needed to replace the full megawatt capacity at Harris. Furthermore, full-scale redesign of the existing turbines is not being considered by Alabama Power during this relicensing.

For these reasons, Alabama Power declines this study proposal and contends that the downstream release alternatives study will provide information for Alabama Power and the stakeholders to effectively evaluate effects of downstream releases on Project resources (both on Lake Harris and in the Tallapoosa River below Harris Dam) and for Alabama Power to propose an operating scenario for the next license term.

2) Pre-and Post-Dam Analysis of Downstream Impacts, including flooding, erosion, and habitat changes to flora and fauna.

Alabama Power's Response:

Mr. Chuck Denman[7] proposed that Alabama Power conduct an additional study that analyzes pre-dam and post-dam impacts on flooding, erosion, plants, and fisheries. This study request did not meet FERC's criteria for an additional study; however, Alabama Power notes that many of the analyses requested by Mr. Denman are in fact occurring as part of the Harris relicensing. FERC does not require a licensee to evaluate pre-project conditions in a relicensing. In FERC's "*Guide to Understanding and Applying the Integrated Licensing Process Study Criteria*" (2012), FERC notes that where information is being sought solely to look at historic effects, FERC staff will not require an applicant to reconstruct pre-project conditions, because that is not the baseline from which the FERC conducts its environmental analysis. The FERC's choice of current environmental conditions as the baseline for environmental analysis in relicense cases was affirmed in American Rivers v. FERC, 187 F.3d 1007, amended and rehearing denied, 201 F.3d 1186 (9th Cir., 1999); Conservation Law Foundation v. FERC, 216 F.3d 41 (D. C. Cir. 2000).

[7] Accession No 20200611-5174.

Alabama Power has consistently communicated and explained that it will use the 100-year flood event to model effects from a change in Harris Project operations on downstream resources. Alabama Power has also completed an erosion evaluation and is reviewing all stakeholder comments on lake and downstream erosion and sedimentation and will address those comments in the Final Erosion and Sedimentation Report. Alabama Power is also evaluating how changes to current Project operations may affect nuisance aquatic vegetation. Finally, Alabama Power has compiled a large amount of existing information on the Tallapoosa River fisheries community and is also conducting three studies investigating fish habitat, aquatic resources in the Tallapoosa River, and water quality and water temperature in both Lake Harris and in the Tallapoosa River. For these reasons, Alabama Power believes the issues raised by Mr. Denman are covered in the FERC-approved Study Plan and a new study is not warranted.

3) A New Study of the Downstream River Using Historic Images Overlaid onto Current Imagery

Alabama Power's Response:

Ms. Donna Matthews[8] proposed that Alabama Power conduct a new study using GIS to compare historic imagery to current imagery to evaluate effects of releases downstream of Harris Dam. Ms. Matthews notes that existing data can be used and that Alabama Power can gather historic images and overlay them on current images to determine the effects of the dam on the river downstream. The primary purpose of this study is to address "significant and persistent concerns about erosion" in the Tallapoosa River downstream of Harris Dam.

Alabama Power notes that while this study does not conform to FERC's criteria for additional studies, Alabama Power is committed to evaluating erosion and sedimentation effects on Lake Harris and in the Tallapoosa River downstream of Harris Dam. Alabama Power is reviewing stakeholder comments on the Draft Erosion and Sedimentation Report and will address these comments in the Final Erosion and Sedimentation Report. Further, the FERC-approved Erosion and Sedimentation Study Plan provides adequate methodology to address erosion and sedimentation issues resulting from Harris Project operations.

As noted above, FERC does not require licensees in the relicensing process to study pre-project conditions; however, Ms. Matthews volunteered in the April 28, 2020 ISR Meeting to provide images to Alabama Power that FERC may consider in conducting its cumulative effects analysis for soils and geologic resources, specifically erosion and sedimentation. Alabama Power intends to contact Ms. Matthews to obtain copies of these photos.

[8] Accession No. 20200611-5169.

Note: The large-scale maps referenced in the response to Question #10 are not included in this version of the filing due to file size recommendations for eFiling.

Harris relicensing - response to ISR comments

APC Harris Relicensing <g2apchr@southernco.com>

Fri 7/10/2020 6:58 PM

To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>

Bcc: 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; 9sling@charter.net <9sling@charter.net>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; alpeeple@southernco.com <alpeeple@southernco.com>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; amanda.mcbride@ahc.alabama.gov <amanda.mcbride@ahc.alabama.gov>; amccartn@blm.gov <amccartn@blm.gov>; ammcvica@southernco.com <ammcvica@southernco.com>; amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; andrew.nix@dcnr.alabama.gov <andrew.nix@dcnr.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; athall@fujifilm.com <athall@fujifilm.com>; aubie84@yahoo.com <aubie84@yahoo.com>; awhorton@corblu.com <awhorton@corblu.com>; bart_roby@msn.com <bart_roby@msn.com>; baxterchip@yahoo.com <baxterchip@yahoo.com>; bboozer6@gmail.com <bboozer6@gmail.com>; bdavis081942@gmail.com <bdavis081942@gmail.com>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; bill_pearson@fws.gov <bill_pearson@fws.gov>

1 attachments (143 KB)

2020-07-10 Response to ISR Comments.pdf;

Harris relicensing stakeholders,

On April 10, 2020, Alabama Power filed the Initial Study Report (ISR) along with six Draft Study Reports and two cultural resources documents. Alabama Power held the ISR Meeting with stakeholders and FERC on April 28, 2020. On May 12, 2020, Alabama Power filed the ISR Meeting Summary. Comments on the ISR, draft reports, and ISR Meeting Summary were due on June 11, 2020.

Alabama filed a response to ISR comments with FERC today. The response is attached and can also be found on the relicensing website: www.harrisrelicensing.com under “Relicensing Documents.” Note that the larger scale maps requested by FERC can be found in the HAT 4 – Project Lands folder.

Thanks,

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

APC Harris Relicensing

From: Anderegg, Angela Segars
Sent: Monday, July 13, 2020 8:53 AM
To: Barry Morris
Subject: RE: Harris Relicensing: continuous minimum flow in Tallapoosa River

Hi Barry,

The answer is B – the Green Plan includes pulses *plus* releases for generation needs.

The Green Plan is included in the Downstream Release Alternatives study plan and in the Pre-Application Document (Appendix E). However, the best explanation of how we operate is in a presentation Alan Peeples gave on January 31, 2018. The entire presentation is worth watching; however, the specifics of peaking operations and the Green Plan begins around minute 40 in the video and slide 53 in the powerpoint.

http://harrisrelicensing.com/_layouts/15/start.aspx#/HAT%201%20%20Project%20Operations/Forms/AllItems.aspx

I hope this helps!

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

From: Barry Morris <rbmorris222@gmail.com>
Sent: Saturday, July 11, 2020 10:20 AM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: Re: Harris Relicensing: continuous minimum flow in Tallapoosa River

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Your explanation is not confusing, but what I can't grasp is why the CMF plus peak demand generating will not cause the lake level to go lower.

OR, has the dam been doing the 3x10 pulsing *plus* peak demand generating for years and I've not been aware of it? In that case obviously the amount of water thru the dam in CMF is the same, just spaced out throughout the day.

Sorry if my ignorance of the green plan is causing you extra work. Does the company have a concise summary of the green plan that I could use to make me and the LWPOA smarter?

Thanks for your help. Barry

On July 10, 2020, at 8:37 AM, "Anderegg, Angela Segars" <ARSEGARS@southernco.com> wrote:

Hi Barry,

A 150 cfs continuous minimum flow is the same daily volume as the 3- 10 minute pulses currently provided by the Green Plan and does not include any releases for peaking operations. The Green Plan pulses are released through the turbines, so a large volume of water is released over a short period of time each time we pulse. The 150 cfs continuous flow spreads the volume provided by the pulses throughout the day. Also, the 150 cfs would have to be provided through some other mechanism than the turbines because they are not designed to operate at that low flow.

I hope this helps, but if it’s still confusing, don’t hesitate to give me a call.

Thanks,

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

From: Barry Morris <rbmorris222@gmail.com>
Sent: Thursday, July 9, 2020 12:49 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: Harris Relicensing: continuous minimum flow in Tallapoosa River

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Angie: I'm trying to write up relicensing notes for the LWPOA membership and I'm still puzzled as to how a 150 CFS continuous minimum flow (equivalent of a day's generation) would not impact the Lake RL Harris water level. Seems to me it would double the amount of water released thru the dam every day and thus *must* lower the lake. What am I missing here?

I can't find anything in the on line documents, but there's a lot there. Could you please have one of your folks send me some sort of explanation, or direct me to a place in the documents where this is spelled out?

Thanks for your help.

Barry Morris
LWPOA
404 449 3452

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
August 10, 2020

OFFICE OF ENERGY PROJECTS

Project No. 2628-065 – Alabama
R.L. Harris Hydroelectric Project
Alabama Power Company

VIA FERC Service

Angie Anderegg
Harris Relicensing Project Manager
Alabama Power Company
600 North 18th Street
Birmingham, AL 35203

Reference: Determination on Requests for Study Modifications for the R.L. Harris Hydroelectric Project

Dear Ms. Anderegg:

Pursuant to 18 C.F.R. § 5.15 of the Commission's regulations, this letter contains the determination on requests for modifications to the approved study plan for Alabama Power Company's (Alabama Power) R.L. Harris Hydroelectric Project No. 2628 (Harris Project). The determination is based on the study criteria set forth in sections 5.9(b) and 5.15(d) and (e) of the Commission's regulations, applicable law, Commission policy and practice, and Commission staff's review of the record of information.

Background

Commission staff issued the study plan determination (SPD) for the Harris Project on April 12, 2019. Alabama Power filed an initial study report (ISR) and associated draft study reports on April 10, 2020, held an ISR meeting on April 28, 2020, and filed an ISR meeting summary on May 12, 2020. Comments on the ISR and meeting summary were filed by Commission staff on June 10, 2020, and by Alabama Department of Conservation and Natural Resources, Alabama Rivers Alliance, David Bishop, Dana Chandler, Wayne Cotney, Chuck Denman, Albert Eiland, Nelson Hay, Sharon Holland, Carol Knight, Joe Meigs, David Royster, Ronnie Siskey, Mike Smith, Michelle Waters, and John Carter Wilkins on June 11, 2020. The Alabama Department of Environmental Management, the U.S. Environmental Protection Agency (EPA), and Donna Matthews filed comments on June 12, 2020,[1] and the National Park Service filed comments June 29, 2020. Alabama Power filed reply comments on July 10, 2020.

Comments

Some of the comments received do not specifically request modifications to the approved study plan. This determination does not address these types of comments, which include: comments on the presentation of data and results; requests for additional information; disagreements on study results; recommendations for protection, mitigation, or enhancement measures; or issues that were previously addressed in either the November 16, 2018 Scoping Document 2 or the April 12, 2019 SPD.

Study Plan Determination

Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required study must be accompanied by a showing of good cause, and must demonstrate that: (1) the approved study was not conducted as provided for in the approved study plan, or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. As specified in section 5.15(e), requests for new information gathering or studies must include a statement explaining: (1) any material change in law or regulations applicable to the information request, (2) why the goals and objectives of the approved study could not be met with the approved study methodology, (3) why the request was not made earlier, (4) significant changes in the project proposal or that significant new information material to the study objectives has become available, and (5) why the new study request satisfies the study criteria in section 5.9(b).

Alabama Power agreed with requests to modify its Water Quality Study, as discussed immediately below. As indicated in Appendix A, two additional study modifications were requested, one of which Alabama Power partially agreed to and is required with staff modifications. In addition, three new studies were requested, one of which is approved herein, with staff modifications. The bases for modifying the study plan or approving new studies are explained in Appendix B (Requested Modifications to Approved Studies). Commission staff considered all study plan criteria in section 5.9 of

[1] Alabama Department of Environmental Management (Alabama DEM) and Donna Matthews' comments were filed on June 11, 2020, just after close of Commission business at 5:00 p.m. EST. Section 385.2001(a)(2) of the Commission's regulations provide that any filing received on a regular business day after close of Commission business is considered filed on the next regular business day. Therefore, the comments by Alabama Department of Environmental Management and Donna Matthews are considered filed on the next regular business day, or June 12, 2020.

the Commission's regulations; however, only the specific study criteria particularly relevant to the study in question are referenced in Appendix B.

Water Quality Study

The draft Water Quality Study Report includes measurements of dissolved oxygen concentration and water temperature at a generation monitor located in the Harris Dam tailrace (3 years of data) and at a continuous monitor located about 0.5 mile downstream from Harris Dam (1 year of data). As requested by Alabama Rivers Alliance and other stakeholders, in its ISR reply comments,[2] Alabama Power agrees to collect additional water quality data in 2020 and 2021. Alabama Power provided a monitoring schedule for 2021 but did not do so for 2020 other than to say that monitoring began on May 4, 2020. Because the approved study plan requires Alabama Power to monitor dissolved oxygen and water temperature through October 31, the 2020 monitoring period should extend until October 31, 2020.

Threatened and Endangered Species Study

As noted in staff's comments on the ISR, the draft Threatened and Endangered (T&E) Species Study Report does not provide an assessment of T&E species populations and/or their habitats at the project, or a record of consultation with the U.S. Fish and Wildlife Service (FWS) regarding the need for field surveys for all of the species on the official T&E species list.[3] In its reply comments, Alabama Power states that existing information is insufficient to determine some of the T&E species' presence/absence and habitat suitability in the project area. Alabama Power also states that it may conduct additional field surveys[4] for T&E species and/or their potentially suitable habitat based on ongoing consultation with the FWS and Alabama Natural Heritage Program, and will provide documentation of this consultation in the Final T&E Species Report which will be filed in January 2021, per the approved study plan schedule filed on May 13, 2019.

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[2] *See* Alabama Power's July 10, 2020 Reply Comments at 2. Alabama Power indicates that the continuous monitor was installed on May 4, 2020, and the tailrace monitor was installed on June 1, 2020.

[3] *See* the official list of T&E species within the Harris Project boundaries (i.e., at Lake Harris and Skyline), accessed on July 27, 2018, by staff using the FWS's Information for Planning and Conservation website (https://ecos.fws.gov/ipac/) and filed on July 30, 2018.

[4] Alabama Power confirmed it would complete T&E species field verifications by September 2020, per the approved study plan schedule.

Requested Variances

In the ISR, Alabama Power requests variances to the approved schedules for the Draft Recreation Evaluation Study Report and the Cultural Resources Study.[5] Specifically, Alabama Power proposes to file its Draft Recreation Evaluation Study Report in August 2020, instead of June 2020, to allow time to complete two new recreation surveys, a Tallapoosa River Downstream Landowner Survey and a Tallapoosa River Recreation User Survey. Alabama Power also proposes to finalize the Area of Potential Effect (APE) for its Cultural Resources Study and file it with documentation of consultation in June 2020, which it did on June 29, 2020. No stakeholders objected to the requested variances and these changes to the approved study schedule will not affect the overall relicensing schedule. Therefore, the requested variances are approved.

Please note that nothing in this determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies.

If you have any questions, please contact Sarah Salazar at sarah.salazar@ferc.gov or (202) 502-6863.

Sincerely,

for
Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of determinations on requested modifications to approved studies and new study requests

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[5] Alabama Power also requested a variance to the approved schedule for the Water Quality Study, proposing to submit its Clean Water Act section 401 water quality certification (certification) application to the Alabama DEM in April 2021, instead of as originally proposed in 2020. Section 5.23(b) of the Commission's regulations requires the application for certification to be submitted to the certifying agency within 60 days of issuance of the Ready for Environmental Analysis notice, which will occur post-filing. Accordingly, a variance for submitting the certification application prior to filing the license application is not needed.

Appendix B – Commission staff's recommendations on requested modifications to approved studies and new study requests

APPENDIX A

SUMMARY OF DETERMINATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES (see Appendix B for discussion)

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Requested Modifications to Approved Studies				
Downstream Release Alternatives Study	Commission staff, Alabama Rivers Alliance, EPA		X	
Operating Curve Change Feasibility Analysis Study and Downstream Release Alternatives Study – Climate Change Assessment	Donna Matthews			X
New Study Requests				
Battery Storage Feasibility Study	Alabama Rivers Alliance		X	
Pre-and Post-Dam Analysis of Downstream Impacts	Chuck Denman			X
Study of the Downstream River Using Historic, Pre-Dam Images Overlaid onto Current, Post-Dam Imagery	Donna Matthews			X

APPENDIX B

STAFF RECOMMENDATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES AND NEW STUDY REQUESTS

Downstream Release Alternatives Study

Background

Alabama Power designed and constructed the Harris Project, which began operation in 1983, as a peaking project. Prior to 2005, Alabama Power, while operating in a peaking mode, would alternately generate electricity for part of the day, and store flow in the reservoir for the rest of the day.[6] While storing flows, there would be no downstream flow releases into the Tallapoosa River other than a license required minimum release of 45 cubic feet per second (cfs), as measured at the United States Geological Survey (USGS) gage located 14 miles downstream at Wadley, Alabama.

In 2005, Alabama Power voluntarily modified project operation to provide downstream pulse flow releases ranging from 15 minutes to 4 hours in length during non-generation periods for the benefit of the aquatic community downstream (called “Green Plan”).

The goal of the approved Downstream Release Alternatives Study is to evaluate the effects of the current Green Plan and the historic peaking operation, along with alternative downstream releases, on environmental and developmental resources affected by the project. Throughout the study planning and implementation process, Alabama Power has requested that stakeholders provide alternative flow releases to model as part of the study.[7]

Requested Study Modification

The approved study plan requires Alabama Power to model four downstream release scenarios, including: (1) current operation (the Green Plan); (2) the project’s historic peaking operation; (3) a modified Green Plan (i.e., modifying the time of day during which the pulses are released); and (4) a downstream continuous minimum flow of 150 cfs under a historic peaking operation scenario. Based on the findings in the draft Downstream Release Alternatives Study Report, in comments on the ISR, Commission

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[6] *See* Final Downstream Release Alternatives Study Report at 1.

[7] *See* Study Plan Meeting Summary in the Revised Study Plan filed on March 13, 2019; the ISR Meeting Summary filed on May 12, 2020; and Alabama Power’s ISR reply comments filed on July 10, 2020.

staff, the Environmental Protection Agency (EPA), and Alabama Rivers Alliance, request that Alabama Power evaluate additional downstream release alternatives. Commission staff request that Alabama Power model continuous minimum flows of 150, 350, 600, and 800 cfs under the historic peaking, Green Plan, and modified Green Plan release scenarios. EPA requests that Alabama Power evaluate: (1) the Green Plan with minimum flows; and (2) continuous minimum flows higher than 150 cfs. Alabama River Alliance requests Alabama Power evaluate the following downstream flow alternatives:

1. a variation of the existing Green Plan where the Daily Volume Release is 100 percent of the prior day's flow at the upstream USGS Heflin stream gage (rather than the current 75 percent);
2. a hybrid Green Plan that incorporates a downstream continuous minimum flow of 150 cfs;
3. releases from the Harris Project that match flow at the downstream USGS Wadley stream gage to the USGS Heflin stream gage to mimic natural flow variability; and
4. downstream continuous minimum flows of 300 and 600 cfs.

<u>Comments on Requested Study Modification</u>

In Attachment B of its reply comments, Alabama Power proposes to model the following five downstream release alternative model runs, in addition to the required four initial alternative model runs, for a total of nine alternative model runs:

1. a variation to the existing Green Plan where the Daily Volume Release is 100 percent of the prior day's flow at the USGS Heflin stream gage;
2. a 150-cfs continuous minimum flow with Green Plan releases;
3. a 300-cfs continuous minimum flow with historic peaking operation;[8]
4. a 600-cfs continuous minimum flow with historic peaking; and
5. an 800-cfs continuous minimum flow with historic peaking.

Alabama Power does not propose to model Alabama Rivers Alliance's requested alternative for a release from the Harris Project that mimics the natural flow variability in the Tallapoosa River. Alabama Power states that such operation would significantly reduce or eliminate use of the project for peaking. Moreover, Alabama Power states that the project's units are not capable of adjusting, to the extent necessary, to simulate natural

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[8] In the draft Downstream Release Alternatives Study Report, Alabama Power refers to the continuous minimum flow alternatives solely as minimum flows. To eliminate confusion, we recommend Alabama Power define the minimum flow alternatives, with regard to the associated operational scenario (e.g., 150-cfs continuous minimum flow with Green Plan operation).

river flows. Alabama Power also does not propose to model staff's requested range of minimum flows with the Green Plan (except 150 cfs) or modified Green Plan releases (with any flow). Alabama Power states that modeling one combination of a minimum flow (150 cfs) and Green Plan releases is adequate to determine the effect of this downstream release alternative on project resources.

Discussion and Staff Recommendation

The purpose of the Green Plan releases is to reduce the effects of peaking operation on the aquatic community, including habitat, in the Tallapoosa River downstream from Harris Dam. Monitoring conducted since initiation of the Green Plan in 2005 indicates that there has been an increase in shoal habitat availability, but the response by the fish community has been mixed (Irwin, 2019).

Alabama Rivers Alliance's request for a downstream release alternative, whereby releases from the Harris Project would mimic the Tallapoosa River's natural flow variability, which could benefit the habitat and aquatic community downstream from Harris Dam, would require a change in project operation from peaking to run-of-river. As detailed by Alabama Power in its July 10, 2020, comments,[9] the turbine-generator units at the Harris Project are designed to be operated at best gate and are not capable of adjusting to the extent necessary to simulate natural river flows (i.e., it is unable to operate in a run-of-river mode). Operating the units in this manner would lead to cavitation, which would damage the units. Therefore, operating the Harris Project to mimic the river's natural flow variability under a run-of-river mode would likely require significant redesign and redevelopment of the project (e.g., structural modifications, intake redesign, turbine retrofits, etc.). Because run-of-river operation is not feasible at the Harris Project without a major redesign and redevelopment of the project, we do not consider it to be a reasonable alternative for further consideration as part of our eventual environmental analysis. Therefore, we do not recommend modifying the study to include a release alternative that mimics natural flow variability in the Tallapoosa River.

With respect to the modified Green Plan releases requested by staff, we no longer recommend that Alabama Power model continuous minimum flows with this release strategy because, other than shifting the time of day of the releases, the release characteristics, model results, and environmental benefits would be the same as those for the continuous minimum flows and the Green Plan release strategy being modeled.

As noted above, the current license requires Alabama Power to release flows from the project such that a 45-cfs minimum flow is provided at the downstream USGS Wadley streamflow gage. Incrementally higher minimum flows (e.g., 150, 300, 600, and

[9] *See* Alabama Power's July 10, 2020 comments, Attachment B, page 2.

800 cfs) would provide additional wetted width, which could improve habitat availability between pulsing releases. Therefore, there is the potential for additional enhancement and protection that we will need to consider as part of our environmental analysis. Modeling a range of continuous minimum flows with the existing Green Plan releases would allow for an evaluation of flows that could improve downstream aquatic habitat. Therefore, in addition to the nine alternative model runs identified by Alabama Power,[10] we recommend Alabama Power model three additional continuous minimum flows with the Green Plan releases (i.e., 300, 600, and 800 cfs).[11]

Operating Curve Change Feasibility Analysis Study and Downstream Release Alternatives Study – Climate Change Assessment

Background

The approved study plan includes two operations-related modeling studies: an Operating Curve Change Feasibility Analysis Study and a Downstream Release Alternative Study. The respective objectives of these approved studies are to: (1) evaluate proposed incremental increases to the winter rule curve for Harris Lake; and (2) evaluate the effects of the historic peaking, existing Green Plan, and alternative downstream release alternatives, on environmental and developmental resources affected by the project.

Requested Study Modification

Donna Matthews requests that the Operating Curve Change Feasibility Analysis and Downstream Release Alternative Studies be modified to include additional modeling of the effect of climate change on flows and Harris Project operation. The additional modeling would use predictive data from climate change studies.

Comments on Requested Study Modification

No comments were filed on this requested study modification.

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[10] *See* Alabama Power's July 10, 2020 Reply Comments at Appendix B, page 2.

[11] These flows were selected because they are consistent with those minimum flows selected by Alabama Power for their historic peaking model runs.

Discussion and Staff Recommendation

We are not aware of any available climate change model or assessment, including the climate change assessment referenced by Ms. Matthews,[12] that would support, with any degree of accuracy and reliability, a prediction of water availability at the individual project level. However, there is historical streamflow data available for the Tallapoosa River upstream of, and downstream from, the Harris Project. This data can be used to evaluate whether climate change has resulted in any changes to hydrologic inputs over time at the project. Therefore, we do not recommend modifying either the Operating Curve Change Feasibility Analysis Study or Downstream Release Alternative Study to include additional modeling using predictive data from climate change studies.

[12] Ms. Matthews references U.S. Department of Energy (2017), which was cited in EPA's March 29, 2019 comments on Alabama Power's Revised Study Plan.

STAFF RECOMMENDATIONS ON REQUESTED NEW STUDIES

Battery Energy Storage Systems (BESS) Study

Background

Harris Lake is a storage reservoir in which flows are stored to supplement inflows from April through December. The daily discharge from the project is based on a percentage of flows measured at the upstream USGS Heflin gage (i.e., the Green Plan calls for daily discharge to be at least 75 percent of flows at Heflin). Hydropower is typically generated during hours when demand for electrical power is highest (i.e., peak energy), causing significant variations in downstream flows. Daily hydropower releases from the dam vary from 0 cfs during off-peak periods to as much as 16,000 cfs, which is approximately best gate,[13] or the maximum turbine discharge.

The project has two turbine-generating units, rated at 67.5 megawatts (MW) each, which produce about 60 MW and have a hydraulic capacity of 8,000 cfs each at best gate opening. Lake elevations can vary 0.5- to 1.5-feet during a 24-hour period as a result of daily peak releases. Daily tailwater levels can vary significantly (up to 5 feet) because of peaking hydropower operations at Harris Dam, characterized by a rapid rise in downstream water levels immediately after generation is initiated, and a rapid fall in elevations as generation is ceased. Except during high flow conditions when hydropower may be generated for more extended periods of time, this peaking power generation scenario with daily fluctuating downstream flows is repeated nearly every weekday. Under the voluntary Green Plan, environmental flows are released through the turbines daily for short periods of time (i.e., 15 minutes to 4 hours).

Recommended New Study

In its comments on the ISR, Alabama Rivers Alliance requests a new study titled "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts." The goal of the study is to determine whether a battery energy storage system (BESS) could be economically integrated at Harris to mitigate the impacts of peaking, while retaining full system peaking capabilities. Under such a scenario, the BESS would be used to provide power during peak demand periods, which would

[13] In its reply comments, Alabama Power notes that the best gate setting is a permanent setting on the governor system to ensure that the control system will force a fast movement of the wicket gates to the best gate position thereby minimizing the time spent in the rough zone (i.e., an area on the operating curve in which flows that are less than efficient gate cause increased vibrations in the turbine and cavitation along the low-pressure surfaces of the turbine runner).

decrease the need for peak generation flow releases and reduce flow fluctuations downstream of the project. The objectives of the study are to evaluate battery type and size configurations, costs, and ownership options, as well as technical barriers to implementing BESS. The study would also assess how much operational flexibility could be provided by BESS and allow for more control of discharges downstream of the dam.

Alabama Rivers Alliance acknowledges that BESS at hydropower projects is a new field with no established methodologies. Alabama Rivers Alliance requests a desktop analysis to evaluate the feasibility of BESS at the Harris Project, including a preliminary cost/benefit analysis. Alabama Rivers Alliance estimates the cost of this study would be $20,0000 to $30,000.

Comments on the Study Request

Alabama Power did not adopt this study because it believes the system would have a high cost and the turbines at Harris Dam are not designed to operate in a gradually loaded rate over an extended period. Rather, the turbines are peaking units designed to quickly react to electrical grid needs. Restricted ramping may be possible; however, it would require replacement of both turbine runners at a cost in addition to the cost of the batteries. Alabama Power estimates the cost of one 60 MW-1-hour storage battery unit equivalent to the power of one turbine, would be $36,000,000. A battery equivalent to the power of both turbines would be $72,000,000. There would be additional cost for any necessary modification of the project turbine-generator units. (Alabama Power did not provide an estimate for the cost of modifying/replacing the turbine runners.) Alabama Power dismisses the feasibility of a smaller MW battery. Alabama Power states that a smaller MW battery, i.e., 5 MW, would not be large enough to make up the lost power in full ramping mode. A battery smaller than the turbine's efficient gate would not allow for full ramping of that turbine.

Discussion and Staff Recommendation

We reviewed Alabama Power's cost estimate for the installation of a BESS at the Harris Project. Alabama Power's cost of the battery is based on a 2018 National Renewable Energy Report which estimates the cost of a 60 MW, 1-hour reserve battery at $601/kWh, or about $36,0000,000 to be used in place of the MWs from one turbine at Harris (DOE, 2018). This cost does not include any modifications to the turbine-generator units, which would be necessary. In addition, a battery with 4 hours reserve storage may be necessary, because the Harris Project can generate up to 4 hours in peaking mode. The 2018 National Renewable Energy Report estimates the cost of a 60 MW, 4-hour reserve battery at $380/kWh, or about $91,0000,000 to mirror the MW from one unit at Harris. This option would also require modification of the turbine runners at additional costs.

The goal of Alabama Rivers Alliance's study is to evaluate the feasibility of a storage system which could be economically implemented at the Harris Project. Such a study would require evaluating not only the cost of installing the battery units, but also the potential benefits to both developmental and non-developmental resources. Installing a BESS at the Harris Project has the potential to mitigate project effects on water levels in Harris Lake, and fluctuations in flows released downstream during peaking operations. Potential hydrologic changes could be achieved by spreading out the releases throughout the day/night rather than releasing most of flows during peak hours. Assuming the same daily volume of flow is released, installing one 60-MW battery to provide an equivalent amount of the power provided by one turbine-generator unit could reduce daily fluctuations in Harris Lake by half. Harris Lake water levels, which currently fluctuate up to 1.5 feet daily, could be reduced to 0.75 feet daily. Downstream releases during peaking could be reduced from 16,000 cfs to 8,000 cfs, and the tailwater surface elevation could be reduced by 2.8 feet.[14] To consider the environmental benefits potentially associated with such changes in hydrologic conditions described above, the changes in releases from the project would have to be considered in the context of Alabama Power's approved Downstream Release Alternatives Study, which provides for identifying and evaluating Alternative Release scenarios.

Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project. We currently have insufficient information to evaluate the potential environmental benefits of a BESS. The cost of conducting the study, between $20,000 and $30,000, is relatively low and would provide information that does not already exist and is needed for our analysis.

Alabama Rivers Alliance's study methodology includes a description of operational flexibility associated with installing a range of battery sizes. Alabama Power did not consider a smaller battery because of the operational limits of the existing turbines. Alabama Power's analysis should not be limited to the existing turbines but should also consider the feasibility and cost of modifying or replacing a turbine necessary to support operation of a smaller battery, which may be more cost-effective and provide some environmental benefits. At minimum, the study should look at the costs and

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[14] The tailwater elevation below Harris dam is 667.7 feet msl when two units are operating and 664.9 feet msl when one unit is operating, a difference of 2.8 feet.

environmental benefits of replacing one 60 MW unit, as discussed above, and at least one smaller battery and its associated changes in project releases.

Alabama Rivers Alliance's study methodology includes a survey of battery cost estimates based on public resources, future projections for battery costs, and potential incentives to offset battery cost. Alabama Power used a 2018 Department of Energy Report which provides a reasonable methodology for estimating the cost of a technology which has not been widely implemented in hydropower. The cost of batteries, however, is rapidly decreasing,[15] and future projections in the cost of a battery should be considered in the cost analysis.

In summary, we recommend that Alabama Power conduct a BESS Study, along with the Downstream Release Alternative Study. The Downstream Release Alternative Study should be amended to include at least two new release alternatives: (a) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and (b) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e. 5, 10 or 20 MW battery). Alabama Power should include in its cost estimates for installing a BESS any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type. Finally, consistent with the Downstream Release Alternative Study Plan, Alabama Power should evaluate how each of these release alternatives (i.e., items (a) and (b) above) would affect recreation and aquatic resources in the project reservoir and downstream.

Change Analyses: Project Operation Effects on Environmental Resources in the Tallapoosa River Downstream from Harris Dam

<u>Background</u>

The purpose of the Erosion and Sedimentation Study relative to downstream resources is to identify problematic erosion sites and sedimentation areas on the Tallapoosa River downstream from Harris Dam as well as determine the likely causes. The plan calls for sites downstream of Harris Dam to be identified, including by stakeholders; documented by observation and video; and assessed for the location, extent, and potential causes of erosion or sedimentation. As outlined in the approved study plan, during Phase 1 of the Operating Curve Change Feasibility Analysis Study, Alabama Power modeled the effect of increasing the winter elevation of Harris Lake by 1-, 2-, 3-, and 4-feet on the ability to provide flood control and downstream releases, among other operational parameters. Information from the Erosion and Sedimentation Study will be used in Phase 2 of both the Downstream Release Alternatives Study and the Operating

[15] The National Energy Research Laboratory reports that since 2018, battery costs have been reduced by about 15 percent, with further decreases expected.

Curve Change Feasibility Analysis Study to assess the effects of potential changes in project operation on resources downstream from Harris Dam, including erosion and sedimentation in the Tallapoosa River.

Recommended New Studies

Pre-and Post-Dam Analysis of Downstream Impacts

Chuck Denman requests a new study with the goal of analyzing pre-dam and post-dam impacts on environmental resources downstream from Harris Dam, including flooding, erosion, and habitat changes to flora and fauna. Specifically, Mr. Denman requests the following information:

1. a storm runoff model comparing 25-, 50-, and 100-year 24-hour storm events.
2. use of available remote sensing materials to identify erosion by comparing the current river channel and islands' sizes and shapes with pre-dam conditions.
3. use of remote sensing to map flag grass[16] and invasive plant communities to compare changes from pre-dam conditions.
4. review available materials from local individuals in the community, as well as fish and game and other resources to determine what effect the dam has had on downstream fish species and population sizes.

Study of the Downstream River Using Historic, Pre-Dam Images Overlaid onto Current, Post-Dam Imagery

Donna Matthews states that erosion is a significant and persistent concern that is problematic for landowners, flora, and fauna in and around the Tallapoosa River downstream from Harris Dam. Ms. Matthews requests that Alabama Power use existing aerial imagery[17] and other available data to analyze changes in erosion, fisheries, and other environmental resources downstream from Harris Dam. As part of the study, Ms. Matthews requests that Alabama Power prepare a detailed geographic information system (GIS) map with existing information relating fish populations and other parameters in three dimensions (3D). The 3D GIS map would display presence/absence of species along the river length and during different decades, where data are available. Ms.

[16] Staff assumes that "flag grass" here refers to a non-native plant in the genus *Acorus*, such as *Acorus calamus*, given that the range of the native *Acorus americanus*, or "American sweetflag," is northern United States and Canada (USDA, 2020).

[17] Ms. Matthews filed an image of the Tallapoosa River in the Harris Project area from 1942 and provided a source for obtaining additional existing aerial imagery of the project area from 1950, 1954, 1964, and 1973.

Matthews states that the results could be used to evaluate the potential effects of future changes to downstream flow patterns.

Comments on the Study Requests

Alabama Power indicates that it is conducting many of the requested analyses as part of the approved study plan, including evaluations of how existing operation affects, and alternative operations may affect, erosion and sedimentation, nuisance aquatic vegetation, fisheries/aquatic resources, and water quality in the Tallapoosa River downstream from Harris Dam. Alabama Power also states that the approved Erosion and Sedimentation Study provides an adequate methodology to evaluate project-related effects on erosion and sedimentation downstream from Harris Dam. To support the Commission's cumulative effects analysis for soils and geologic resources (i.e., erosion and sedimentation), Alabama Power indicates that it intends to contact Ms. Matthews to obtain copies of the aerial images referenced in her study request and file them with the Commission.[18]

Discussion and Staff Recommendation

Mr. Denman and Ms. Matthews present their new study requests as collecting data on pre-dam conditions, which is not necessary with the context of the Commission's environmental baseline (i.e., current conditions) for evaluating project effects during a relicensing proceeding and does not relate to the eventual proposed action, which is relicensing an existing hydroelectric project.[19] The images of the project area that Ms. Matthews identifies were all taken prior to the construction and operation of the Harris Project. Analysis of these images would not be helpful in evaluating project-related erosion.

The flood analysis component of the Operating Curve Change Feasibility Analysis is intended to assess the effects of a large-scale flood, which could address some of the existing stormwater runoff and erosion issues that Mr. Denman identifies in his proposed study. The Downstream Release Alternatives Study calls for Alabama Power to model potential changes in operational flow releases. Modeling these potential operational scenarios will support an analysis of flow effects downstream of Harris Dam under a range of scenarios more effectively than additional modeling of smaller floods. The 100-year flood serves as a representative large flood for risk assessment and planning purposes. Therefore, modeling the 100-year flood scenario is sufficient.

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[18] *See* Alabama Power August 4, 2020 Memo.

[19] *Am. Rivers v. FERC*, 187 F.3d 1007, *amended by and denying reh'g*, 201 F.3d 1186 (9th Cir. 1999); *Conservation Law Found. v. FERC*, 216 F.3d 41 (D. C. Cir. 2000).

The data collected as part of the approved studies, including the Downstream Release Alternatives Study, Erosion and Sedimentation Study, Aquatic Resource Study, and Downstream Aquatic Habitat Study, include much of the information that Mr. Denman and Ms. Matthews request with regard to current conditions. The results of Phase 2 of the Downstream Release Alternatives Study that is being conducted currently (during the second study season, April 2020 through April 2021) will also provide information responsive to most of Mr. Denman and Ms. Mathews' requests. The information gained through the approved studies should be adequate to assess the effects of project operation on downstream resources, including erosion and sedimentation and related invasive species effects, fisheries, water quality and use, terrestrial resources, recreation, and cultural resources. Therefore, we do not recommend that Alabama Power conduct Mr. Denman's or Ms. Matthews' requested new studies.

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Attachment 2
Comments and Responses on the Draft Operating Curve Change Feasibility Analysis Phase 1 Report

Commenting Entity	Date of Comment & FERC Accession Number	Comment on Draft Operating Curve Change Feasibility Analysis Phase 1 Study Report	Alabama Power Response
Federal Energy Regulatory Commission (FERC) Note: footnotes included in the original letter have been omitted from this table	6/10/2020 20200610-3059	Figure 5-3, on page 39 of the Draft Operating Curve Change Feasibility Analysis (Phase 1) Study Report, shows how changing the winter pool elevation from the current project operating curve to the +1, +2, +3, and +4-foot winter operating curves could affect reservoir elevations in Lake Harris throughout the year. Moreover, the figure documents the interaction between higher winter pool levels and low-inflow periods. During the period between 2006 and 2008, which encompasses two low-flow periods, the model showed that increasing the winter pool elevation can result in higher reservoir elevations during low-flow years, compared to the existing operating curve. However, Figure 5-3 shows that from about July 2007 through mid-February 2008, modeled reservoir levels for the +2 and +3-foot winter pool curve alternatives were lower than that of the other operating curve alternatives for the same operating period. Please explain what appears to be an anomaly in the modeling result in the final report.	Alabama Power has been in contact with the USACE Hydrologic Engineering Center regarding the HEC-ResSim model since the draft report was distributed. Based on its guidance, Alabama Power updated the HEC-ResSim model and in doing so resolved the apparent anomaly in the modeling result. Figure 5-3 has been updated in the final report and now demonstrates that +2 and +3-foot winter operating curve alternatives could have kept the reservoir slightly higher from July 2007 through mid-February 2008 due to the reservoir starting with a higher elevation.
Alabama Department of Conservation and Natural Resources (ADCNR) Note: footnotes included in the original letter have been omitted from this table	6/11/2020 20200611-5152	On page 6, section 2.1.1.5 Lower Tallapoosa River of the Operation Curve Change Feasibility Analysis Study discusses downstream gages. Include years of discharge and stage data for these gages, similar to previous gages years of discharge and stage data discussed and included in the document.	This change has been made in the final report.
ADCNR		On pages 45-50, Figures 5-7 through 5-12 of the Operation Curve Change Feasibility Analysis Study visually indicate inundation boundaries for the baseline of four winter pool alternatives. Include a Table with calculated totals of inundated acreages for the baseline and four winter pool increase alternatives to assist with the quantitative evaluation of inundation effects downstream of the dam.	A table with the calculated totals of inundated acreages for the baseline and four winter pool alternatives has been included in the final report.

Commenting Entity	Date of Comment & FERC Accession Number	Comment on Draft Operating Curve Change Feasibility Analysis Phase 1 Study Report	Alabama Power Response
Chuck Denman	6/11/2020 20200611-5174	Harris Dam additional studies suggested A general review of historical materials ie newspapers, and other records dealing with the proposals for constructing the Dam. Including comments and conditions provided in initial permitting. With the goal being to determine if the dam has achieved the original benefits expected. Perhaps a score card. A pre vs post Dam analysis of down stream impacts. Including flooding, erosion and habitat changes to flora and fauna. 1. Flooding: storm runoff model comparing 25,50 and 100 year 24 hour storm events. 2. Erosion: utilizing available remote sensing materials to compare river channel and islands size and shape today and pre dam. 3. Plants: utilize remote sensing materials to map flag grass and invasive plant communities to compare changes from pre Dam. 4. Fisheries: review available materials from locals in the community, fish and game and other resources to determine what effect the Dam has had on down stream fish types and numbers.	See Alabama Power's response filed July 10, 2020 (Accession No. 20200710-5122) and FERC's Determination on Requests for Study Modifications (Accession No. 20200810-3007).
Donna Matthews	6/11/2020 20200612-5018	For studies using 100 year climate data to model outcomes, (d) **I propose additional modelling based on predictive data from the studies of climate change**. It is my understanding Federal Dams do additional modelling to take effects of climate change into account when undergoing licensing. This would include climate change considerations of Operating Curve Rules among others. This idea was previously presented to FERC in 2019 comments by Maria Clark from the EPA. Given the long life of the permit, the measurable manifestations of climate change and the Southern Company's goal to shift power generation away from fossil fuels, it seems prudent to take advantage of modelling in preparation to be best able to deal with unexpected situations such as greater reliance on hydro power by APC. 1. To my knowledge climate alternative data has not been modelled 2. Modelling is a very cost effective way to prepare for future events.	See Alabama Power's response filed July 10, 2020 (Accession No. 20200710-5122) and FERC's Determination on Requests for Study Modifications (Accession No. 20200810-3007).

Attachment 3
Final Operating Curve Change Feasibility Analysis Phase 1 Report

OPERATING CURVE CHANGE FEASIBILITY ANALYSIS

PHASE 1 REPORT

R.L. HARRIS HYDROELECTRIC PROJECT

FERC No. 2628

Prepared by:

Alabama Power Company

and

Kleinschmidt Associates

August 2020

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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 mean sea level (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, U.S. Army Corps of Engineers (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 feet 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.

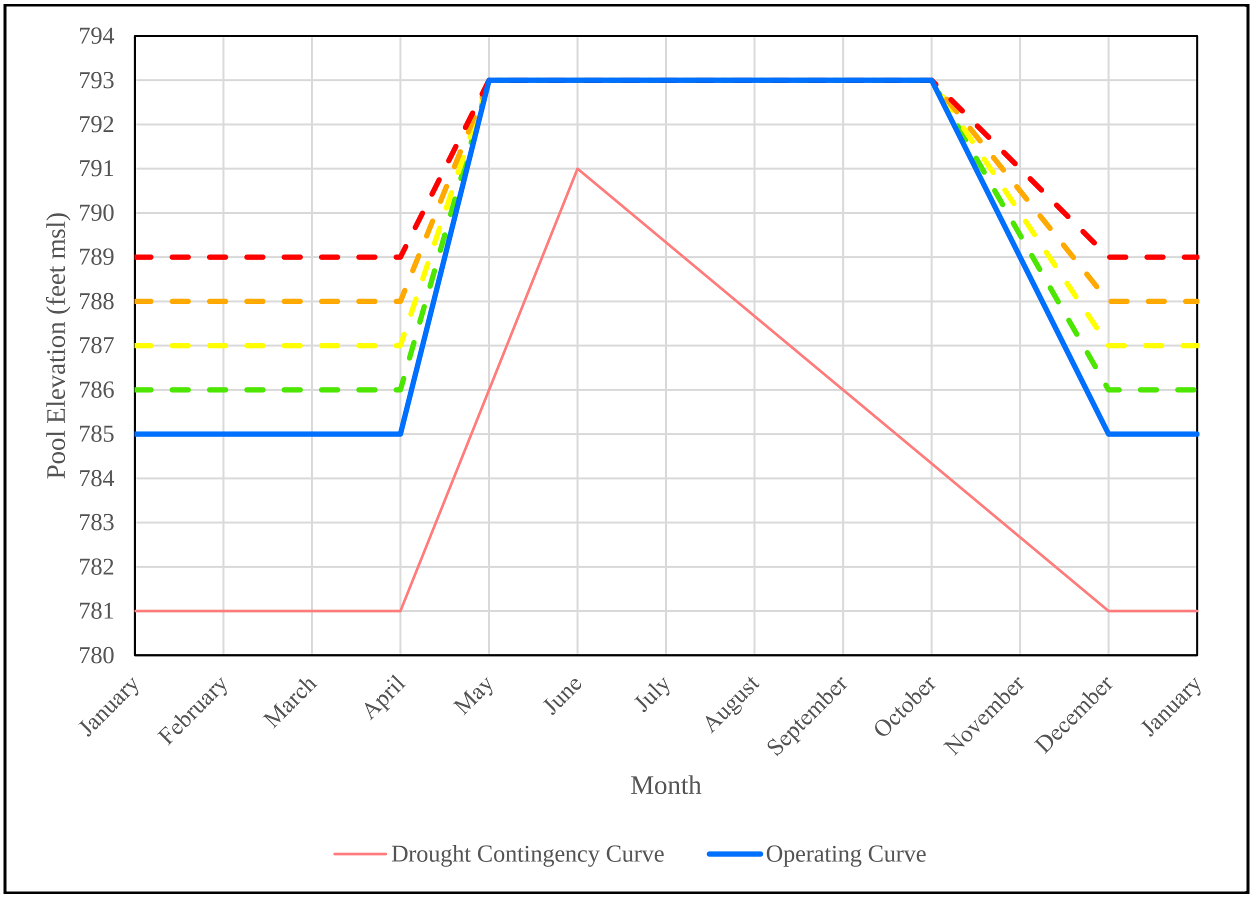


Figure 1-1 Harris Operating Curve with Proposed 1-Foot Incremental Changes

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 68 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 45 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 97 years of daily flow and stage data and Horseshoe Bend has 35 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

[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.

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 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 and has 85 years of daily flow data (ending in 2013). The Milstead gage (No. 02419500) is located on the Alabama Highway 229 Bridge (RM 39.8) and has 26 years of daily stage data, and the most downstream gage on the Tallapoosa River is located at the Montgomery Water Works plant (No. 02419890) at RM 12.9 and has 25 years of daily flow data and 31 years of daily stage data. 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 (93 years of daily discharge data and 87 years of daily stage data) and the "Montgomery gage" (No. 02419988) at RM 296.9 (49 years of daily stage data).

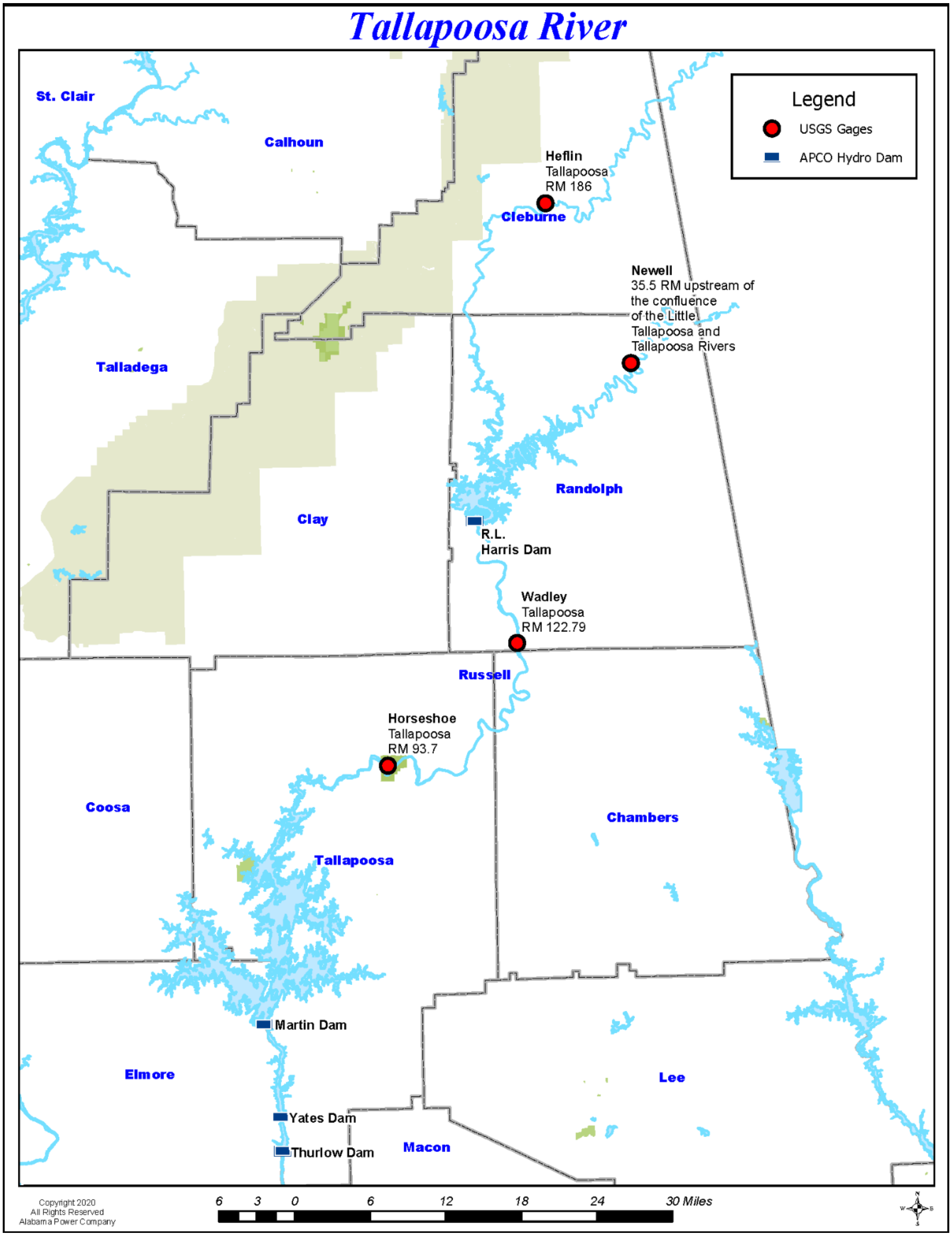


Figure 2-1 Tallapoosa River Map

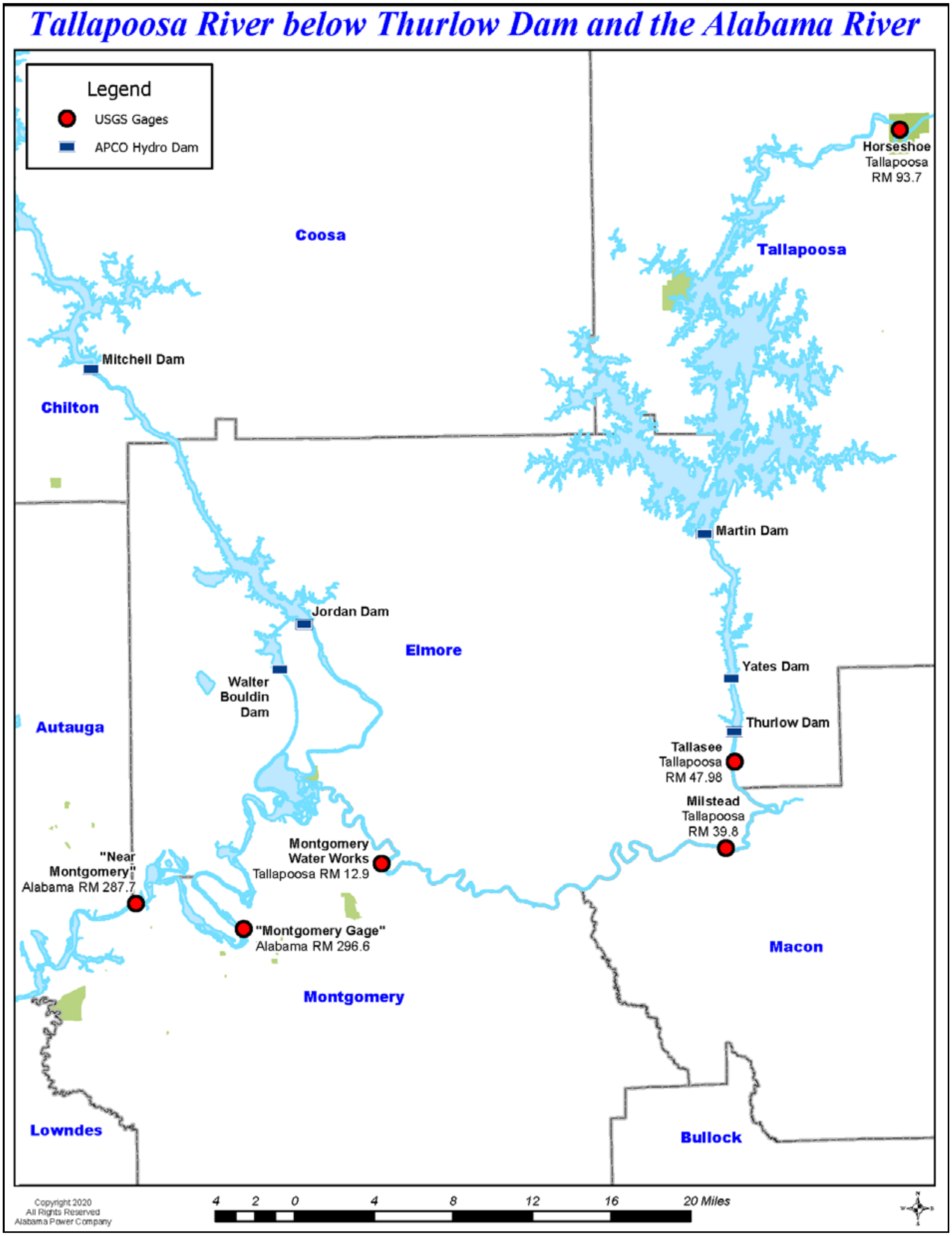


Figure 2–2 Map of the Tallapoosa River below Thurlow Dam and the Alabama River

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

[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.

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. 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

[4] In hydraulic modeling, simulations run in the unsteady state consider the variance of flow with respect to time.

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 AND 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 1990s, 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 study results 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 with the downstream reservoir, Martin, for minimum flow operations when the pool is not being operated for flood control.

[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.

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 cubic feet per second (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 feet and 7.5 feet in the Alabama River below the Claiborne Lock and Dam. If a 9.0 feet channel cannot be made available due to inflows, a 7.5 feet channel is attempted, which would allow light loaded barges to move through the system. If basin inflows do not support a 7.5 feet 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 feet to 793 feet depending on the date. The elevation 790 feet serves as a transition elevation for flood control operations. When the reservoir elevation is above the operating curve and below 790 feet, Harris is operated to keep the Wadley gage at or below a stage of 13.0 feet, with a maximum release of 13,000 cfs. If the pool elevation exceeds 790 feet 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.

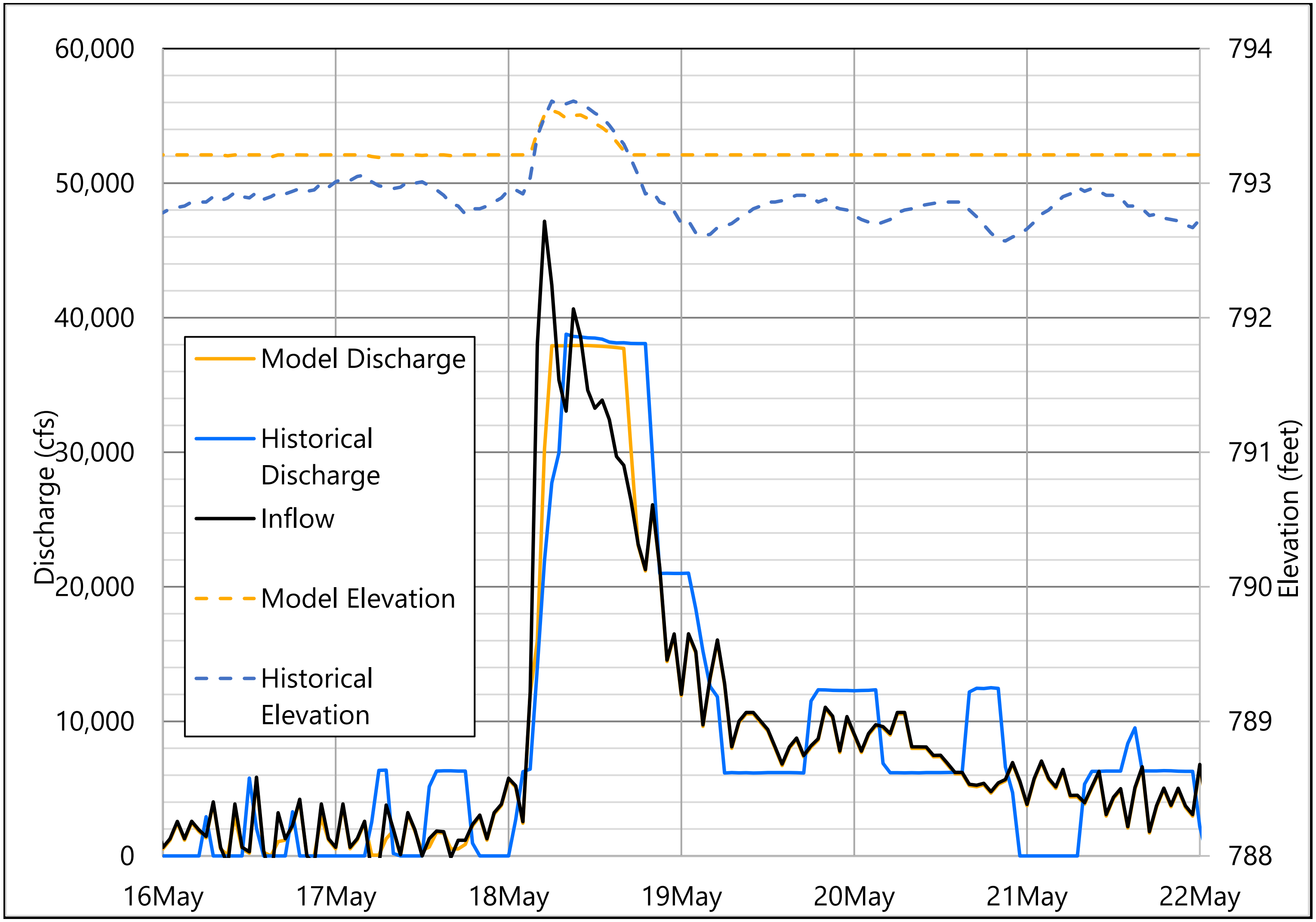


Figure 4-1 Harris Reservoir Hourly ResSim Calibration – May 2013

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. Section 4.5.3 describes the intervening flows used in the HEC-RAS modeling.

Table 4-2 Hydrograph Results for 100-Year 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-Year 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

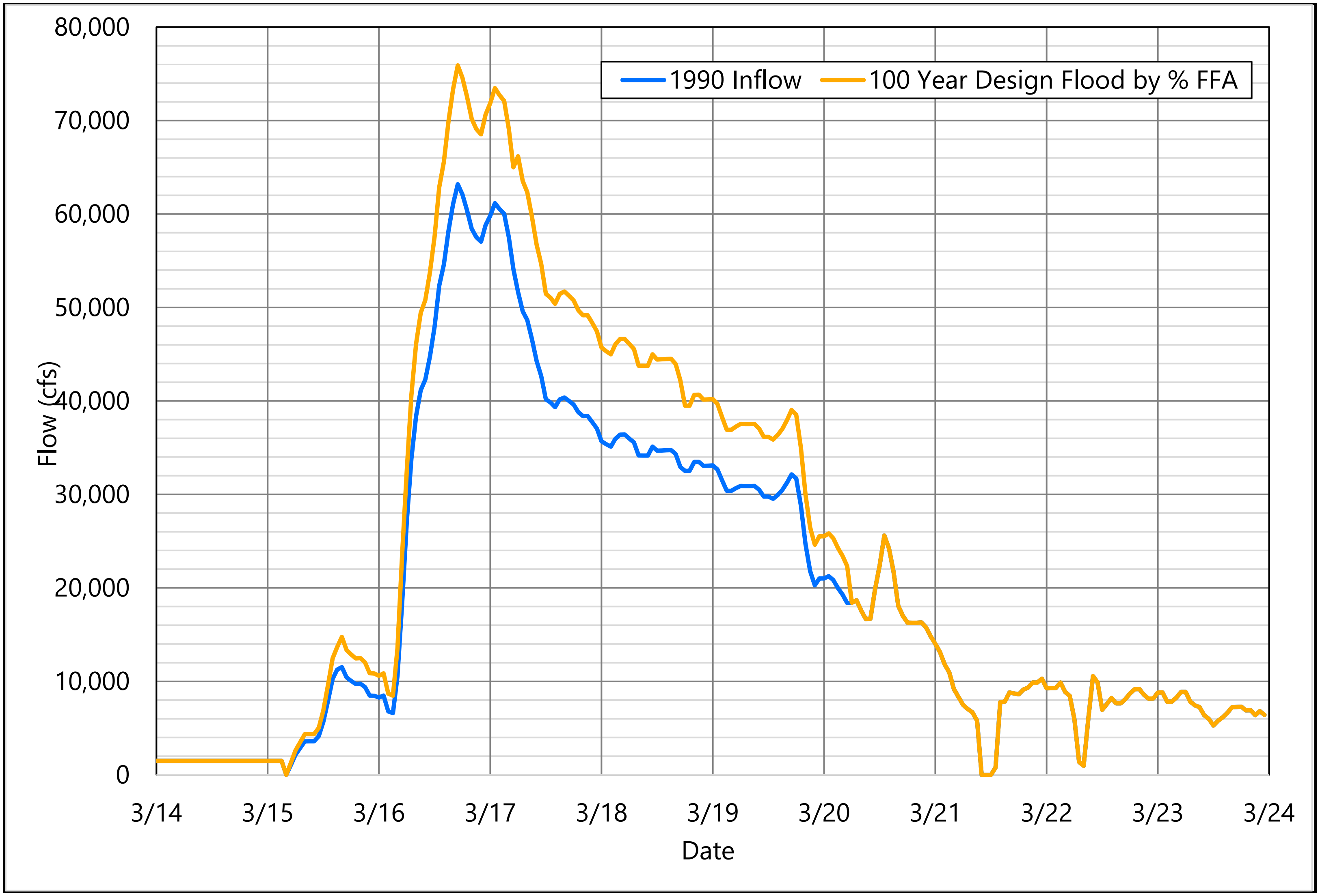


Figure 4-2 Inflows at Harris Reservoir for 100-Year Design Flood for Harris Dam

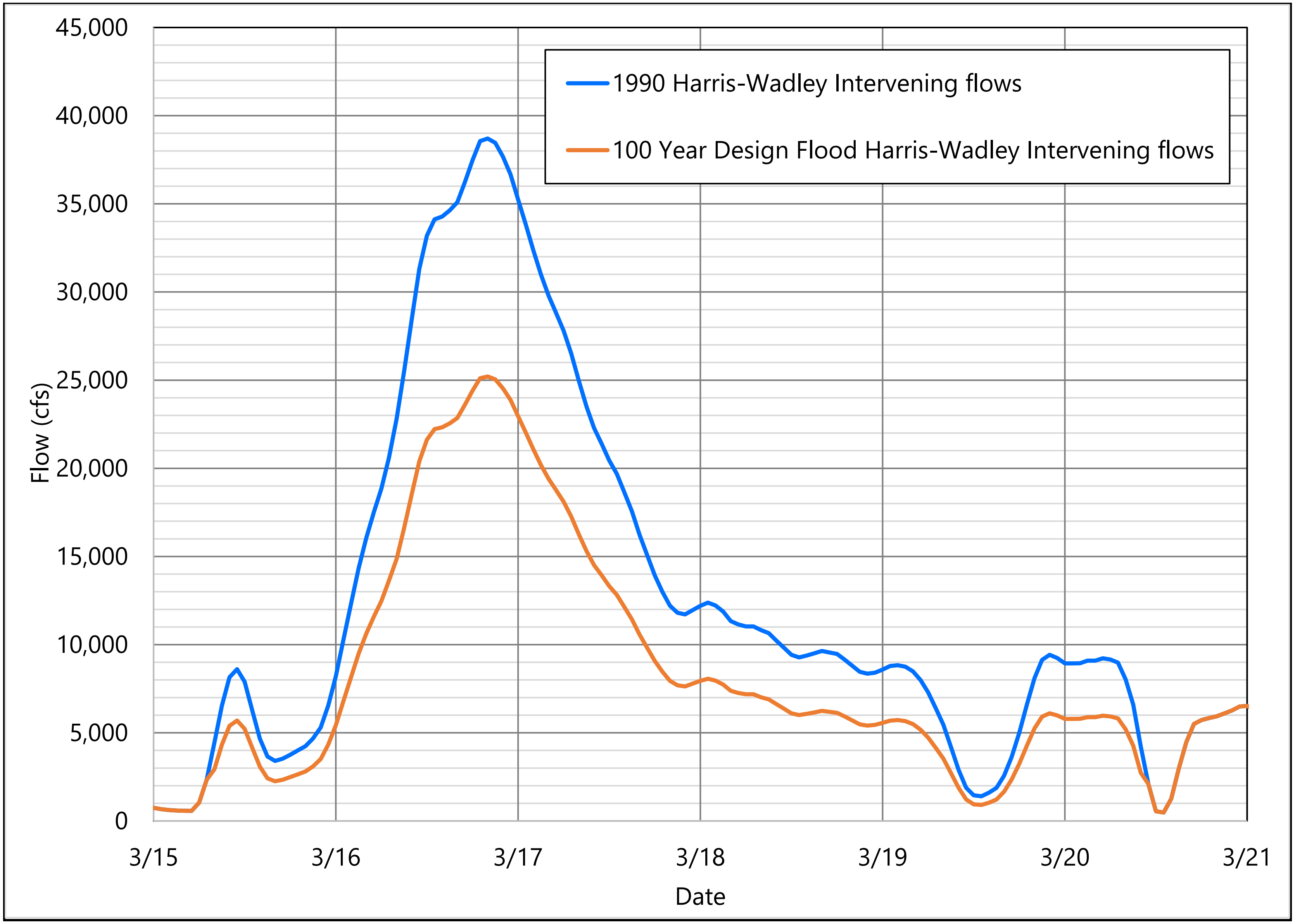


Figure 4-3 Intervening Flows at Wadley for 100-Year Design Flood for Harris Dam

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.

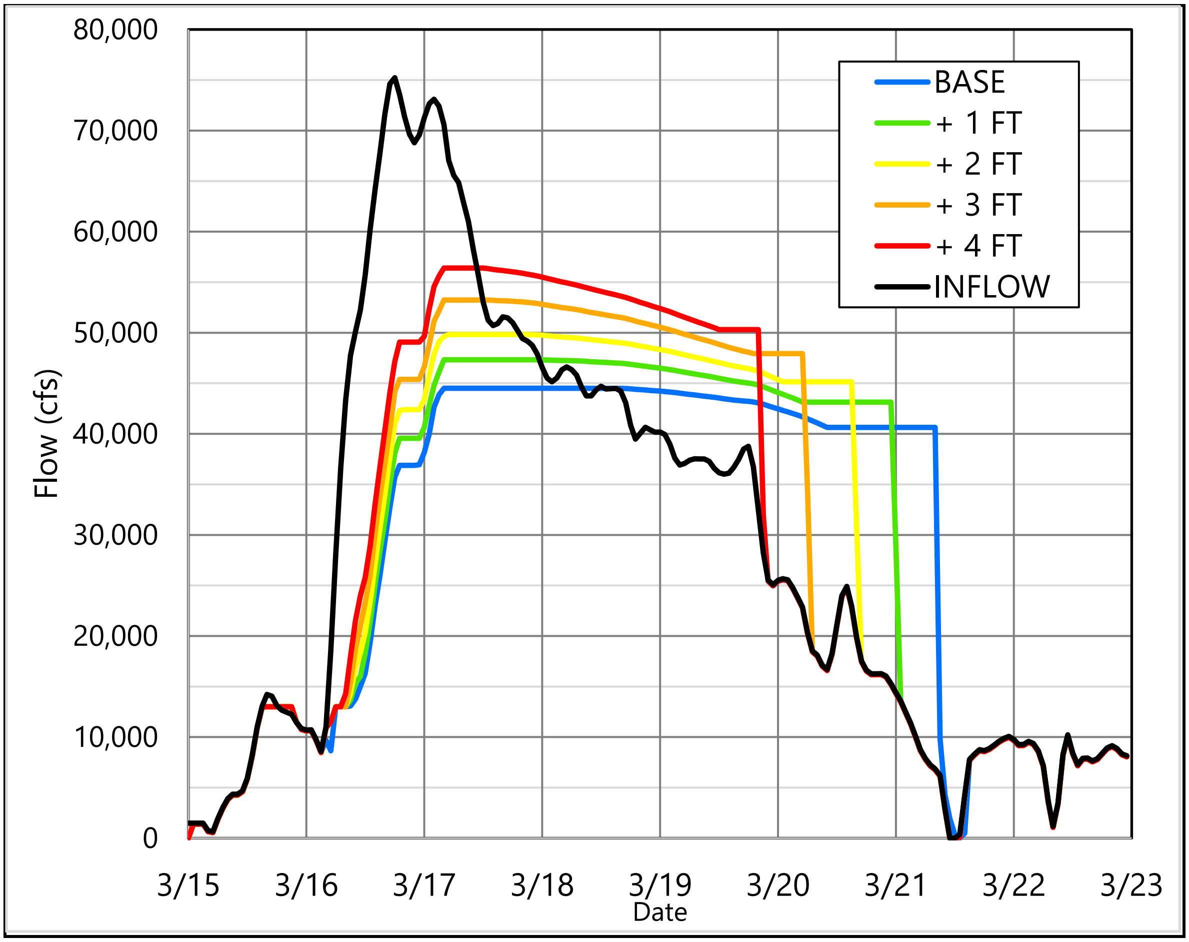


Figure 4-4 Harris Reservoir Hourly ResSim Model-Winter Pool Evaluation

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.

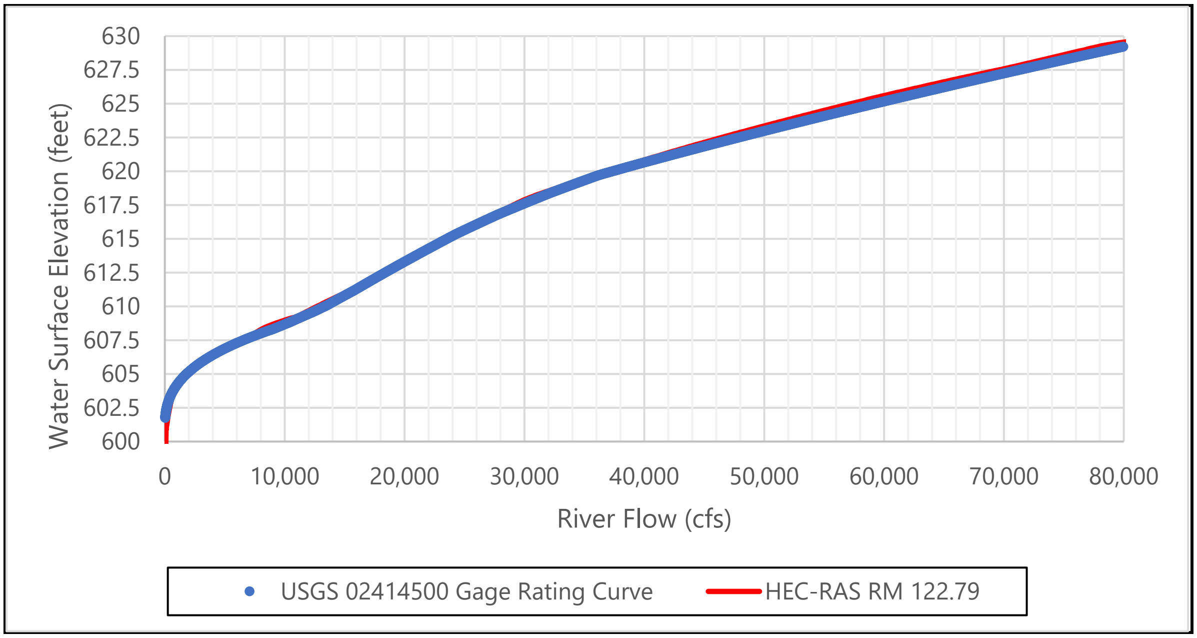


Figure 4-5 Harris-Martin HEC-RAS Model Results versus USGS Wadley Gage No. 02414500

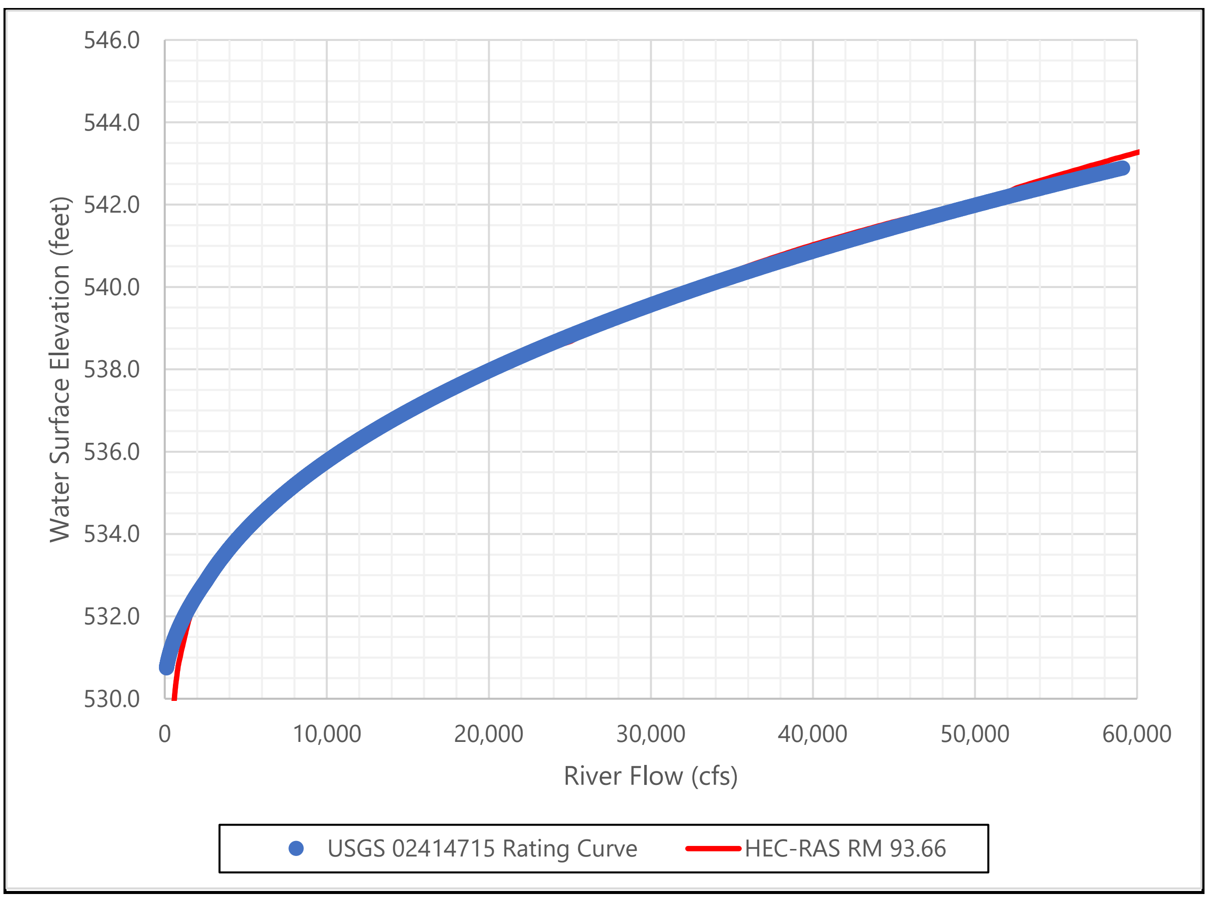


Figure 4-6 Harris-Martin HEC-RAS Model Results versus USGS Horseshoe Bend Gage No. 02414715

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.

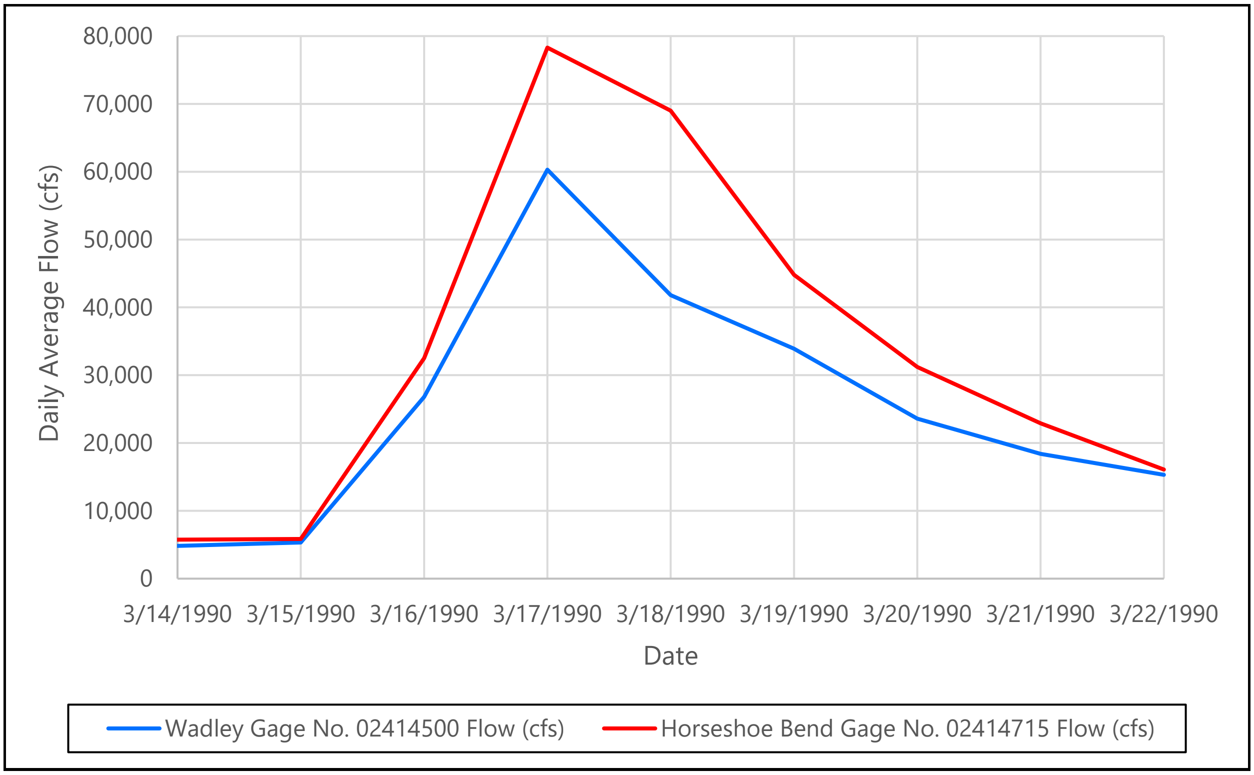


Figure 4-7 Daily Average Flow at Wadley and Horseshoe Bend USGS Gages

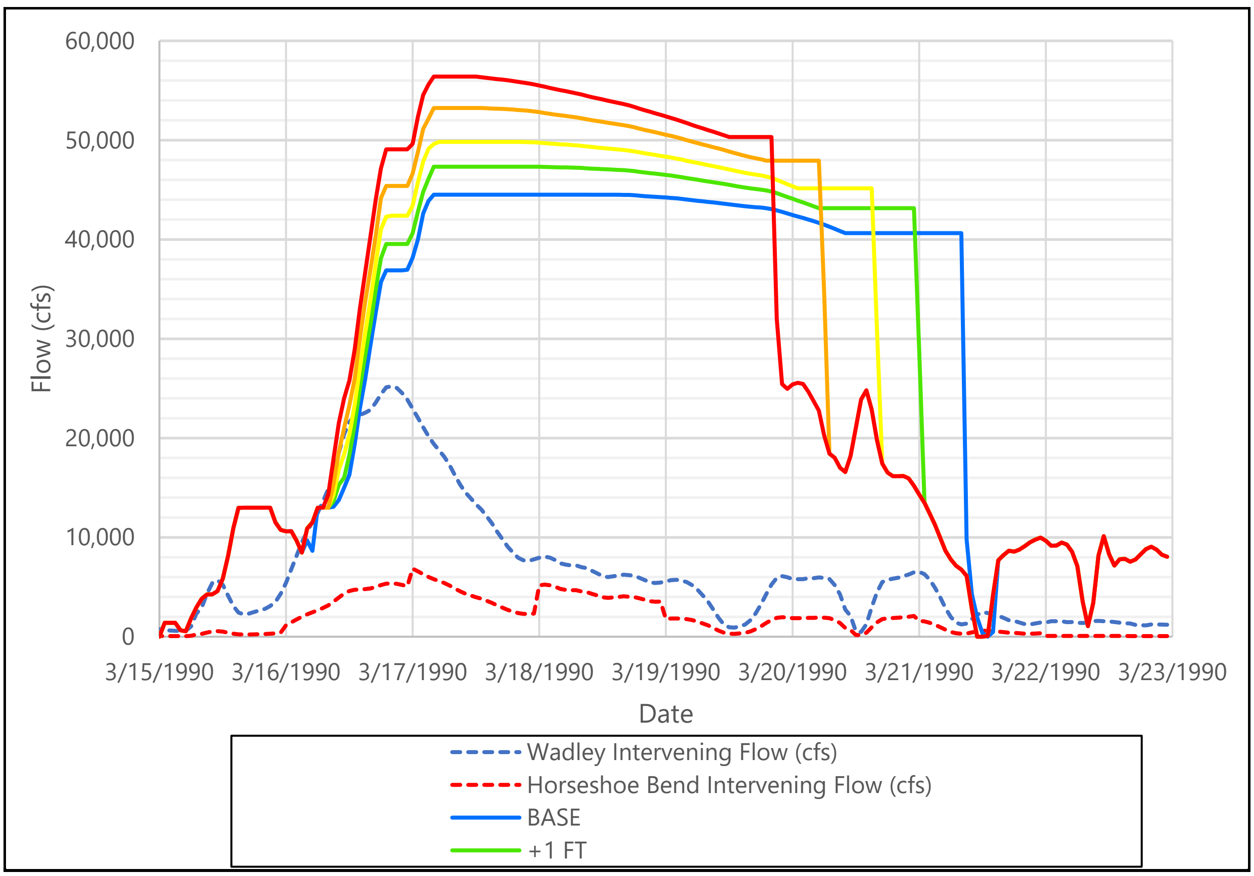


Figure 4-8 Unsteady Flow Plan Hydrographs

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 1990s. 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 feet 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 feet 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 feet msl. All alternatives exceeded 793.0 feet 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.

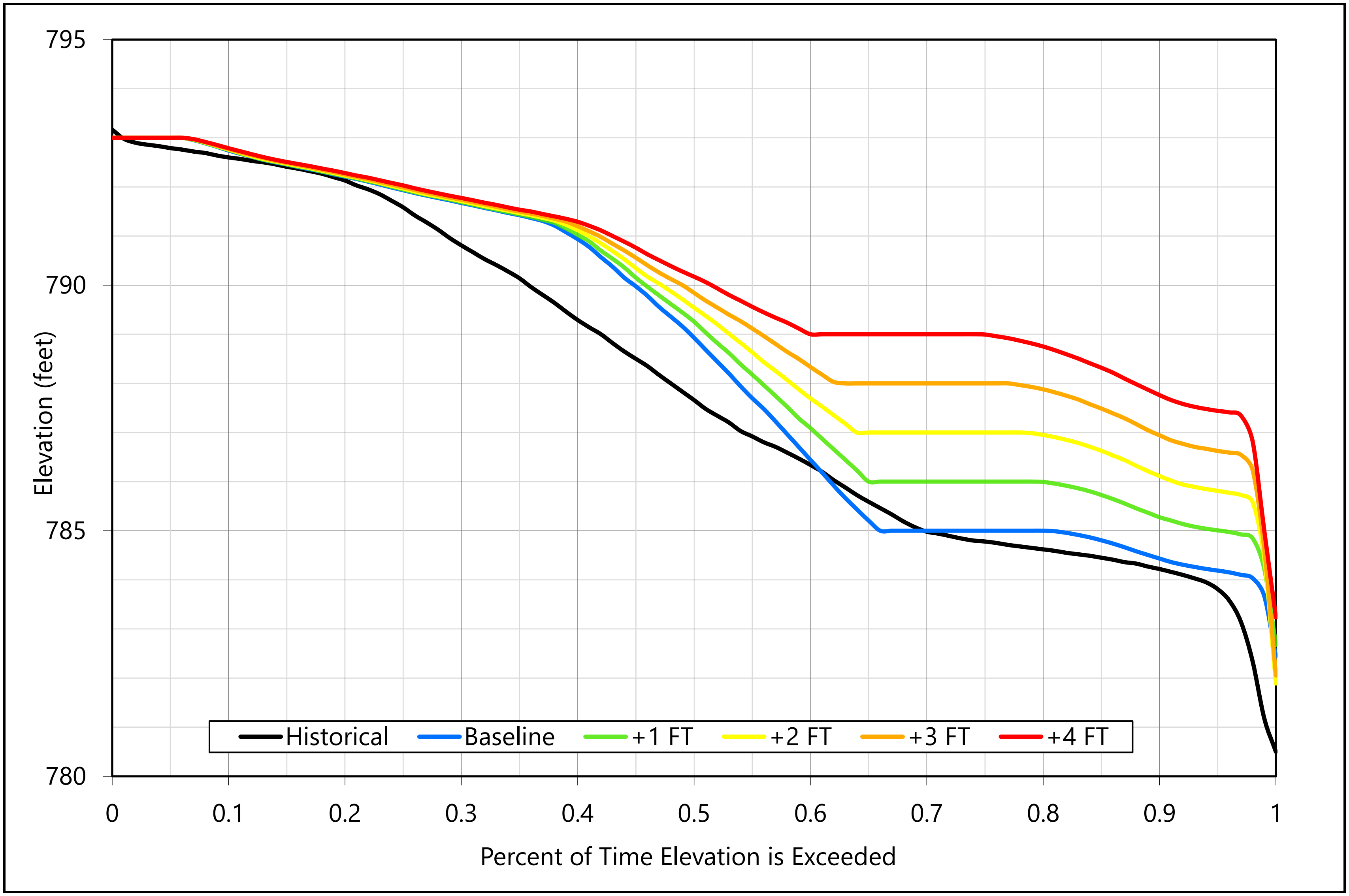


Figure 5-1 Annual Stage Duration Frequency Curve for Operating Curve Alternatives

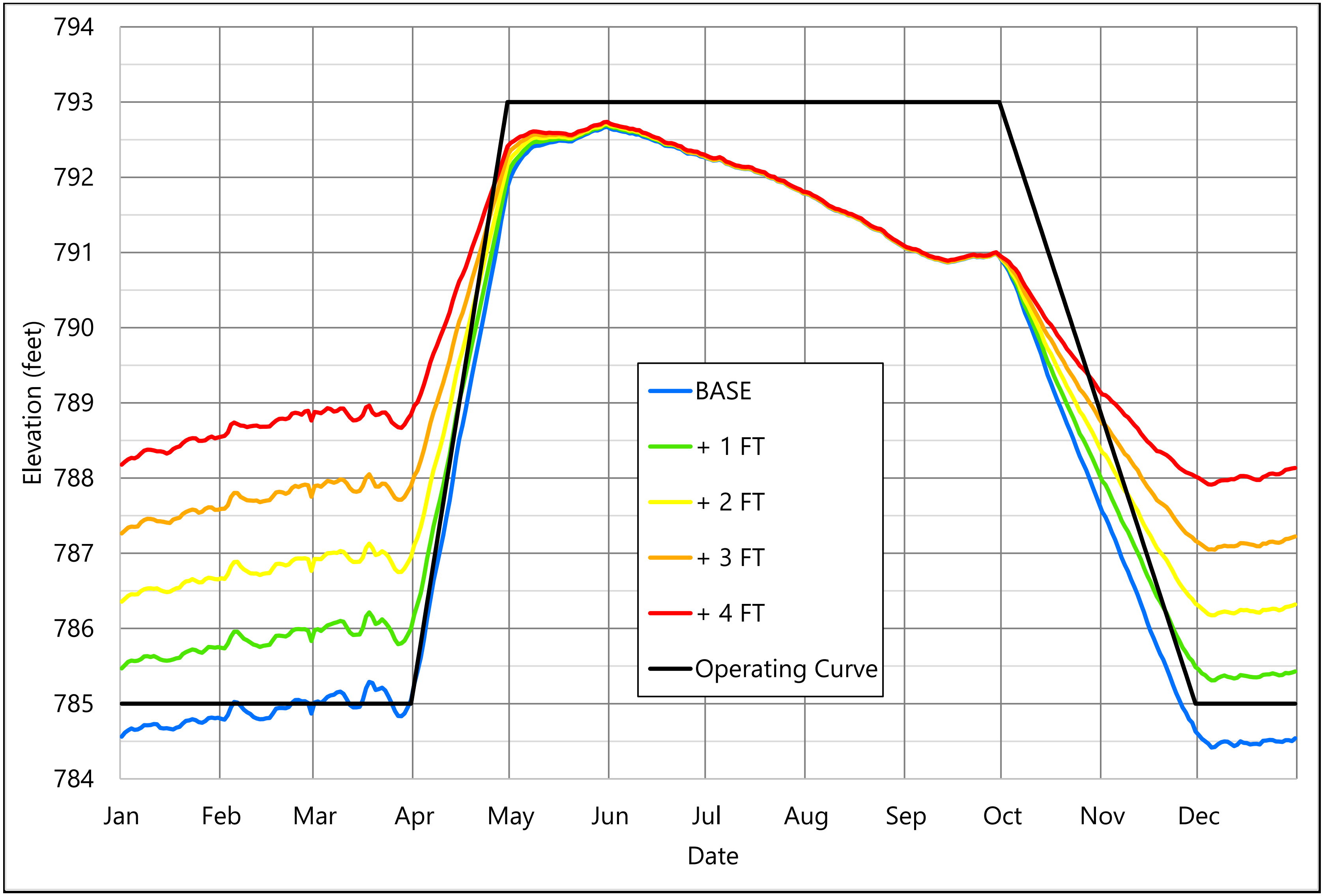


Figure 5-2 Average Daily Elevations for Operating Curve Alternatives

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.

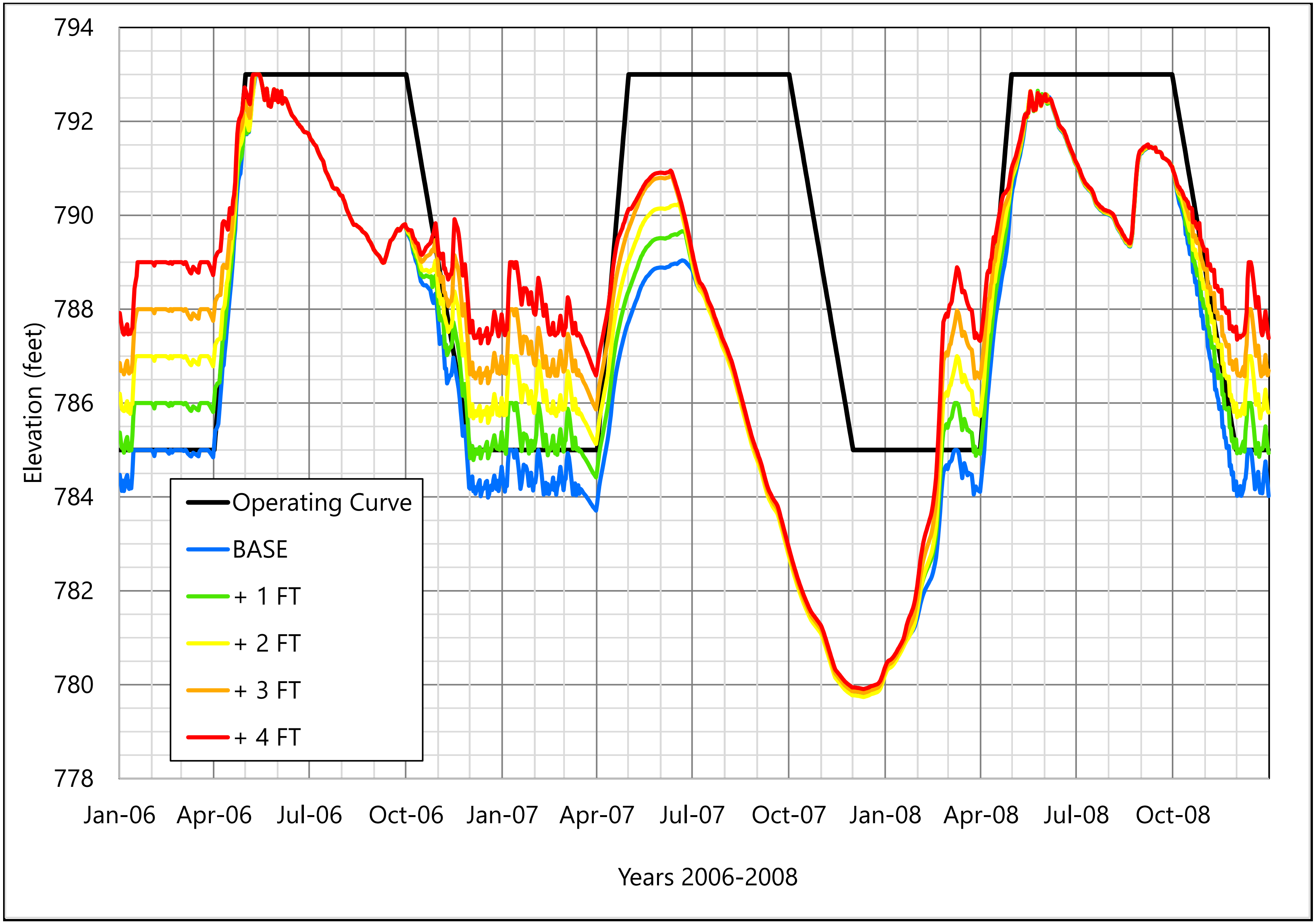


Figure 5-3 Effects of Winter Pool Increases 2006-2008

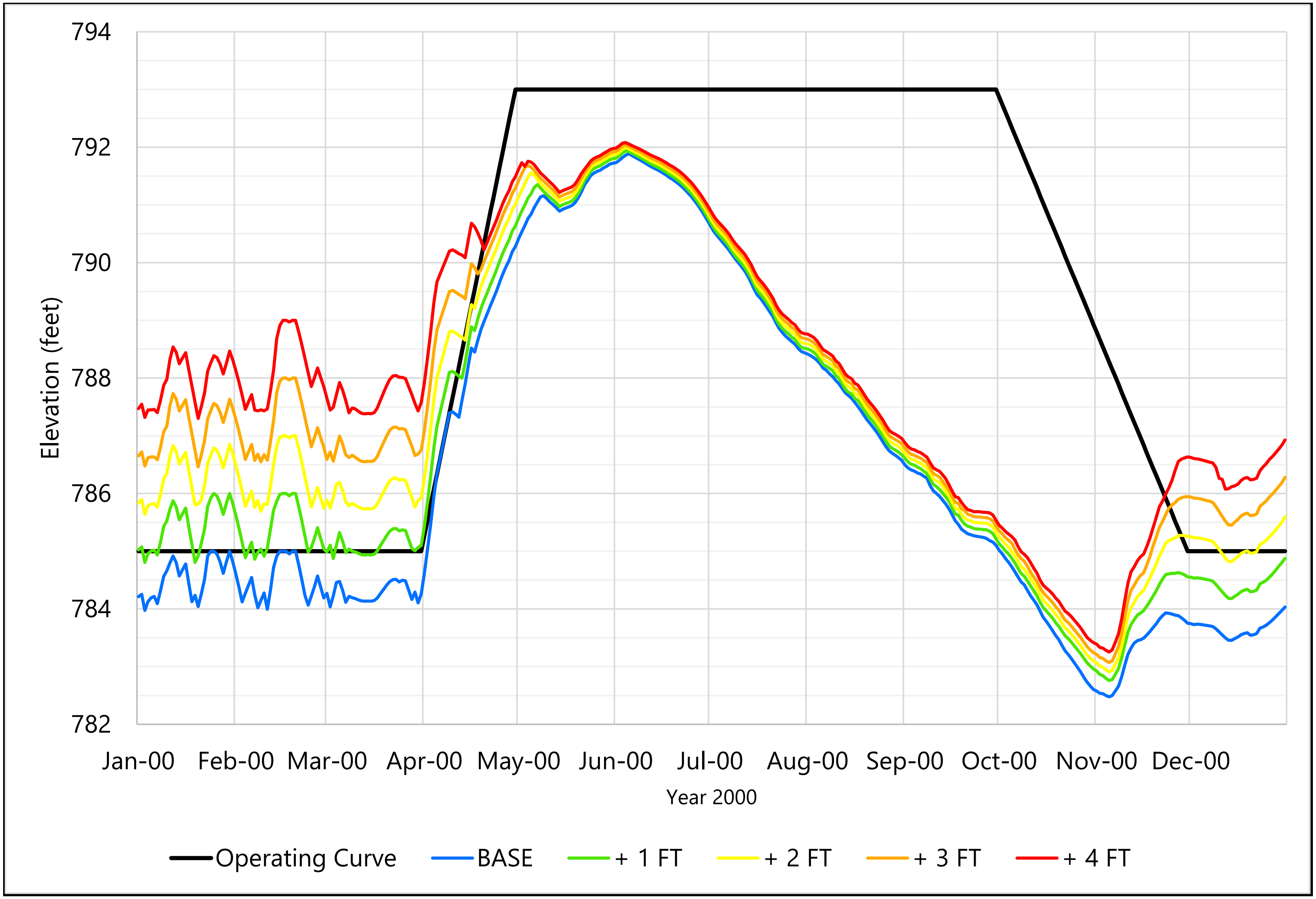


Figure 5-4 Effects of Winter Pool Increases 2000

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.

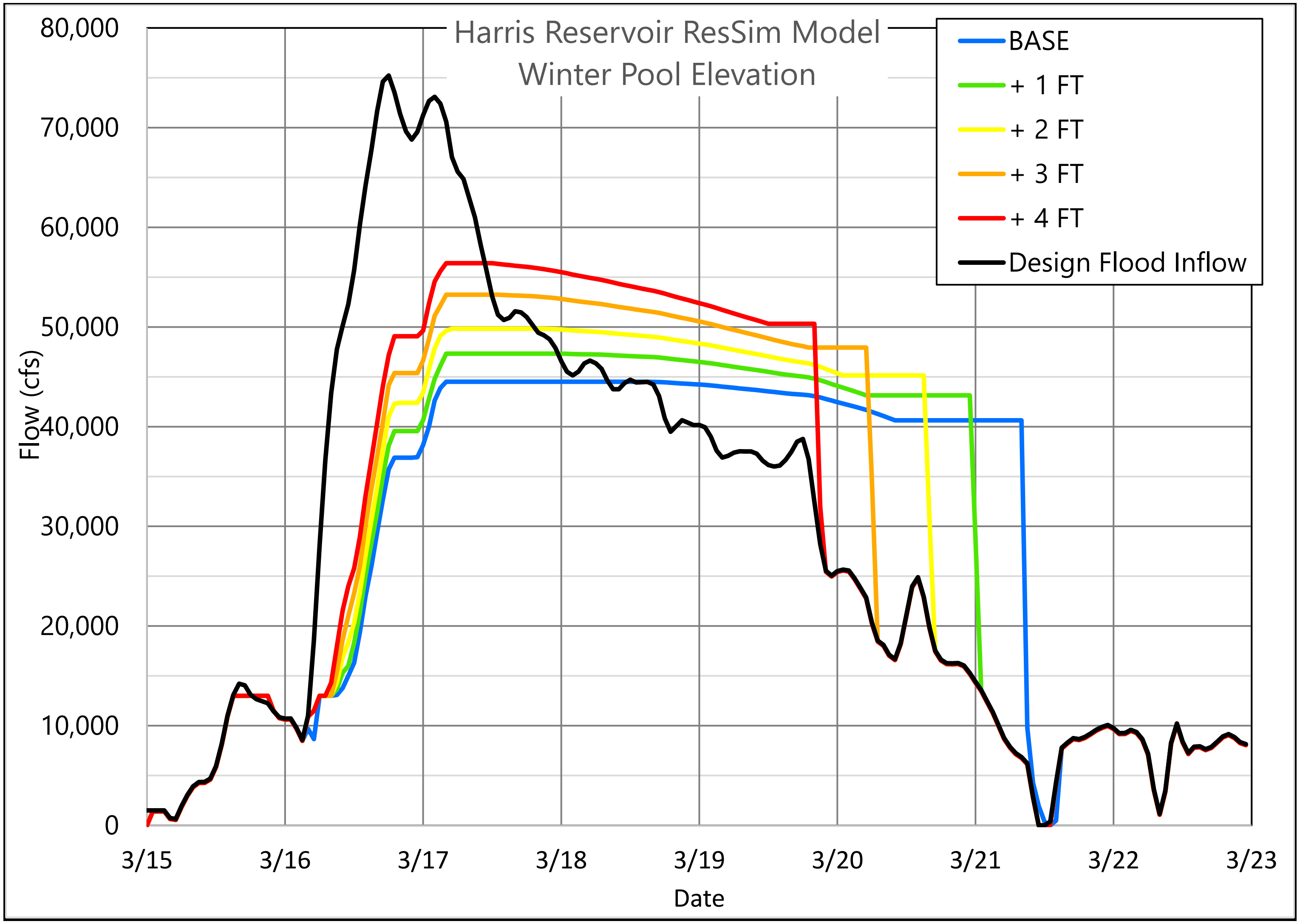


Figure 5-5 Outflow Hydrographs from the 100-Year Design Flood Routed through the Harris Reservoir ResSim Model

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.

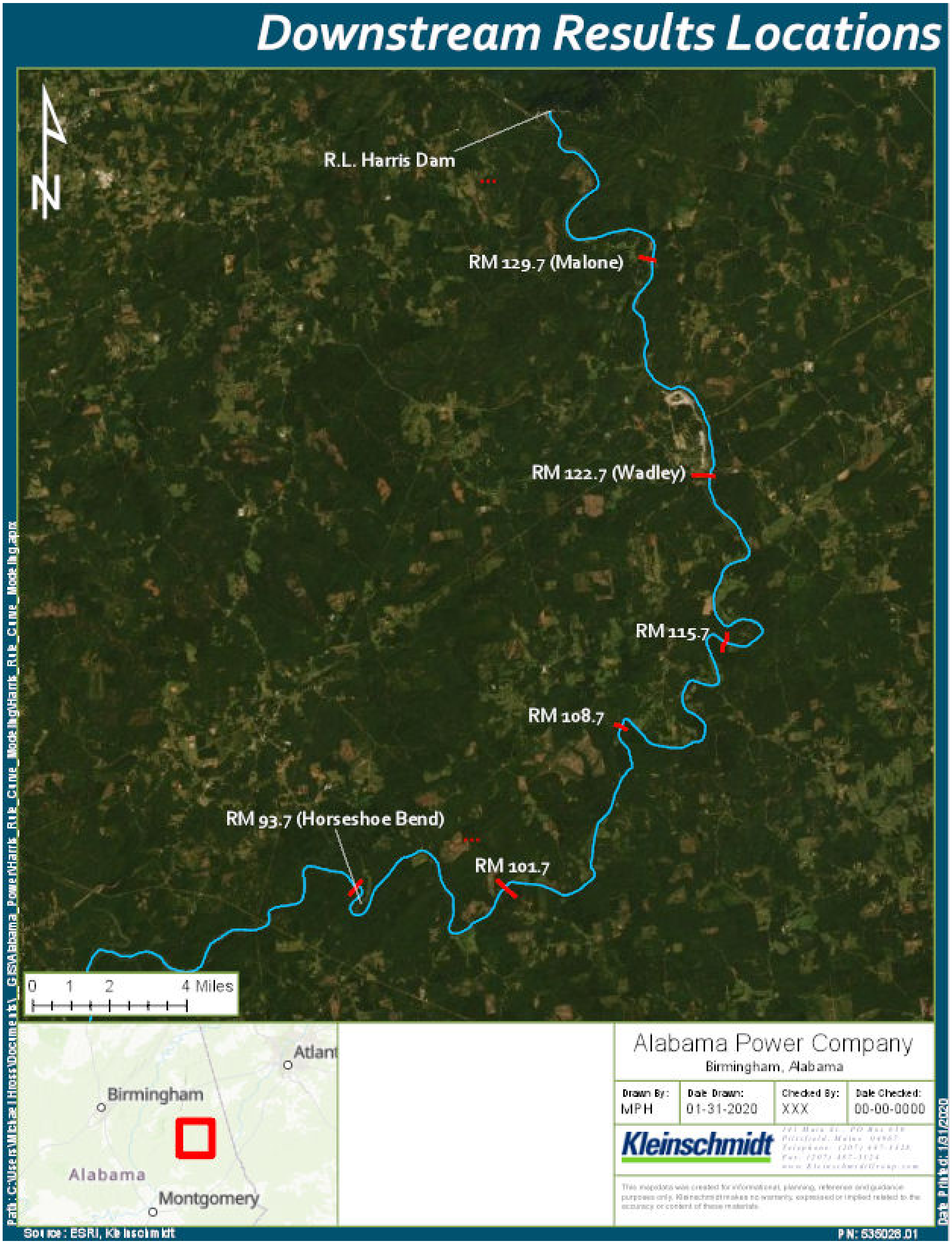


Figure 5-6 Location of Selected Areas to Illustrate Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

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. Table 5-2 shows the total increase in inundated area, measured in acres, resulting from the different winter pool alternatives. The values reflect the overbank areas outside of the river that are inundated by any amount of depth. Figures 5-7 through 5-12 show inundation boundaries for the baseline and four winter pool increase alternatives run using the HEC-RAS model.

Table 5-2 Total Acres Inundated Downstream of Harris Dam Based on Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

Elevation	Total Inundation Area (acres)	Increase over Baseline (acres)	Percent Increase over Baseline
Baseline (785 feet msl)	6,105	-	-
+ 1 foot	6,403	298	4.9%
+ 2 feet	6,590	485	7.9%
+ 3 feet	6,791	686	11.2%
+ 4 feet	6,995	889	14.6%

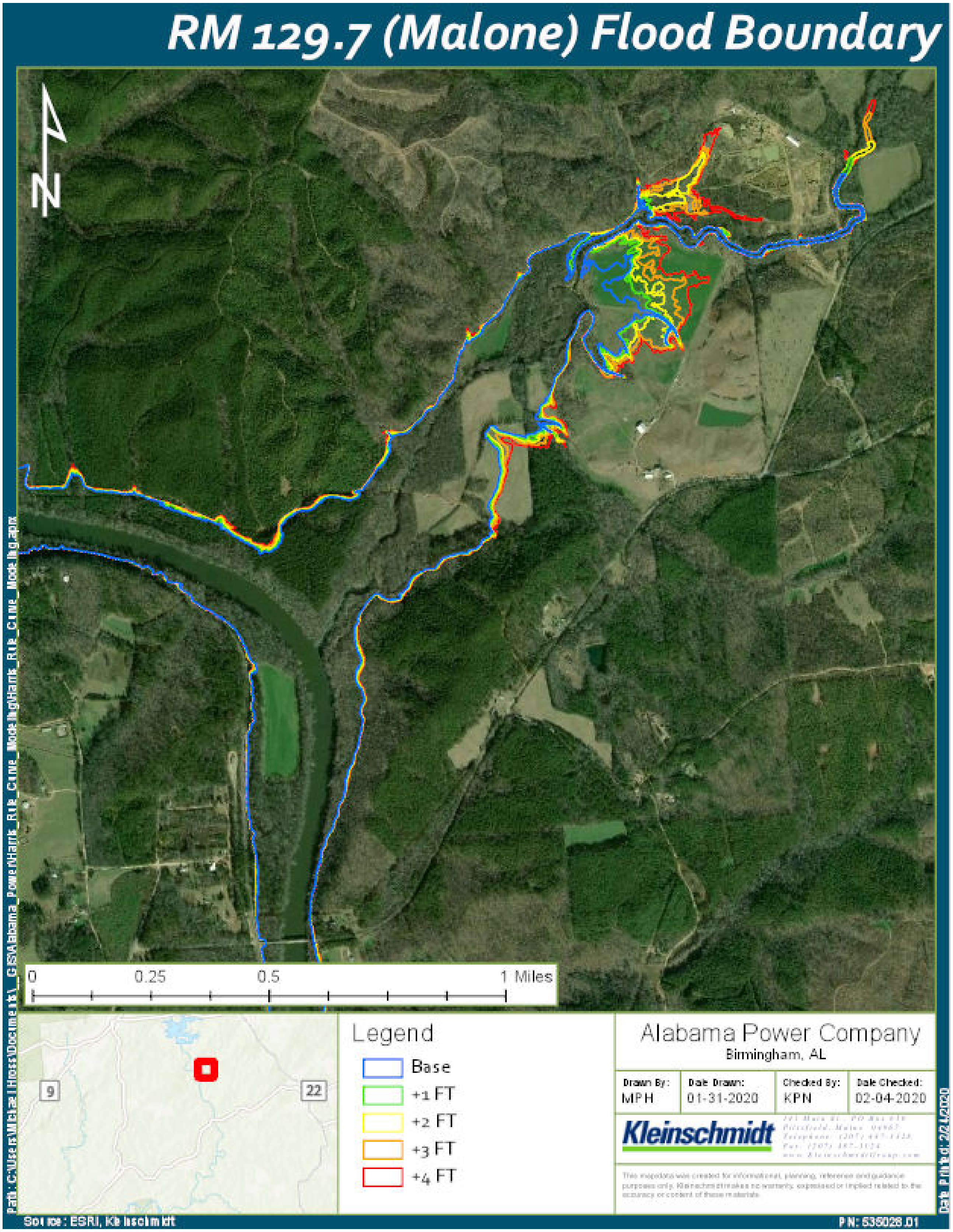


Figure 5-7 Extent of Flooding at RM 129.7 (Malone) from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

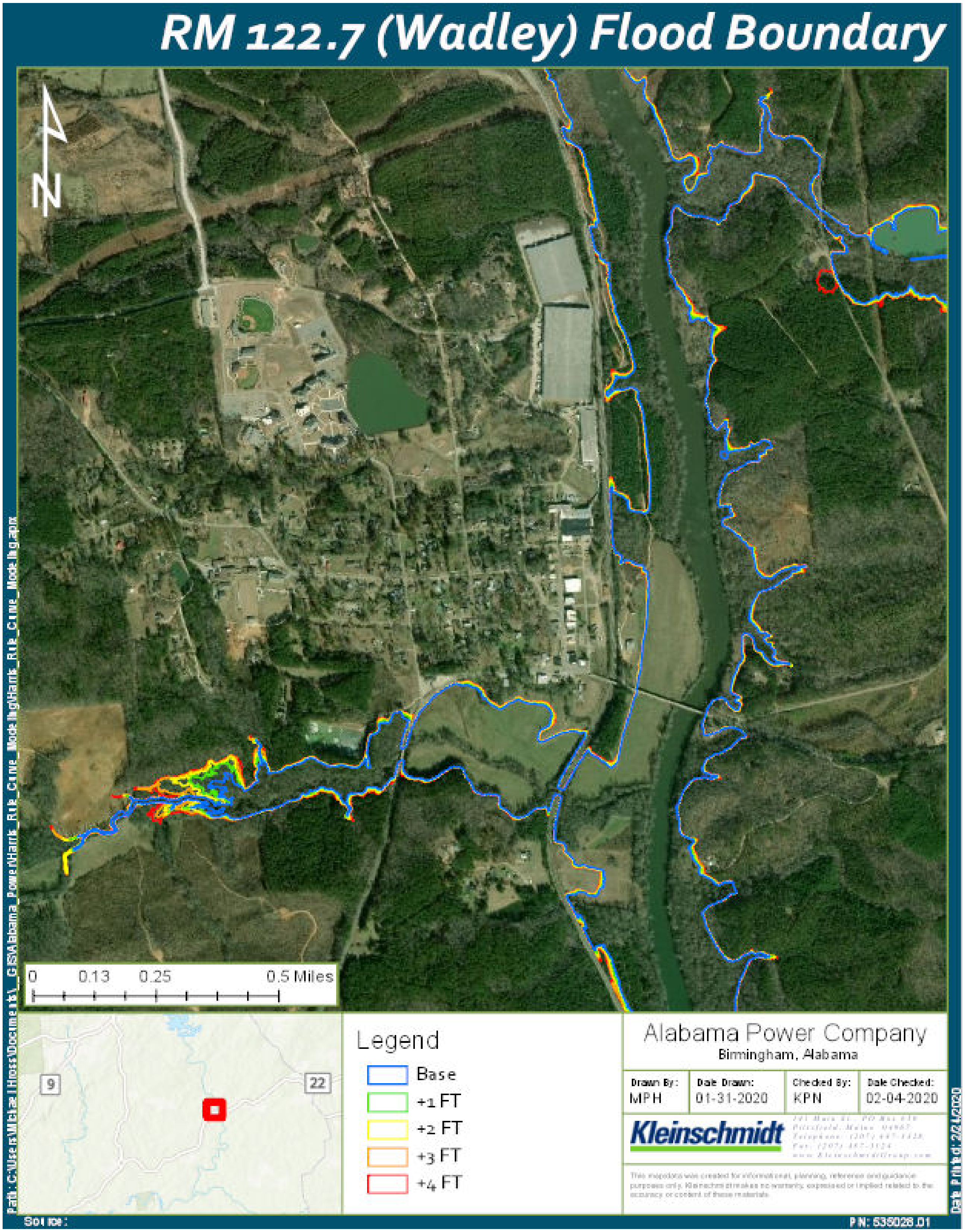


Figure 5-8 Extent of Flooding at RM 122.7 (Wadley) from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

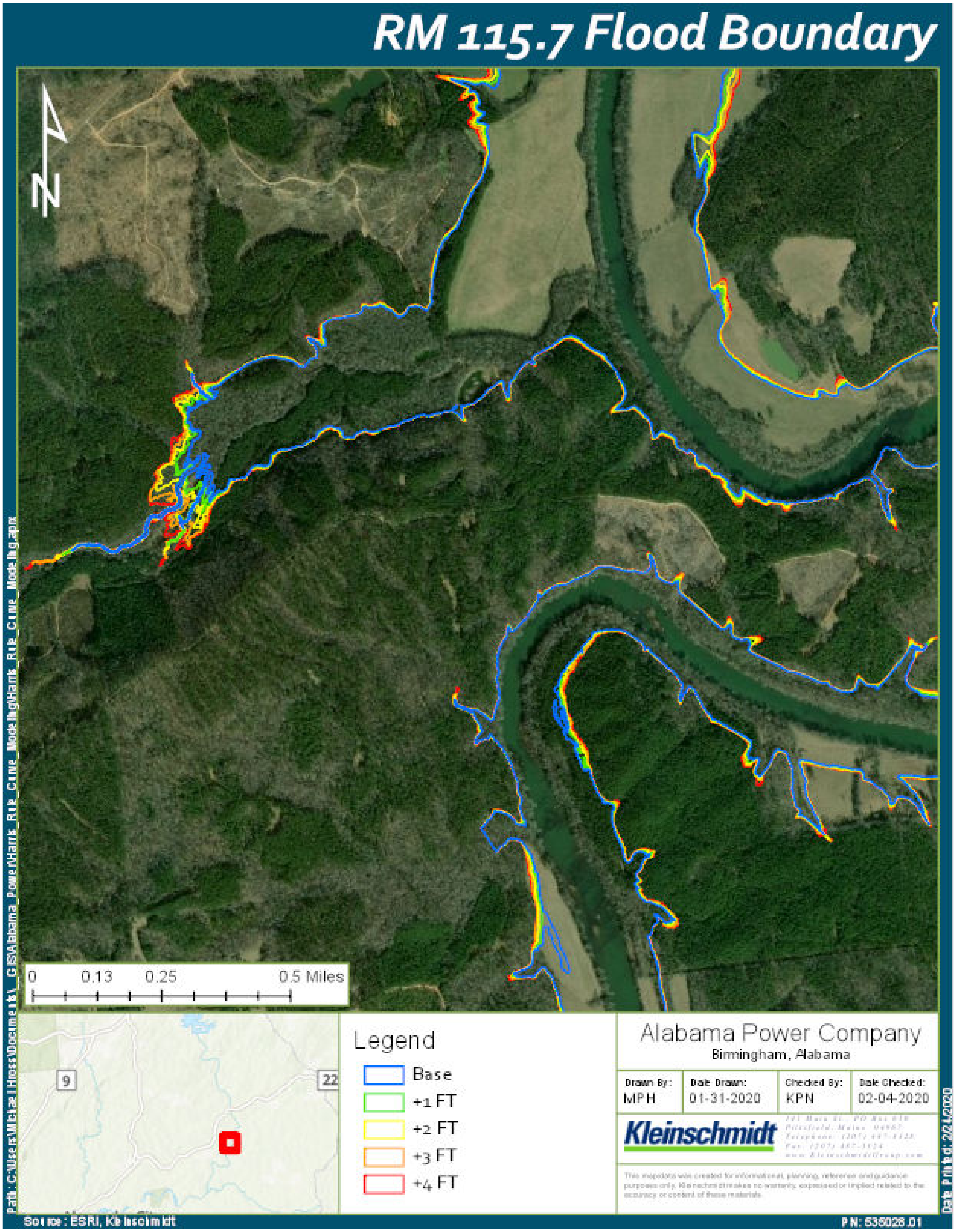


Figure 5-9 Extent of Flooding at RM 115.7 from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

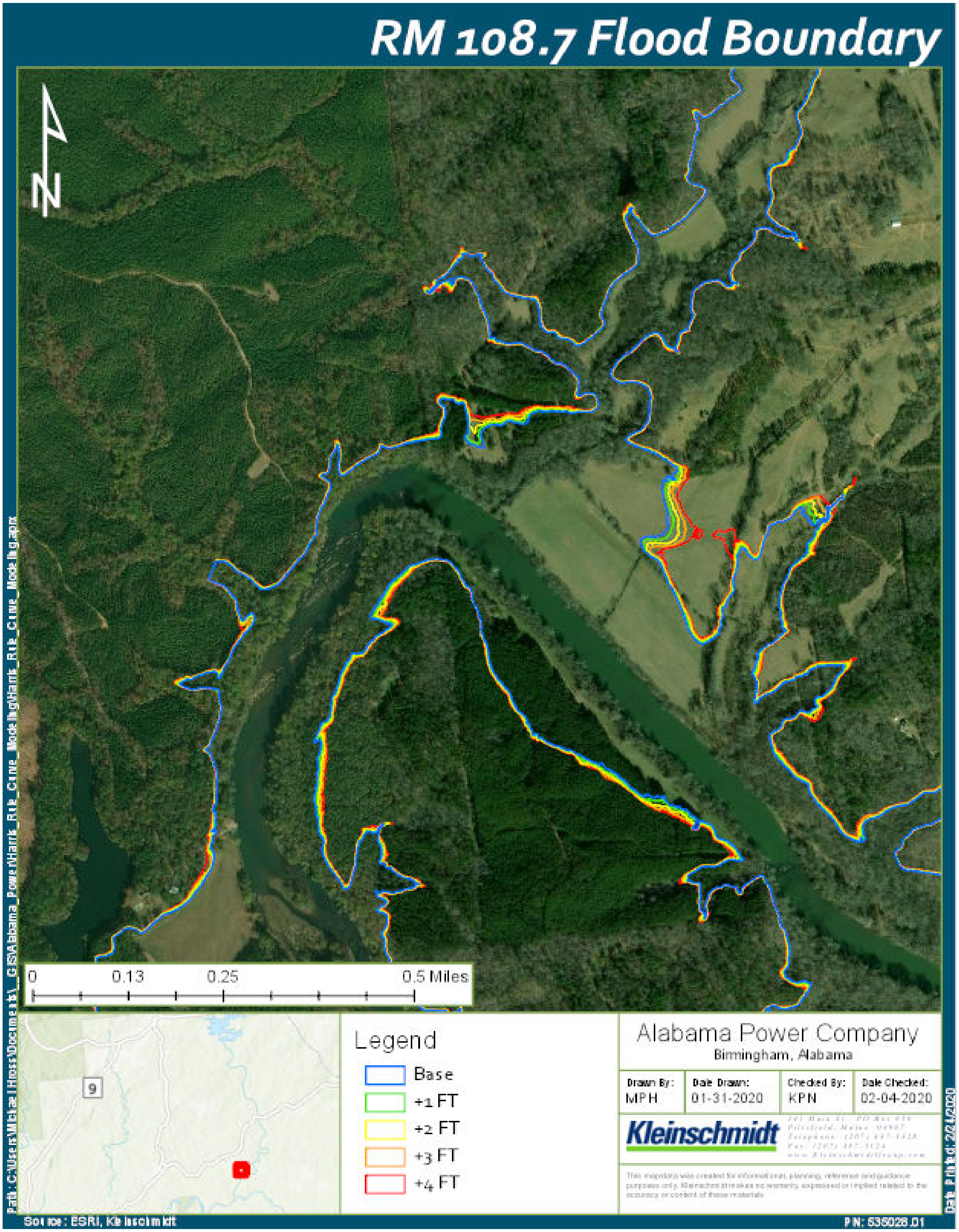


Figure 5-10 Extent of Flooding at RM 108.7 from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

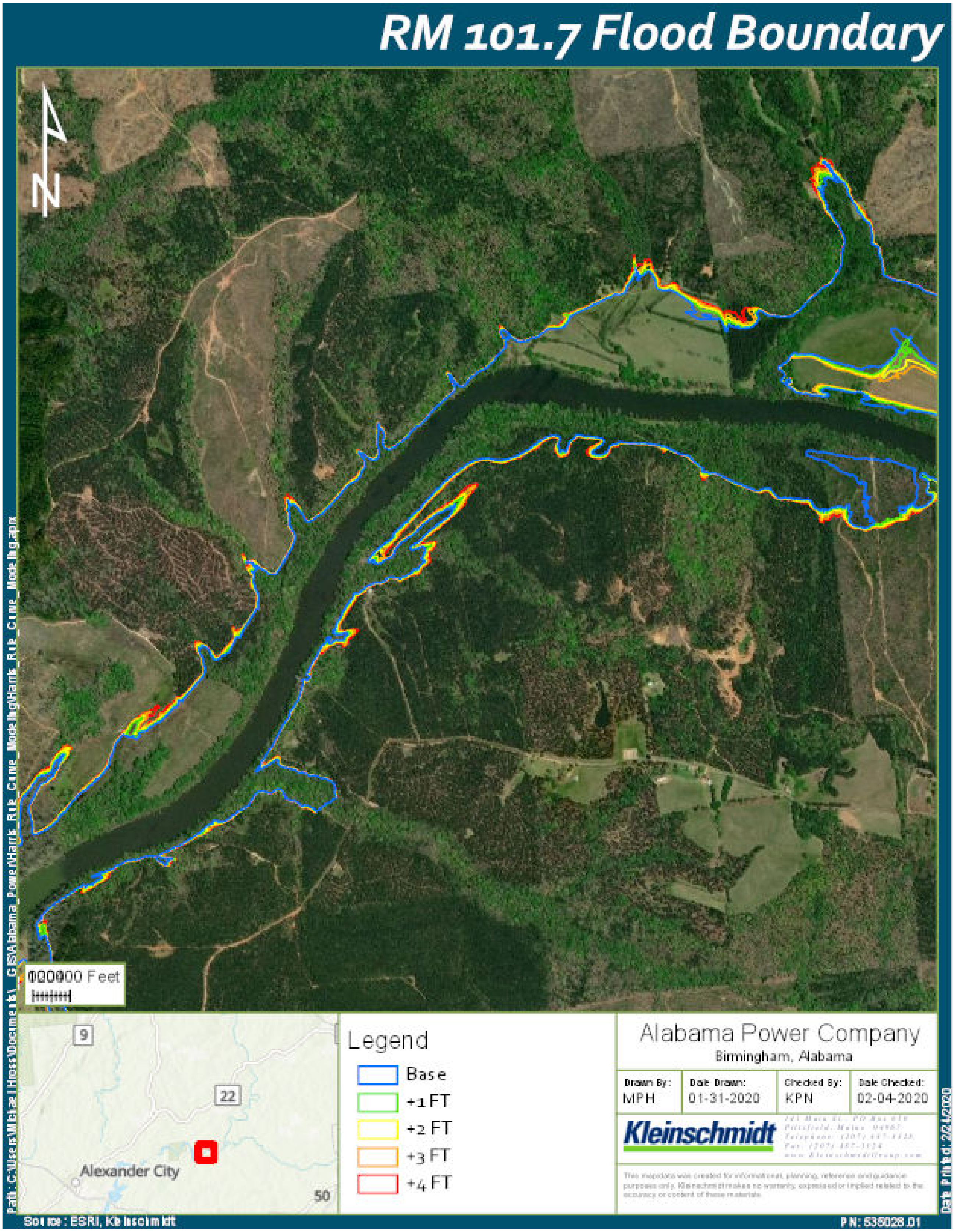


Figure 5-11 Extent of Flooding at RM 101.7 from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

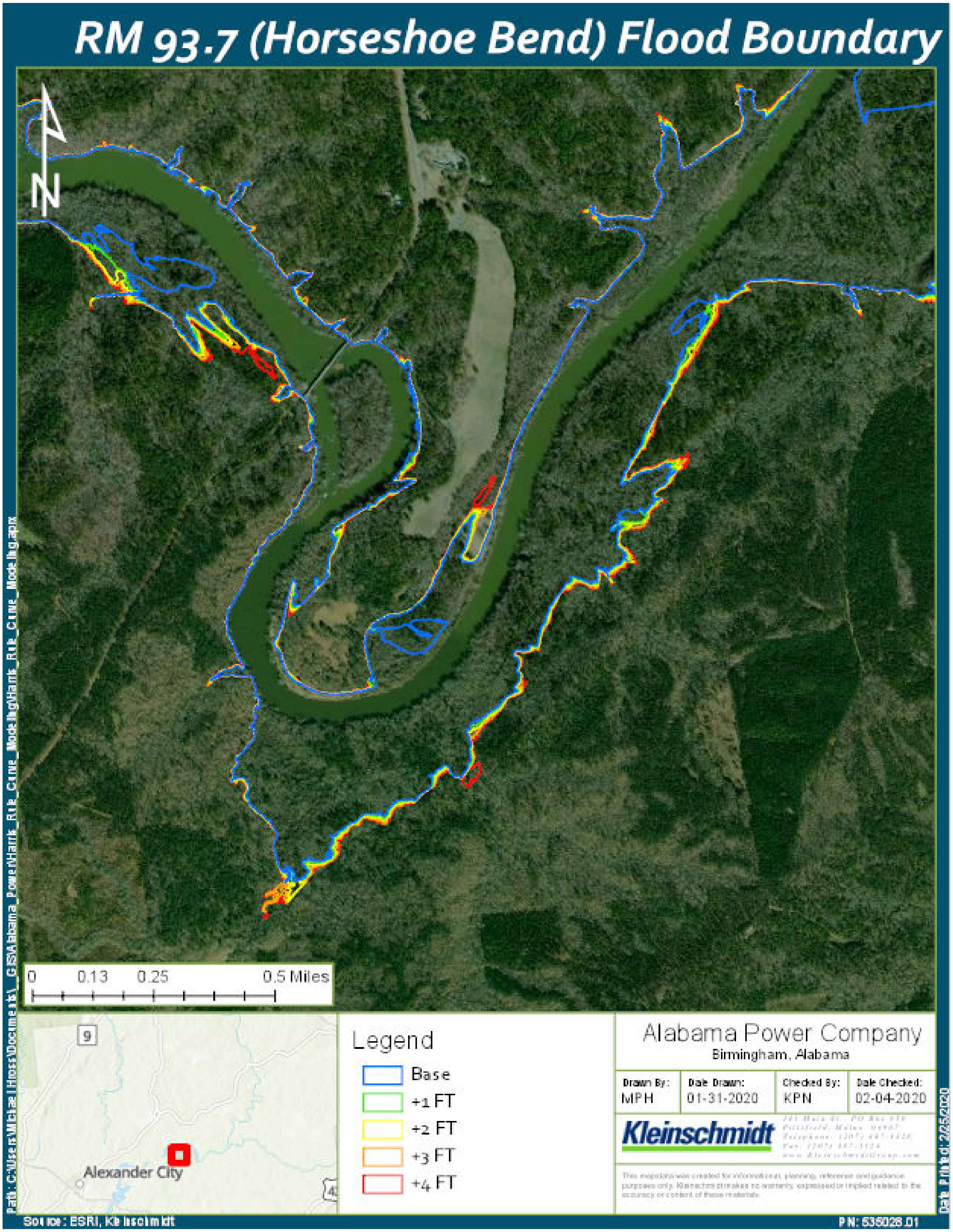


Figure 5-12 Extent of Flooding at RM 93.7 (Horseshoe Bend) from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

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 5-3 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 5-3 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 5-3 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. The increased flooding depth generally decreases moving downstream from Harris Dam, as is expected as the flood hydrographs are attenuated (i.e., the volume of discharge is stretched out over time, reducing the peak of the hydrograph) due to flow being stored in the floodplain adjacent to the river. However, there is a shoal complex between RM 113.6 and RM 114.8 that is constricting the flow and causing the incremental water surface rise at RM 115.7 to be greater than might be expected due to its distance from the dam and the trend of decreasing rise exhibited at the other locations.

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 5-4 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 5-4 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	35	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.

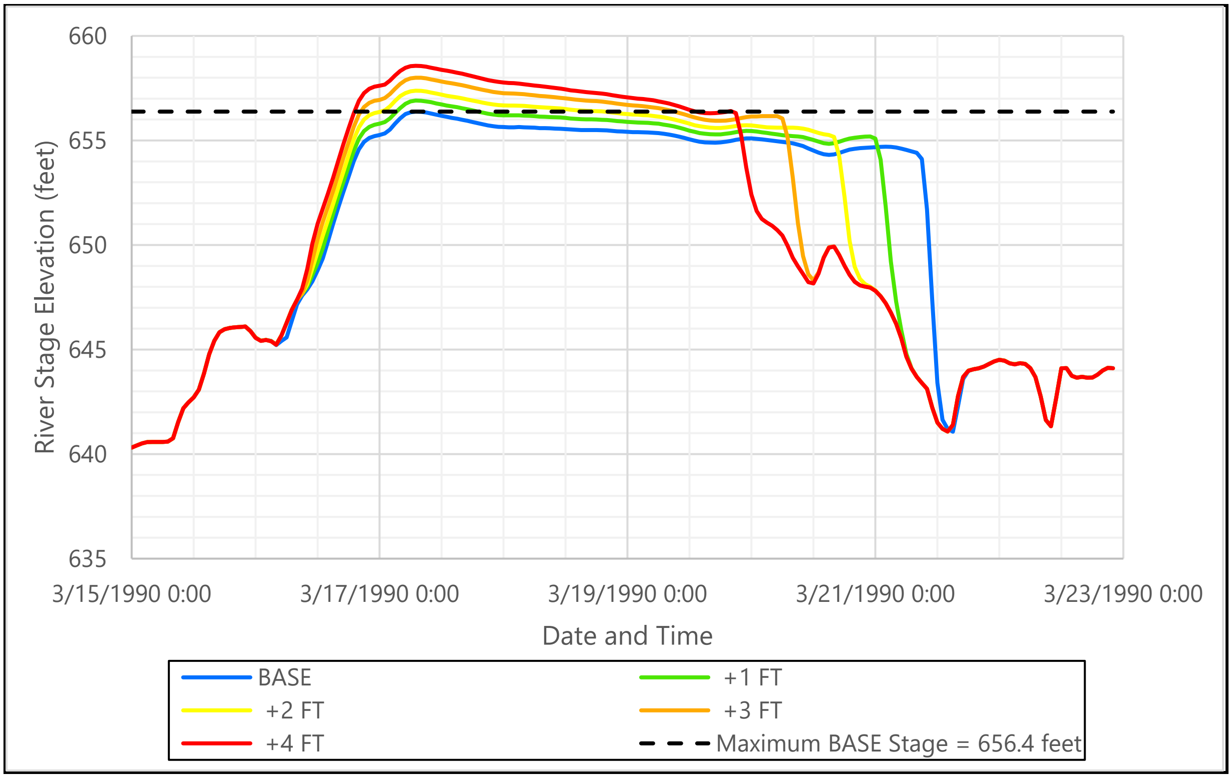


Figure 5-13 Tallapoosa River Stage Hydrographs at RM 129.7 (Malone) from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

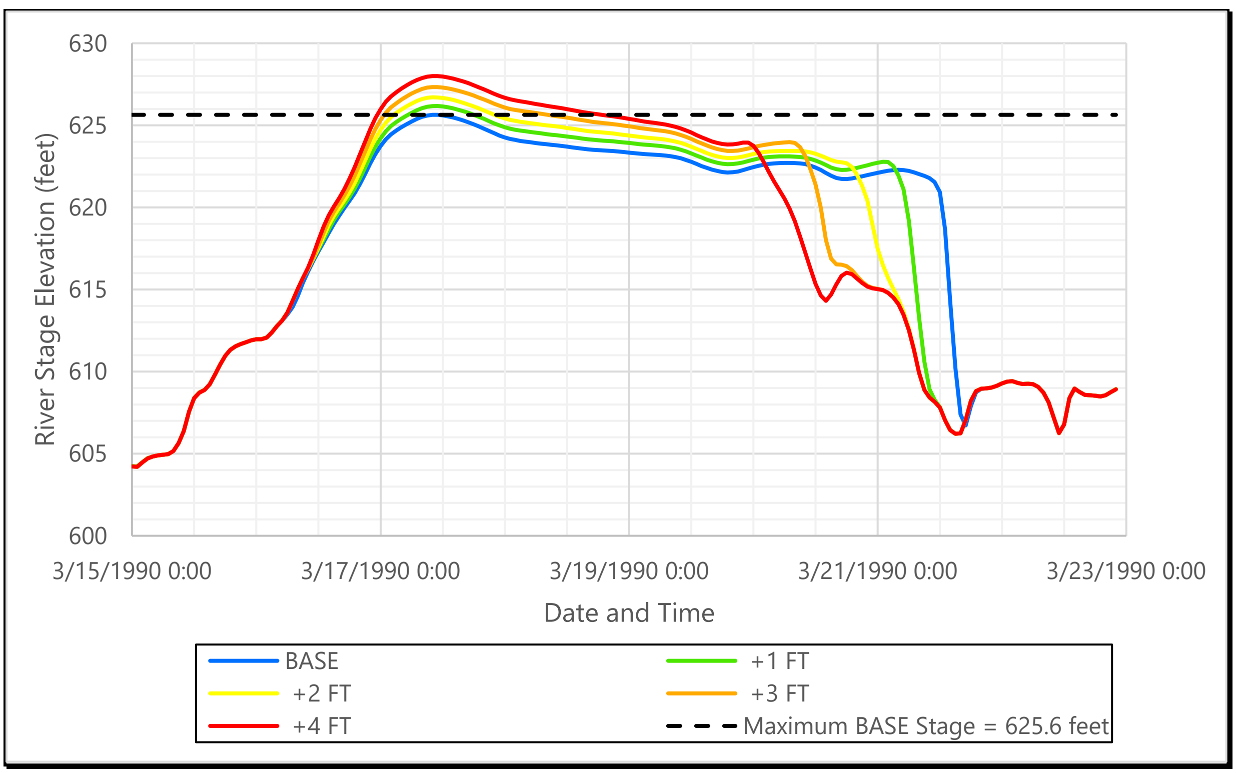


Figure 5-14 Tallapoosa River Stage Hydrographs at RM 122.7 (Wadley) from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

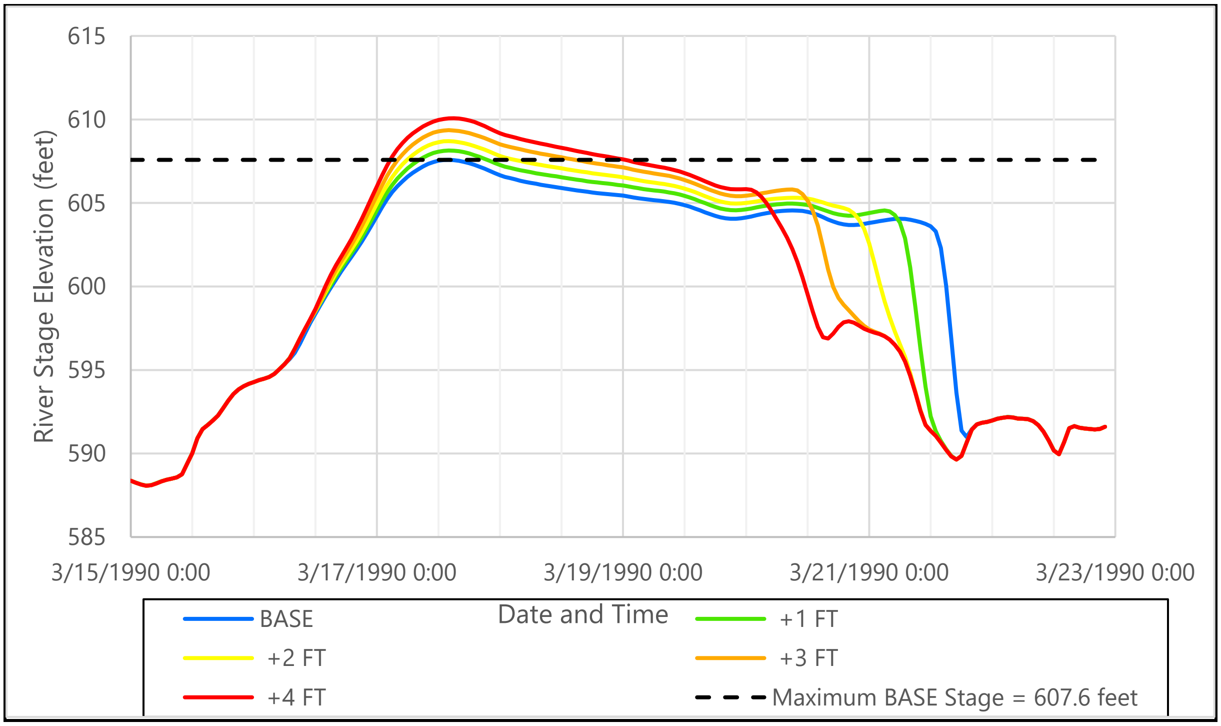


Figure 5-15 Tallapoosa River Stage Hydrographs at RM 115.7 from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

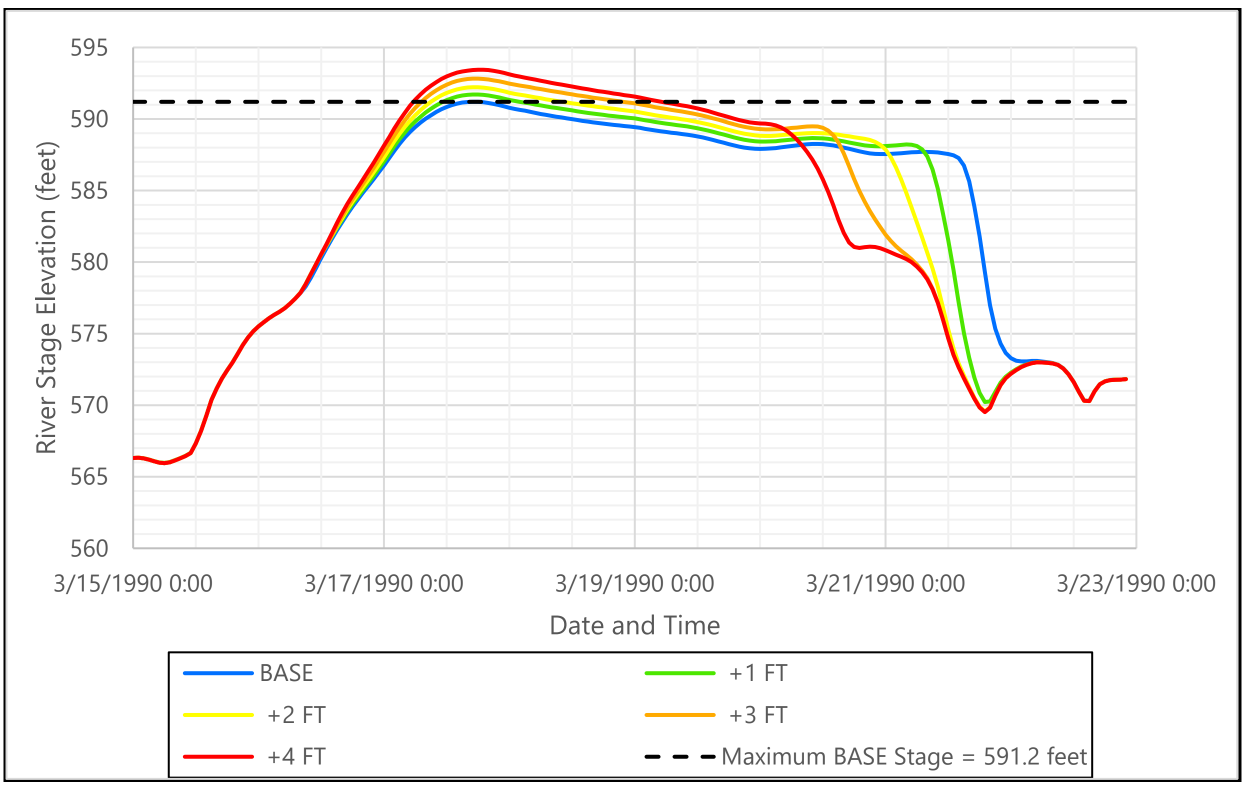


Figure 5-16 Tallapoosa River Stage Hydrographs at RM 108.7 from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

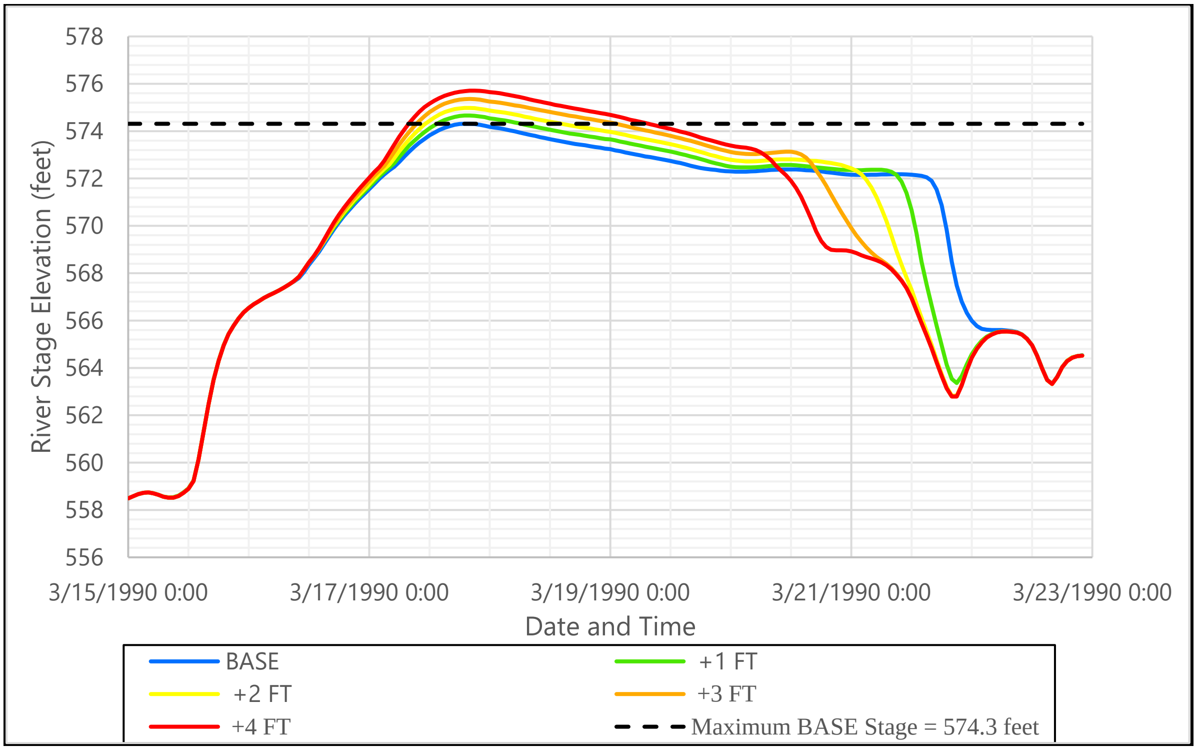


Figure 5-17 Tallapoosa River Stage Hydrographs at RM 101.7 from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

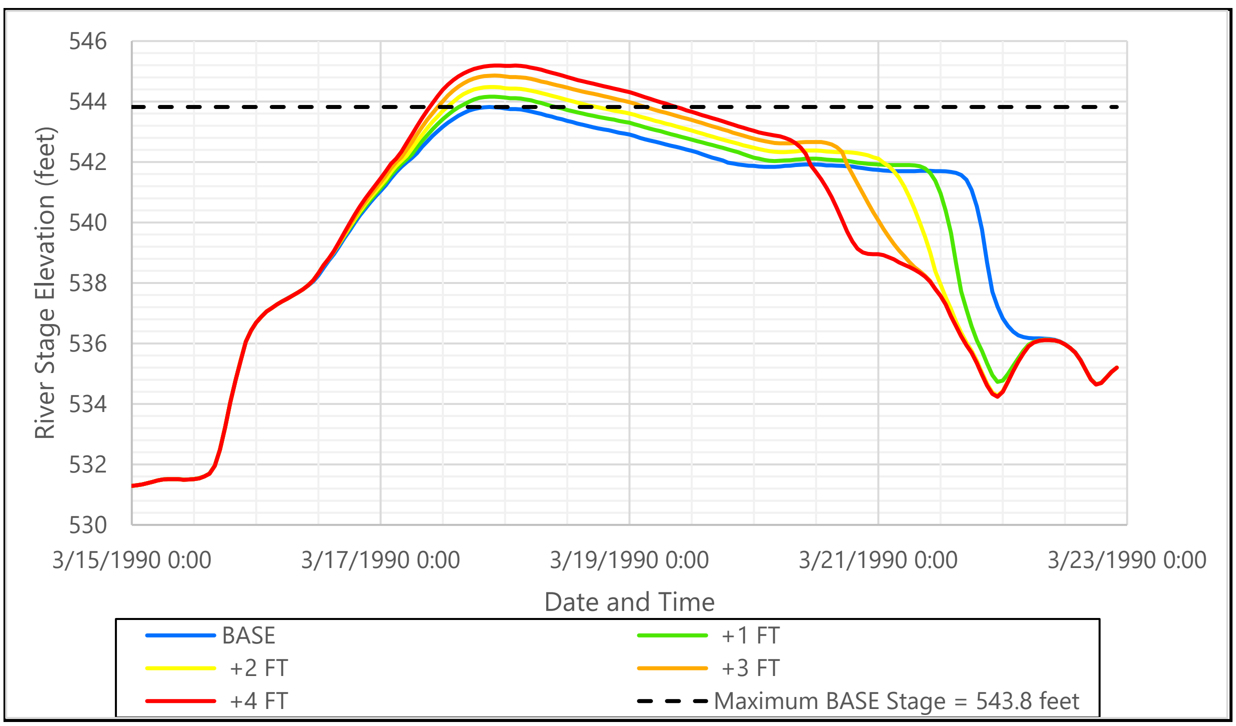


Figure 5-18 Tallapoosa River Stage Hydrographs at RM 93.7 (Horseshoe Bend) from Results of 100-Year Design Flood in Harris-Martin HEC-RAS Model

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-foot increase in winter pool for the modeled 1990 spill event.

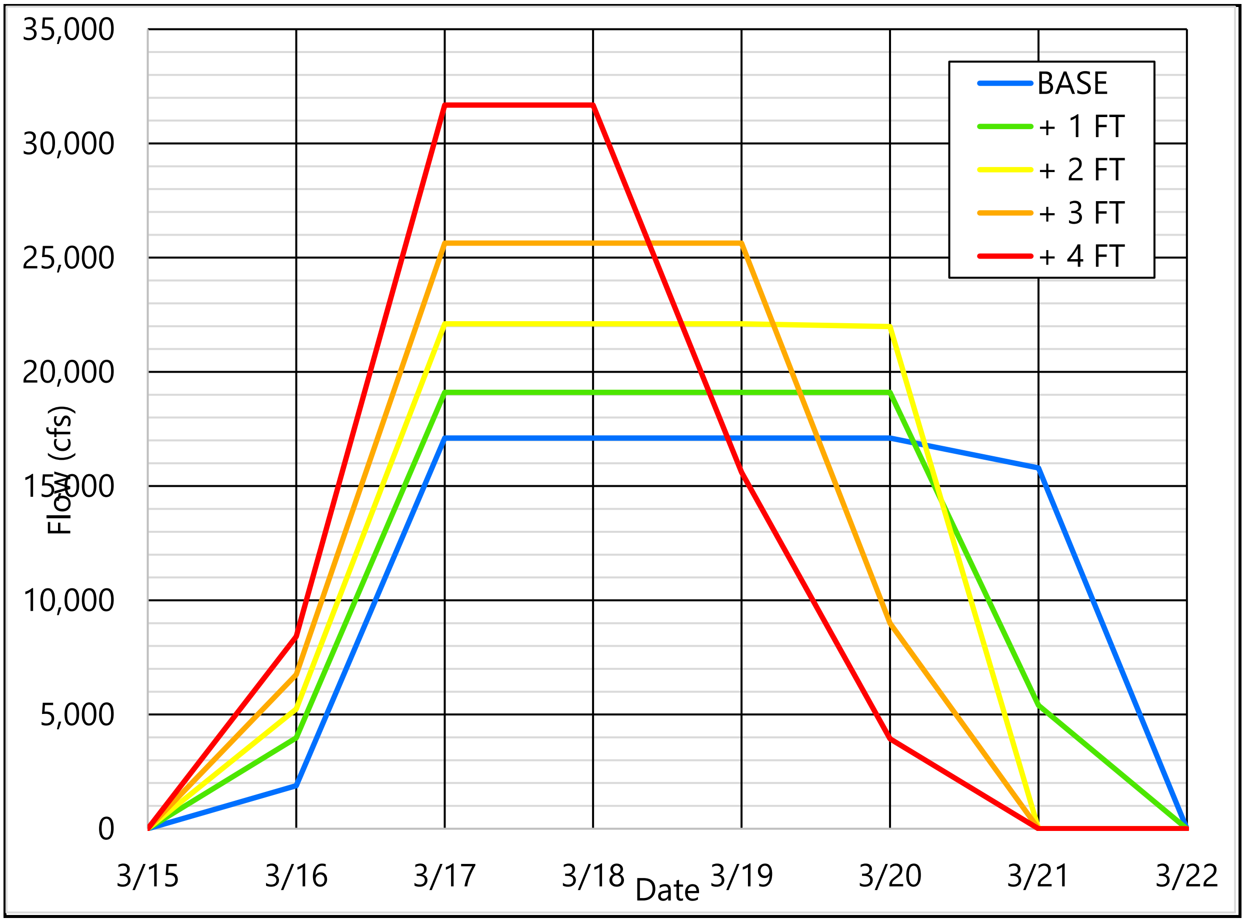


Figure 5-19 Change in Magnitude and Duration of Release for Modeled 1990 Spill Event

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 foot increase in winter pool, the frequency of spill increases, as shown in Table 5-4. The frequency of spill with a 4 feet 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 5-5 Percentage of Time Spent in Turbine Capacity and Spillway Operations for Each Alternative

Elevation	Spillway Operations	Turbine Capacity
Baseline (785 feet 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%

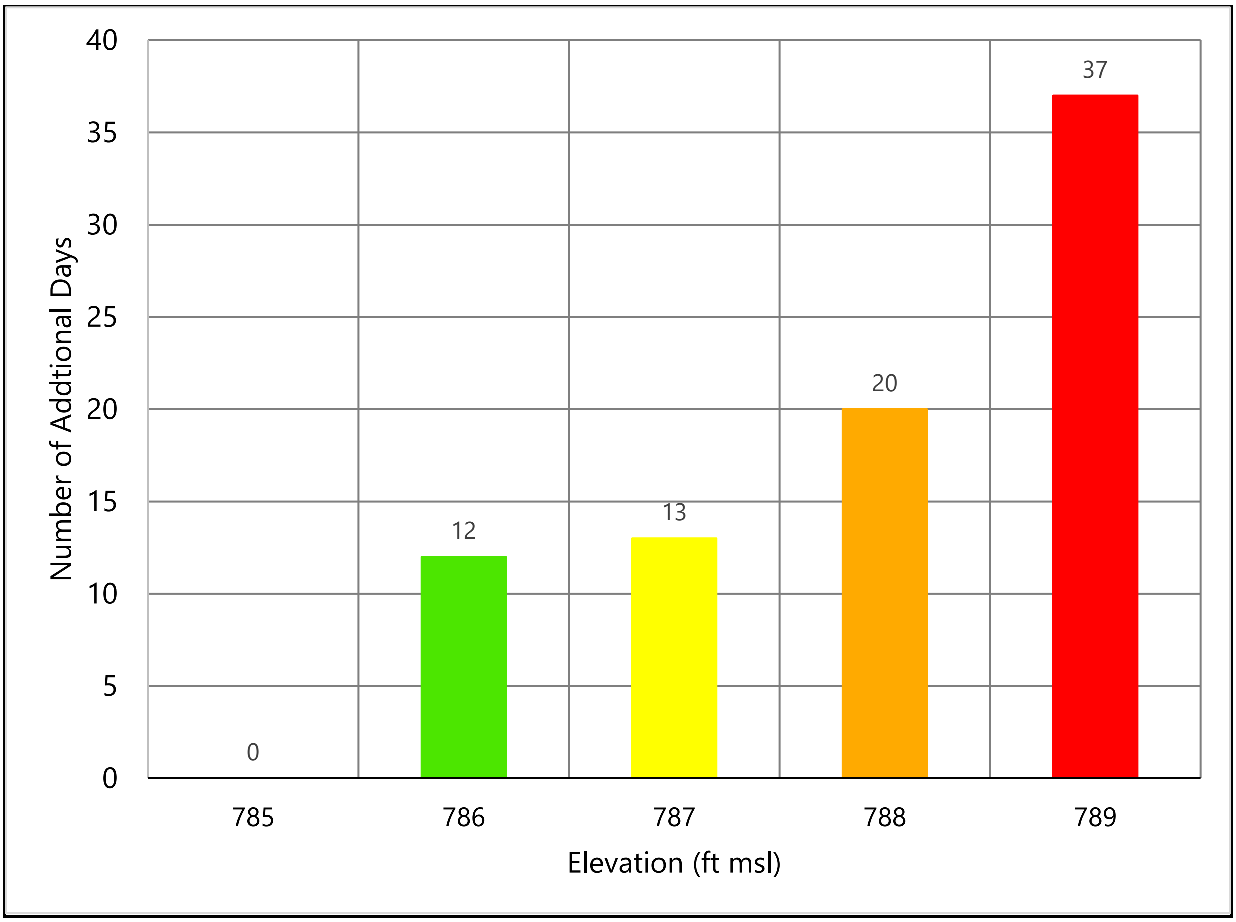


Figure 5-20 Additional Days of Spill for Each Alternative at Harris Reservoir

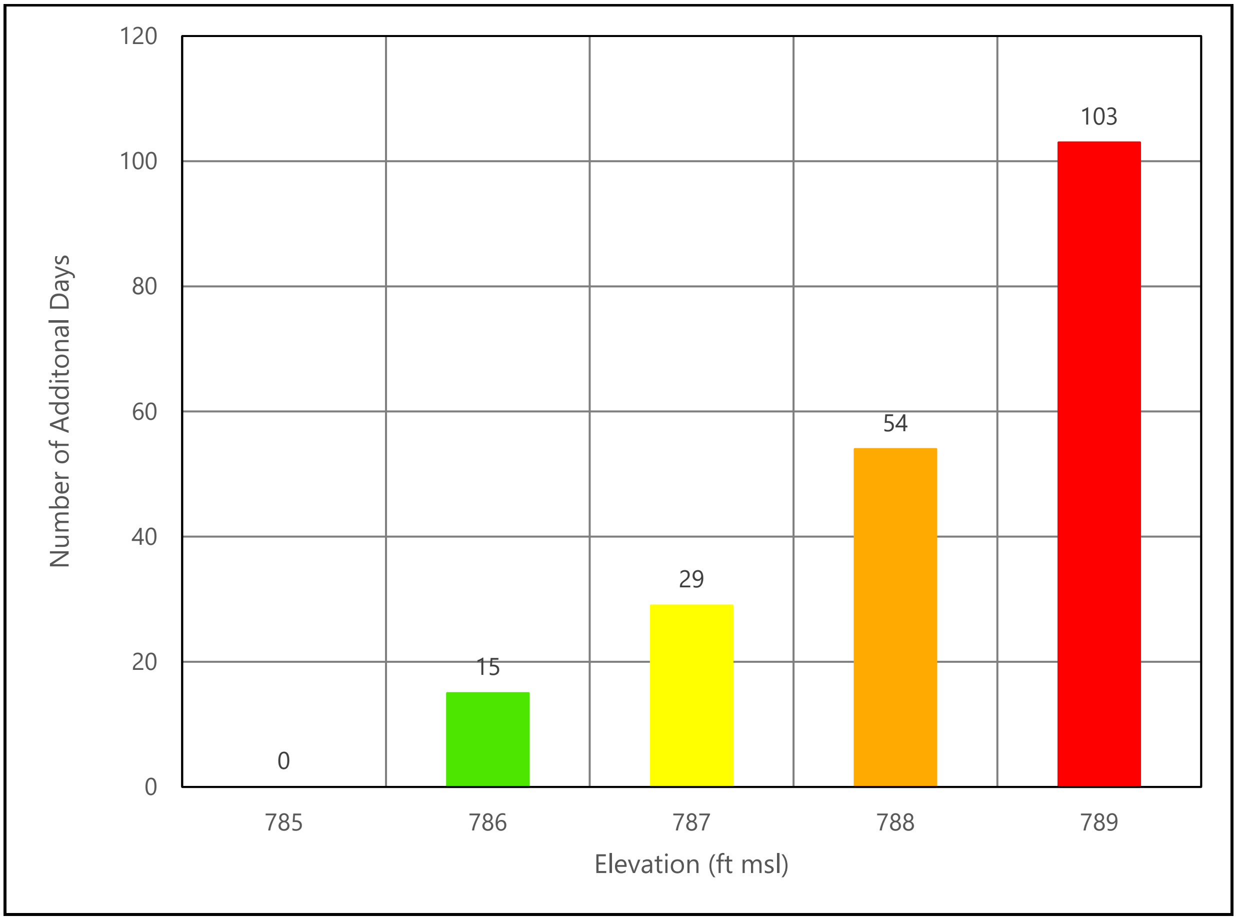


Figure 5-21 Additional Days of Capacity Operations for Each Alternative at Harris Reservoir

5.3 Navigation

Each of the alternatives were evaluated to determine impacts to navigation releases (Table 5-6) The number of days over the period of record that each alternative supported a navigation channel of 9 feet, 7.5 feet, 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 5-6 Winter Pool Alternatives at Harris Dam and Navigation Releases

Percentage of Time in Each Navigation Level					
Navigation Channel Depth	**Baseline (785 feet msl)**	**+1 foot**	**+2 feet**	**+3 feet**	**+4 feet**
9.0 feet	73%	73%	73%	73%	73%
7.5 feet	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 5-7). 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 5-7 Evaluation of Drought Operations and Winter Pool Alternatives

Percent of Time in Each Drought Intensity Level (DIL)					
DIL	**Baseline (785 feet 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	• Phase 1 results • FERC-approved Recreation Evaluation Study

Resource	Method	
	Lake Harris	Tallapoosa River Downstream of Harris Dam through Horseshoe Bend
	• LIDAR data	• 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

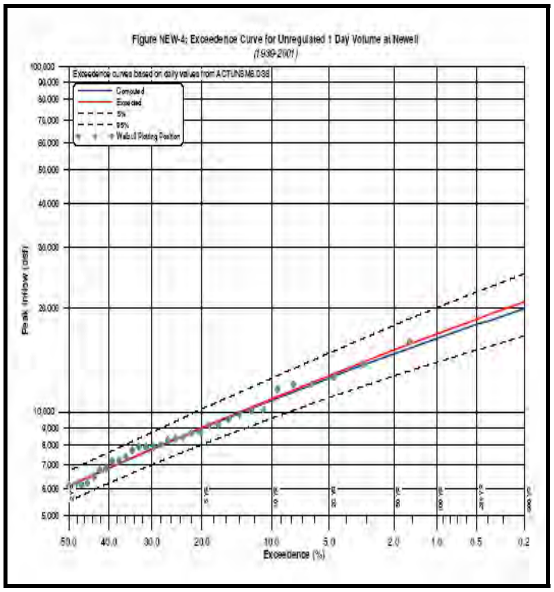
WCM	Water Control Manual
WMA	Wildlife Management Area
WMP	Wildlife Management Plan
WQC	Water Quality Certification

APPENDIX B

TALLAPOOSA RIVER BASIN FLOOD FREQUENCY ANALYSIS

TALLAPOOSA RIVER BASIN

FLOOD FREQUENCY ANALYSIS



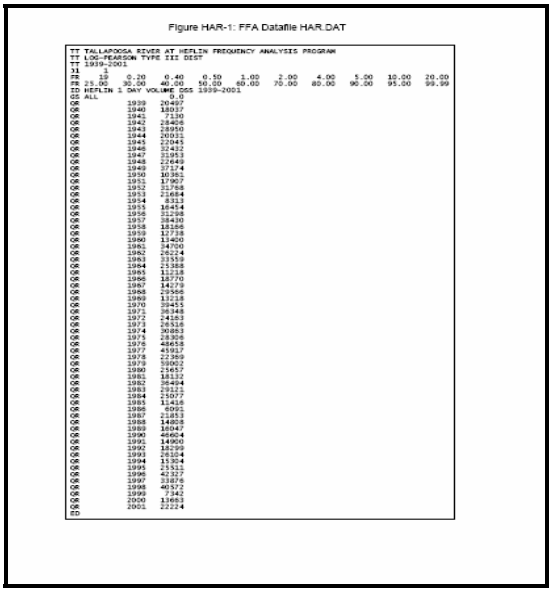


Figure HAR-1: FFA Datafile HAR.DAT

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TT 1939-2001
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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
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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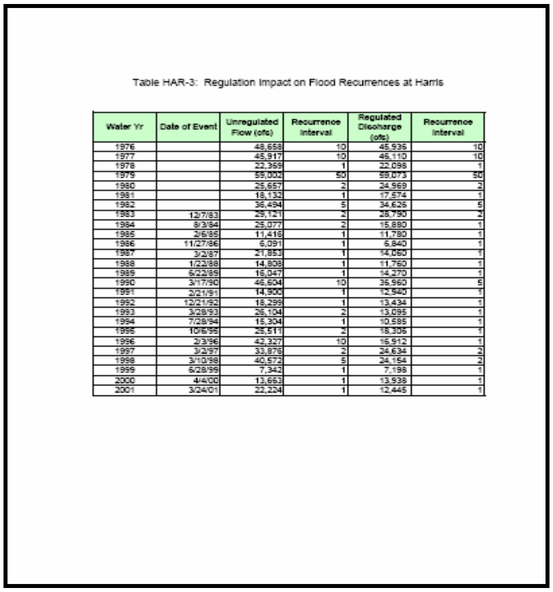

Table HAR-3: Regulation Impact on Flood Recurrences at Harris

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

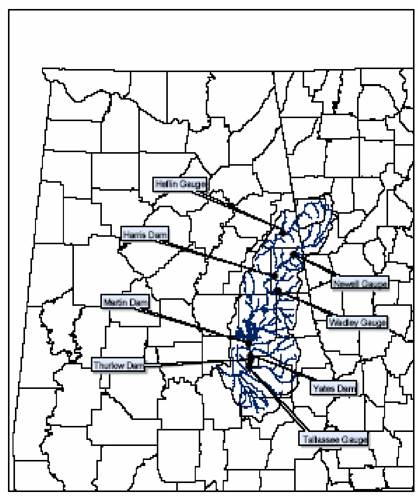

Figure 1-1: Tallapoosa River Basin

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.

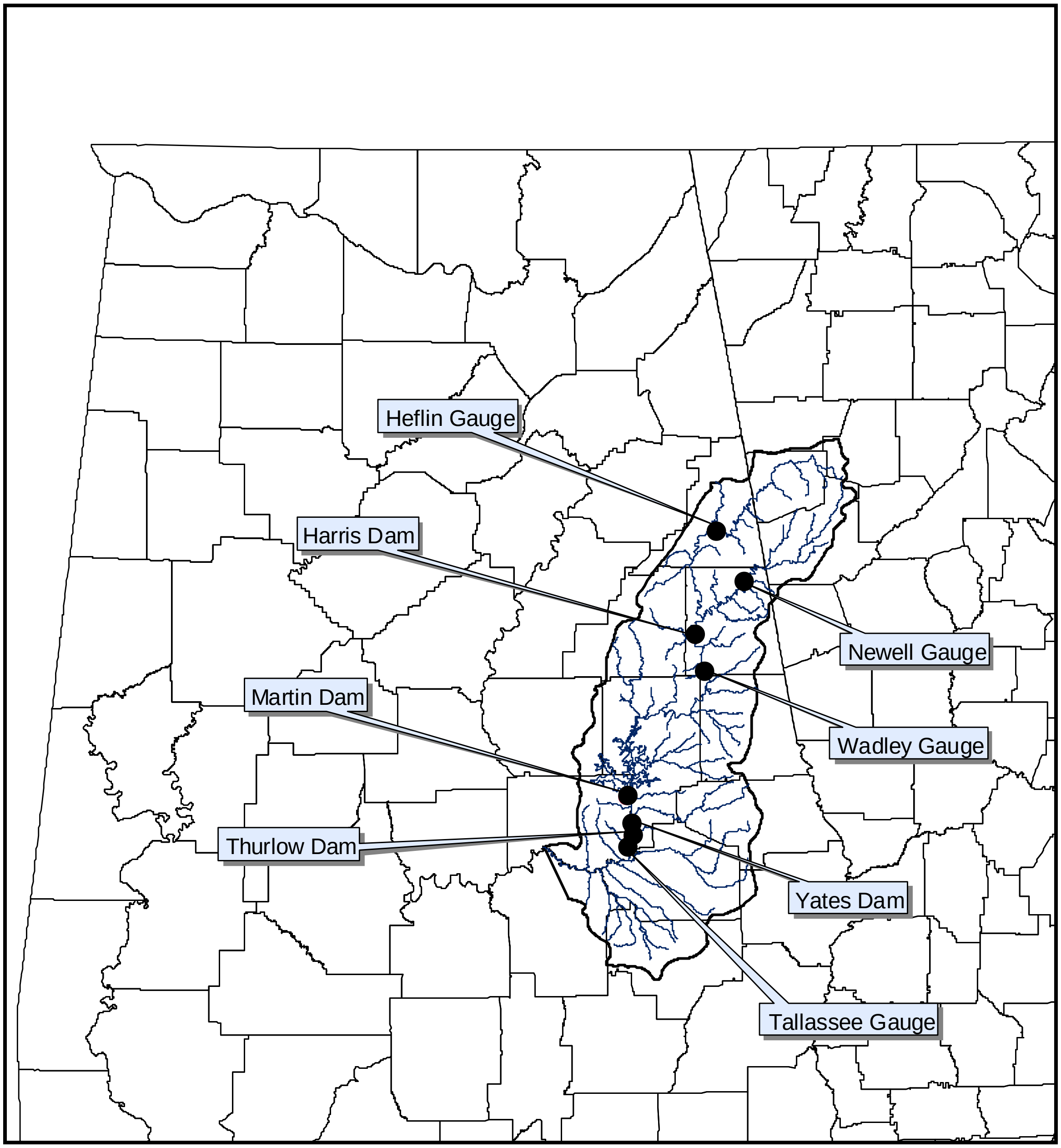

Figure 1-1: Tallapoosa River Basin

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.

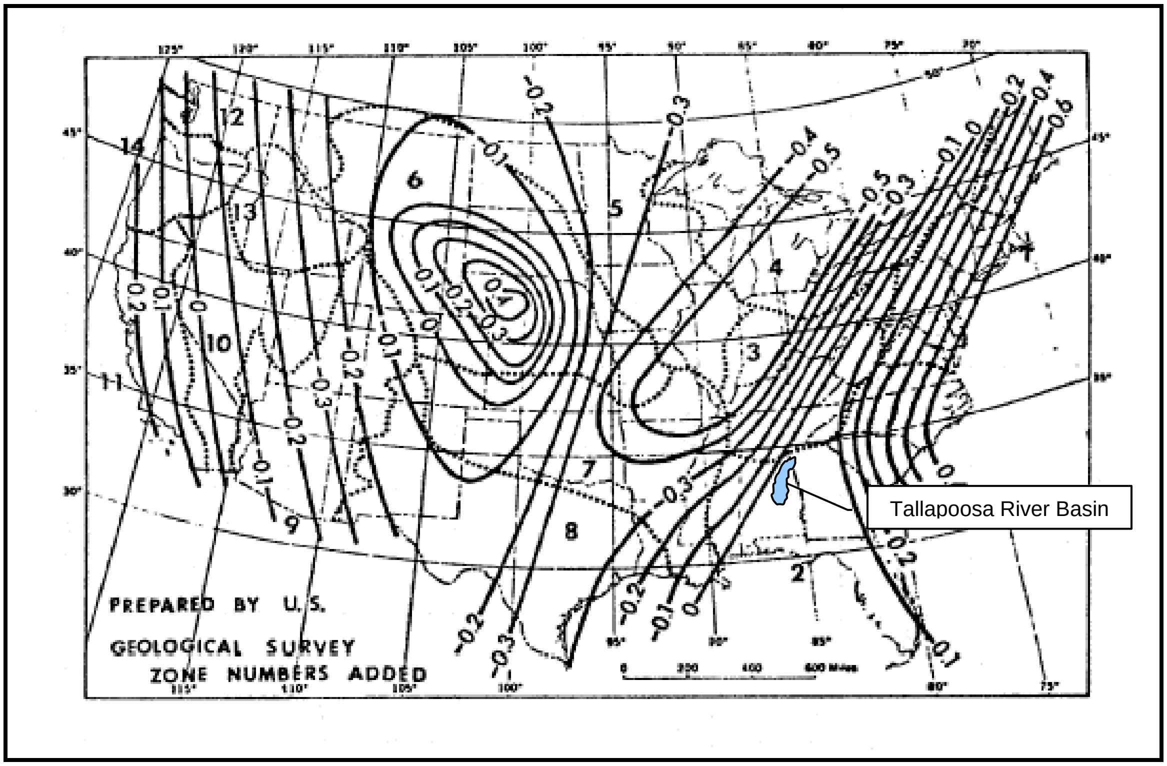

Figure 2: Generalized Skew Coefficients for Tallapoosa River Basin

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

											Modify	Modify
Location	**RM**	**10YR**	**25YR**	**50YR**	**100YR**	**250 YR**	**500 YR**	**Apr-79**	**Feb-90**		**Apr-79**	**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%

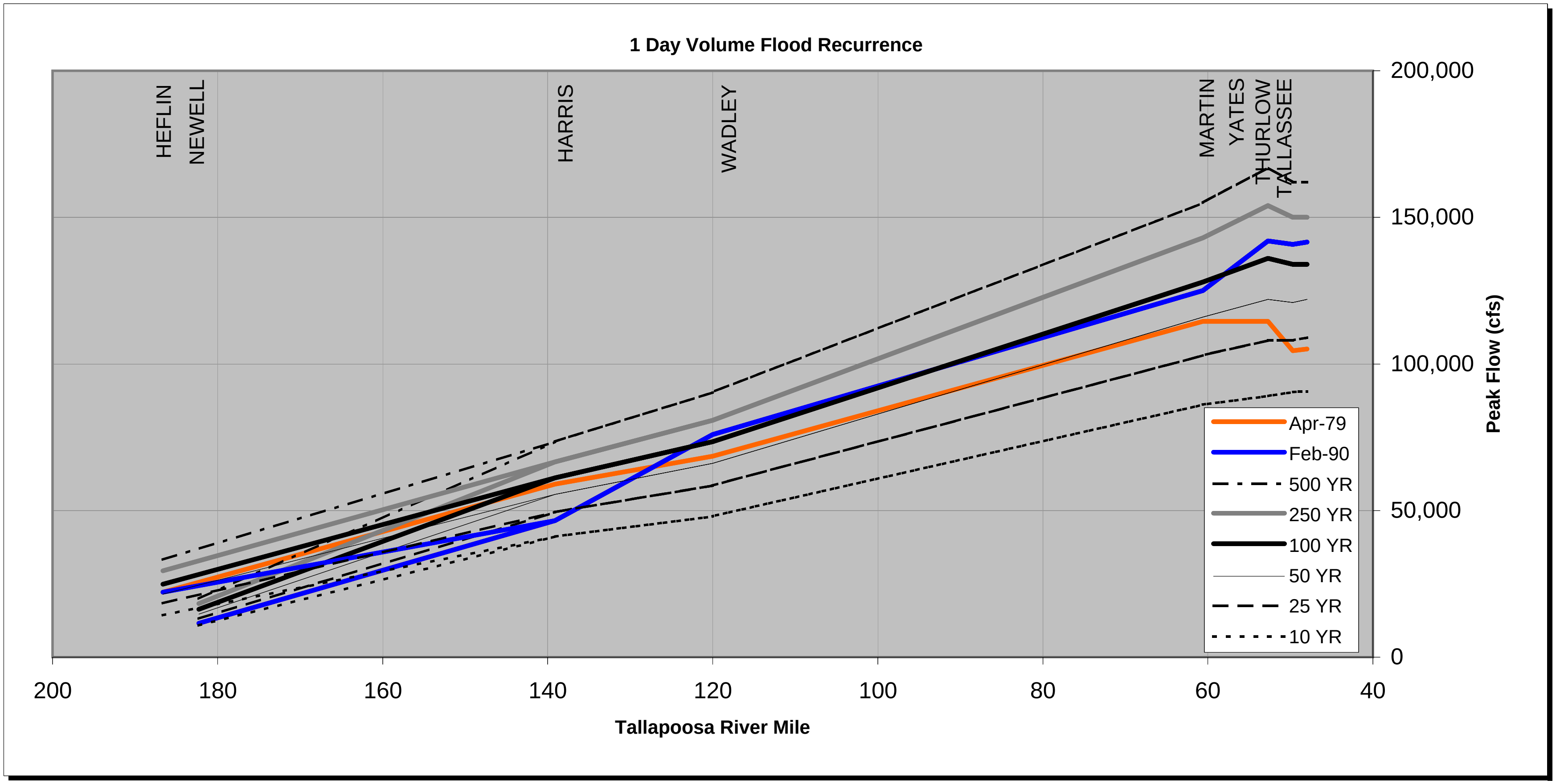

Figure 4: Unregulated 3 Day Volume Flood Recurrence

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%

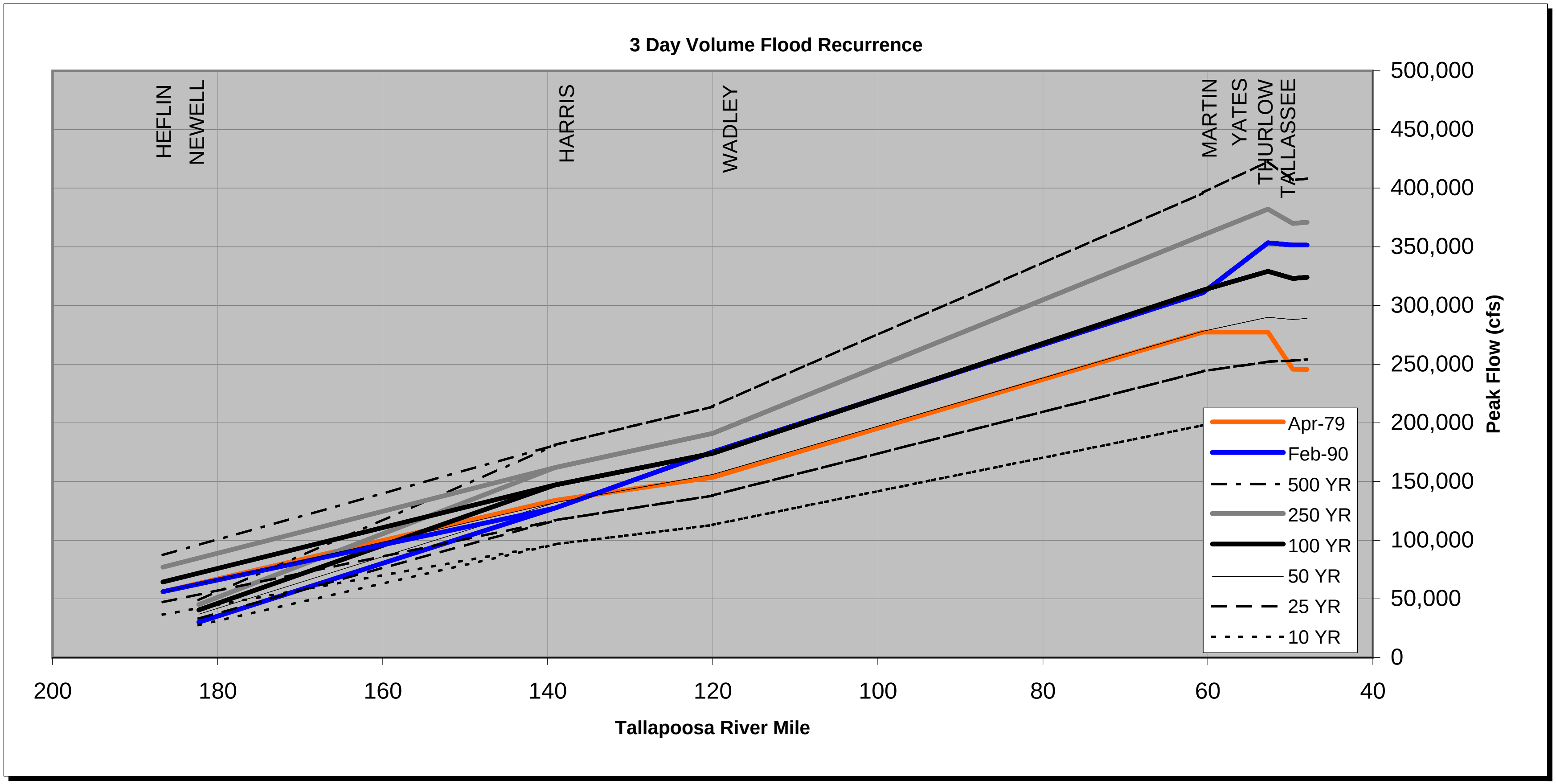

Figure 5: Unregulated 5 Day Volume Flood Recurrence

											Modify	Modify
Location	**RM**	**10YR**	**25YR**	**50YR**	**100YR**	**250 YR**	**500 YR**	**Apr-79**	**Feb-90**		**Apr-79**	**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%

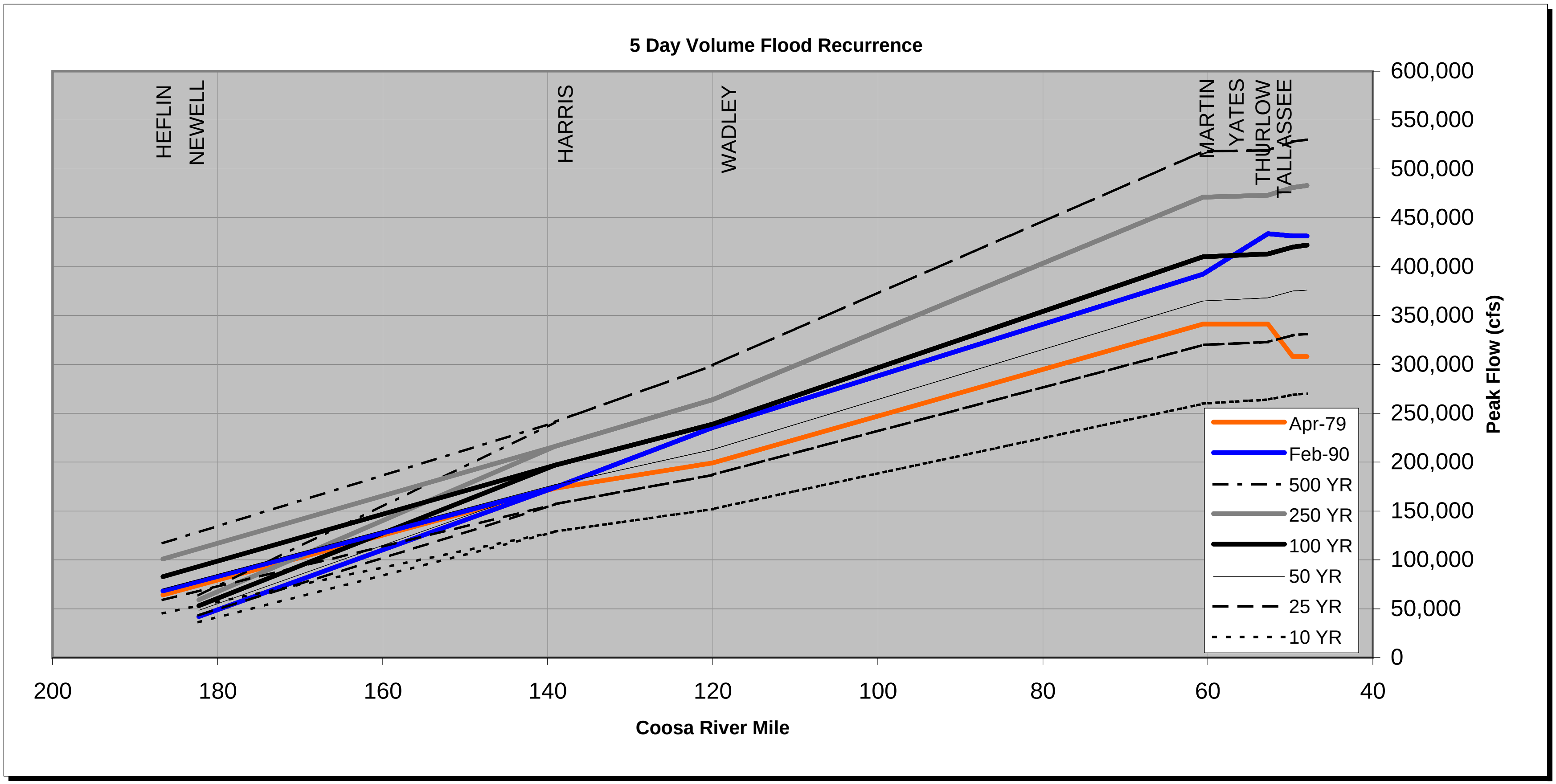

Figure HEF-1: FFA Datafile HEF.DAT

```
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
QR           1940    4550
QR           1941    2087
QR           1942    9520
QR           1943    8722
QR           1944    6100
QR           1945    4020
QR           1946   10090
QR           1947   11173
QR           1948    6841
QR           1949   13168
QR           1950    3090
QR           1951    7126
QR           1952    9577
QR           1953    7931
QR           1954    6721
QR           1955    4501
QR           1956    6781
QR           1957    8501
QR           1958    4591
QR           1959    6421
QR           1960    4822
QR           1961   17502
QR           1962    8702
QR           1963    9202
QR           1964    8152
QR           1965    3972
QR           1966    6622
QR           1967    8812
QR           1968   15002
QR           1969    3662
QR           1970   13202
QR           1971    6102
QR           1972    8682
QR           1973    7902
QR           1974    9292
QR           1975    6522
QR           1976   13102
QR           1977   30202
QR           1978    6732
QR           1979   22202
QR           1980    7982
QR           1981    5591
QR           1982   17601
QR           1983    7792
QR           1984   10002
QR           1985    4492
QR           1986    1702
QR           1987    6612
QR           1988    4752
QR           1989    5744
QR           1990   22202
QR           1991    6662
QR           1992    6352
QR           1993    6342
QR           1994    5594
QR           1995    7805
QR           1996   11906
QR           1997    8545
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
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 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
QR            1944    14242
QR            1945     8987
QR            1946    25824
QR            1947    27876
QR            1948    16938
QR            1949    35400
QR            1950     7498
QR            1951    18910
QR            1952    22108
QR            1953    21073
QR            1954    15973
QR            1955     9783
QR            1956    18403
QR            1957    20503
QR            1958    11103
QR            1959    17163
QR            1960    12156
QR            1961    45106
QR            1962    22546
QR            1963    21386
QR            1964    21996
QR            1965     9086
QR            1966    17066
QR            1967    23436
QR            1968    27736
QR            1969     9986
QR            1970    33506
QR            1971    15566
QR            1972    22846
QR            1973    19486
QR            1974    23786
QR            1975    16586
QR            1976    34686
QR            1977    74806
QR            1978    17026
QR            1979    56106
QR            1980    20376
QR            1981    12383
QR            1982    43403
QR            1983    18806
QR            1984    27696
QR            1985    11456
QR            1986     3895
QR            1987    16475
QR            1988    10876
QR            1989    13832
QR            1990    56206
QR            1991    16256
QR            1992    15296
QR            1993    15106
QR            1994    11302
QR            1995    20625
QR            1996    33018
QR            1997    22185
QR            1998    24435
QR            1999     6824
QR            2000    10905
QR            2001    16725
ED
```

Figure HEF-3: FFA Datafile HEF5.DAT

```
TT TALLAPOOSA RIVER AT HEFLIN 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 HEFLIN 5 DAY VOLUME DSS 1939-2001
GS ALL                 0.0
QR          1939   17533
QR          1940   16467
QR          1941    8965
QR          1942   29451
QR          1943   31435
QR          1944   18257
QR          1945   12563
QR          1946   38195
QR          1947   37773
QR          1948   23307
QR          1949   52787
QR          1950    9752
QR          1951   21768
QR          1952   28813
QR          1953   25545
QR          1954   18606
QR          1955   13065
QR          1956   23545
QR          1957   27705
QR          1958   13885
QR          1959   19655
QR          1960   15380
QR          1961   62610
QR          1962   28710
QR          1963   25830
QR          1964   26710
QR          1965   13060
QR          1966   26610
QR          1967   29460
QR          1968   34610
QR          1969   13970
QR          1970   41090
QR          1971   20690
QR          1972   29440
QR          1973   23990
QR          1974   29730
QR          1975   22060
QR          1976   40730
QR          1977   86440
QR          1978   21810
QR          1979   64100
QR          1980   25930
QR          1981   14648
QR          1982   51325
QR          1983   24430
QR          1984   38200
QR          1985   15150
QR          1986    5167
QR          1987   20268
QR          1988   12950
QR          1989   17050
QR          1990   68110
QR          1991   21560
QR          1992   18620
QR          1993   18160
QR          1994   12974
QR          1995   28105
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)

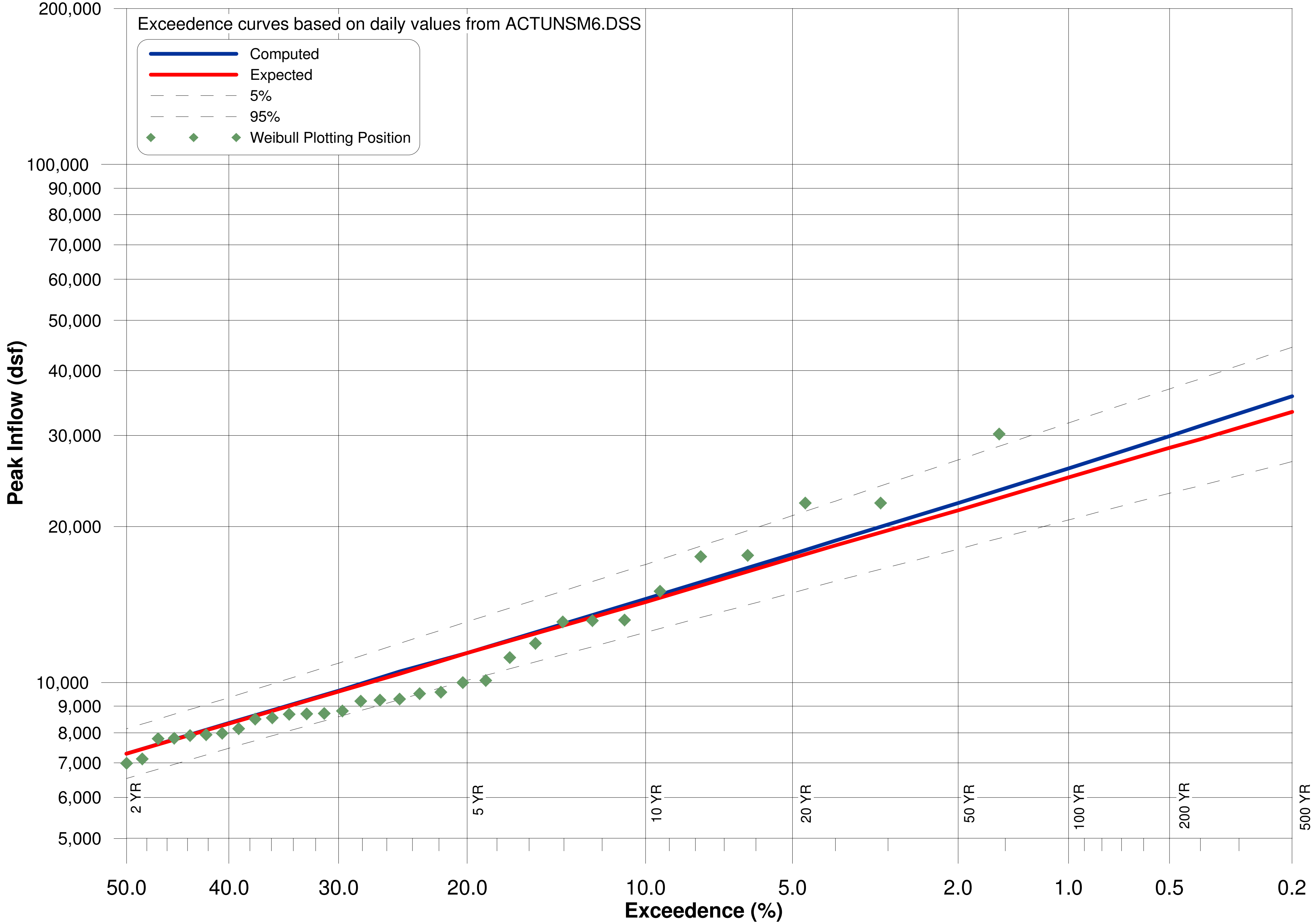

Figure HEF- 5: Exceedence Curve for Unregulated 3 Day Volume at Heflin

(1939-2001)

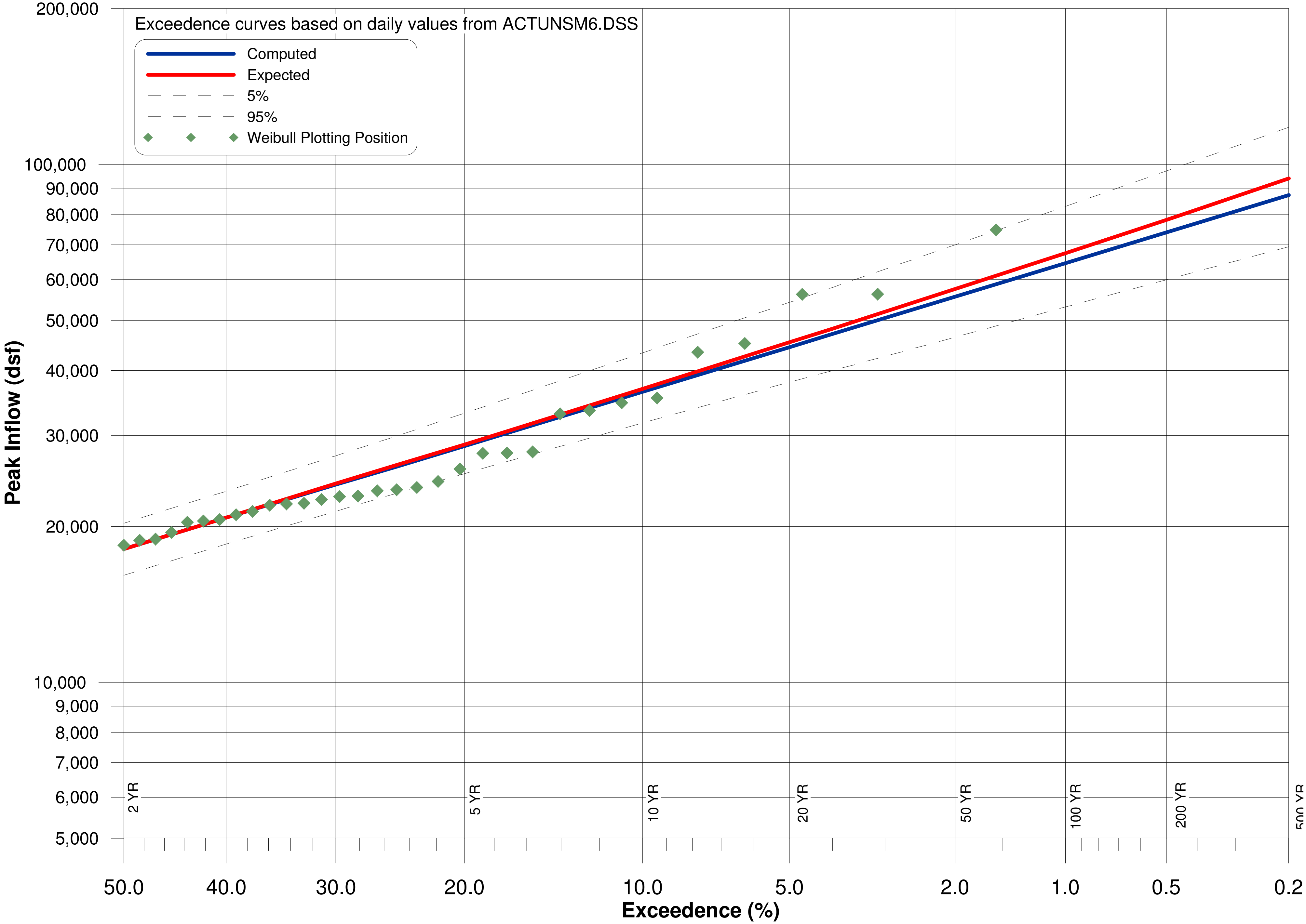

Figure HEF- 6: Exceedence Curve for Unregulated 5 Day Volume at Heflin

(1939-2001)

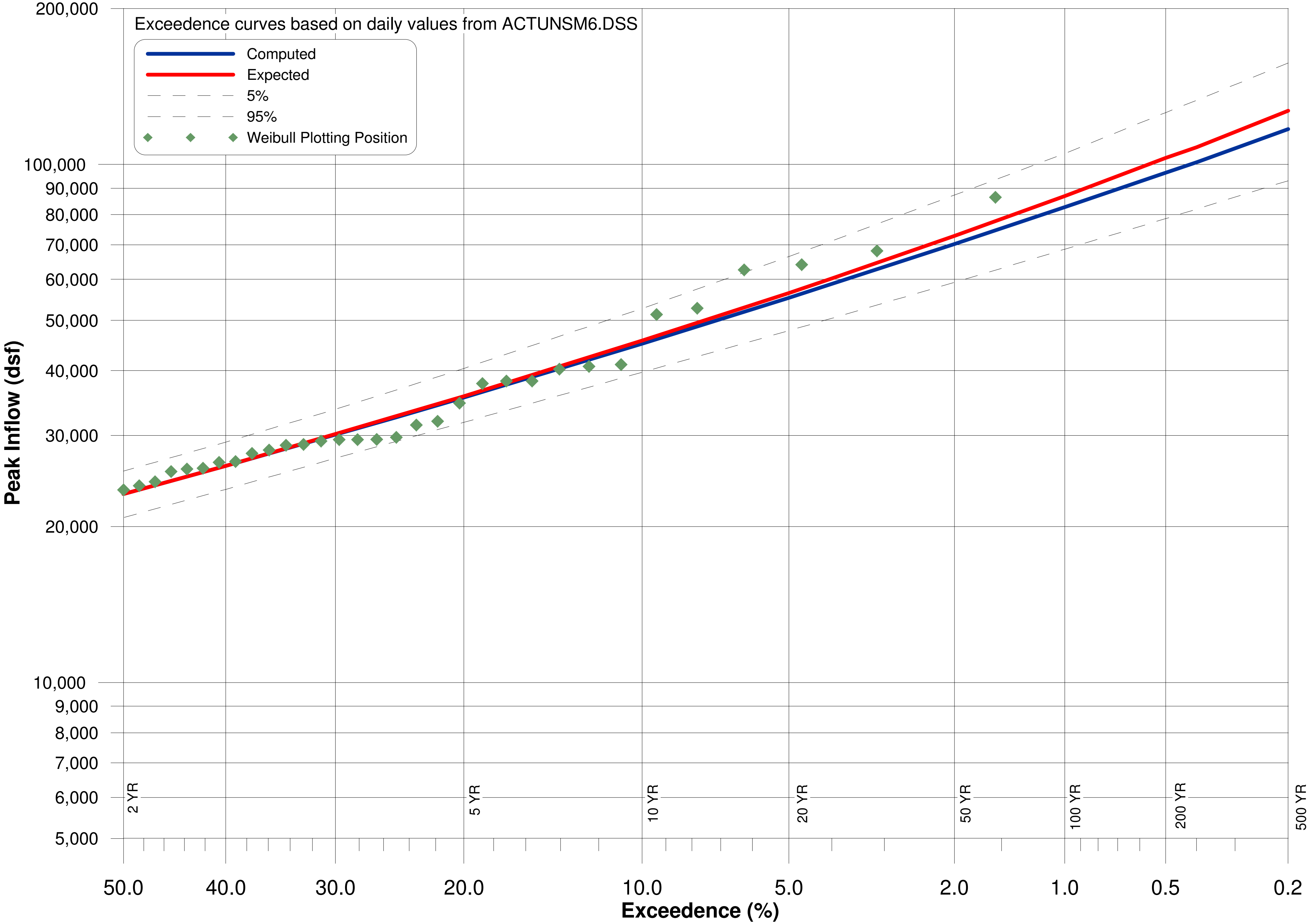

Table HEF-2: Summary of FFA Results for Heflin

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)	Confidence Limits 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)	Confidence Limits 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)	Confidence Limits 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)

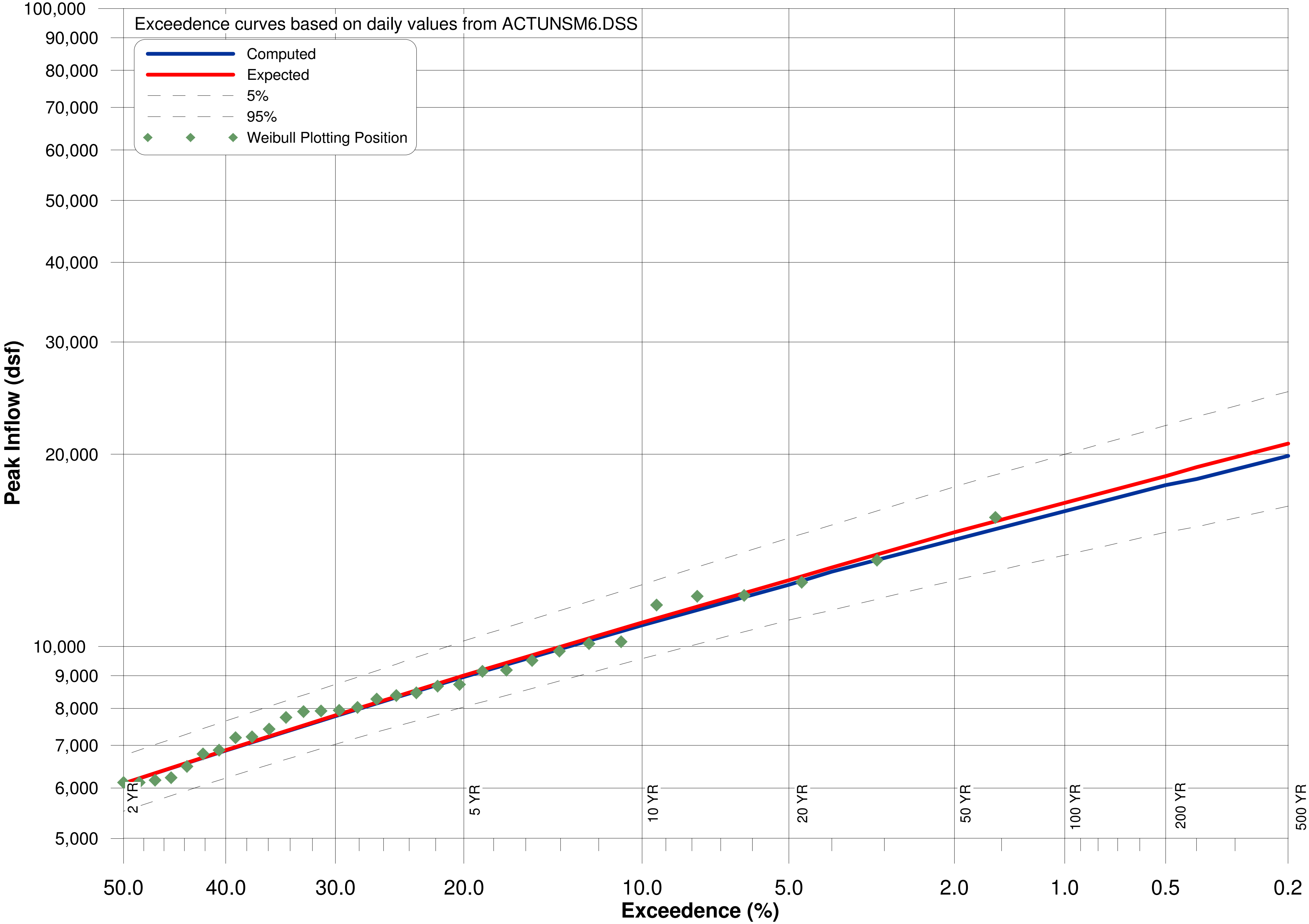

Figure NEW-5: Exceedence Curve for Unregulated 3 Day Volume at Newell

(1939-2001)

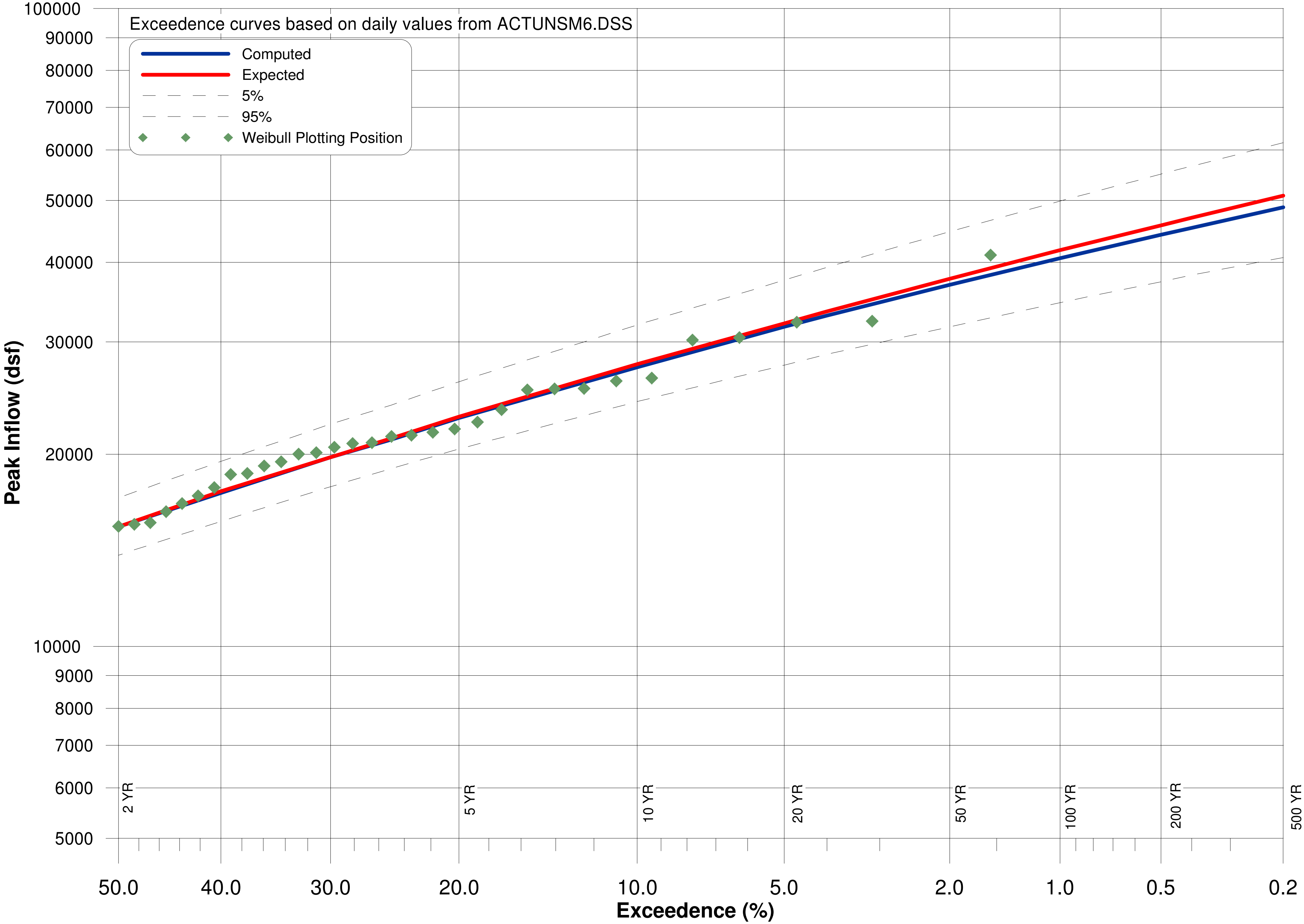

Figure NEW-6: Exceedence Curve for Unregulated 5 Day Volume at Newell

(1939-2001)

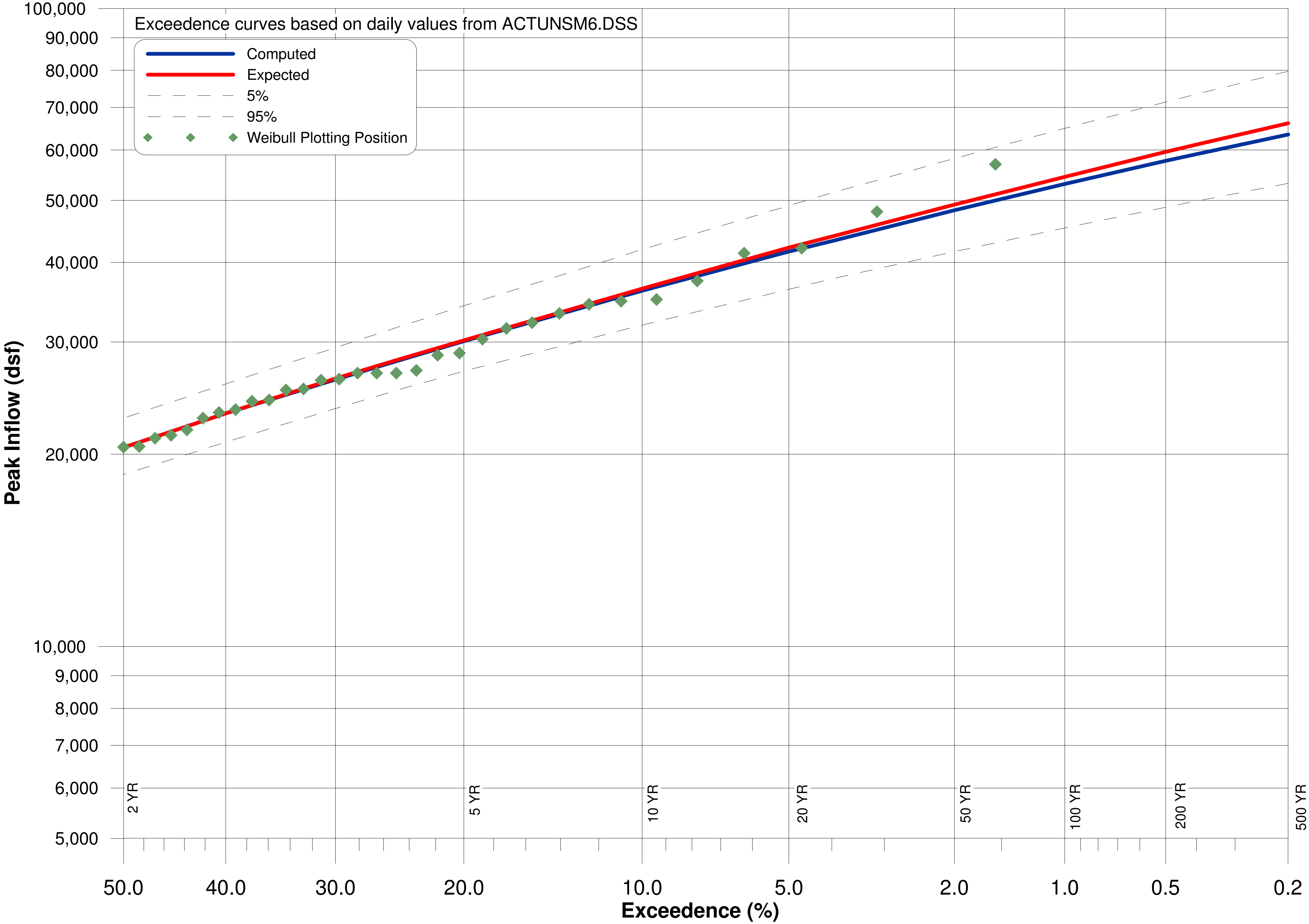

Figure HAR-1: FFA Datafile HAR.DAT

```
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
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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
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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
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QR          1990   46604
QR          1991   14900
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QR          1994   15304
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QR          1996   42327
QR          1997   33876
QR          1998   40572
QR          1999    7342
QR          2000   13663
QR          2001   22224
ED
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Figure HAR-2: FFA Datafile HAR3.DAT

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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

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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)

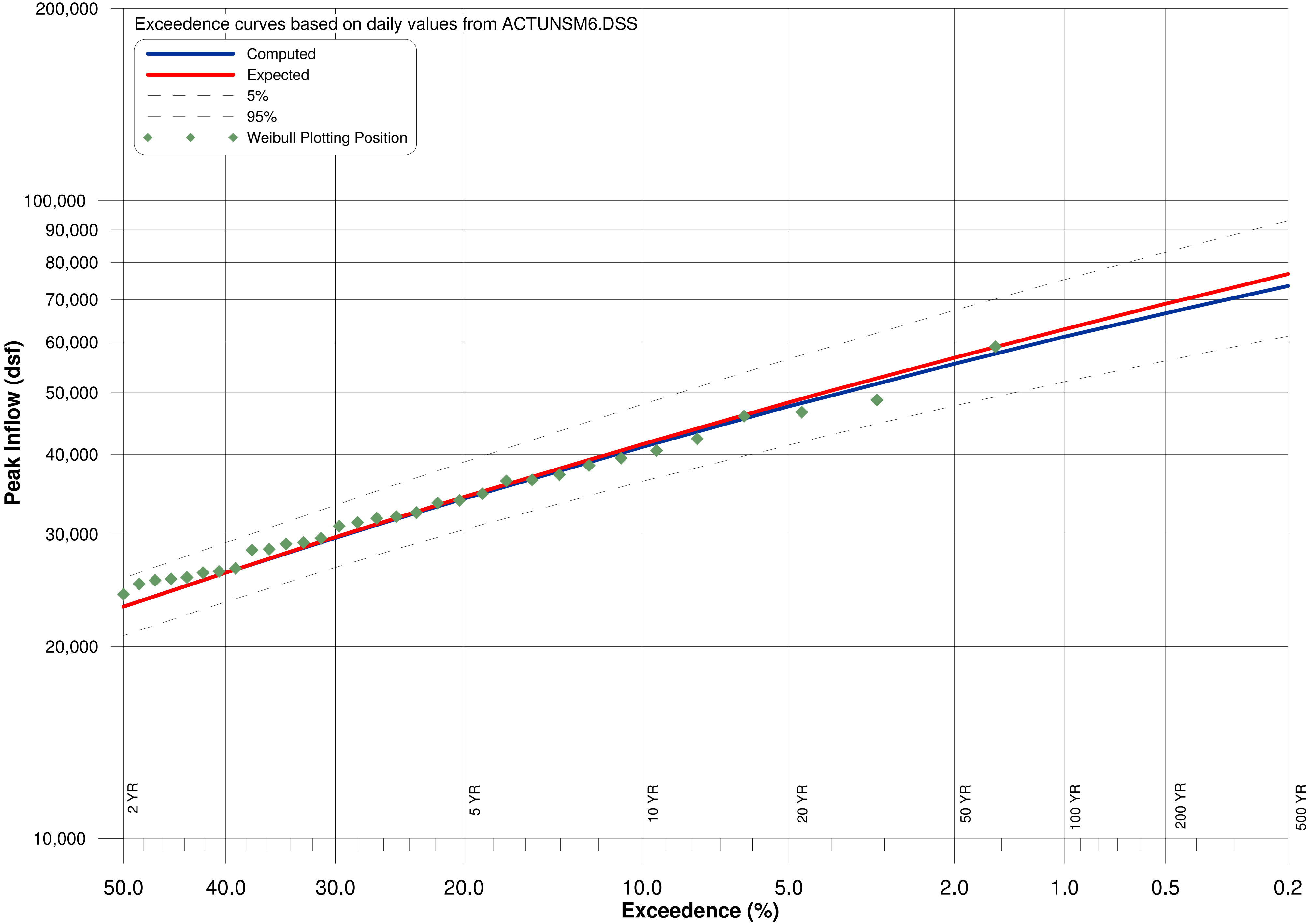

Figure HAR- 5: Exceedence Curve for Unregulated 3 Day Volume at Harris
(1939-2001)

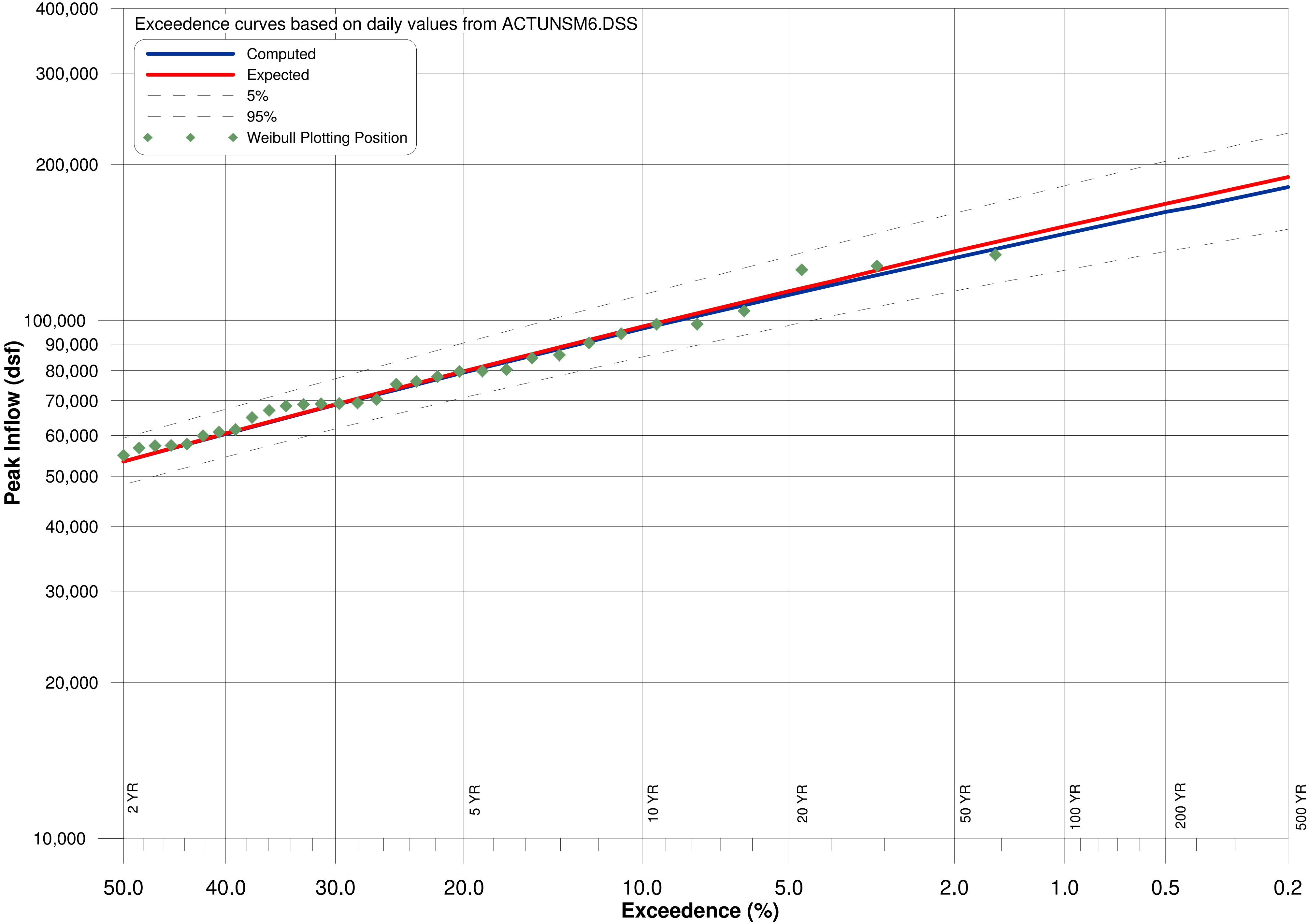

Figure HAR- 6: Exceedence Curve for Unregulated 5 Day Volume at Harris
(1939-2001)

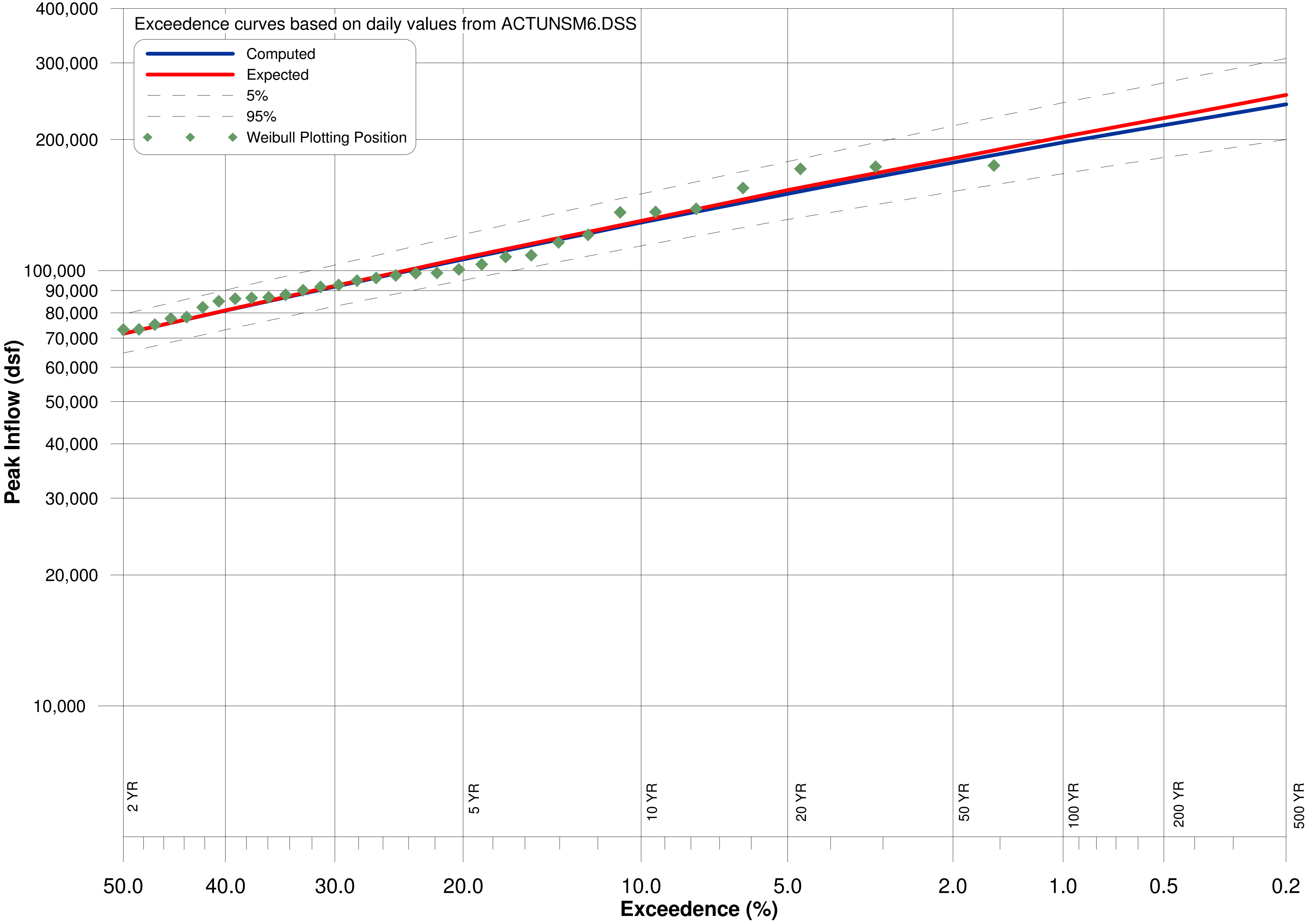

Table HAR-3: Regulation Impact on Flood Recurrences at Harris

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

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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
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QR            1948   25196
QR            1949   42807
QR            1950   11796
QR            1951   21140
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QR            1953   24527
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QR            1955   18647
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QR            1958   20784
QR            1959   14152
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QR            1966   21374
QR            1967   16328
QR            1968   33052
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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
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Figure WAD-2: FFA Datafile WAD3.DAT

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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			
Rank	Yr	Flow (cfs)	Position
1	1990	75,976	1.56
2	1979	68,567	3.13
3	1976	55,146	4.69
4	1977	53,273	6.25
5	1998	47,858	7.81
6	1996	46,420	9.38
7	1970	44,476	10.94
8	1957	43,657	12.50
9	1949	42,807	14.06
10	1971	41,640	15.63
11	1982	40,838	17.19
12	1961	39,704	18.75
13	1963	39,324	20.31
14	1946	37,244	21.88
15	1947	35,906	23.44
16	1956	35,766	25.00
17	1952	35,711	26.56
18	1974	35,125	28.13
19	1997	35,080	29.69
20	1943	33,162	31.25
21	1968	33,052	32.81
22	1983	32,792	34.38
23	1975	32,396	35.94
24	1942	31,428	37.50
25	1995	30,621	39.06
26	1993	30,366	40.63
27	1973	29,987	42.19
28	1962	29,729	43.75
29	1980	29,356	45.31
30	1964	29,171	46.88
31	1972	27,587	48.44
32	2001	27,550	50.00
33	1984	26,724	51.56
34	1988	26,496	53.13
35	1978	25,932	54.69
36	1948	25,196	56.25
37	1945	25,120	57.81
38	1953	24,527	59.38
39	1987	23,485	60.94
40	1939	23,147	62.50
41	1944	22,901	64.06
42	1992	22,169	65.63
43	1966	21,374	67.19
44	1951	21,140	68.75
45	1958	20,784	70.31
46	1981	20,618	71.88
47	1940	20,575	73.44
48	1994	20,204	75.00
49	1955	18,647	76.56
50	1989	18,163	78.13
51	2000	16,601	79.69
52	1967	16,328	81.25
53	1991	15,493	82.81
54	1960	15,307	84.38
55	1985	14,943	85.94
56	1969	14,927	87.50
57	1959	14,152	89.06
58	1965	12,918	90.63
59	1950	11,796	92.19
60	1954	9,522	93.75
61	1999	8,683	95.31
62	1941	8,214	96.88
63	1986	7,311	98.44

WADLEY - 3 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	175,176	1.56
2	1979	153,693	3.13
3	1977	143,963	4.69
4	1976	120,583	6.25
5	1998	115,378	7.81
6	1982	112,983	9.38
7	1949	112,169	10.94
8	1970	108,450	12.50
9	1996	100,625	14.06
10	1961	98,965	15.63
11	1971	96,964	17.19
12	1997	94,338	18.75
13	1957	92,681	20.31
14	1963	92,407	21.88
15	1956	91,858	23.44
16	1947	86,765	25.00
17	1983	83,466	26.56
18	1974	81,360	28.13
19	1968	79,998	29.69
20	1942	79,543	31.25
21	1943	79,286	32.81
22	1946	79,031	34.38
23	1952	77,157	35.94
24	1975	75,036	37.50
25	1972	70,931	39.06
26	1964	69,539	40.63
27	1984	69,288	42.19
28	1962	68,898	43.75
29	2001	66,811	45.31
30	1980	66,461	46.88
31	1973	66,317	48.44
32	1993	66,210	50.00
33	1953	65,963	51.56
34	1995	63,959	53.13
35	1978	62,965	54.69
36	1987	57,963	56.25
37	1948	55,899	57.81
38	1992	55,585	59.38
39	1939	55,284	60.94
40	1966	51,940	62.50
41	1951	50,801	64.06
42	1944	48,532	65.63
43	1981	47,969	67.19
44	1989	47,391	68.75
45	1958	45,291	70.31
46	2000	44,321	71.88
47	1940	44,222	73.44
48	1945	44,064	75.00
49	1991	43,034	76.56
50	1967	41,965	78.13
51	1959	40,922	79.69
52	1994	40,383	81.25
53	1969	39,150	82.81
54	1988	38,345	84.38
55	1955	36,813	85.94
56	1960	36,379	87.50
57	1985	35,866	89.06
58	1965	34,658	90.63
59	1954	26,701	92.19
60	1950	25,064	93.75
61	1999	22,011	95.31
62	1941	19,039	96.88
63	1986	15,805	98.44

WADLEY - 5 DAY			
Rank	Yr	Flow (cfs)	Position
1	1990	235,281	1.56
2	1979	199,244	3.13
3	1977	197,158	4.69
4	1949	177,598	6.25
5	1976	159,534	7.81
6	1982	156,913	9.38
7	1961	156,860	10.94
8	1998	147,314	12.50
9	1970	139,430	14.06
10	1996	126,167	15.63
11	1971	124,723	17.19
12	1997	123,082	18.75
13	1957	118,621	20.31
14	1947	115,504	21.88
15	1946	113,251	23.44
16	1956	112,626	25.00
17	1943	110,816	26.56
18	1983	110,479	28.13
19	1963	109,213	29.69
20	1972	106,824	31.25
21	1975	105,760	32.81
22	1984	104,056	34.38
23	1974	103,981	35.94
24	1952	99,851	37.50
25	1942	99,290	39.06
26	1968	98,103	40.63
27	1964	95,072	42.19
28	1980	90,000	43.75
29	1993	86,756	45.31
30	1962	86,555	46.88
31	1995	86,040	48.44
32	2001	85,014	50.00
33	1973	84,385	51.56
34	1966	83,784	53.13
35	1978	83,191	54.69
36	1953	81,011	56.25
37	1987	77,026	57.81
38	1948	76,350	59.38
39	1992	75,221	60.94
40	1939	73,072	62.50
41	1989	70,623	64.06
42	1940	63,788	65.63
43	1944	62,508	67.19
44	1991	61,764	68.75
45	1951	60,809	70.31
46	1958	59,287	71.88
47	2000	59,080	73.44
48	1967	58,935	75.00
49	1945	58,834	76.56
50	1981	58,496	78.13
51	1959	56,302	79.69
52	1994	54,912	81.25
53	1969	54,201	82.81
54	1960	51,078	84.38
55	1985	50,720	85.94
56	1955	50,519	87.50
57	1965	48,544	89.06
58	1988	45,019	90.63
59	1954	33,791	92.19
60	1950	33,495	93.75
61	1941	30,264	95.31
62	1999	29,522	96.88
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)

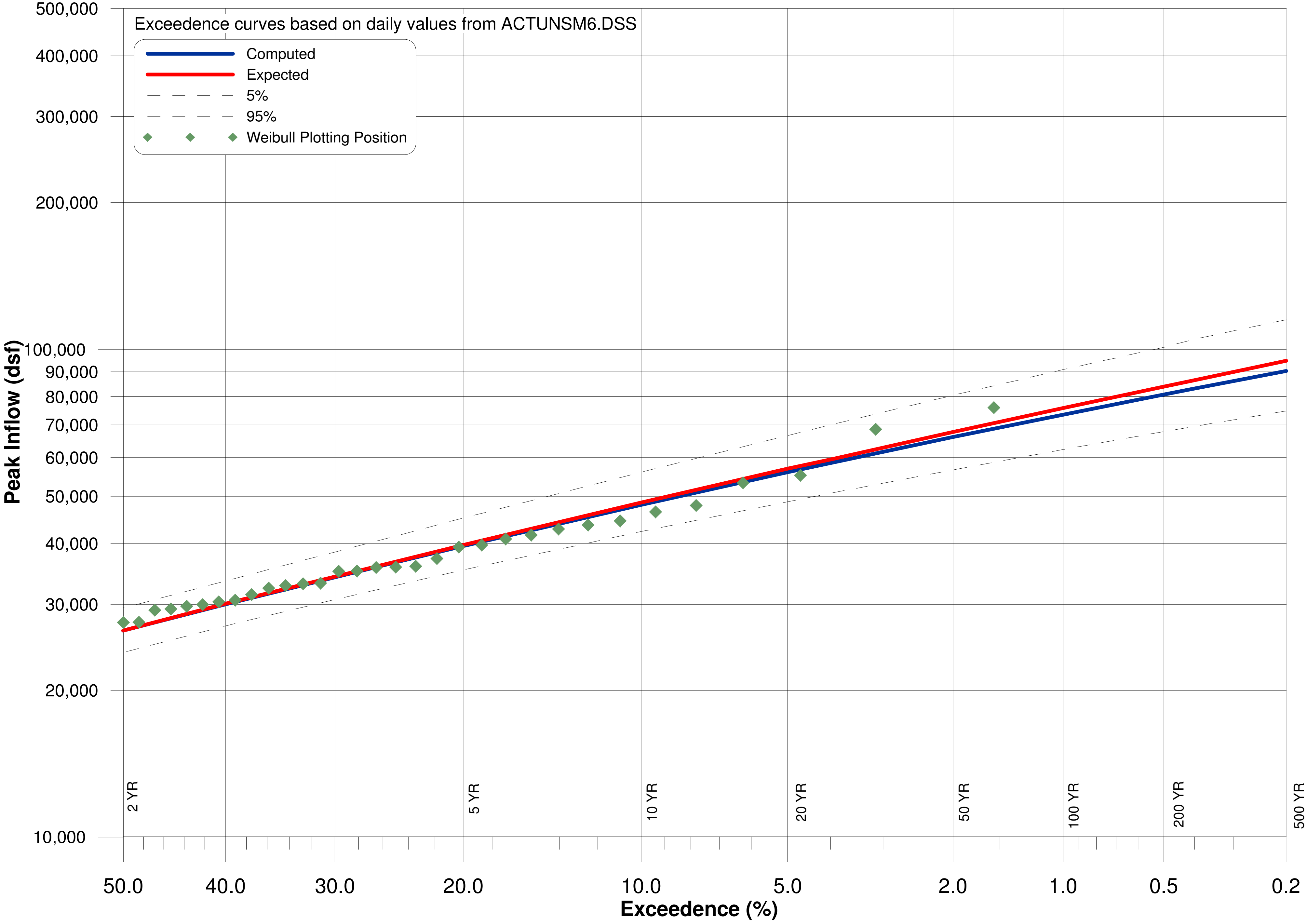

Figure WAD- 5: Exceedence Curve for Unregulated 3 Day Volume at Wadley
(1939-2001)

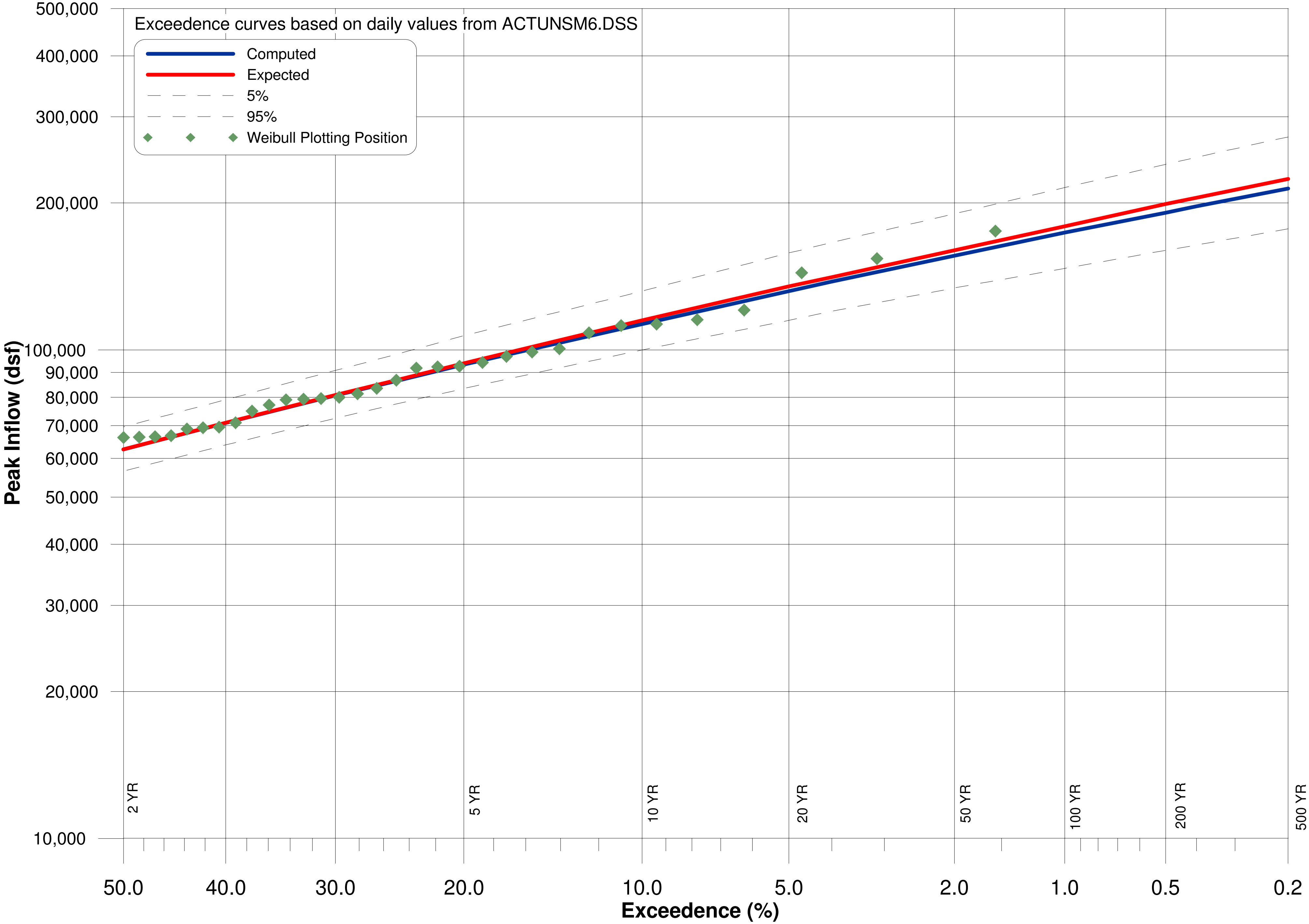

Figure WAD-6: Exceedence Curve for Unregulated 5 Day Volume at Wadley

(1939-2001)

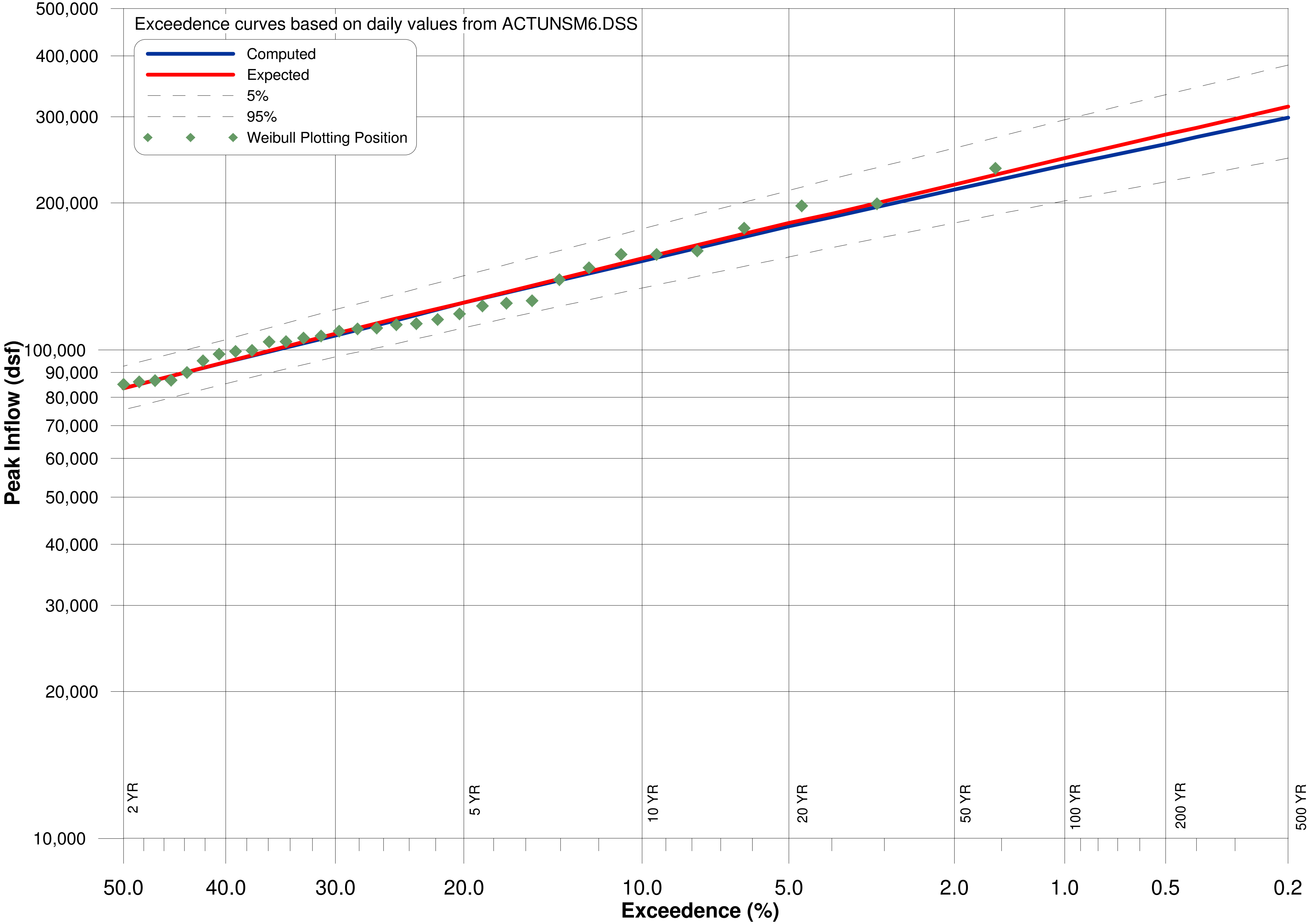

Table WAD-3: Regulation Impact on Flood Recurrences at Wadley

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
QR          1983  145718
QR          1984  108099
QR          1985   65304
QR          1986   42427
QR          1987   79922
QR          1988  100407
QR          1989  158789
QR          1990  310830
QR          1991   58222
QR          1992   75381
QR          1993  116844
QR          1994   72194
QR          1995  103762
QR          1996  156030
QR          1997  139450
QR          1998  196202
QR          1999   43607
QR          2000   55027
QR          2001  111236
ED
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Figure MAR-3: FFA Datafile MAR5.DAT

```
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
QR            1939  157746
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
QR            1963  119914
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)

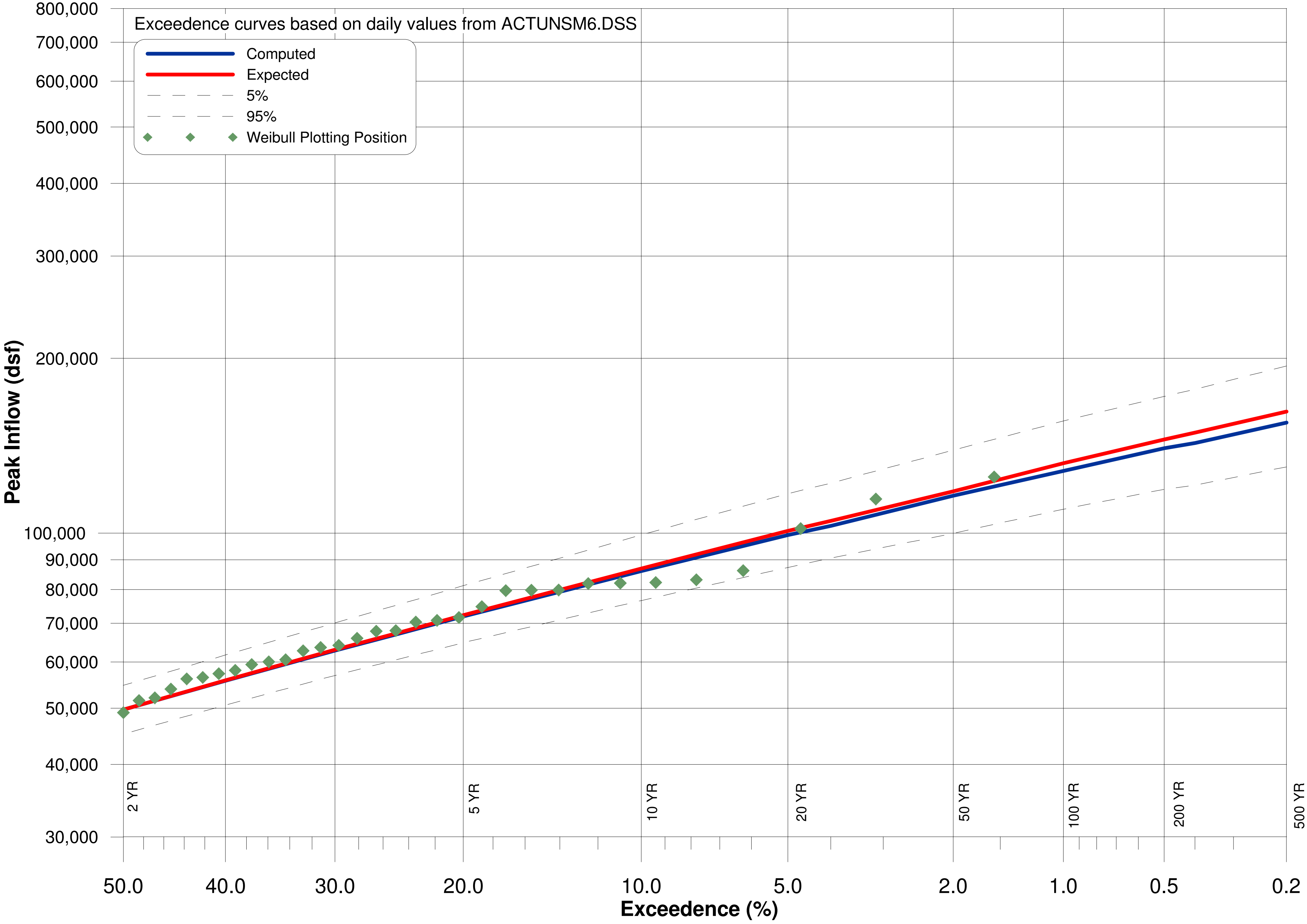

Figure MAR- 5: Exceedence Curve for Unregulated 3 Day Volume at Martin
(1939-2001)

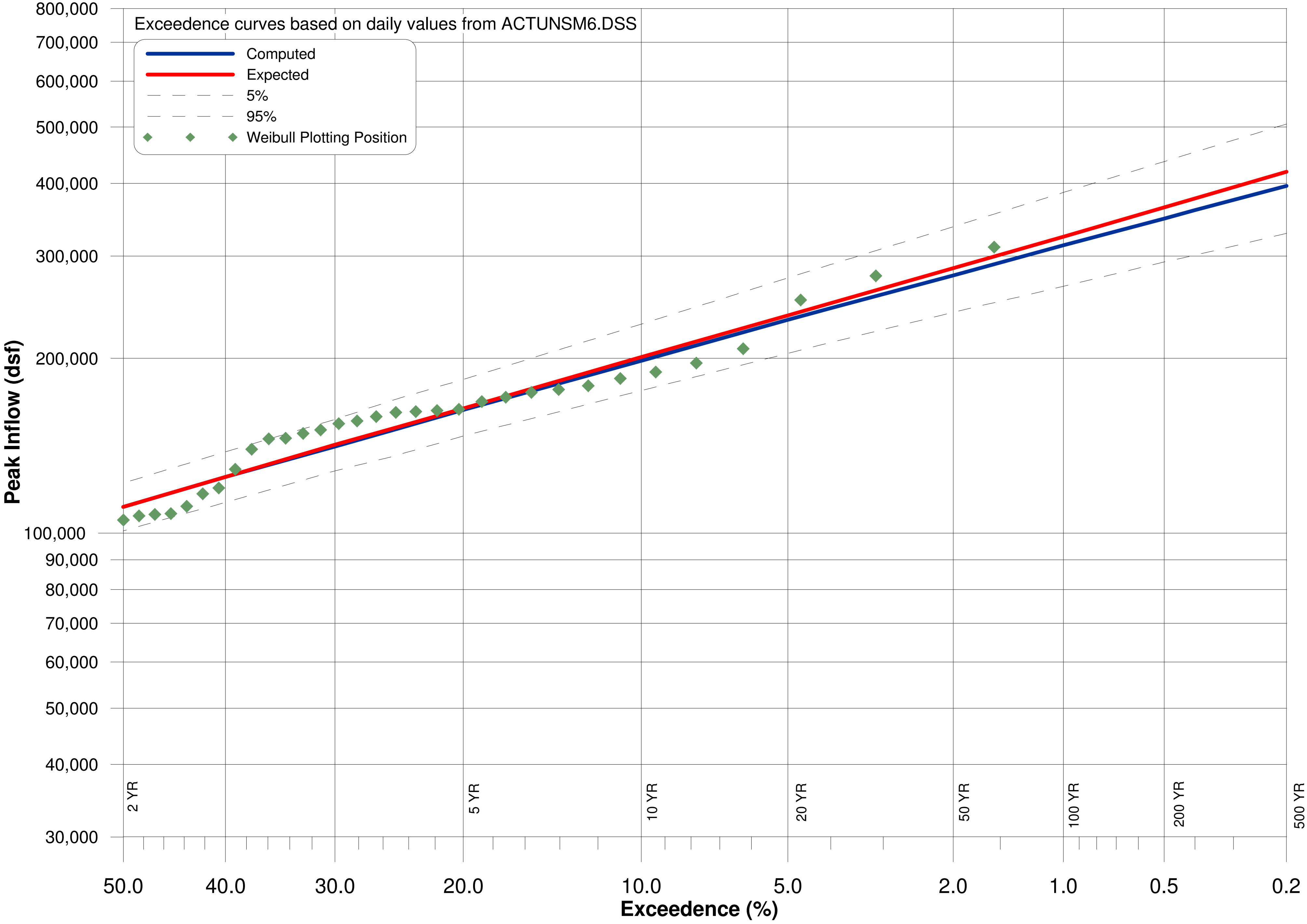

Table MAR-1: Rankings of Flood Events at Martin

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)

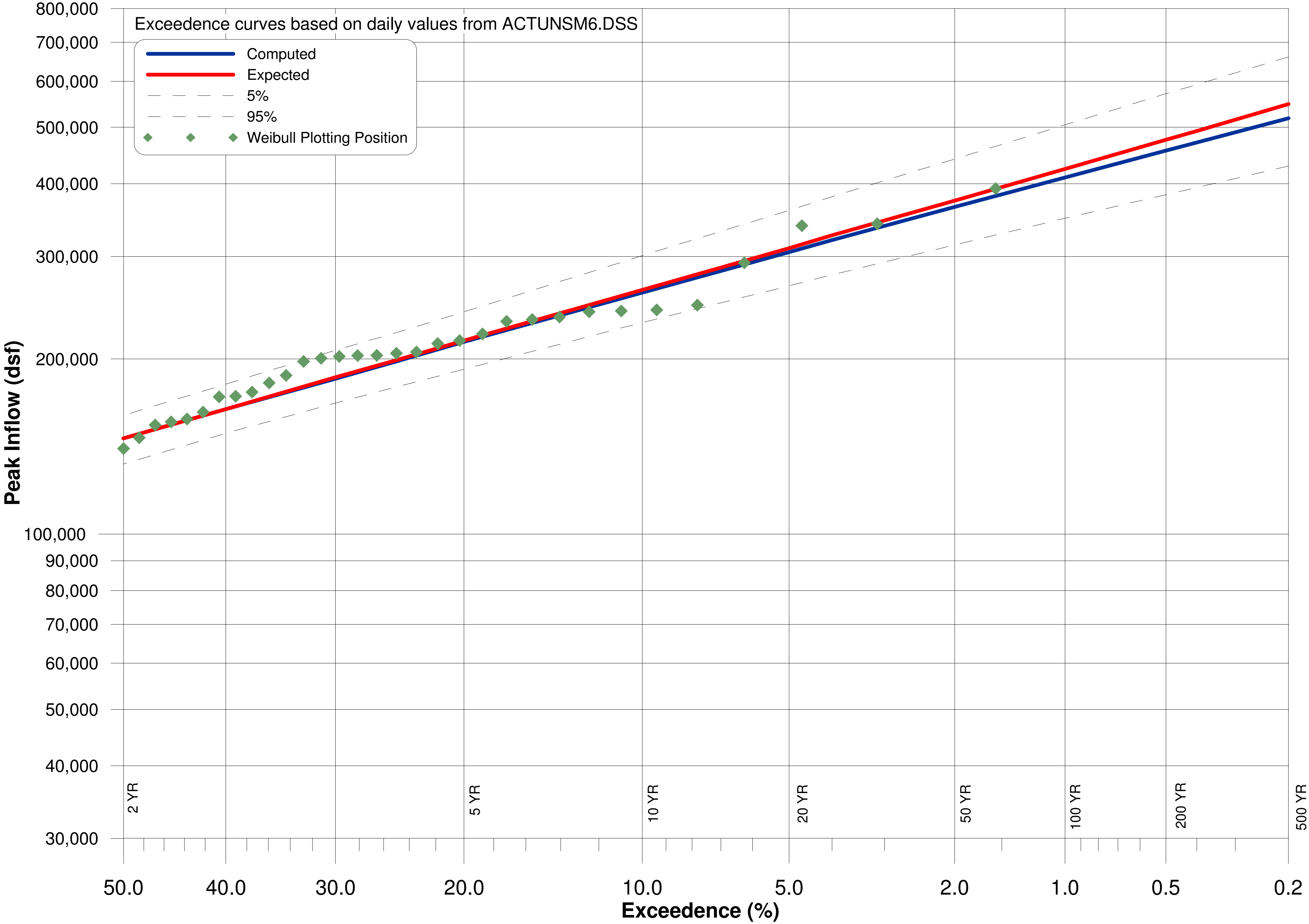

Table MAR-3: Regulation Impact on Flood Recurrences at Martin

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
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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
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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
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QR          1972  184552
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QR          1982  191333
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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
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QR           1948  130403
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QR           1950   64485
QR           1951   94028
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QR           1953  122234
QR           1954   72306
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QR           1957  212596
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QR           1960  116431
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QR           1963  119919
QR           1964  236302
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QR           1966  172209
QR           1967   79296
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QR           1969  108052
QR           1970  197957
QR           1971  233986
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QR           1974  132093
QR           1975  155851
QR           1976  220912
QR           1977  241696
QR           1978  135083
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QR           1980  137766
QR           1981  113041
QR           1982  250200
QR           1983  202350
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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)	Confidence Limits 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)	Confidence Limits 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)	Confidence Limits 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)

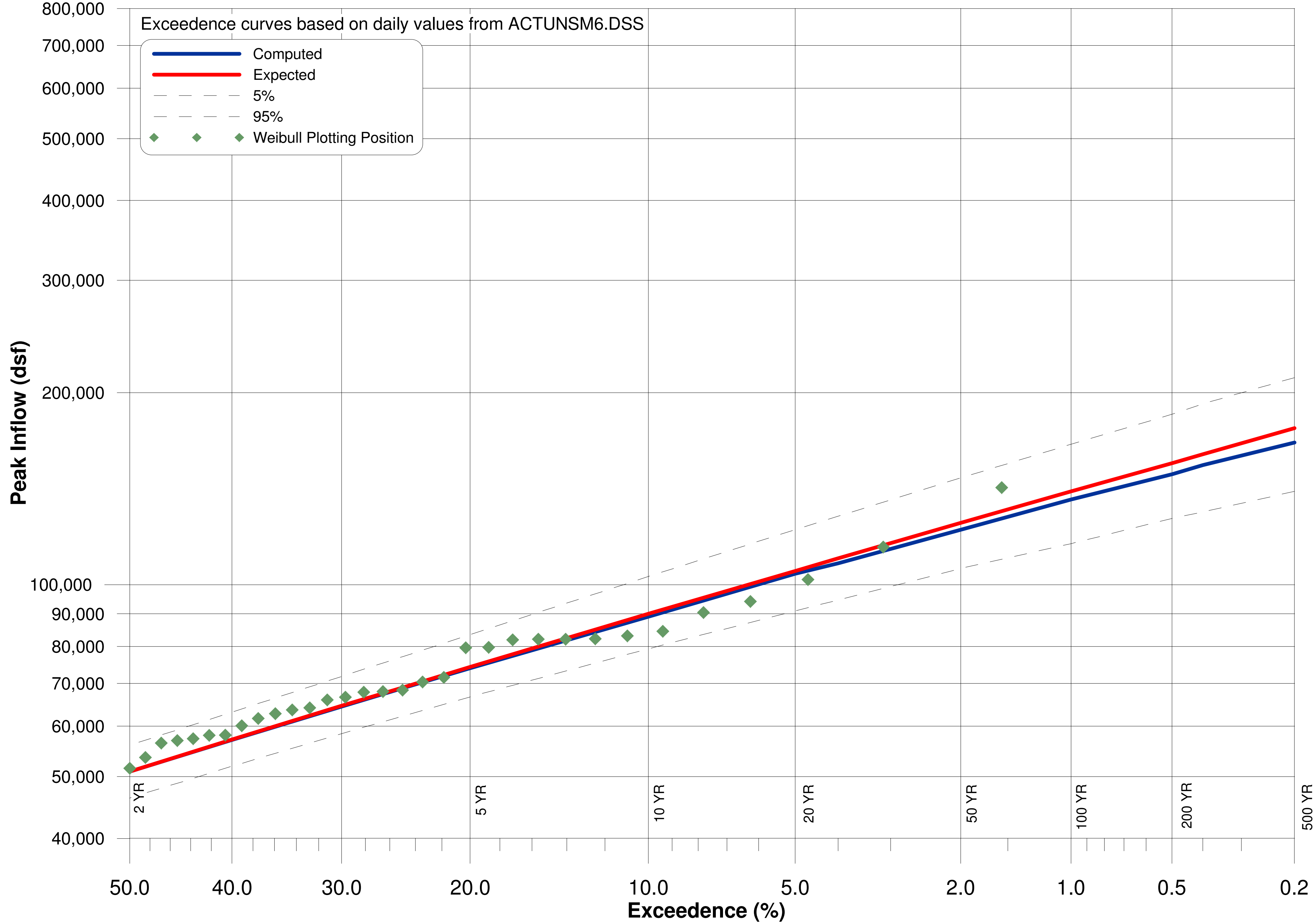

Figure YAT- 5: Exceedence Curve for Unregulated 3 Day Volume at Yates

(1939-2001)

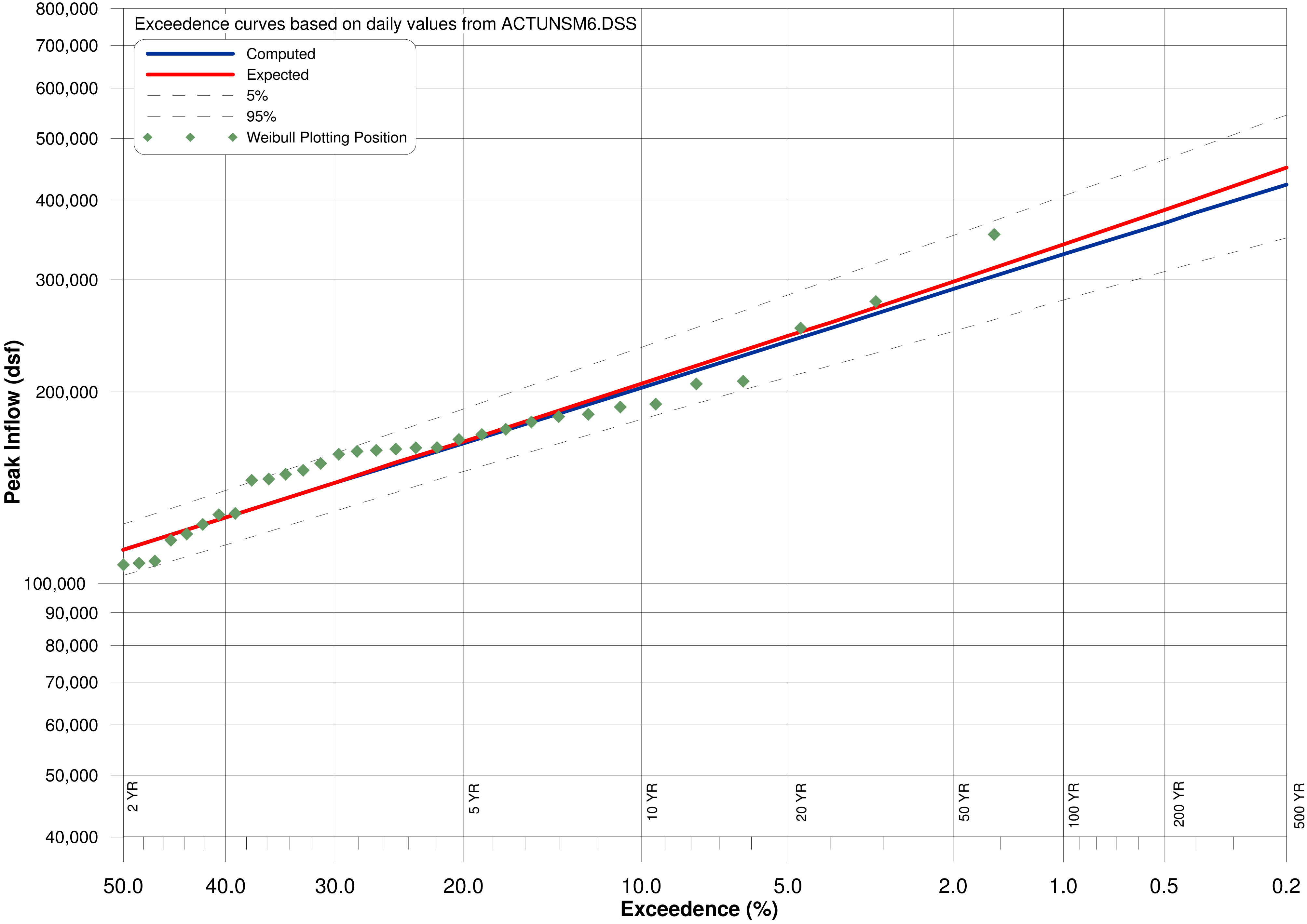

Figure YAT- 6: Exceedence Curve for Unregulated 5 Day Volume at Yates

(1939-2001)

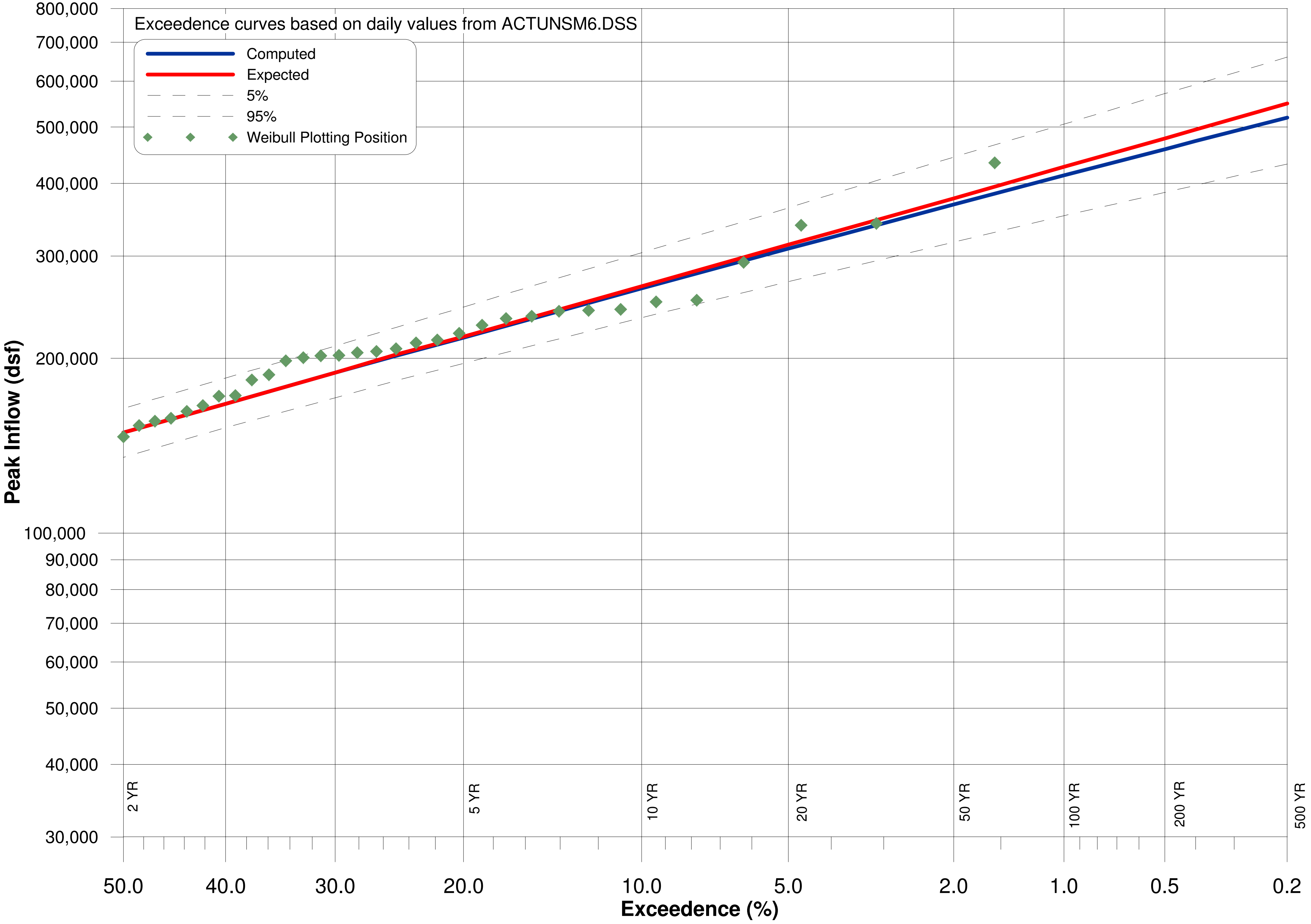

Table YAT-3: Regulation Impact on Flood Recurrences at Yates

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

```
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)

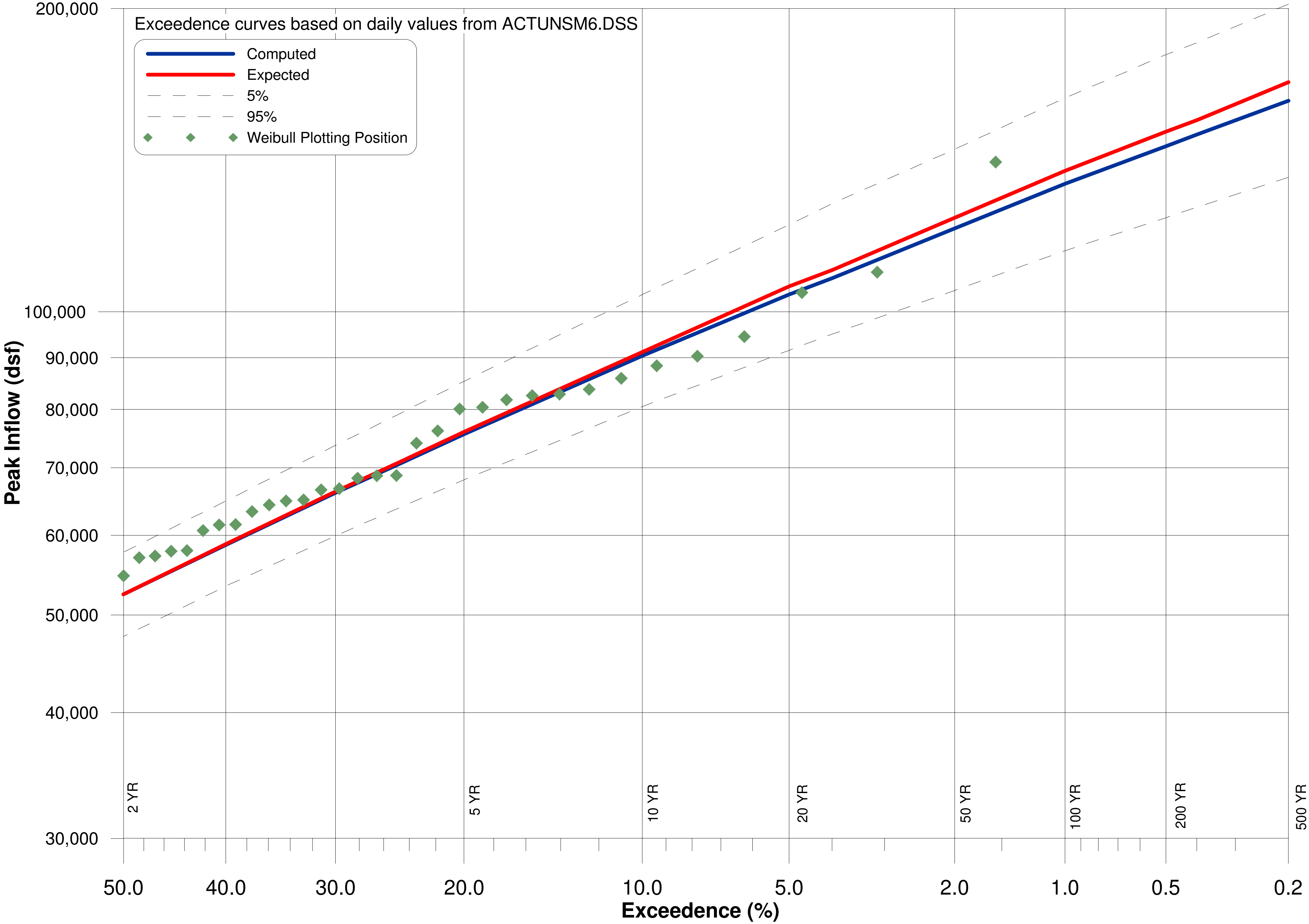

Figure THU- 5: Exceedence Curve for Unregulated 3 Day Volume at Thurlow

(1939-2001)

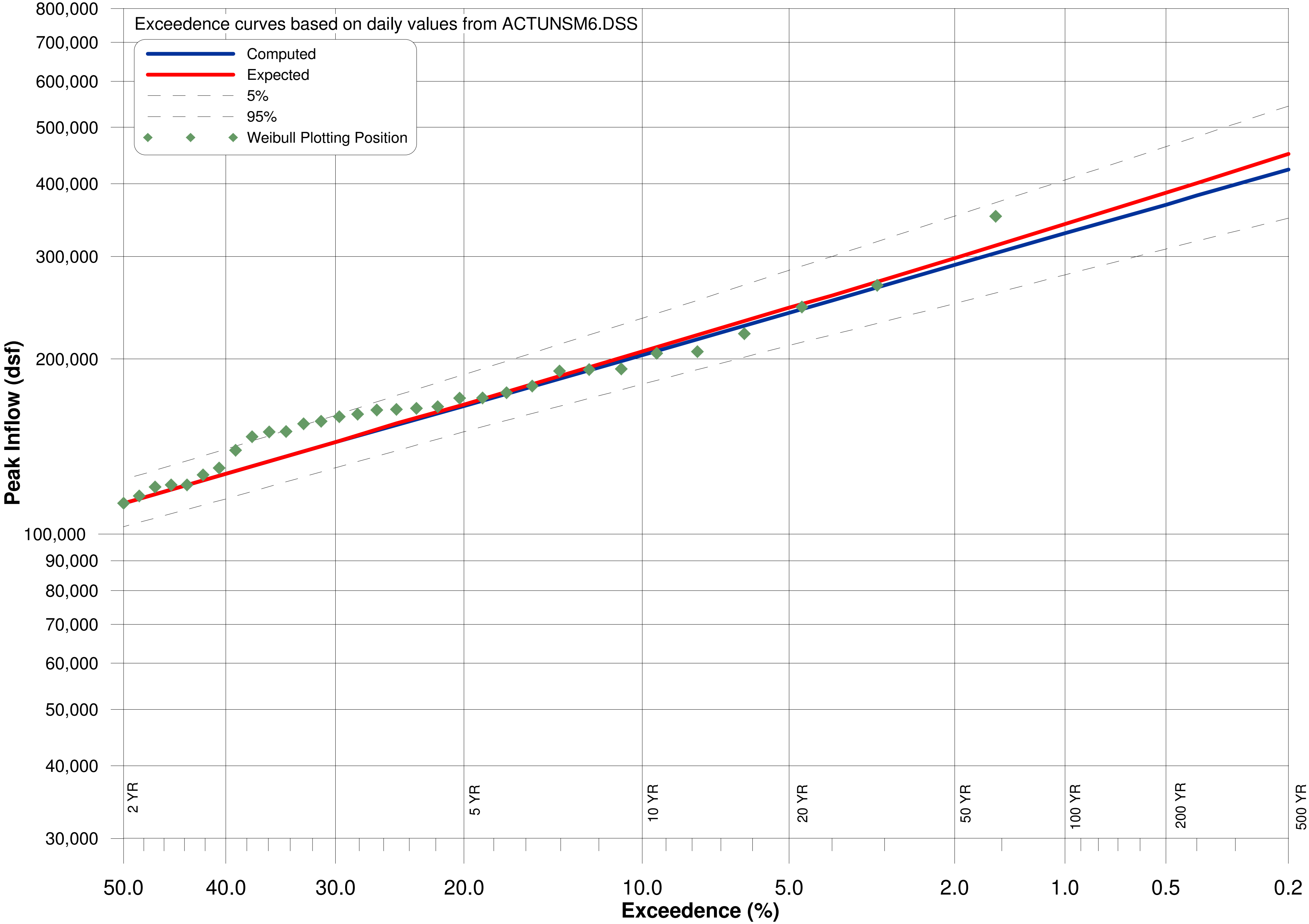

Figure THU - 6: Exceedence Curve for Unregulated 5 Day Volume at Thurlow

(1939-2001)

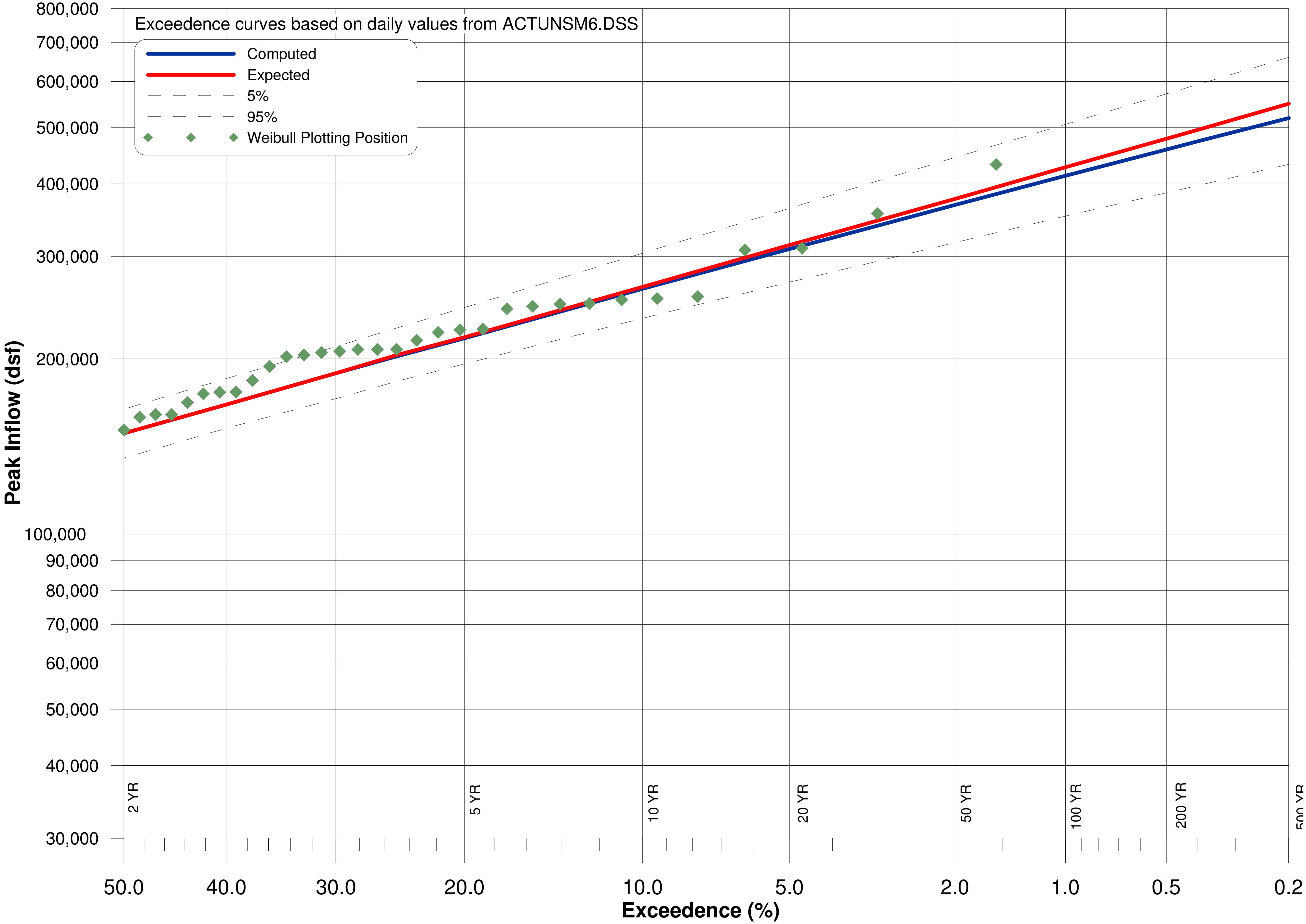

Table THU-3: Regulation Impact on Flood Recurrences at Thurlow

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
QR             1994   37181
QR             1995   54693
QR             1996   81797
QR             1997   57896
QR             1998   94503
QR             1999   21282
QR             2000   22225
QR             2001   60689
ED
```

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)

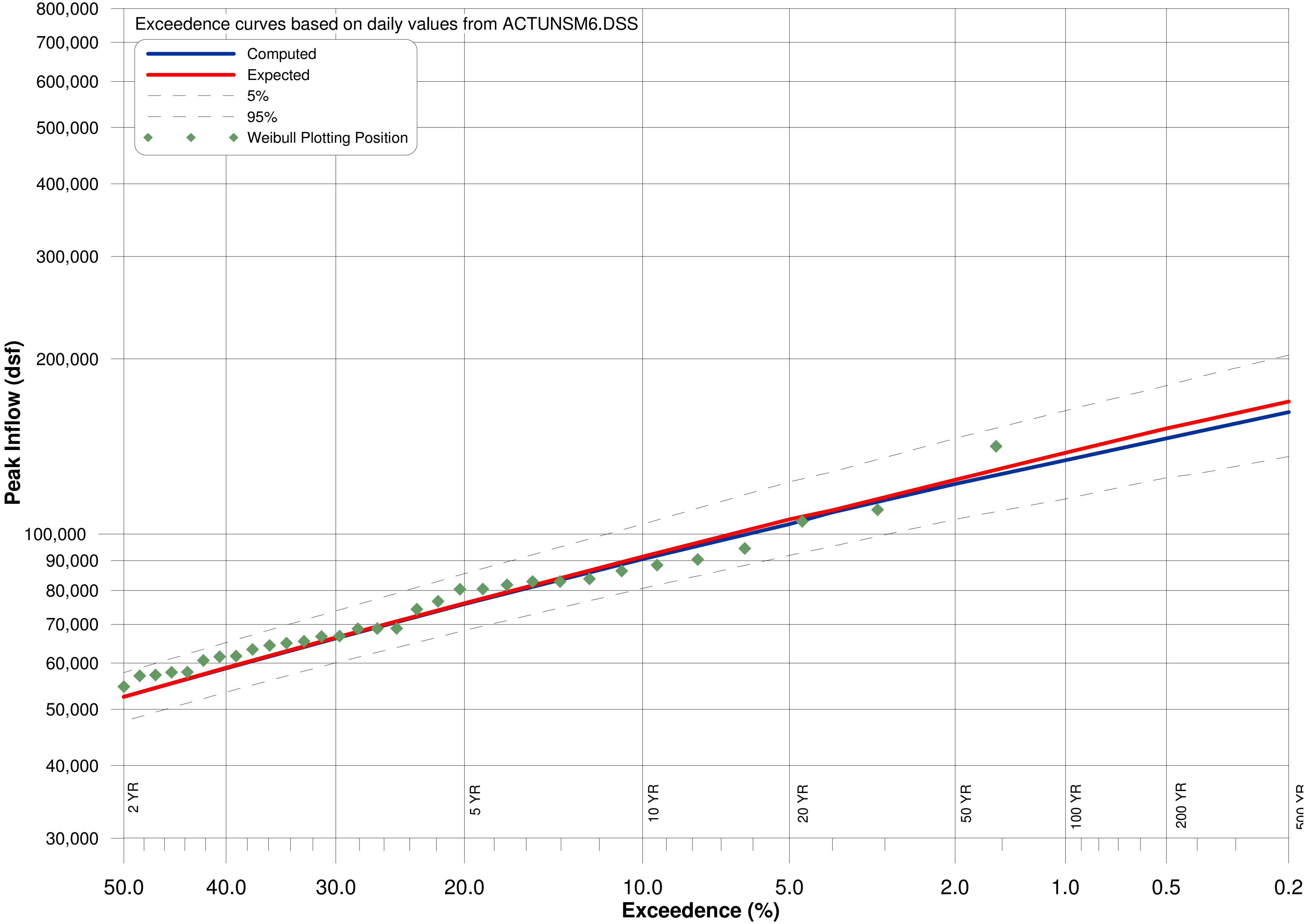

Figure TAL-5: Exceedence Curve for Unregulated 3 Day Volume at Tallassee

(1939-2001)

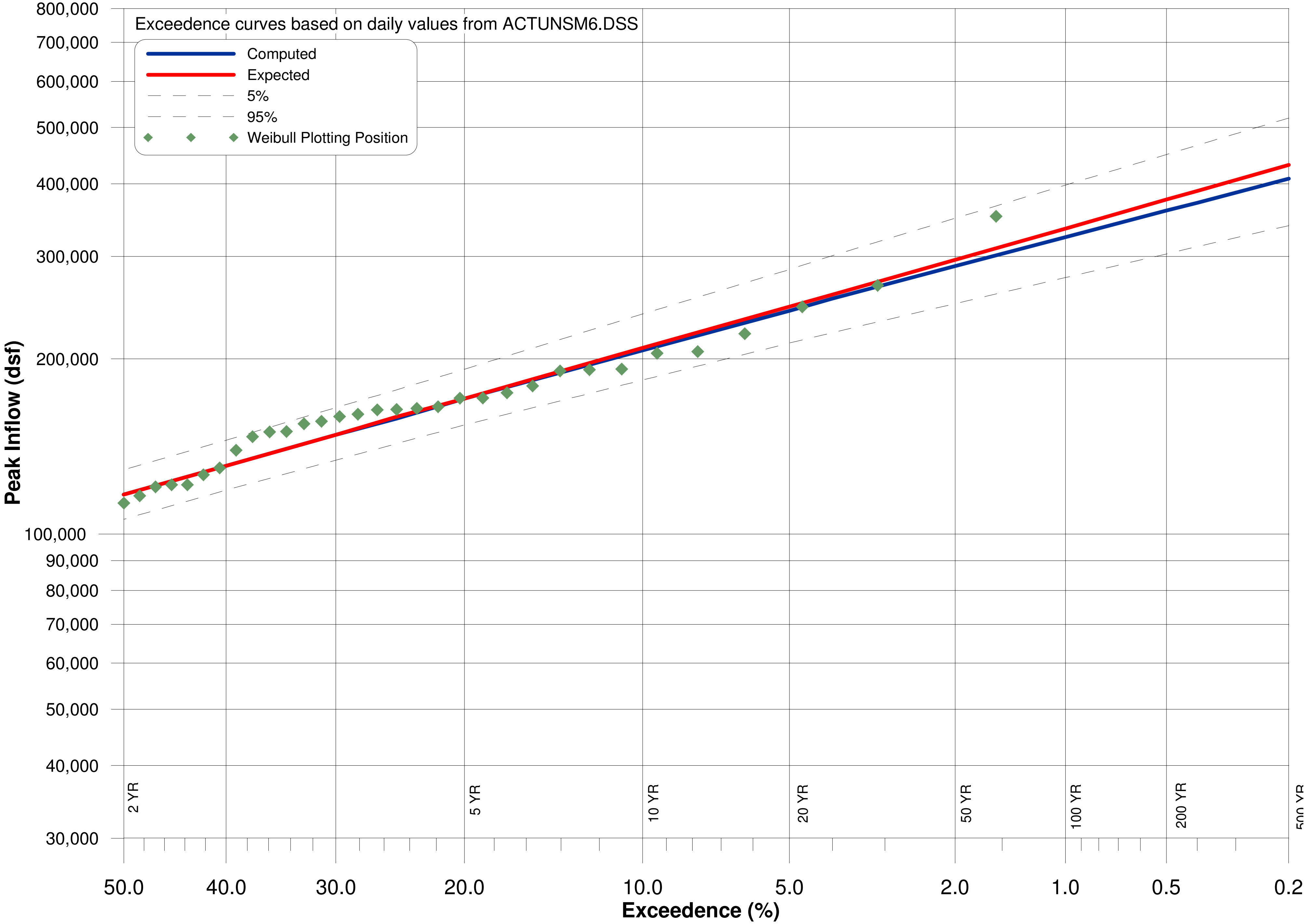

Figure TAL- 6: Exceedence Curve for Unregulated 5 Day Volume at Tallassee

(1939-2001)

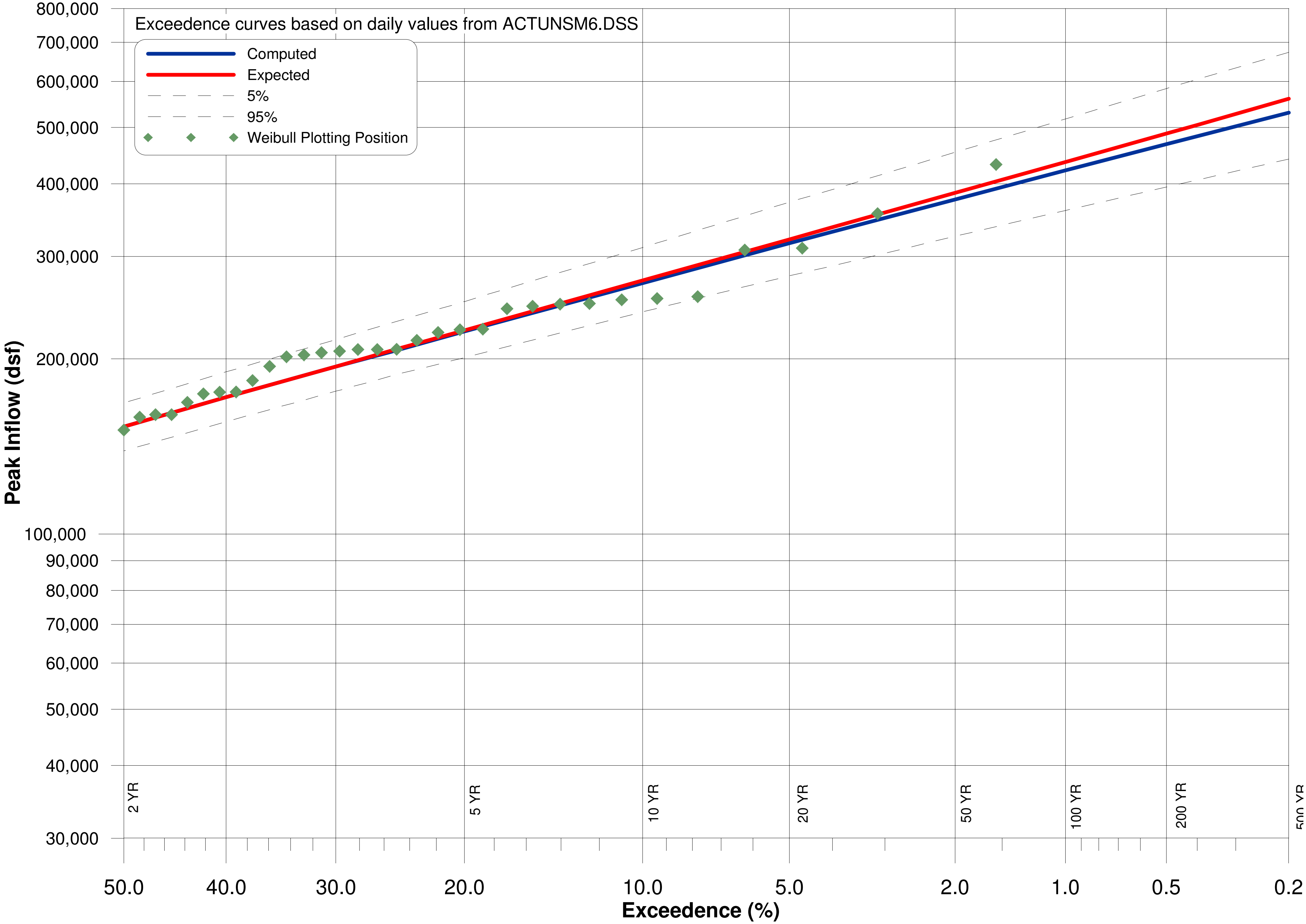

Table TAL-3: Regulation Impact on Flood Recurrences at Tallasse

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

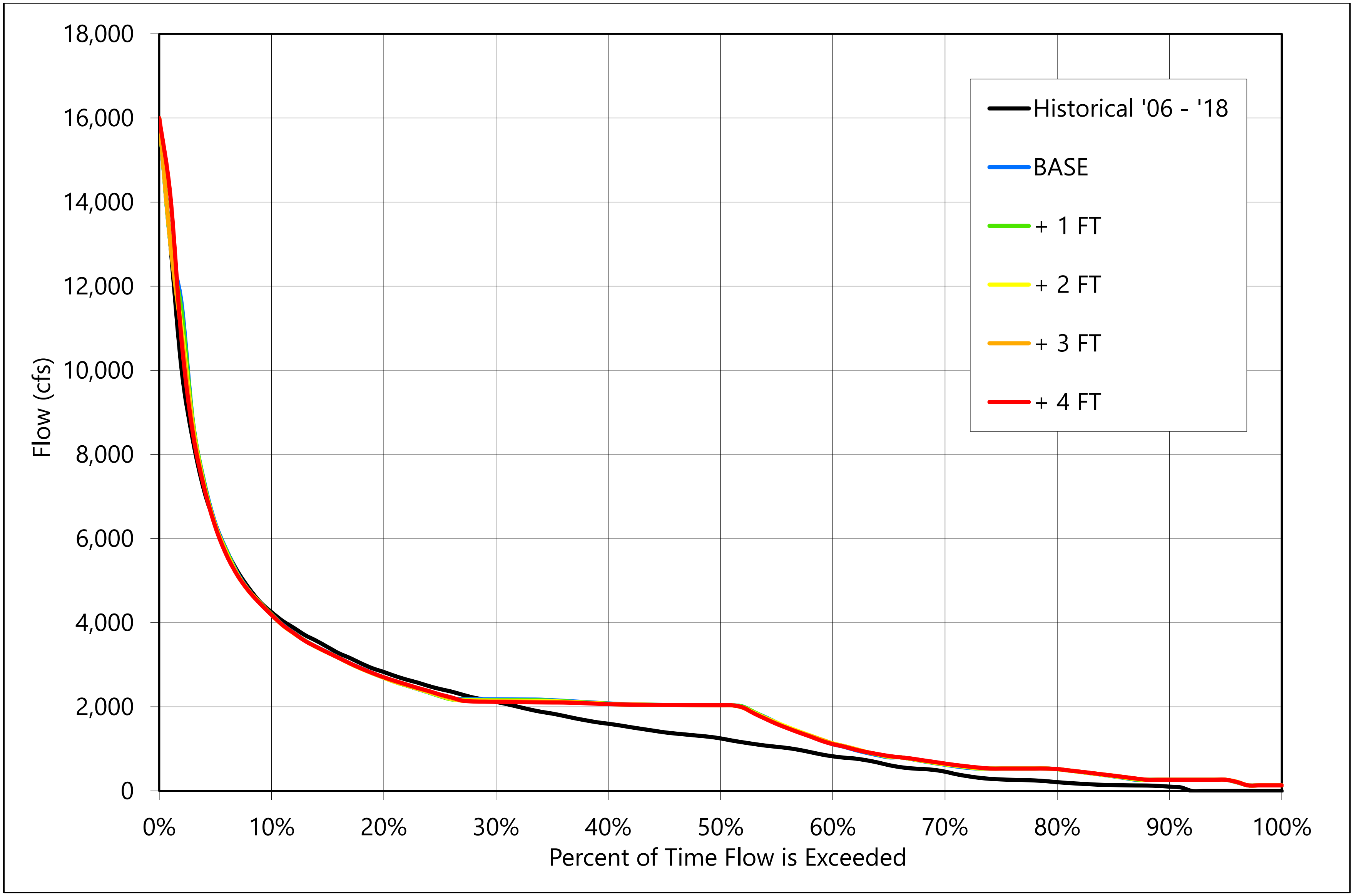

Figure C-1 Harris Reservoir Annual Flow Duration Curve

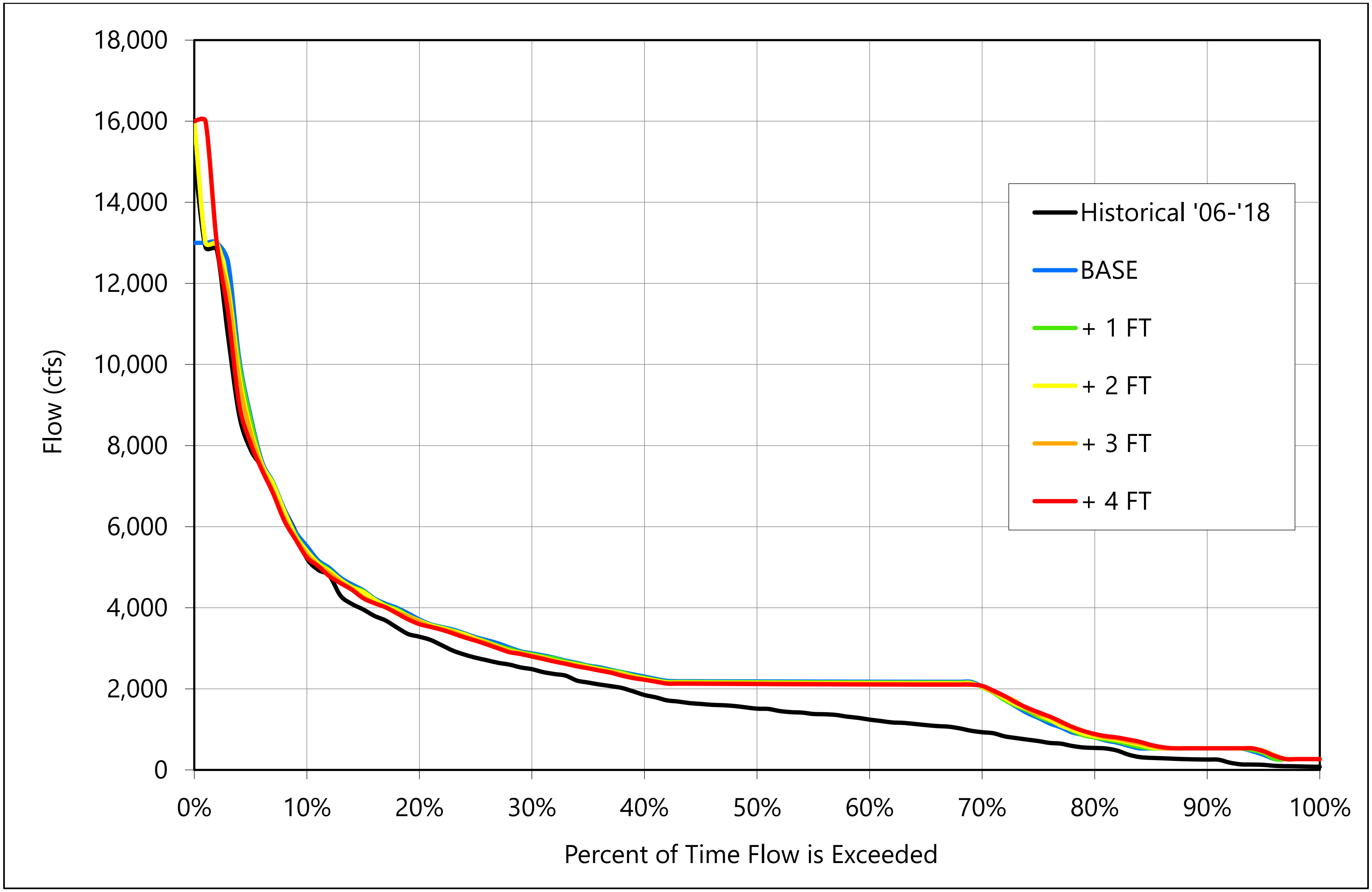

Figure C-2 Harris Reservoir - January Flow Duration Curve

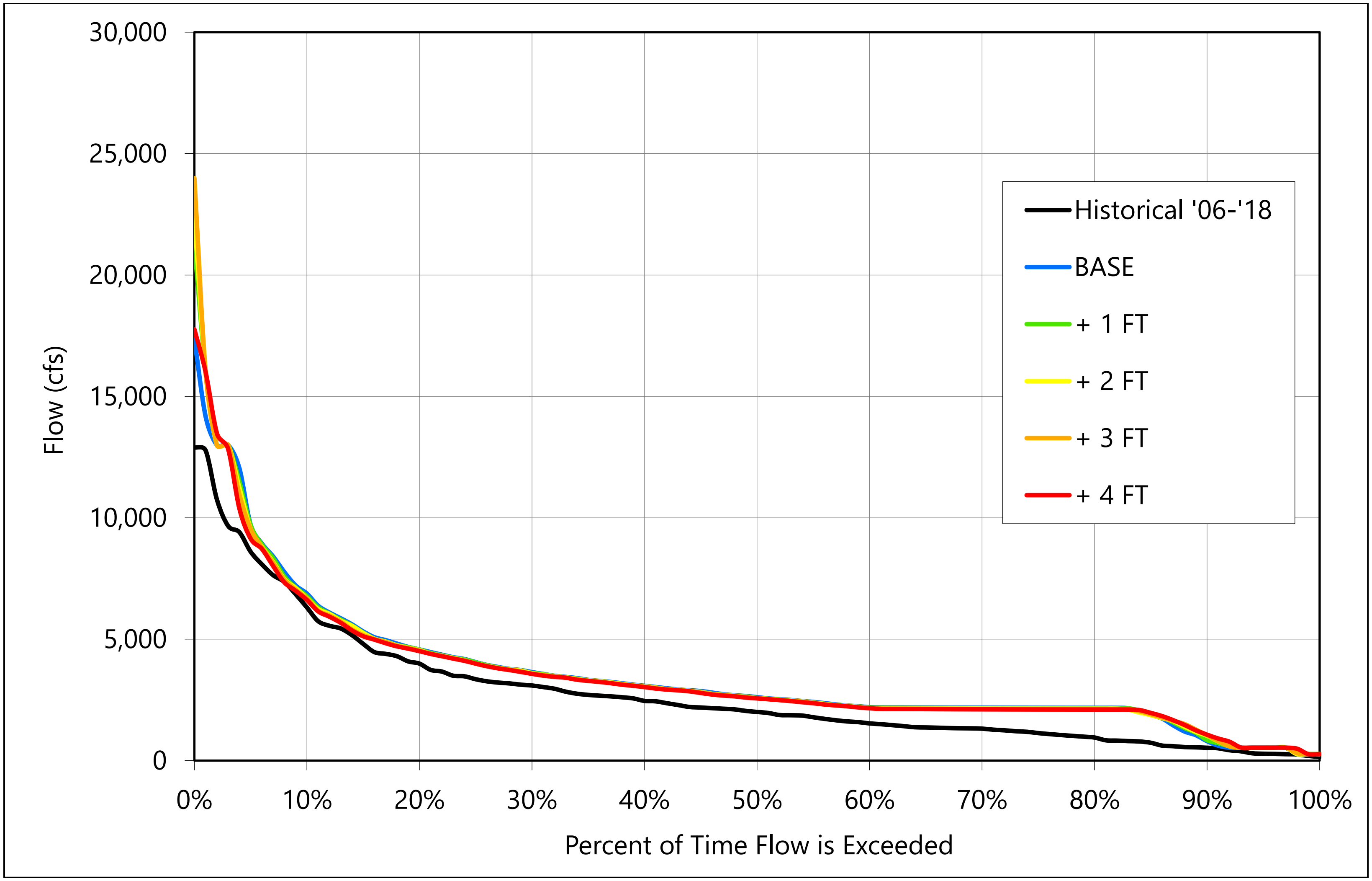

Figure C-3 Harris Reservoir - February Flow Duration Curve

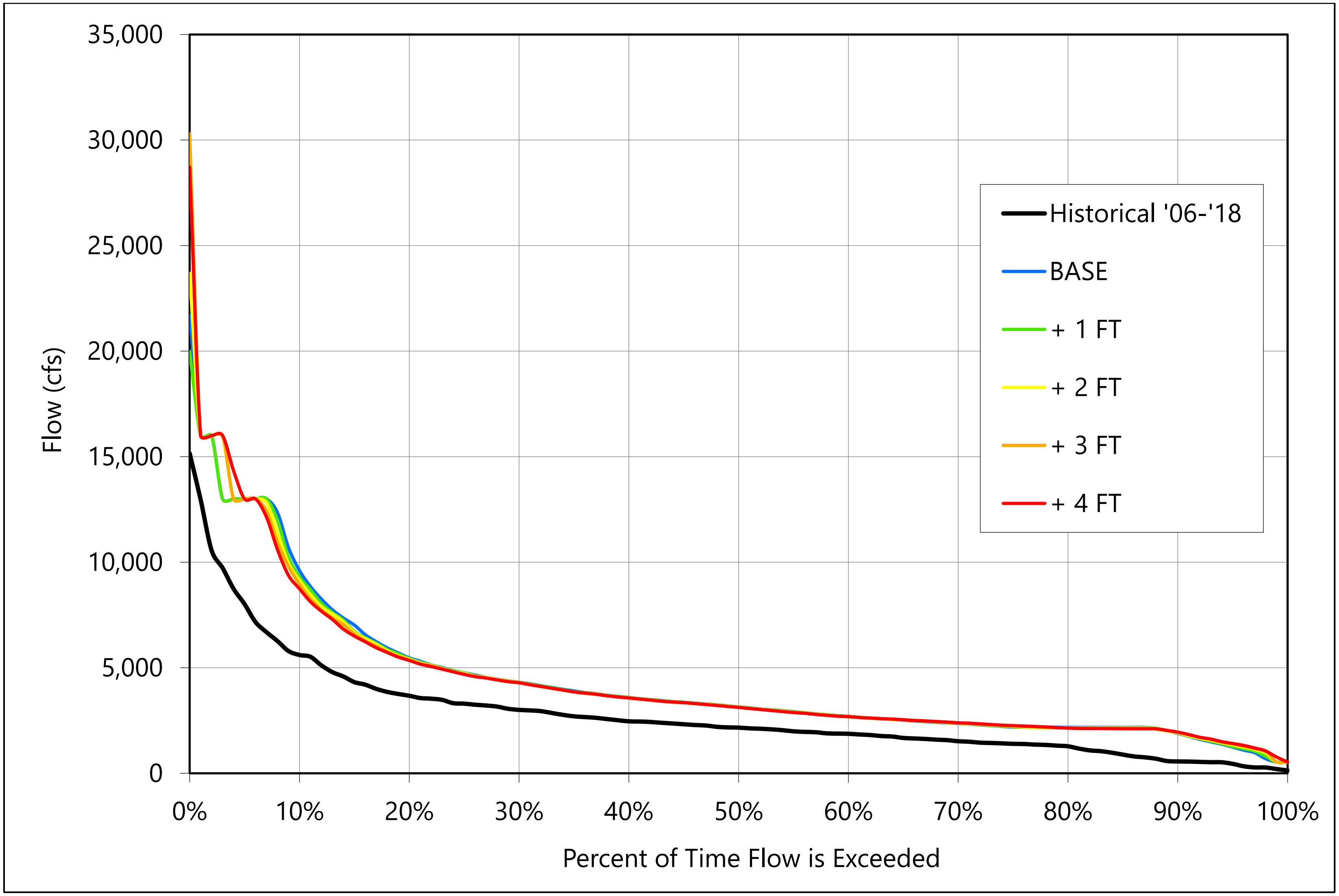

Figure C-4 Harris Reservoir - March Flow Duration Curve

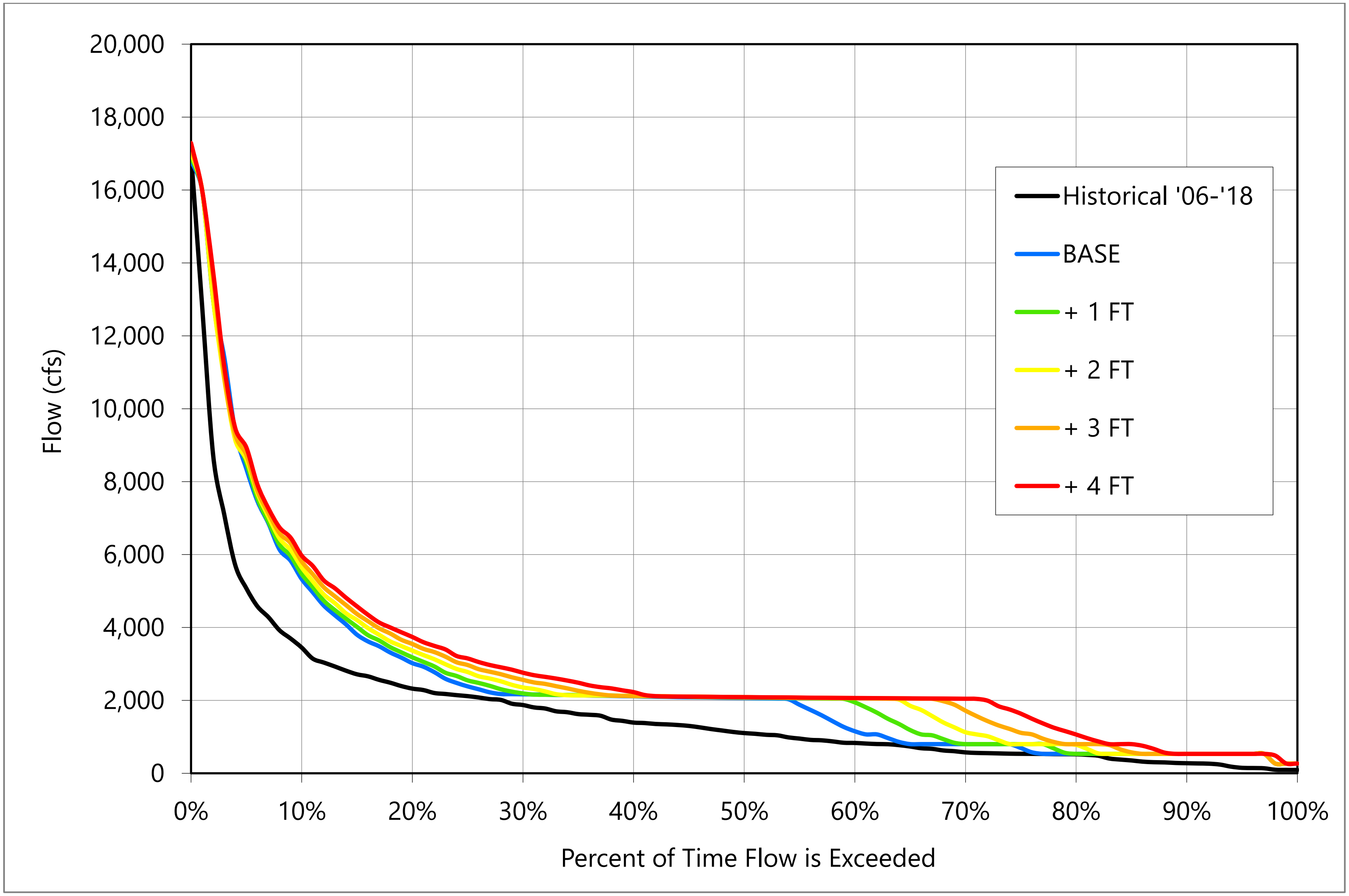

Figure C-5 Harris Reservoir - April Flow Duration Curve

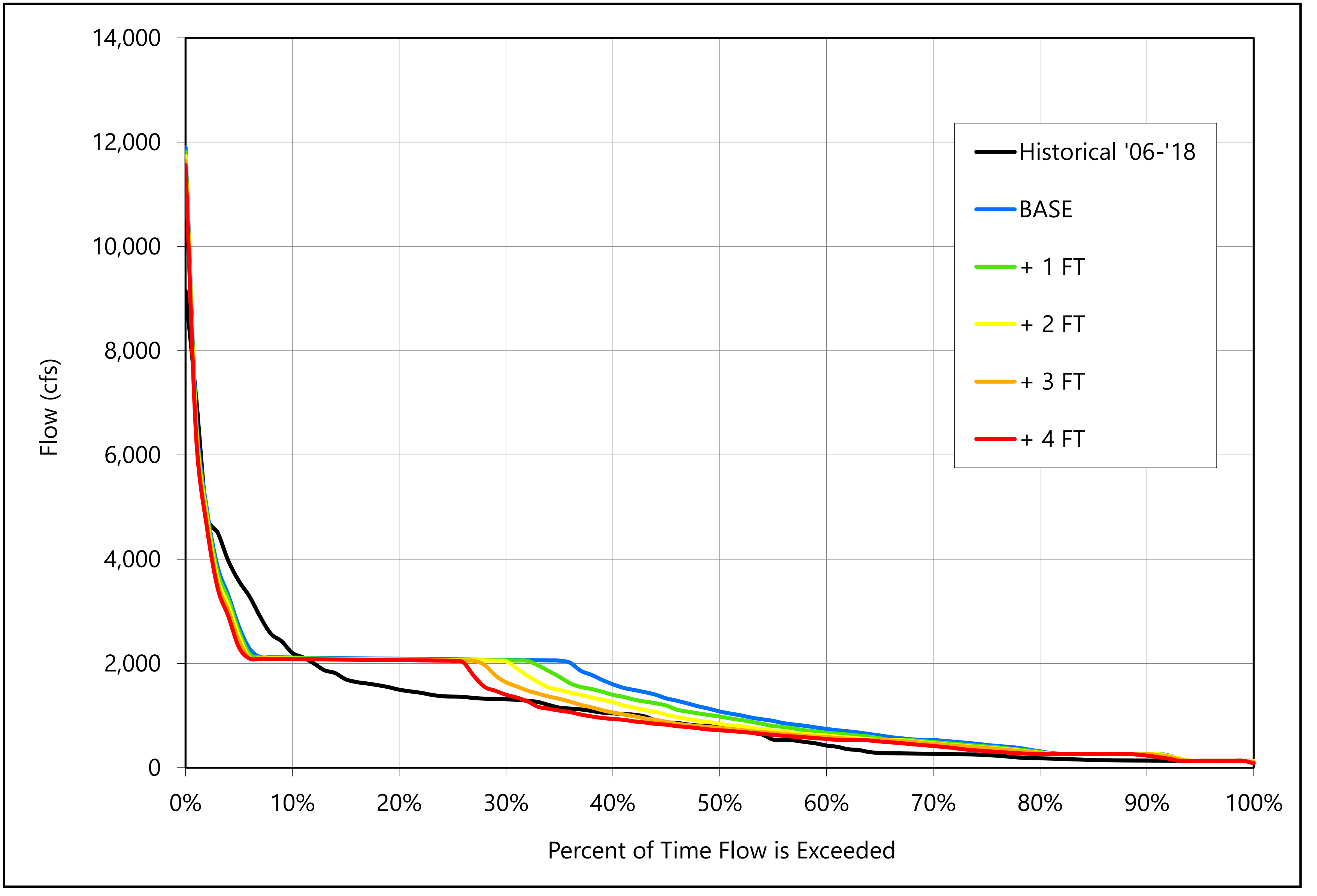

Figure C-6 Harris Reservoir - October Flow Duration Curve

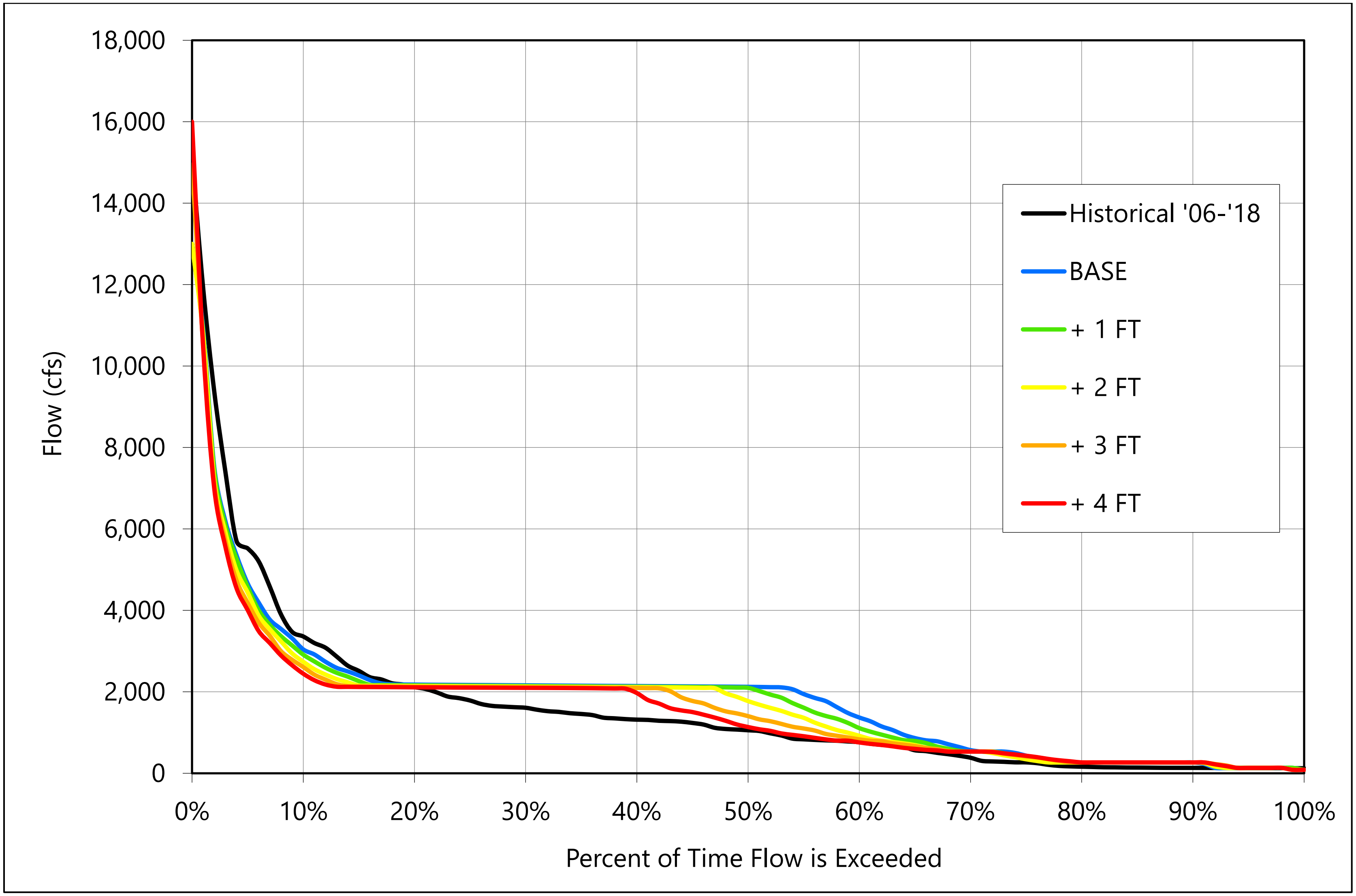

Figure C-7 Harris Reservoir - November Flow Duration Curve

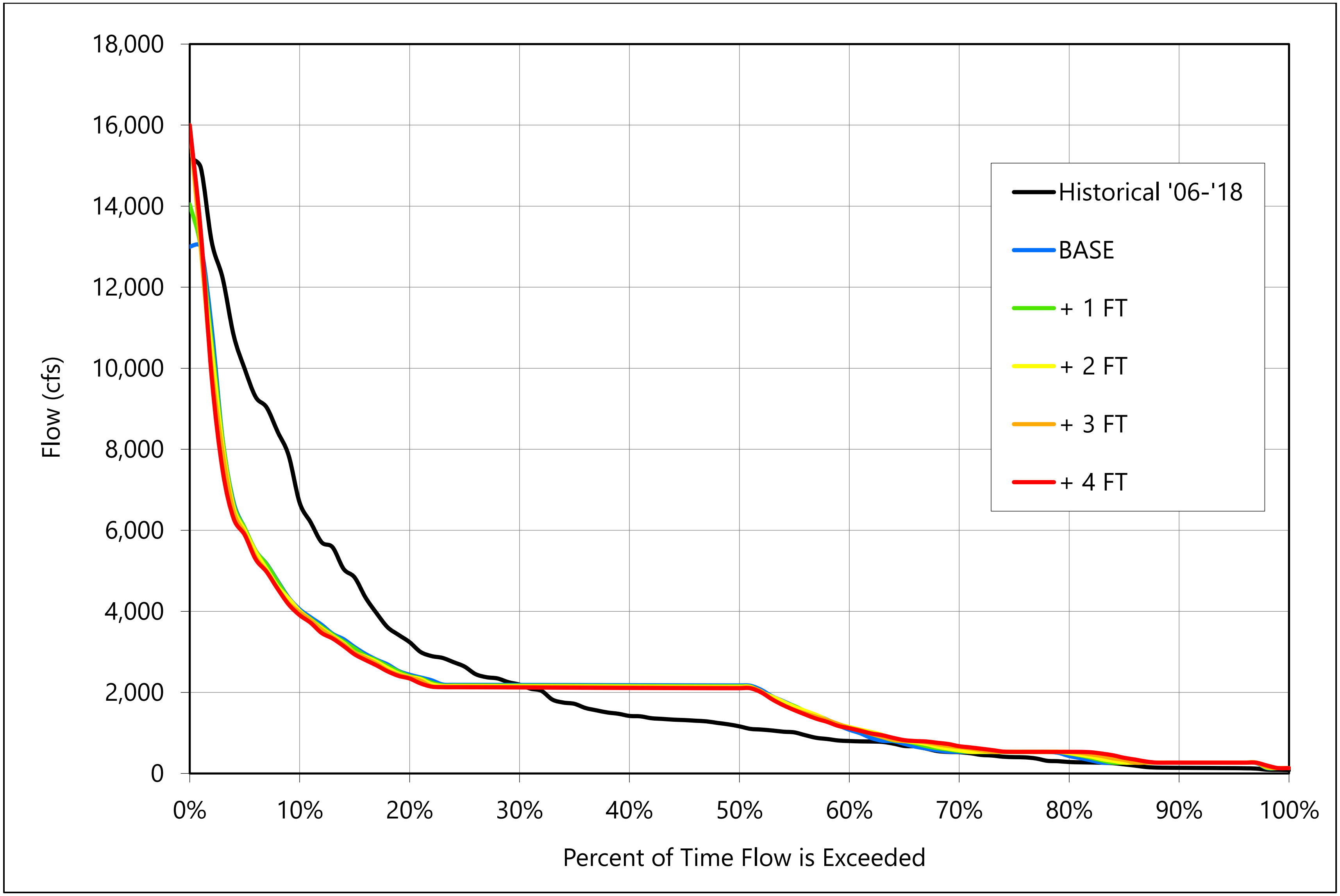

Figure C-8 Harris Reservoir - December Flow Duration Curve