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From: BIERY, PAUL KIM <PAUL.BIERY@scana.com>
Sent: Wednesday, October 9, 2019 8:00 AM
To: LAKhan@ColumbiaSC.Net <LAKhan@ColumbiaSC.Net>; cstone@lex-co.com <cstone@lex-co.com>; Heather Brown <Brown.Heather@richlandcountysc.gov>; coxM@dnr.sc.gov <coxM@dnr.sc.gov>
Cc: EFFINGER, THOMAS (SEG Services - 6) <THOMAS.EFFINGER@DOMINIONENERGY.COM>; Amy Cappellino (Amy.e.Cappellino@usace.army.mil) <Amy.e.Cappellino@usace.army.mil>; Cassidy, Greg <cassidga@dhec.sc.gov>; Berresford, James <berresjl@dhec.sc.gov>; Rusty Contrael <rcontrael21@outlook.com>
Subject: Dominion Energy South Carolina Congaree River Project (No-Rise Certification Submittal)

Dear local Floodplain Managers:

Good morning. Dominion Energy South Carolina (DESC) is continuing to pursue a United States Army Corp of Engineers (USACE) permit to perform a Modified Removal Action (MRA) of a Tar-like Material (TLM) from the Congaree River in Columbia, SC [Attachment 1]. The MRA was reviewed and approved by SCDHEC and various Stakeholders on February 7, 2019 and a document describing the approved scope of work is attached [Attachment 2].

As you may recall, DESC commissioned WSP (our design Engineer) to perform a Hydraulic Analysis (i.e. backwater study) to determine the impact of the proposed cofferdam structures on the Base Flood Elevations (BFE) for existing conditions [Attachment 3]. Based on the backwater analysis, a signed "Engineering 'No-Rise' Certification" was prepared that demonstrated the proposed Congaree River Remediation Project will not impact the 100-year flood elevations, etc., for both Richland and Lexington counties [Attachments 4 & 5].

On Friday, October 4th, 2019 - DESC received notification from the USACE that their comments have been addressed and the analysis regarding the "Engineering No-Rise Certifications" is ready to be submitted to the Floodplain Managers. Therefore, DESC is officially submitting the following documents for your respective review and subsequent written approvals:

Attachments

- 1 – Final MRA 12-12-18 [i.e. Stakeholder-Developed Modified Removal Action (MRA)]
- 2 – Concurrence Letter for MRA with stakeholder declarations final 02-07-19
- 3 – Congaree River Hydraulic Analysis Report Memo dated April 12, 2019
- 4 – Congaree River Remediation No-Rise Certification – April 12, 2019 – Richland County
- 5 – Congaree River Remediation No-Rise Certification – August 13, 2019 – Lexington County
- 6 – A link to a directory with the Calculations used to develop the "No-Rise Certifications" https://apexcos.sharepoint.com/:f:/s/PittsburghPA/EkPfSEAzUylOj12r-JC18G4Bs9ybklx1LFSUCqhGV3ABhQ?e=9tuiu6

These documents have not changed since the preliminary submittal provided earlier for your review. Based on the USACE's request, we are seeking Floodplain Coordinator approval(s) of the No-Rise Certifications so that we may proceed with additional engineering and permitting work to complete this important project. Please provide your written approval (on your respective letterheads) at your earliest convenience.

Please call or email with any questions or comments.

Thank you for your prompt attention to this request.

Paul Biery
Senior Project Manager

400 Otarre Parkway, Cayce, SC 29033
Mailing Address: 220 Operation Way, MC C221, Cayce, SC 29033
O: 803-217-5016 M: 803-465-7736

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December 12, 2018

Mr. Lucas Berresford, Program Manager
State Voluntary Cleanup Program
Division of Site Assessment, Remediation, and Revitalization
Bureau of Land and Waste Management
South Carolina DHEC
2600 Bull Street
Columbia, SC 29201

RE: DRAFT Conceptual Plan for a Modified Removal Action
SCE&G Fleet Maintenance Site (Congaree River)
Columbia, South Carolina
VCC# 02-4295-RP

Dear Mr. Berresford:

At the stakeholder meeting held at DHEC's office on November 15th, 2018, consensus agreement was reached between stakeholders on a Modified Removal Action (MRA) as the preferred path forward on the Congaree River sediment remediation project. At the conclusion of that meeting, DHEC requested SCE&G to prepare drawings and provide a written summary of the MRA for DHEC approval and continuing stakeholder agreement. Attached hereto are the requested drawings and written summary, presented as the Congaree River Project Conceptual Plan for a Modified Removal Action-December 2018. (Conceptual Plan). SCE&G is prepared to submit a pre-application meeting request to the Army Corps of Engineers once DHEC has approved the Conceptual Plan and it has been accepted by Stakeholders.

SCE&G remains committed to pursue any DHEC preferred final remedy that can be conducted in a safe and effective manner. Thank you for your help to move a remedy forward for the Congaree River sediments. If you have questions, please don't hesitate to give me a call at 803-217-9367.

Sincerely,

Thomas N. Effinger

Thomas N. Effinger, Director
Corporate Environmental Services
SCANA

cc: G. Cassidy,
G. Kendall Taylor,
Myra Reece,
Veronica Barringer

Congaree River Project
Conceptual Plan for a Modified Removal Action – December 2018

Objective

The Conceptual Plan delineates a revised approach towards completing a Modified Removal Action (MRA) as the preferred final remedy to address impacted sediment, tar-like material (TLM) and any associated effects that may exist within the Congaree River in Columbia, SC. The Conceptual Plan also defines the agreement and understanding reached among the Stakeholders listed on this document. The Stakeholders attended several meetings at DHEC to discuss the Congaree River remediation project and to develop a potential path forward. The result of those meetings and discussions was consensus agreement on the proposed MRA on November 15, 2018:

- To pursue a Modified Removal Action (MRA) consisting of the removal of sediment and tar-like material (TLM) from two separate areas as depicted on the attached figures and estimated in the attached table as a revised approach in an effort to receive a favorable Department of the Army (DA) permit decision for the necessary cofferdam as well as all other required regulatory approvals.

This Conceptual Plan outlines the proposed limits of the MRA based on the attached figures and justification which forms the basis for all future permit applications, engineering studies, design submittals, etc. that will be required in pursuit of the permits and approvals necessary to implement the MRA.

Conceptual Plan MRA – December 2018

The MRA will involve removal of impacted sediments and TLM from targeted areas that are:

- Close to the shoreline and therefore more susceptible to human dermal contact or exposure (e.g. to recreational users such as kayakers, waders/swimmers, fishermen etc.); and
- More concentrated with TLM, or where thicker deposits of TLM are shown to exist.

The attached Figures provide visual representations of the areas targeted for a modified removal action and their location. Figure 1 compares the outline of the previously proposed full-scale removal action (PRAWP - September 2018) to the two areas comprising this proposed MRA. Also note that the volumes shown on Figure 1 for each approach were calculated using a combination of new survey information collected in the spring of 2018 and the sediment coring logs collected from the remedial investigations conducted in 2010 to 2012. Figure 2 shows the MRA areas with a GIS visualization of each sediment boring as a TLM "hot-spot" which depicts the greater thickness of the TLM by a brighter color. Figure 3 provides an updated depiction of the average TLM thickness with estimated volume, using a similar GIS tool in which the TLM representation extends into the adjacent data point. Sediments in the "other areas" that will not be removed consist of either:

- Relatively minor thicknesses of TLM, and/or
- Are now covered by additional sediment resulting from the "superstorm" of 2015; and/or

- Occur far enough away from the shoreline and in deeper water, whereby risk of human dermal contact or exposure is minimal.

The proposed MRA consists of two areas as shown on the attached Figures. Area 1 is approximately 2.6 acres and has a similar footprint to the original full-scale Phase 1 area. Area 2 is approximately 0.5 acres in size.

Table 1 provides a comparison of volume estimates from previously submitted documents. Assuming successful completion of the MRA as proposed in this Conceptual Plan, an estimated 73% of the total TLM is expected to be removed from the Congaree River.

Permitting

Regulatory permits and approvals will be required from the US Army Corps of Engineers (USACE), various sections within SCDHEC, the SC Department of Natural Resources (SCDNR), the Federal Emergency Management Agency (FEMA) local floodplain coordinators, the City of Columbia and other related state and local authorities to conduct the proposed work within and adjacent to the Congaree River.

Although the Stakeholders acknowledge that significant permitting challenges exist and may prove to be insurmountable, it is the mutual desire among the Stakeholders that all appropriate permits and approvals be obtained so that the MRA can be implemented.

Stakeholders attending the DHEC meetings

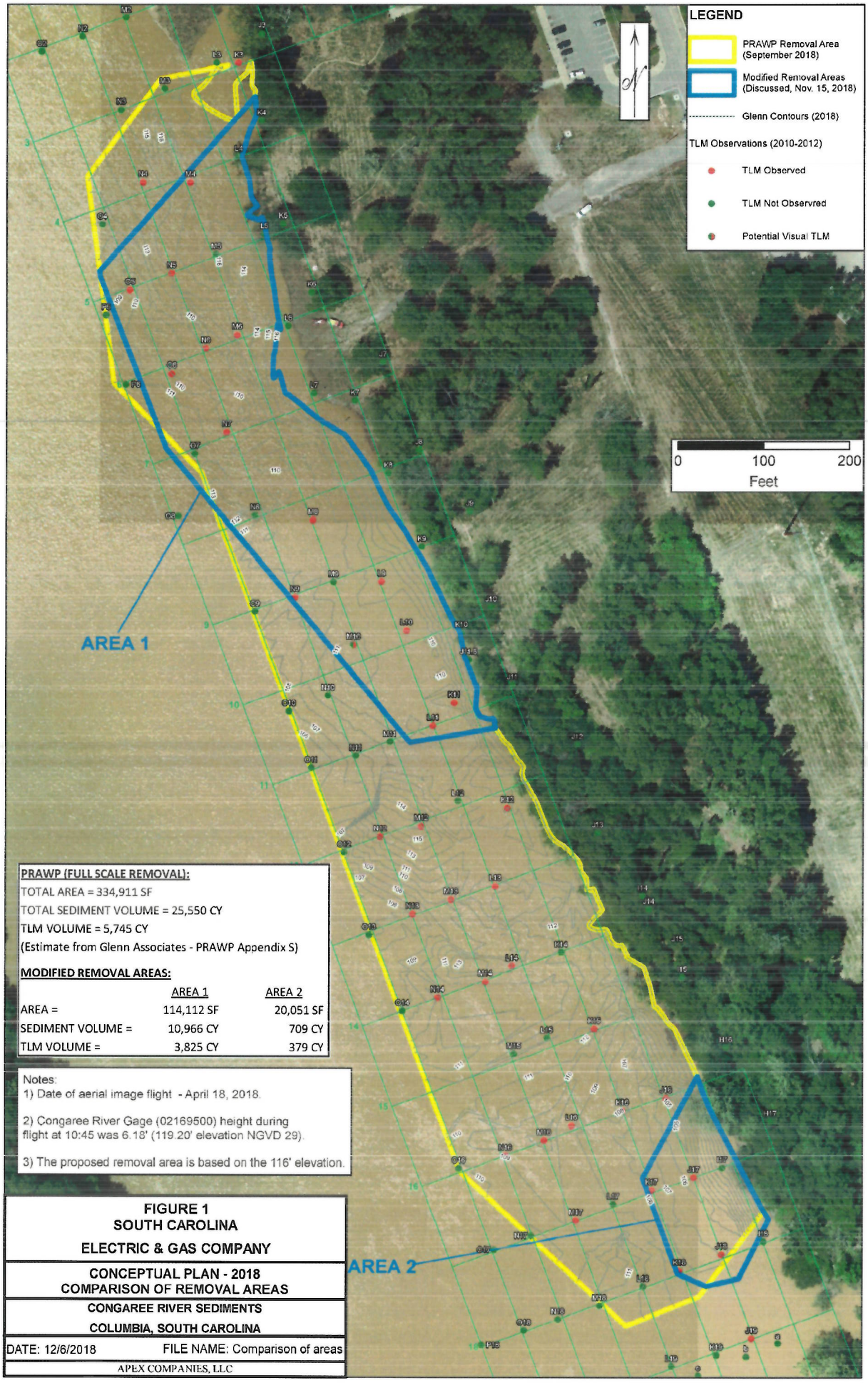
SCANA/SCE&G
SCDHEC
Congaree Riverkeeper
Southern Environmental Law Center
Guignard Associates
City of Columbia
Office of the SC Governor

Attachments

Table 1
3 Figures
Meeting sign-in sheet

Table 1 Estimated Removal Volumes

Estimated by	MTR	Glenn & Associates	Apex	
	EE/CA Sediment Volume Estimate January 2013	Preliminary Removal Action Work Plan (PRAWP) September 2018	Proposed Conceptual Plan - MRA Sediment Volume Estimate December 2018	Percent Removal
	Original, Full-Area Removal	Full-Area Removal	MRA Areas 1 & 2	MRA vs PRAWP
Total Volume of Sediment to be Removed	**26,700 CY**	**25,550 CY**	**11,675 CY**	**46%**
Total Volume of TLM to be Removed	**Not Estimated**	**5,745 CY**	**4,204 CY**	**73%**



PRAWP (FULL SCALE REMOVAL):

TOTAL AREA = 334,911 SF

TOTAL SEDIMENT VOLUME = 25,550 CY

TLM VOLUME = 5,745 CY

(Estimate from Glenn Associates - PRAWP Appendix S)

MODIFIED REMOVAL AREAS:

	AREA 1	AREA 2
AREA =	114,112 SF	20,051 SF
SEDIMENT VOLUME =	10,966 CY	709 CY
TLM VOLUME =	3,825 CY	379 CY

Notes:

1) Date of aerial image flight - April 18, 2018.

2) Congaree River Gage (02169500) height during flight at 10:45 was 6.18' (119.20' elevation NGVD 29).

3) The proposed removal area is based on the 116' elevation.

FIGURE 1
SOUTH CAROLINA
ELECTRIC & GAS COMPANY

CONCEPTUAL PLAN - 2018
COMPARISON OF REMOVAL AREAS

CONGAREE RIVER SEDIMENTS
COLUMBIA, SOUTH CAROLINA

DATE: 12/6/2018 FILE NAME: Comparison of areas

APEX COMPANIES, LLC

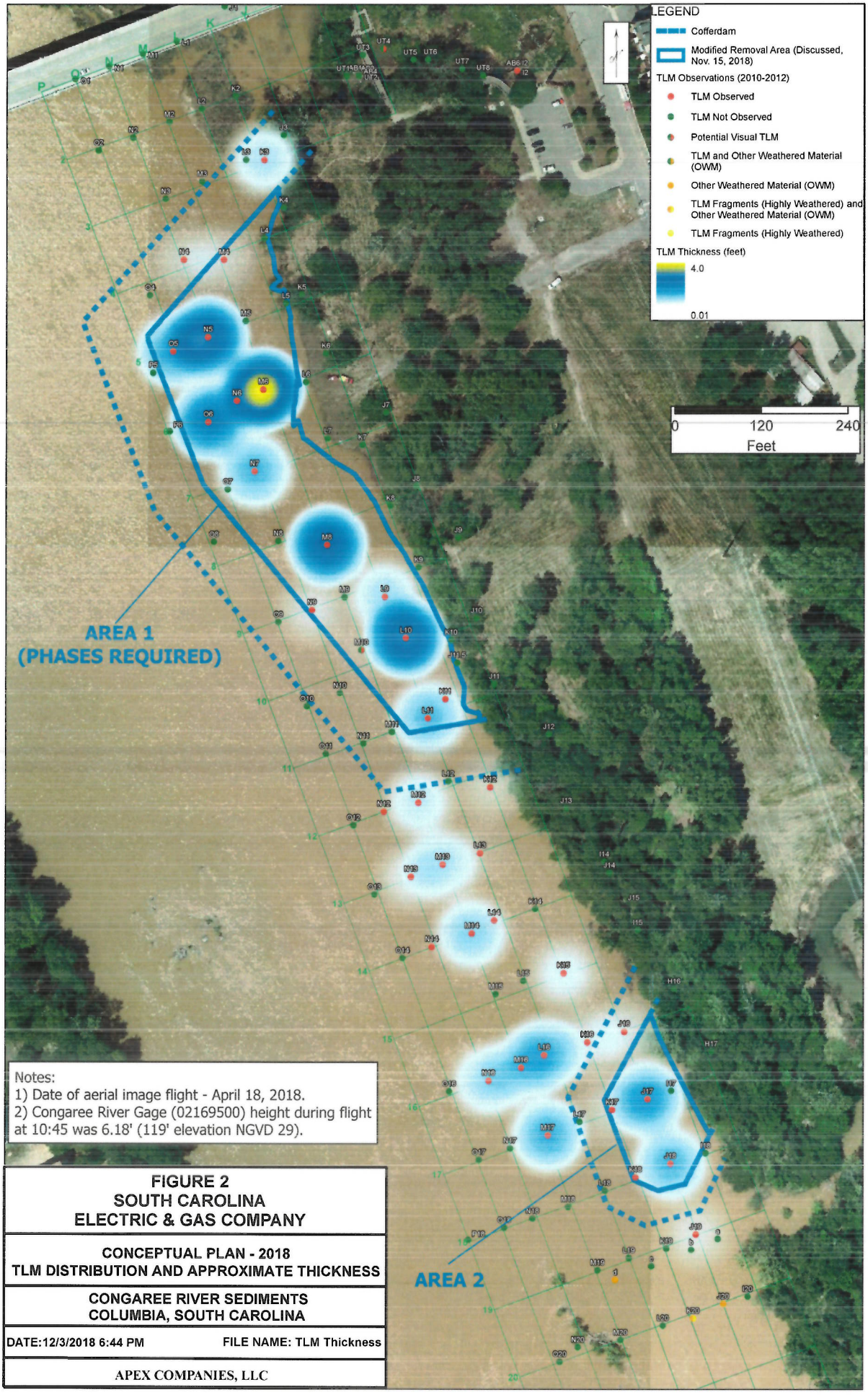


FIGURE 2
SOUTH CAROLINA ELECTRIC & GAS COMPANY

CONCEPTUAL PLAN - 2018
TLM DISTRIBUTION AND APPROXIMATE THICKNESS

CONGAREE RIVER SEDIMENTS
COLUMBIA, SOUTH CAROLINA

DATE:12/3/2018 6:44 PM FILE NAME: TLM Thickness

APEX COMPANIES, LLC

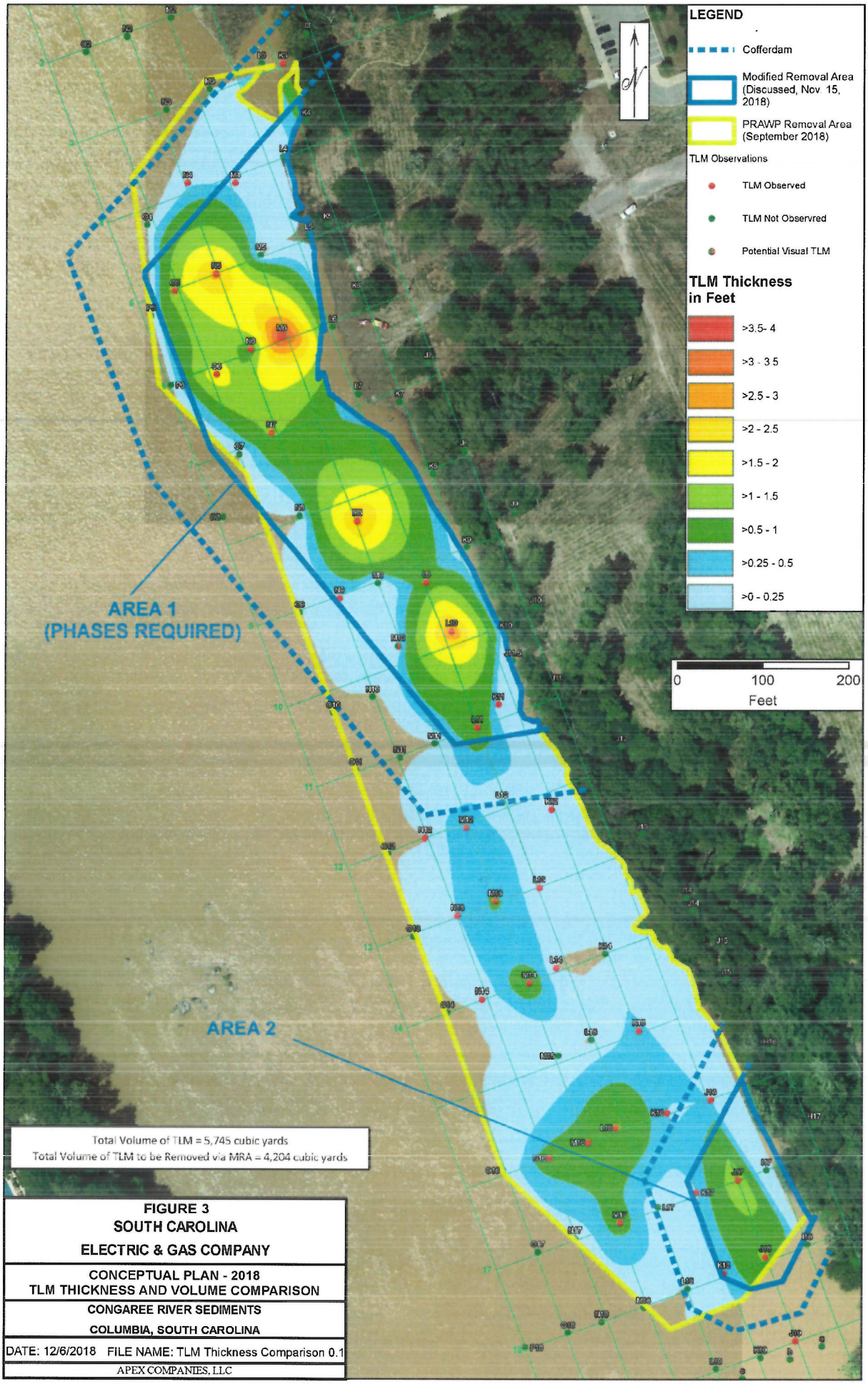


FIGURE 3
SOUTH CAROLINA
ELECTRIC & GAS COMPANY

CONCEPTUAL PLAN - 2018
TLM THICKNESS AND VOLUME COMPARISON

CONGAREE RIVER SEDIMENTS
COLUMBIA, SOUTH CAROLINA

DATE: 12/6/2018 FILE NAME: TLM Thickness Comparison 0.1

APEX COMPANIES, LLC

CONGAREE RIVER SEDIMENT

November 15, 2018

NO.	NAME	PHONE	EMAIL	ORGANIZATION
1	GREG CASSIDY	803-898-0910	cassidga@dhec.sc.gov	DHEC
2	Ken Taylor	803 898 0835	taylorglc@dhec.sc.gov	DHEC
3	Henry Porter	803 898-1911	porterhj@dhec.sc.gov	DHEC
4	Michael Traynham	803-898-0288	Michael.traynham@dhec.sc.gov	DHEC
5	RUSTY CONTRAEL	412-721-6494	RCONTRAEL21@OUTLOOK.COM	SCEPC CONSULTANT
6	TOMMY LAVENDER	803-253-8233	Tlavender@alexsanfrant.com	Alexsanfrant-Guignard
7	CHARLES THOMPSON	803-254-2125	CTHOMPSON@THOMPSONSC.com	GUIGNARD ASSOCIATES LLC
8	Karen Ratigan	803-898-1930	ratigakc@dhec.sc.gov	DHEC
9	JONATHAN YARBOROUGH	803-217-6316	jonathan.yarborough@scana.com	SCANA
10	DON SIROW	803-898-1996	Sivoudl@dhec.sc.gov	SCDHEC
11	Steve Kozlowski	843-600-2228	skoz22@gmail.com	Congaree Riverkeeper
12	Bill Stangler	803-776-3357	CRK@congareeriverkeeper.org	CRK
13	Liz Jones	843-619-4619	ejones@selcsc.org	Southern Env. Law Ctr
14	Catherine Wannamaker	"	cwannamaker@selcga.org	SELC
15	Mark Plowden	803-734-0522	mplowden@governor.sc.gov	Gov Office

CONGAREE RIVER SEDIMENT

November 15, 2018

NO.	NAME	PHONE	EMAIL	ORGANIZATION
1	Hugood Hamilton	803-217-8938	jhamilton@scana.com	SCE&G
2	Myra Reece	803/898-4102	reecem@dhec.sc.gov	SC DHEC
3	Tom Effinger	803/217-9367	teffinger@SCANA.com	SCE&G
4	Rusty Contrael	912/721-6494		
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Healthy People. Healthy Communities.

February 7, 2019

Mr. Thomas Effinger
Southeast Energy Group (SEG)
Mail Code C-221
220 Operation Way
Cayce, SC 29033-3701

RE: Draft Conceptual Plan for a Modified Removal Action (dated 12/12/18)
SCE&G Fleet Maintenance Site (Congaree River)
Columbia, South Carolina

Dear Mr. Effinger:

The Department (DHEC) has reviewed the Modified Removal Action (MRA) approach presented in the Draft Conceptual Plan and agrees this plan should be considered the preferred path-forward on the Congaree River sediment remediation project being conducted under DHEC's Responsible Party Voluntary Cleanup Contract (VCC 02-4295-RP.) This approach would target for removal areas where tar like material (TLM) is most prevalent and poses the greatest risk to human exposure. The target areas are shown in the three figures attached. It also acknowledges that some TLM might remain in the riverbed but situated in areas that would pose very little future risk to human exposure.

DHEC has consulted with two primary stakeholders in this project - The Congaree Riverkeeper and Guignard Associates LLC - and they too have expressed their support of this modified Removal Plan (see attached supporting statements for the record from each attached).

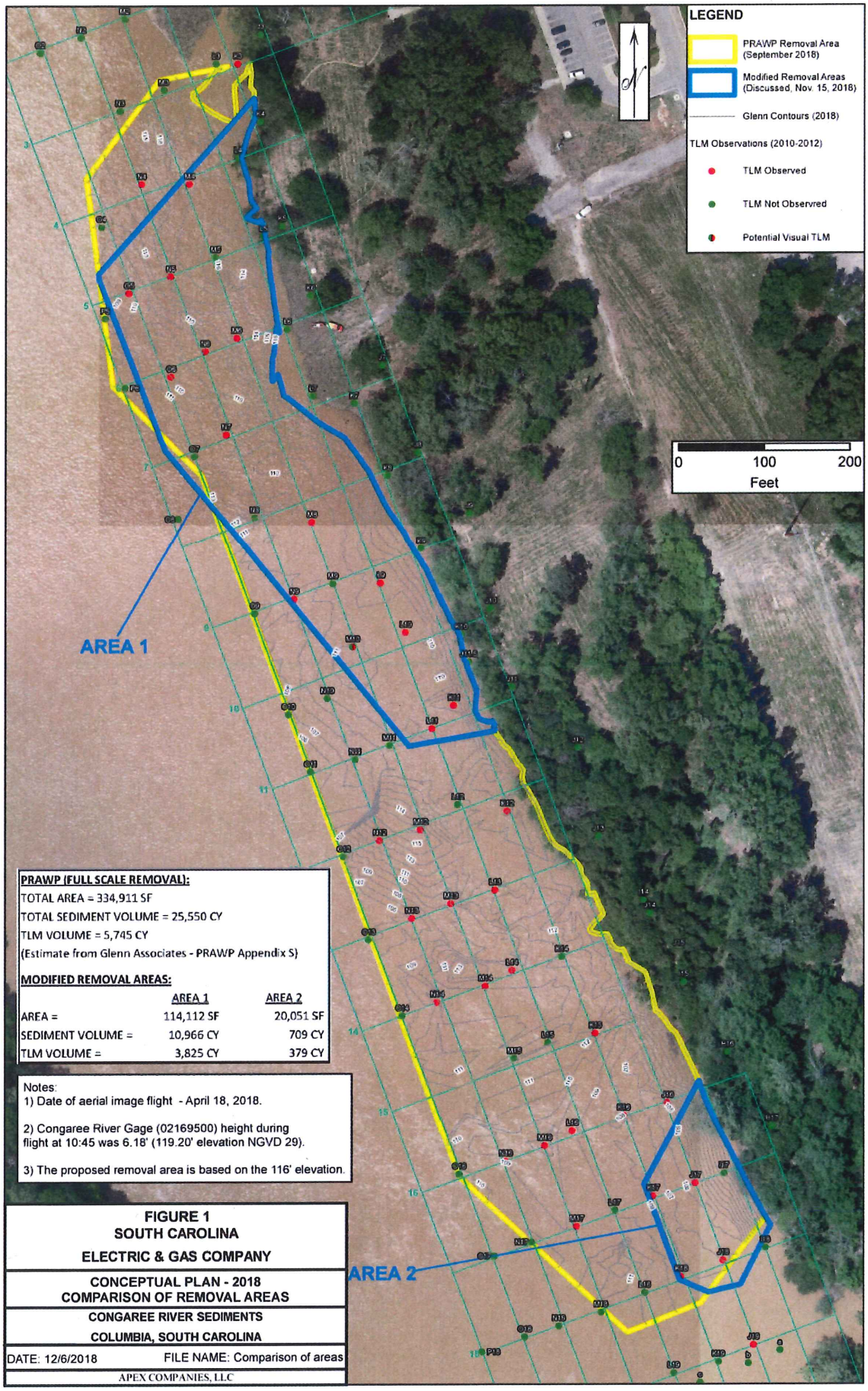
The Department requests SCE&G carry this proposal forward and draft all the proper documents to achieve the necessary regulatory permits and approvals required for implementation. Additionally, understanding that this project is being conducted under DHEC's Responsible Party Voluntary Cleanup Contract (VCC 02-4295-RP), stakeholder involvement and public participation will occur through the entire project. DHEC and the stakeholders agree that this project should be accomplished by the most expeditious route possible in working with the U.S. Army Corps of Engineers.

Sincerely,

G. Kendall Taylor, Director
Division of Site Assessment, Remediation, and Revitalization
Bureau of Land and Waste Management

cc: File 52561
Myra C. Reese, EA Director
Veronica Barringer, Midlands EA Region
Bill Stangler, Congaree Riverkeeper
Charlie Thompson, Guignard Associates LLC

Figures



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ELECTRIC & GAS COMPANY

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CONGAREE RIVER SEDIMENTS
COLUMBIA, SOUTH CAROLINA

DATE: 12/6/2018 FILE NAME: Comparison of areas

APEX COMPANIES, LLC

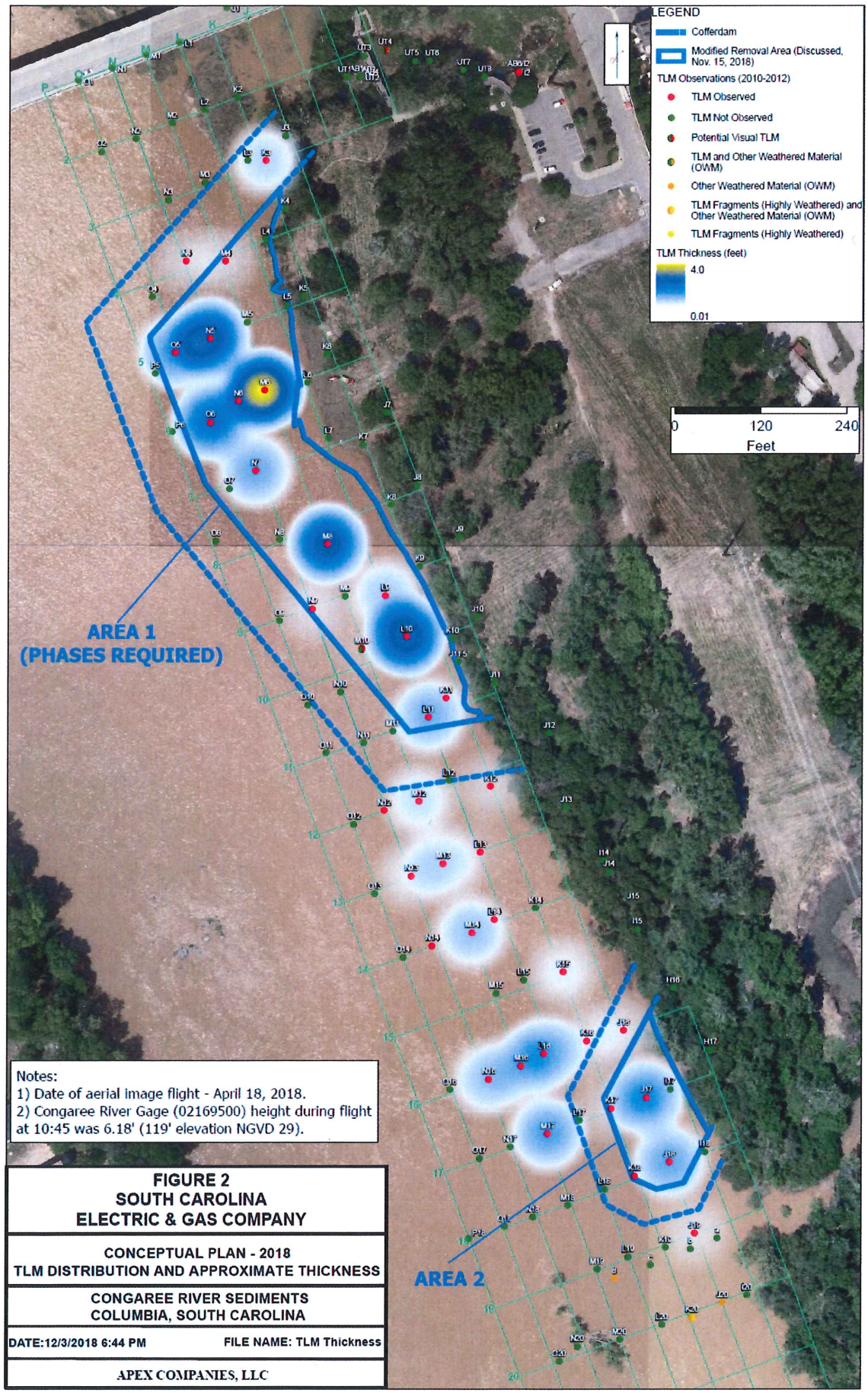


FIGURE 2
SOUTH CAROLINA ELECTRIC & GAS COMPANY

CONCEPTUAL PLAN - 2018
TLM DISTRIBUTION AND APPROXIMATE THICKNESS

CONGAREE RIVER SEDIMENTS
COLUMBIA, SOUTH CAROLINA

DATE:12/3/2018 6:44 PM **FILE NAME: TLM Thickness**

APEX COMPANIES, LLC

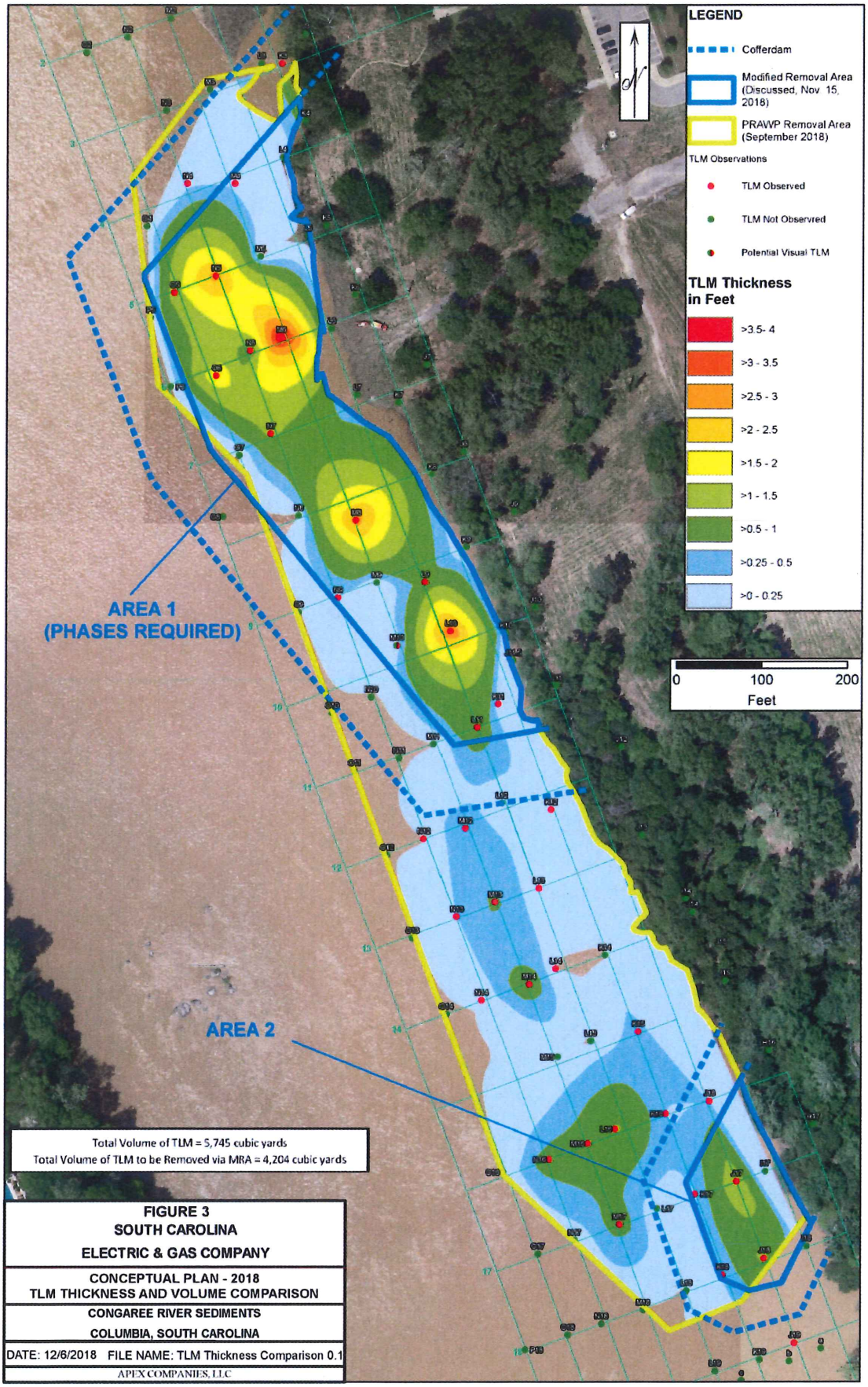


FIGURE 3
SOUTH CAROLINA
ELECTRIC & GAS COMPANY

CONCEPTUAL PLAN - 2018
TLM THICKNESS AND VOLUME COMPARISON

CONGAREE RIVER SEDIMENTS
COLUMBIA, SOUTH CAROLINA

DATE: 12/6/2018 FILE NAME: TLM Thickness Comparison 0.1

APEX COMPANIES, LLC

Declaration of Support by Stakeholders:

1) Congaree Riverkeeper endorses the modified removal action presented by SCE&G and described above, with the understanding that SCE&G will work diligently and make all reasonable efforts to acquire the necessary permits and complete this proposed removal action, and SCE&G will provide stakeholders with regular updates on their progress. We are also committed to supporting the permitting strategy the Corps determines is most appropriate for the Modified Removal Action, provided that the permit authorization process is as expeditious as possible while still affording sufficient opportunity -- either within the permitting process or through the parallel voluntary cleanup contract led by DHEC -- for public comment and for agency consultation.

William J. Stangler (e-signature, 1/23/19)

Bill Stangler
Congaree Riverkeeper

Declaration of Support by Stakeholders:

1. That any such plan and associated application be submitted to the USACE for authorization under the appropriate Nationwide permit, e.g., NWP-38, and not under an Individual permit, to expedite the process and help mitigate the total project timeline.

Charles C. Thompson, Manager
Guignard Associates LLC

Statement of Purpose

The purpose of this calculation is to perform a hydraulic analysis for the affected area along the Congaree River in Columbia, South Carolina, due to the separate installation of two rock fill cofferdams around Areas 1 and 2. The purpose of performing a hydraulic analysis is to determine the impact of the proposed cofferdam structures on the Base Flood Elevations (BFE) for existing conditions.

A plan view showing the extents of the cofferdams is included on Figure 1, based on Apex Drawing "Stakeholder Approved MRA Plan Sediment Remediation Areas" (Apex, 2019a).

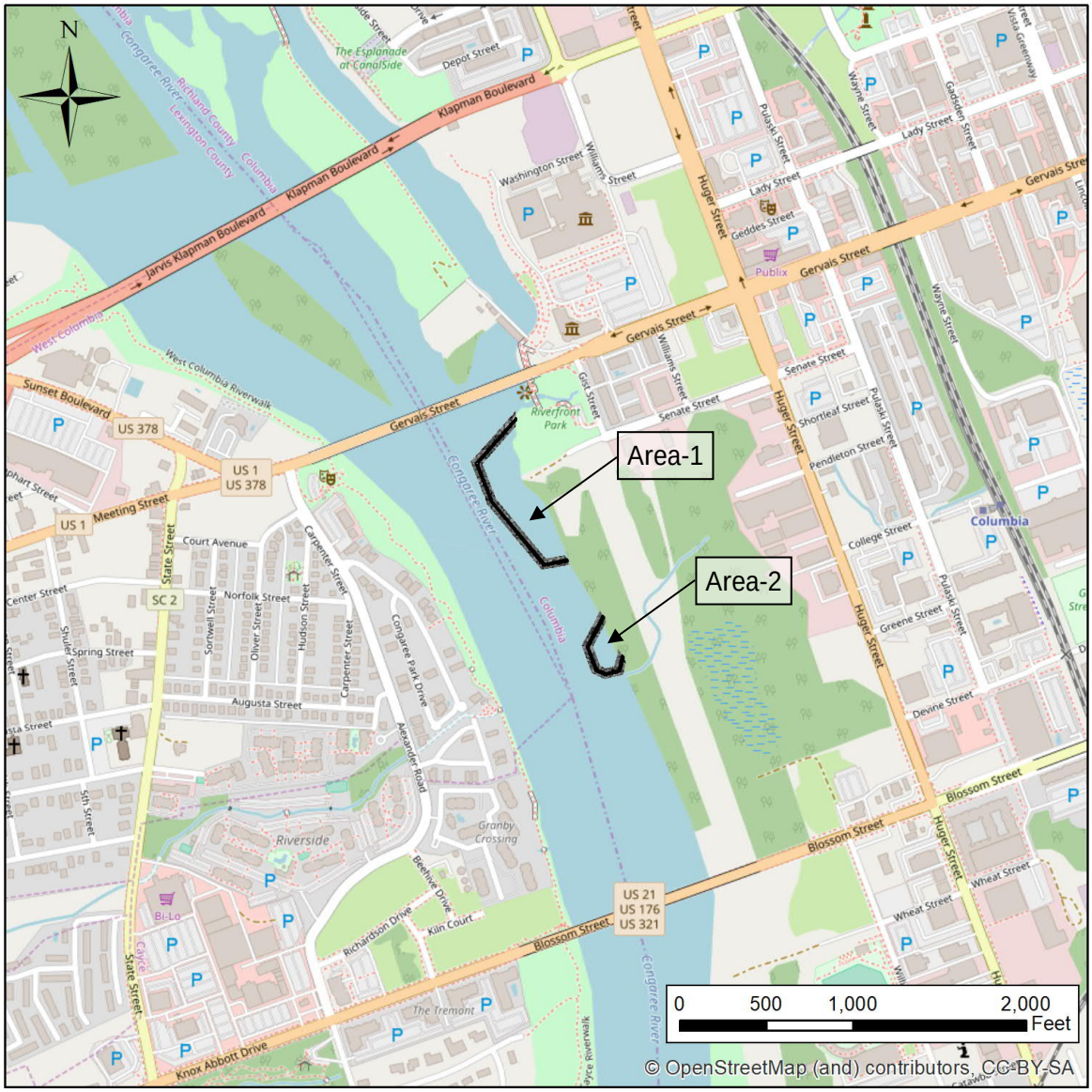


Figure 1: Plan View of Proposed Cofferdams

The typical section of the proposed cofferdam structures is shown in Figure 2. This is an assumed design concept based on discussions with Apex Companies LLC.

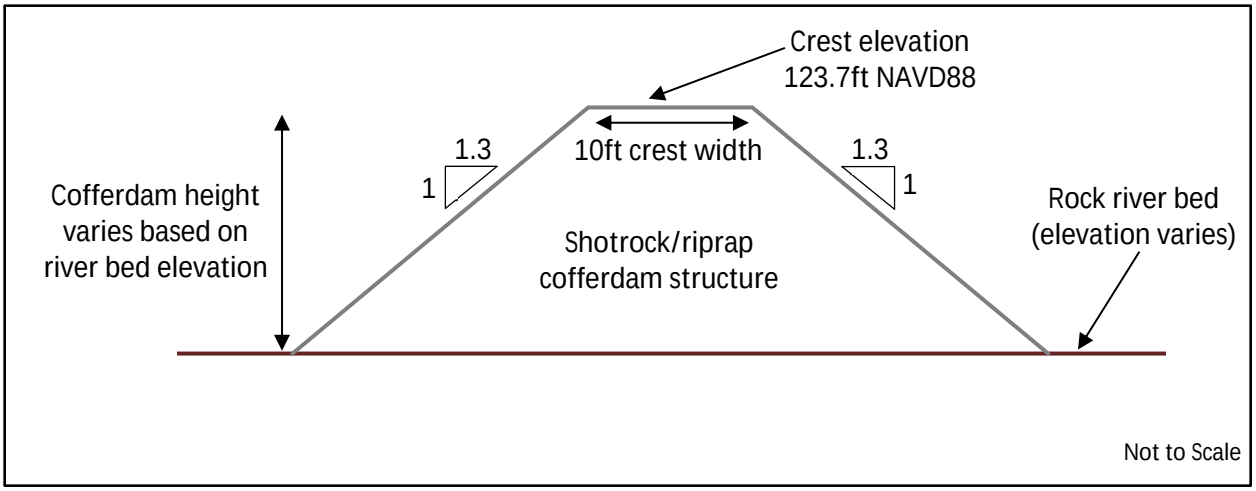


Figure 2: Typical Section of Proposed Cofferdams

Description of Methodology Used

The installation of a rock fill berm cofferdam is proposed along the east bank of the Congaree River, starting just downstream of the Gervais Street Bridge. The proposed cofferdam will be constructed in two separate phases; therefore, each phase is modeled separately for the proposed conditions. The total cofferdam influence area runs approximately 1,650 feet along the east bank, starting downstream of the Gervais Street Bridge and terminating at the inlet of a small unnamed tributary, referred to as Tributary No. 2 for this analysis.

The hydraulic study follows procedures set forth by the Federal Emergency Management Agency (FEMA) in their "Procedures for No-Rise Certification" (FEMA, 2013), which is included in Appendix A. The No-Rise procedures follow several distinct steps:

1. Current Effective Model: Obtain a copy of the current effective hydraulic model for the specified stream from FEMA;
2. Duplicate Effective Model: Upon receipt of the effective model, run the model to duplicate the data in the effective FEMA Flood Insurance Study (FIS; FEMA, 2017/2018).
3. Corrected Effective Model: The model that corrects any errors that occur in the duplicate effective model, adds any additional cross sections, or incorporates more detailed topographic information than that used in the current effective model;
4. Existing Conditions Model: Revise the duplicate effective or the corrected effective model to reflect any modifications that have occurred within the floodplain since the date of the effective model but prior to the construction of the project. If no modifications have occurred since the date of the effective model, then the model would be identical to the duplicate effective or corrected effective model. The results of this Existing Conditions analysis will indicate the 100-yr elevations at the project site;
5. Proposed, or Post-Project Conditions Model: Modify the existing condition or pre-project conditions model (or duplicate effective model or corrected effective model, as appropriate) to

reflect proposed or post-project conditions. (this analysis looks at two separate proposed conditions models) The results of this analysis will indicate the 100-year elevation for proposed conditions at the project site.

Current Effective Model

The current effective model was requested from FEMA by following the procedure outlined in the "Procedures for No-Rise Certification" (FEMA, 2013). The latest hydraulic model used in developing the current FIS for the Congaree River was requested. The hydraulic analyses in the FIS were carried out to estimate flood elevations of the selected recurrence interval. In this case, the recurrence interval is the 100-year flood. This means that the flood has a 1 percent chance of being equaled or exceeded during any given year.

The Congaree River flows along the boundary between Lexington and Richland Counties. A Flood Insurance Rate Map (FIRM) is available for both Lexington County (FEMA, 2018), and Richland County (FEMA, 2017) which includes the location of the cross-sections used to develop the hydraulic model. The two FIRMs are presented on Figure 3 and Figure 4 respectively.

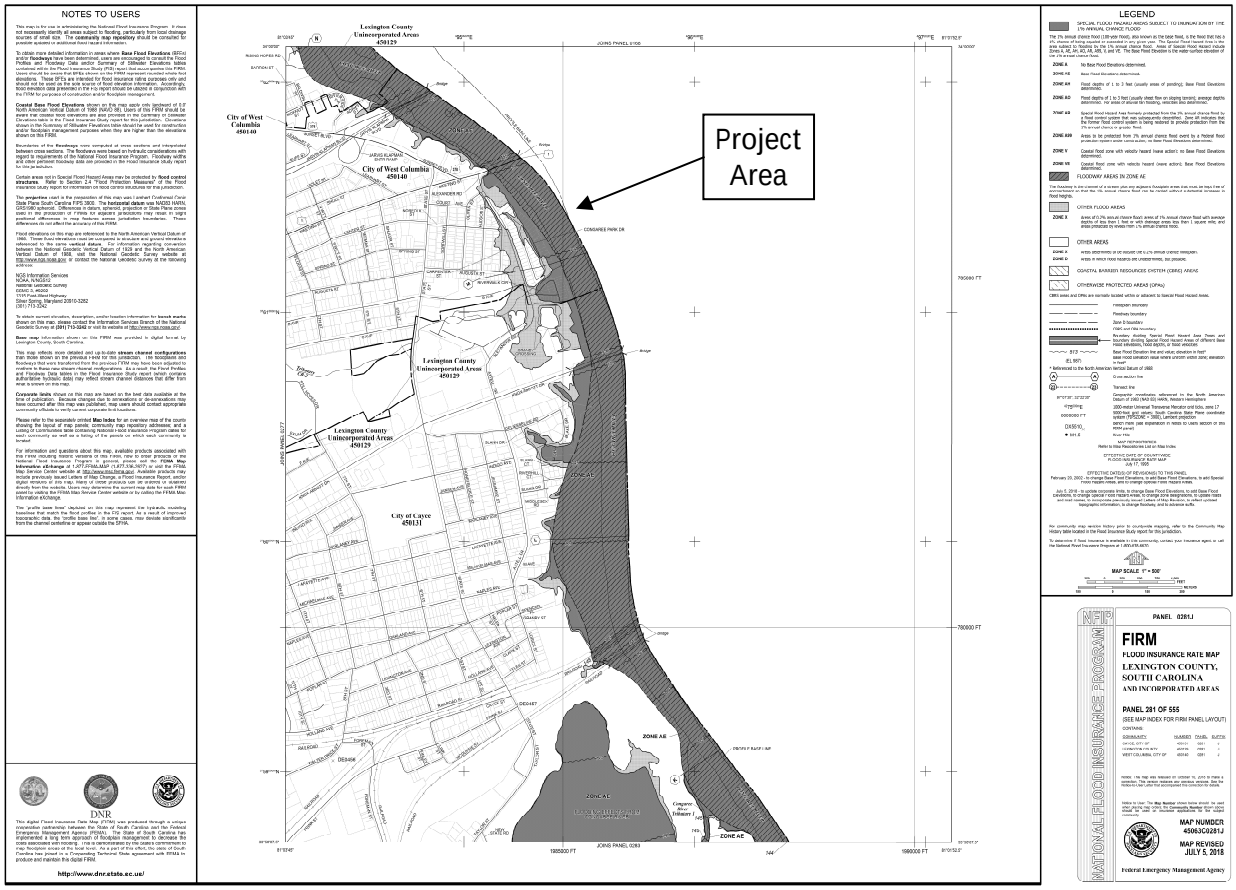


Figure 3: Lexington County Flood Insurance Rate Map (FEMA, 2018)

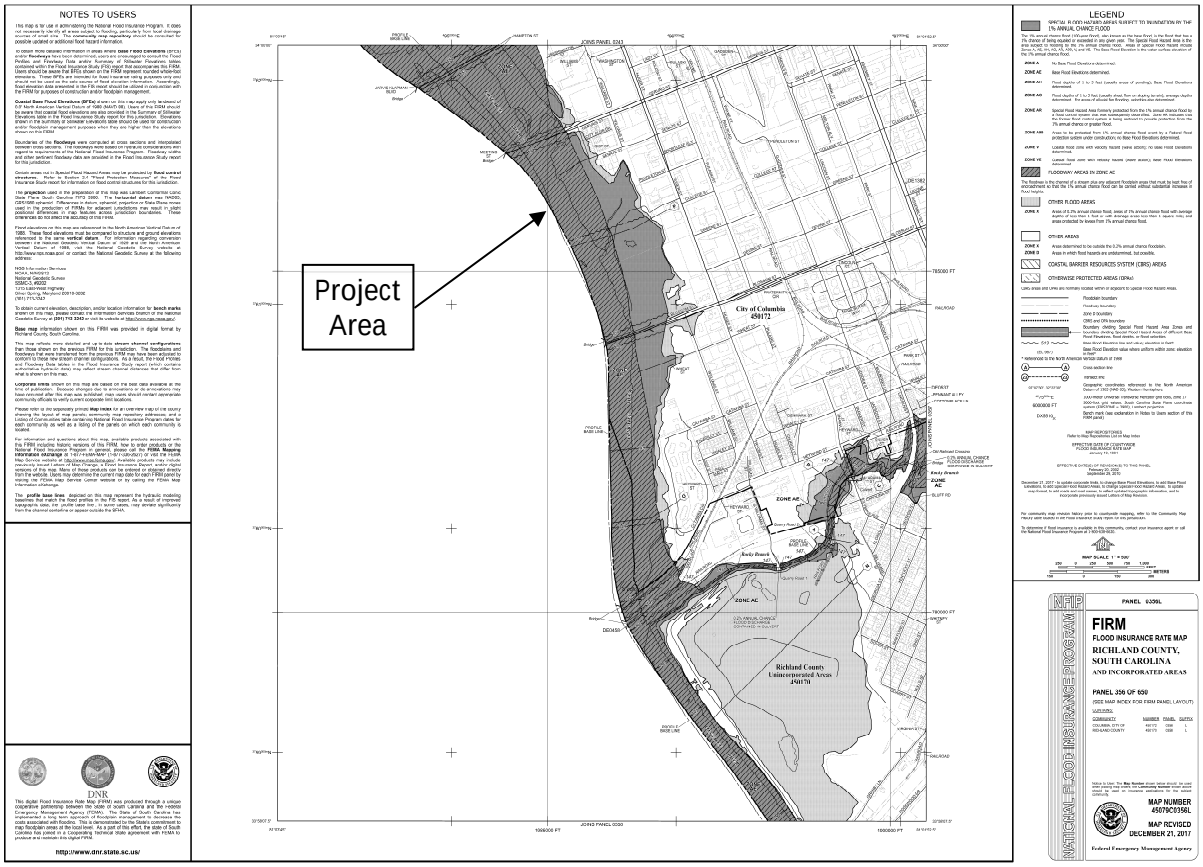


Figure 4: Richland County Flood Insurance Rate Map (FEMA, 2017)

The current effective model for the Congaree River was provided to WSP USA by FEMA in the form of electronic HEC-RAS (USACE, 2010) input and output files. The model is an unsteady flow model covering approximately 14 miles of the Congaree River. The vertical datum of the model is to the North American Vertical Datum of 1988 (NAVD88). The electronic files for all models are included in Appendix B.

Duplicate Effective Model

HEC-RAS Version 4.1 (USACE, 2010) was used to develop the current effective model. HEC-RAS 4.1 is a hydraulic modeling program used for simulating one-dimensional steady and unsteady flows in river channels. The same software version was also used for the duplicate effective model, and all other models used in this hydraulic analysis, to maintain consistency with the current effective model.

Unsteady model simulations for the 10-year, 50-year, and 100-year flood return periods were completed for the duplicate effective model. No changes were made to the current effective model provided by FEMA; the model was not truncated or modified in any way. The results obtained were identical to the current effective model. The current/duplicate effective HEC-RAS model schematic is shown on Figure 5 (full model extent) and Figure 6 (project area).

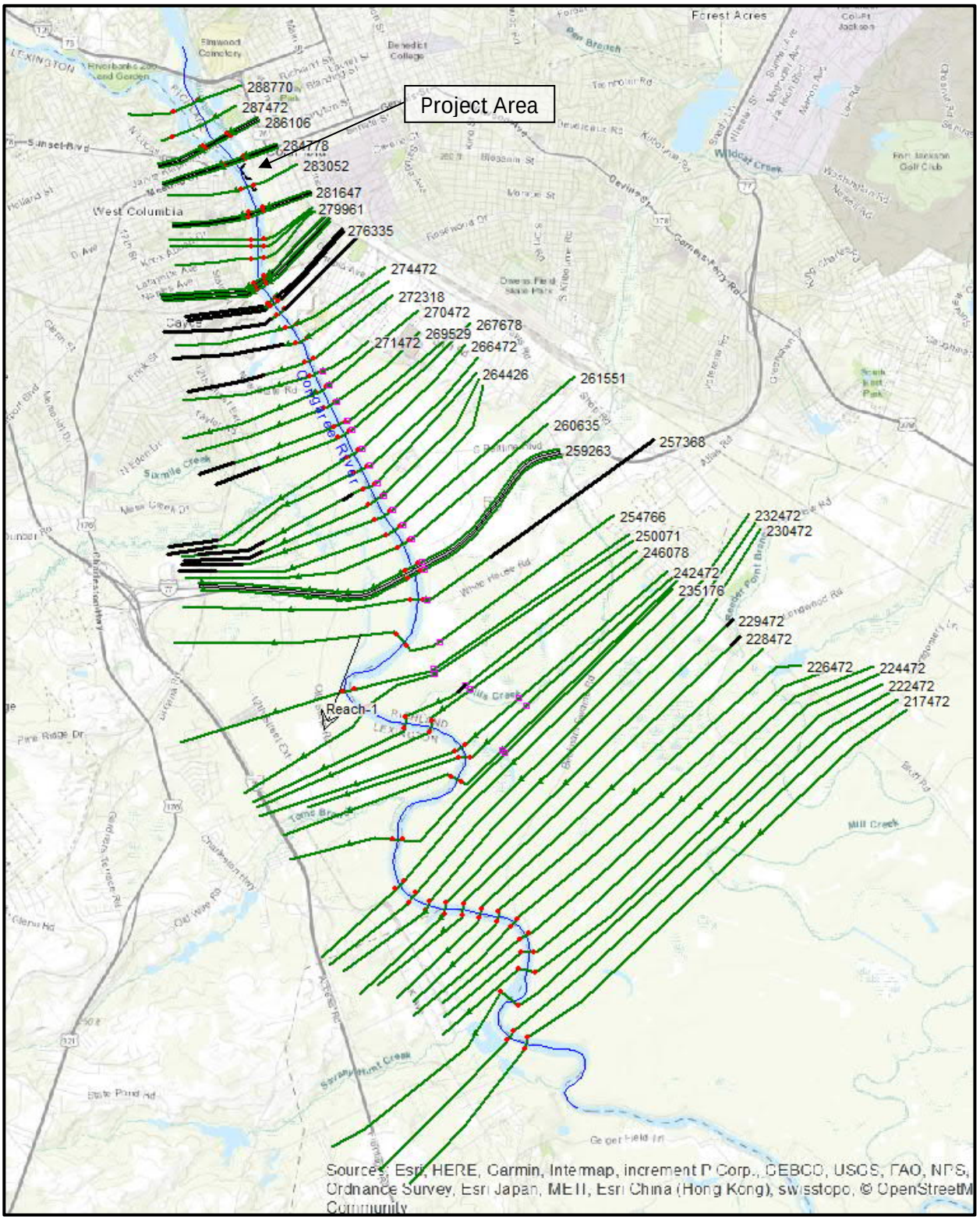


Figure 5: Current/Duplicate Effective HEC-RAS Model Schematic (Full Model Extent)

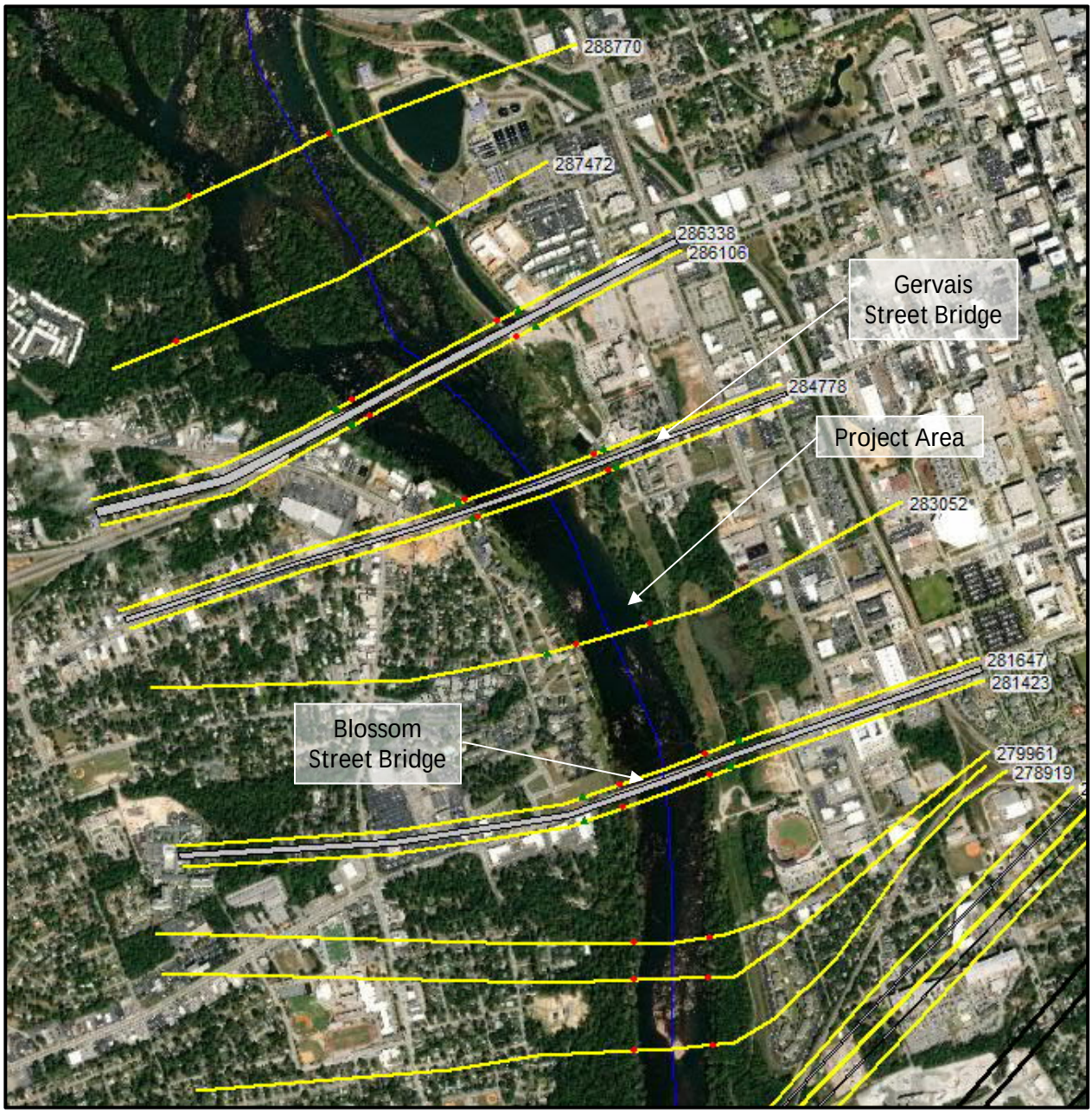


Figure 6: Current/Duplicate Effective HEC-RAS Model Schematic (Project Area)

Corrected Effective Model

No errors were detected in the current/duplicate effective models, but additional topographic data was available for the project area which was used to update the corrected model between Gervais Street and Blossom Street bridges. Additional cross sections were also added in order to provide a more accurate representation of the channel conveyance and floodplain storage throughout the project area. The cross sections were specified in appropriate locations to allow representation of the cofferdams structures in the proposed conditions model.

Figure 7 shows the locations of the cross sections in the corrected effective model throughout the project area. A total of twenty-six additional cross sections were included between Gervais Street and Blossom Street bridges.

This number of sections was required to ensure accurate representation of the upstream and downstream extents of the cofferdams at Area-1 and Area-2.

Figure 7: Corrected Effective HEC-RAS Model Schematic (Project Area)

A bathymetric and topographic survey was completed for the project area in April through July 2018, which was provided to WSP as Drawing ACAD-13951-COMBINED.dwg (Apex, 2019b). The original data is referenced to the National Geodetic Vertical Datum of 1929 (NGVD29) and was converted to NAVD88 by applying the -0.787ft conversion determined from the National Oceanic and Atmospheric Administration (NOAA) Vertcon tool (NOAA, 2019). This process was necessary to ensure that the corrected effective model was updated with data referenced to a consistent datum.

LiDAR data downloaded from South Carolina Department of Natural Resources (SCDNR, 2010) was used to supplement the updated 2018 topographic and bathymetric data provided for the project. This was required to complete the Digital Elevation Model (DEM) for extended floodplain areas that the 2018 data did not cover. Figure 8 shows the updated DEM used to update the corrected effective hydraulic model. The area marked with a white dashed box is the extent of the 2018 project specific data, other parts of the DEM are based on the SCDNR LiDAR data, which was provided referenced to NAVD88.

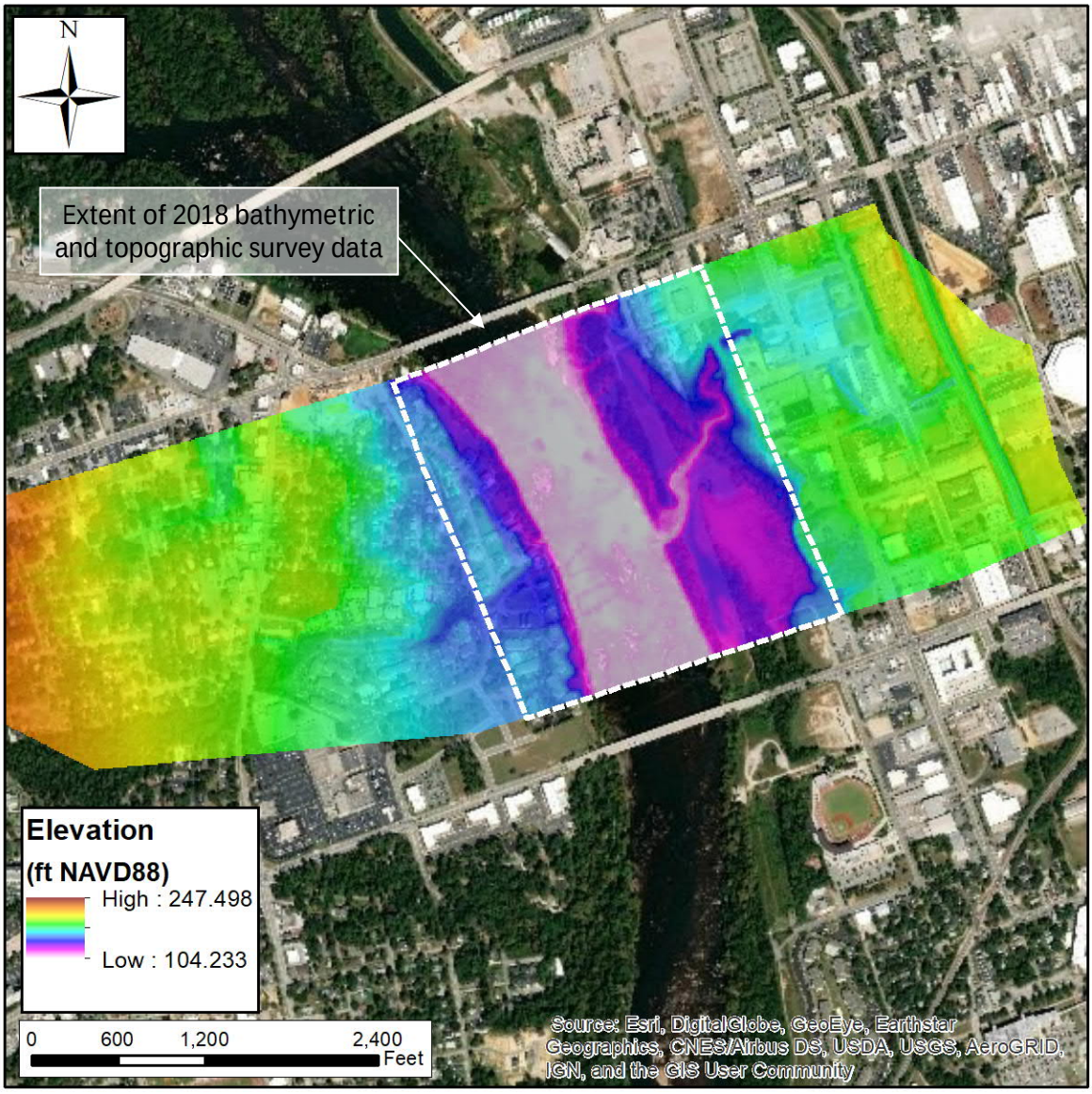


Figure 8: Updated Topographic and Bathymetric Data Extents

The twenty-six new cross sections along with the one existing cross section (River Station 283342) shown on Figure 7, were cut from the DEM to create the corrected effective model. The cross-sections from the corrected model are shown in Appendix C, which also includes the existing cross sections immediately upstream (River Station 284565) and downstream (River Station 281647) of the project area, which were not modified for this analysis.

Existing Conditions Model

No additional changes from the corrected model were required to represent the existing conditions. Therefore, an existing conditions model was not used for this analysis and the results from the corrected model are used to define the existing BFEs at the project site, and for subsequent comparison with the proposed conditions model.

Proposed Conditions Model

The proposed conditions model includes modified cross-sections where the proposed cofferdams will be located. In this case, the proposed cofferdam is along the east bank of the Congaree River. As shown in the typical section (Figure 2), the proposed rockfill cofferdam has a 10-ft wide crest at elevation 123.7 ft (NAVD88) and a side slope of 1.3H:1.0V on both the inboard and outboard slopes.

The cofferdam is to be installed in two separate phases. Therefore, for the purposes of this analysis two separate proposed conditions models are analyzed; one for each of the two phases (Area-1 and Area-2, shown on Figure 1).

Each model is run and the results are compared to those of the corrected effective model to determine if the proposed conditions satisfy the No-Rise condition. Cross-sections updated for the proposed condition models are included in Appendix D.

Assumptions and Justification

1. All elevations are referenced to NAVD88. Topographic survey data and USGS gage data was originally provided referenced to NGVD29, and was converted by applying the -0.787ft conversion determined from the NOAA Vertcon tool (NOAA, 2019).
2. The proposed Area-1 and Area-2 cofferdams are analyzed as a separate proposed conditions model, to reflect the phased approach being followed for the project.
3. The cross section of the proposed cofferdam structures is shown in Figure 2. This is an assumed design concept based on discussions with Apex Companies LLC.

Calculation Input

The current effective model for the Congaree River was provided to WSP USA by FEMA in the form of electronic HEC-RAS (USACE, 2010) input and output files. The model is an unsteady flow model covering approximately 14 miles of the Congaree River. HEC-RAS Version 4.1 (USACE, 2010) was used to develop the current effective model. The same software version was also used for the duplicate effective model, and all other models used in this hydraulic analysis, to maintain consistency with the current effective model.

As discussed in previous sections, changes have been made to the duplicate effective model to create the corrected model. Further specific details are included in the following sections. No changes have been made to the hydraulic model outside of the project area, i.e., no changes have been made to cross sections between River Stations 288770 to 284565, and River Stations 281647 to 216472 (inclusive).

Channel Cross Section and Structure Geometry

The geometric data for the twenty-six additional cross sections that were included between Gervais Street and Blossom Street bridges (shown on Figure 7) was extracted from the DEM developed for the project (shown on Figure 8). The geometry for one existing cross section, River Station 283042, was also extracted from the DEM and updated. No changes were made to the bridge structures, as the cross sections immediately upstream and downstream of these structures were not modified.

The cross section geometry was manually modified to represent the cofferdam structures within Area-1 and Area-2, based on Apex Drawing “Stakeholder Approved MRA Plan Sediment Remediation Areas” (Apex, 2019a). The upstream and downstream extents of the cofferdams are represented using four cross sections each. For the

upstream extent, the first cross section defines the geometry immediately upstream of the start of the cofferdam, and represents conditions at the upstream toe of the structure. No changes are made to this section for the proposed models. The next two cross section represent the crest of the structure that is perpendicular to the flow in the river channel. These sections are located 10ft apart to represent the 10ft crest width of the cofferdam. The crest of the upstream end of the cofferdam is intended to act as an overtopping structure, and it has a crest level set 1ft lower than the rest of the structure, at Elevation 122.7ft NAVD. The fourth cross section represents the topography at the downstream toe of the upstream cofferdam extent. This section also defines the geometry of the cofferdam that runs parallel to the river flow direction.

A series of cross sections is then used to represent the parts of the cofferdam(s) that are aligned parallel to the flow in the river. These sections define the crest of the cofferdam at Elevation 123.7ft NAVD88. This elevation is also defined as a levee crest feature; meaning that the area behind the cofferdam remains dry until the water rises above the crest and flows over the top of the structure. The storage and conveyance associated with the area behind the cofferdams is therefore not accounted for until the levee is overtopped. The dry area behind the cofferdams is also specified as an ineffective flow area to ensure that the additional cross-sectional area and wetted perimeter are not accounted for until the water level rises above the crest of the cofferdam.

The downstream extent of the cofferdam is also represented using the four cross section approach outlined above, with a cross section to represent the topography immediately upstream and downstream of the cofferdam, and two sections located 10ft apart to represent the crest width of the structure.

Ineffective Flow Areas

The FEMA model uses ineffective flow areas to represent areas of the floodplain which only provide flood storage and not flow conveyance. The same approach has been applied for the new cross sections, with areas of the right and left overbanks specified as ineffective flow areas until the water level rises above specified elevations.

Manning's Roughness Coefficient

The FEMA model uses a Manning's roughness coefficient of 0.038 for the main channel. For the left and right overbanks, a Manning's roughness coefficient of 0.1 or 0.125 is used to represent buildings in urban areas, and values of 0.08 to 0.04 to represent vegetated floodplain areas. These roughness coefficients were applied throughout the new cross sections; with a 0.038 value used to represent the main channel, 0.08 used to represent densely vegetated floodplain areas, and 0.125 used for urban areas with buildings. No changes were made to the roughness values between River Stations 288770 to 284565, and River Stations 281647 to 216472 (inclusive).

Contraction and Expansion Coefficients

The FEMA model uses a contraction coefficient of 0.3 and expansion coefficient of 0.5 at the cross-sections just prior to or after any bridges in the model. Coefficients of 0.1 and 0.3, respectively, are used elsewhere throughout the model, and were applied to all new cross sections in the model.

Boundary Conditions

The boundary conditions from the current effective model have been used for all model runs completed for this hydraulic analysis without modification. Time varying flow vs time inflow boundaries are used as the upstream model boundary, and a normal depth boundary based on a channel slope of 0.0004 is specified as the downstream boundary. The downstream boundary is approximately 13 miles downstream of the project area and will not be controlling the model results throughout the area of interest.

The peak flow values for the 100-year, 50-year, and 10-year flood events are provided in Table 1, and the full inflow hydrographs are shown on Figure 9. The table and figure also includes the November 2018 event information (USGS, 2019), which is used as a model calibration event.

Table 1: Peak Boundary Condition Inflows

Flood Event	Peak Inflow (cfs)
100-year	286,000
50-year	239,400
10-year	147,600
Nov 2018[a]	62,100

Notes: [a](USGS, 2019)

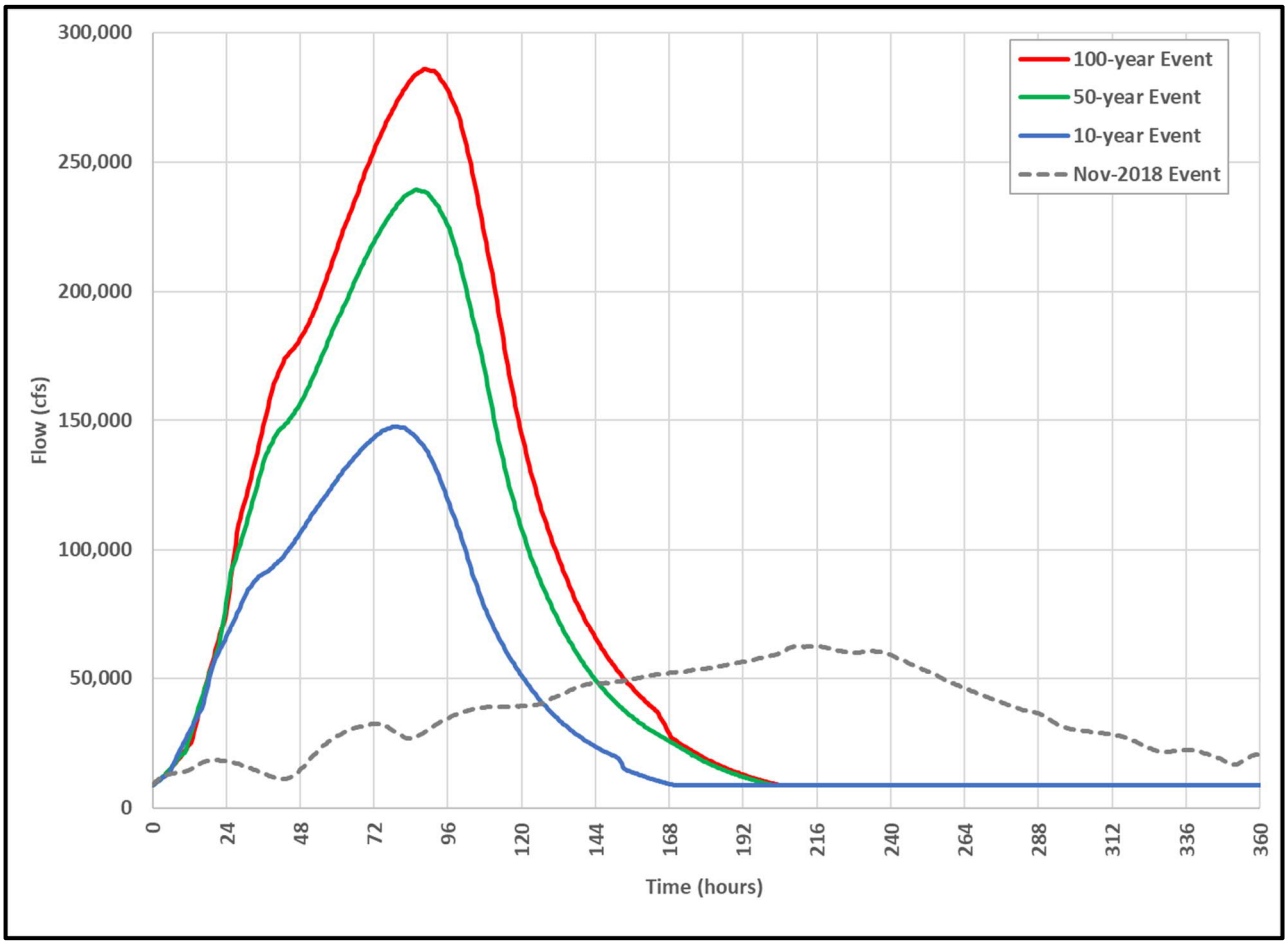


Figure 9: Upstream Inflow Boundaries

Numerical Calculations

All hydraulic analysis calculations are performed within the HEC-RAS Version 4.1 (USACE, 2010). The unsteady flow analysis parameters such as start/end time, computational interval, and hydrograph output interval were not

modified i.e., the parameters used are identical to the parameters for the current effective model provided by FEMA.

Calculation Output

The HEC-RAS Output Tables are provided in Appendix E. The electronic input and output files for all hydraulic models are provided in Appendix B.

Results

Table 2 summarizes the results of the current effective and duplicate effective hydraulic model runs for the 100-year, 50-year, and 10-year flood events. As shown in the table, the results from the two models are identical.

Table 2: Comparison of Current Effective and Duplicate Effective Model Water Surface Elevations; 100-year, 50-year, and 10-year Flood Events

Cross Section/ River Station	100-year Event			50-year Event			10-year Event		
	W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)		
	Current	Duplicate	Change	Current	Duplicate	Change	Current	Duplicate	Change
288770	153.97	153.97	0.0	150.86	150.86	0.0	144.37	144.37	0.0
287472	153.85	153.85	0.0	150.61	150.61	0.0	143.69	143.69	0.0
286338	153.60	153.60	0.0	150.36	150.36	0.0	143.39	143.39	0.0
286106	153.36	153.36	0.0	150.11	150.11	0.0	143.14	143.14	0.0
284778	153.02	153.02	0.0	149.81	149.81	0.0	142.92	142.92	0.0
284565[a]	151.27	151.27	0.0	148.10	148.10	0.0	141.24	141.24	0.0
283052[b]	150.62	150.62	0.0	147.46	147.46	0.0	140.70	140.70	0.0
281647[c]	150.19	150.19	0.0	147.08	147.08	0.0	140.44	140.44	0.0
281423	149.95	149.95	0.0	146.88	146.88	0.0	140.31	140.31	0.0
279961	149.29	149.29	0.0	146.28	146.28	0.0	139.90	139.90	0.0
279605	149.18	149.18	0.0	146.18	146.18	0.0	139.81	139.81	0.0
278919	149.03	149.03	0.0	146.03	146.03	0.0	139.70	139.70	0.0

Notes:

a. Located downstream of Gervais Street bridge
b. Cross section 'P' on Richland County FIRM (FEMA, 2017) and cross section 'M' on Lexington County FIRM (FEMA, 2018)
c. Located upstream of Blossom Street bridge

Table 3 summarizes the results of the duplicate effective and corrected effective hydraulic model runs for the 100-year, 50-year, and 10-year flood events. For the 100-year and 50-year flood events, the corrected model results are approximately 0.4ft higher in the vicinity of the Gervais Street bridge and further upstream. Throughout the project area towards the Blossom Street bridge and further downstream, the corrected model results are typically less than 0.05ft higher for the 100-year and 50-year flood events.

For the 10-year flood event, the corrected model results are approximately 0.1ft lower in the vicinity of the Gervais Street bridge and further upstream. Throughout the project area towards the Blossom Street bridge and further downstream, the corrected model results are approximately 0.6ft lower for the 10-year flood event.

Table 3: Comparison of Duplicate Effective and Corrected Effective Model Water Surface Elevations; 100-year, 50-year, and 10-year Flood Events

Cross Section/ River Station	100-year Event			50-year Event			10-year Event		
	W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)		
	Duplicate	Corrected	Change[a]	Duplicate	Corrected	Change[a]	Duplicate	Corrected	Change[a]
288770	153.97	154.37	0.4	150.86	151.24	0.4	144.37	144.31	-0.1
287472	153.85	154.28	0.4	150.61	151.01	0.4	143.69	143.61	-0.1
286338	153.60	154.04	0.4	150.36	150.78	0.4	143.39	143.31	-0.1
286106	153.36	153.80	0.4	150.11	150.54	0.4	143.14	143.06	-0.1
284778	153.02	153.47	0.5	149.81	150.23	0.4	142.92	142.83	-0.1
284565[b]	151.27	151.72	0.5	148.10	148.53	0.4	141.24	141.14	-0.1
283052[c]	150.62	150.65	0.0	147.46	147.51	0.1	140.70	140.26	-0.4
281647[d]	150.19	150.20	0.0	147.08	147.09	0.0	140.44	139.89	-0.6
281423	149.95	149.96	0.0	146.88	146.89	0.0	140.31	139.75	-0.6
279961	149.29	149.30	0.0	146.28	146.29	0.0	139.90	139.30	-0.6
279605	149.18	149.19	0.0	146.18	146.18	0.0	139.81	139.22	-0.6
278919	149.03	149.04	0.0	146.03	146.03	0.0	139.70	139.09	-0.6

Notes:

a. 'Change' is calculated by subtracting 'Proposed' from 'Corrected' and rounding to one decimal place
b. Located downstream of Gervais Street bridge
c. Cross section 'P' on Richland County FIRM (FEMA, 2017) and cross section 'M' on Lexington County FIRM (FEMA, 2018)
d. Located upstream of Blossom Street bridge

The localized changes to peak water surface elevations is the result of the updated topographic data and additional cross sections that provide a more accurate representation of the channel conveyance and floodplain storage throughout the project area. However, the changes do not result in any changes to the 100-year flood level published on the FEMA FIRM (FEMA, 2017/2018) at River Station 283052.

The United States Geological Survey (USGS) gage 02169500 is located on the Congaree River corrected on the west bank opposite the locations of the proposed cofferdams. The USGS gage data (USGS, 2019) was reviewed to select a high flow event that could be simulated using to model, to determine how accurately the HEC-RAS model results matched the gage data. A high flow event from November 2018 was selected for calibration, with a peak flow of 62,100 cfs. A comparison of the corrected effective HEC-RAS results and the USGS gage data from this event is shown in Figure 10.

Figure 10 shows good correlation between the corrected effective model results and the USGS gage data. The peak water surface elevation predicted by the corrected effective HEC-RAS model is 0.26ft lower than the value reported by the USGS gage.

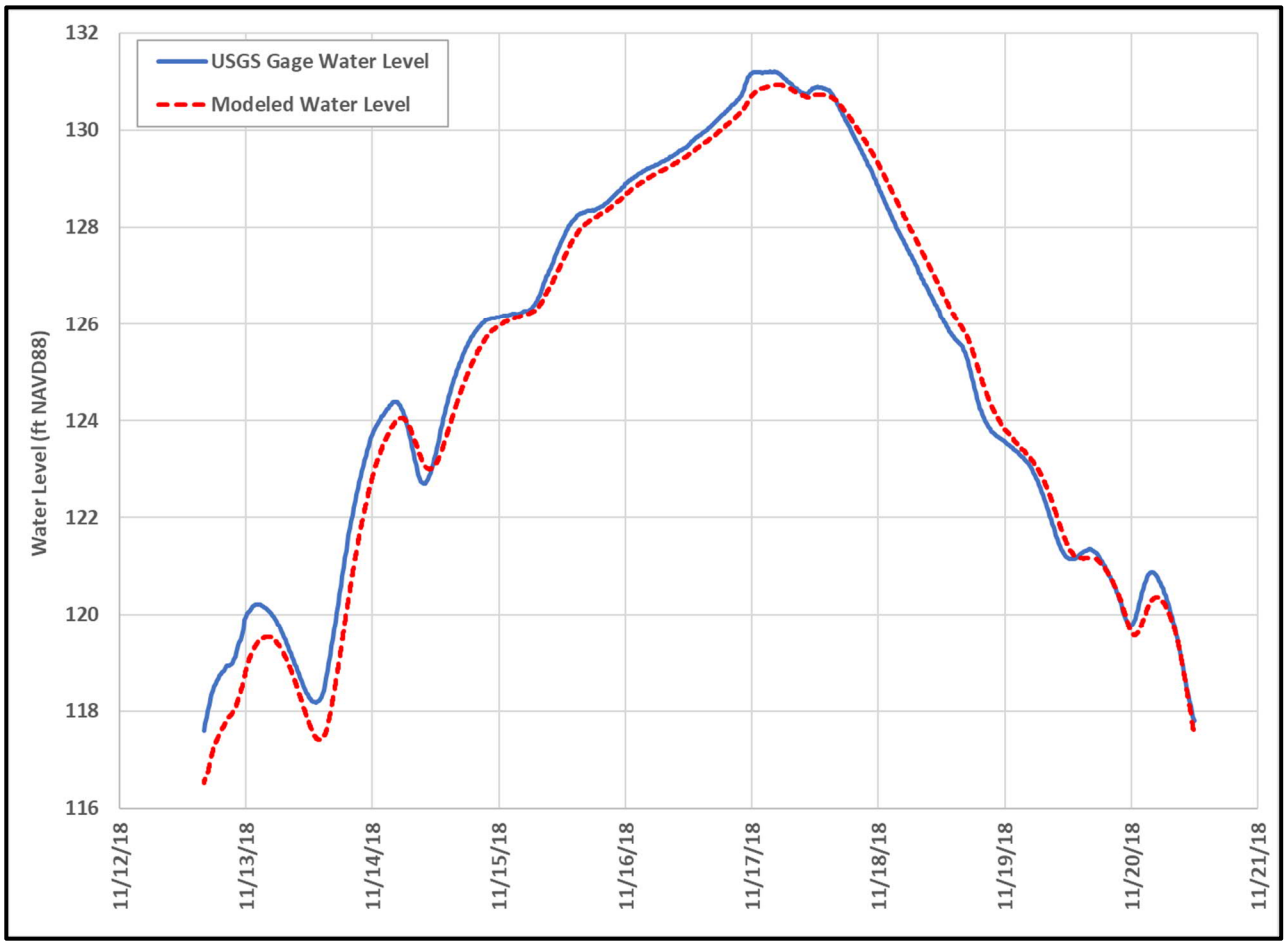


Figure 10: Comparison of HEC-RAS Corrected Effective Model Results and USGS Gage Data for November 2018 High Flow Event

The corrected model is used as a baseline for comparison with the proposed models, which have been developed to represent the conditions incorporating the Area-1 and Area 2 cofferdam structures (each area is represented in a separate model, as the work will be completed using a phased approach).

Table 4 summarizes the results of the corrected effective and proposed Area-1 hydraulic model runs for the 100-year, 50-year, and 10-year flood events. The results demonstrate that the impact of the proposed Area-1 cofferdam structure is relatively consistent for the 100-year, 50-year, and 10-year flood events. The results typically show an increase of approximately 0.04ft upstream of the Area-1 cofferdam, and an increase of 0.01 to 0.03ft in the middle of the structure. At the upstream and downstream cofferdam extents, the results show there is reduction of approximately 0.1ft, and downstream of the structure there is no change to the peak water surface elevations.

Table 4: Comparison of Corrected Effective and Proposed Area-1 Model Water Surface Elevations; 100-year, 50-year, and 10-year Flood Events

Cross Section/ River Station	100-year Event			50-year Event			10-year Event		
	W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)		
	Corrected	Proposed	Change[a]	Corrected	Proposed	Change[a]	Corrected	Proposed	Change[a]
288770	154.374	154.412	0.0	151.235	151.273	0.0	144.313	144.341	0.0
287472	154.278	154.318	0.0	151.011	151.052	0.0	143.609	143.644	0.0
286338	154.040	154.081	0.0	150.776	150.819	0.0	143.308	143.345	0.0
286106	153.804	153.846	0.0	150.535	150.578	0.0	143.055	143.094	0.0
284778	153.465	153.508	0.0	150.234	150.278	0.0	142.829	142.869	0.0
284565[b]	151.716	151.759	0.0	148.525	148.569	0.0	141.140	141.180	0.0
284431	151.610	151.653	0.0	148.398	148.443	0.0	140.999	141.039	0.0
284408[c]	151.479	151.423	-0.1	148.301	148.248	-0.1	140.947	140.888	-0.1
284395[c]	151.453	151.393	-0.1	148.279	148.222	-0.1	140.937	140.876	-0.1
284372[c]	151.418	151.449	0.0	148.248	148.282	0.0	140.922	140.953	0.0
284267[c]	151.234	151.251	0.0	148.092	148.113	0.0	140.827	140.847	0.0
284060[c]	151.035	151.048	0.0	147.912	147.928	0.0	140.691	140.705	0.0
283820[c]	150.852	150.850	0.0	147.724	147.724	0.0	140.537	140.535	0.0
283636[c]	150.781	150.641	-0.1	147.654	147.503	-0.2	140.467	140.306	-0.2
283611[c]	150.683	150.546	-0.1	147.566	147.423	-0.1	140.406	140.255	-0.2
283601[c]	150.739	150.618	-0.1	147.593	147.459	-0.1	140.392	140.236	-0.2
283574	150.696	150.696	0.0	147.536	147.536	0.0	140.323	140.323	0.0
283490	150.711	150.711	0.0	147.558	147.558	0.0	140.268	140.268	0.0
283342	150.727	150.727	0.0	147.570	147.570	0.0	140.233	140.233	0.0
283203	150.668	150.668	0.0	147.525	147.525	0.0	140.257	140.257	0.0
283179	150.658	150.658	0.0	147.518	147.518	0.0	140.206	140.206	0.0
283169	150.665	150.665	0.0	147.524	147.524	0.0	140.211	140.211	0.0
283139	150.642	150.642	0.0	147.500	147.500	0.0	140.204	140.204	0.0
283093	150.688	150.688	0.0	147.533	147.533	0.0	140.206	140.206	0.0
283052[d]	150.652	150.652	0.0	147.506	147.506	0.0	140.257	140.257	0.0
283001	150.753	150.753	0.0	147.594	147.594	0.0	140.320	140.320	0.0
282937	150.706	150.706	0.0	147.552	147.552	0.0	140.110	140.110	0.0
282912	150.679	150.679	0.0	147.525	147.525	0.0	140.209	140.209	0.0
282902	150.676	150.676	0.0	147.521	147.521	0.0	140.194	140.194	0.0
282874	150.641	150.641	0.0	147.498	147.498	0.0	140.157	140.157	0.0
282707	150.511	150.511	0.0	147.358	147.358	0.0	139.929	139.929	0.0
282424	150.448	150.448	0.0	147.299	147.299	0.0	139.966	139.966	0.0
282071	150.344	150.344	0.0	147.204	147.204	0.0	139.950	139.950	0.0
281647[e]	150.199	150.199	0.0	147.087	147.087	0.0	139.888	139.888	0.0
281423	149.960	149.960	0.0	146.886	146.886	0.0	139.748	139.748	0.0
279961	149.301	149.301	0.0	146.289	146.289	0.0	139.302	139.302	0.0
279605	149.191	149.191	0.0	146.183	146.183	0.0	139.215	139.215	0.0
278919	149.039	149.039	0.0	146.033	146.033	0.0	139.088	139.088	0.0

Notes:

a. 'Change' is calculated by subtracting 'Proposed' from 'Corrected' and rounding to one decimal place
b. Located downstream of Gervais Street bridge
c. Area-1 cofferdam
d. Cross section 'P' on Richland County FIRM (FEMA, 2017) and cross section 'M' on Lexington County FIRM (FEMA, 2018)
e. Located upstream of Blossom Street bridge

Table 5 summarizes the results of the corrected effective and proposed Area-2 hydraulic model runs for the 100-year, 50-year, and 10-year flood events. The results demonstrate that the impact of the proposed Area-2 cofferdam structure is relatively consistent for the 100-year, 50-year, and 10-year flood events. The results

typically show an increase of approximately 0.02ft upstream of the Area-2 cofferdam. From the upstream to the downstream cofferdam extents, the results show there is reduction typically between 0.01 and 0.1ft, with reductions up to 0.2ft at the downstream extent. Downstream of the structure there is no change to the peak water surface elevations.

Table 5: Comparison of Corrected Effective and Proposed Area-2 Model Water Surface Elevations; 100-year, 50-year, and 10-year Flood Events

Cross Section/ River Station	100-year Event			50-year Event			10-year Event		
	W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)			W.S. Elev (ft NAVD88)		
	Corrected	Proposed	Change[a]	Corrected	Proposed	Change[a]	Corrected	Proposed	Change[a]
288770	154.374	154.389	0.0	151.235	151.251	0.0	144.313	144.320	0.0
287472	154.278	154.294	0.0	151.011	151.028	0.0	143.609	143.619	0.0
286338	154.040	154.057	0.0	150.776	150.794	0.0	143.308	143.318	0.0
286106	153.804	153.821	0.0	150.535	150.553	0.0	143.055	143.066	0.0
284778	153.465	153.482	0.0	150.234	150.253	0.0	142.829	142.840	0.0
284565[b]	151.716	151.733	0.0	148.525	148.544	0.0	141.140	141.151	0.0
284431	151.610	151.627	0.0	148.398	148.416	0.0	140.999	141.009	0.0
284408	151.479	151.496	0.0	148.301	148.319	0.0	140.947	140.958	0.0
284395	151.453	151.470	0.0	148.279	148.297	0.0	140.937	140.947	0.0
284372	151.418	151.436	0.0	148.248	148.267	0.0	140.922	140.933	0.0
284267	151.234	151.252	0.0	148.092	148.111	0.0	140.827	140.838	0.0
284060	151.035	151.053	0.0	147.912	147.931	0.0	140.691	140.702	0.0
283820	150.852	150.870	0.0	147.724	147.744	0.0	140.537	140.549	0.0
283636	150.781	150.800	0.0	147.654	147.675	0.0	140.467	140.479	0.0
283611	150.683	150.702	0.0	147.566	147.586	0.0	140.406	140.418	0.0
283601	150.739	150.758	0.0	147.593	147.613	0.0	140.392	140.403	0.0
283574	150.696	150.716	0.0	147.536	147.557	0.0	140.323	140.334	0.0
283490	150.711	150.730	0.0	147.558	147.578	0.0	140.268	140.279	0.0
283342	150.727	150.747	0.0	147.570	147.590	0.0	140.233	140.245	0.0
283203	150.668	150.686	0.0	147.525	147.544	0.0	140.257	140.268	0.0
283179[c]	150.658	150.594	-0.1	147.518	147.452	-0.1	140.206	140.085	-0.1
283169[c]	150.665	150.597	-0.1	147.524	147.453	-0.1	140.211	140.081	-0.1
283139[c]	150.642	150.639	0.0	147.500	147.498	0.0	140.204	140.182	0.0
283093[c]	150.688	150.685	0.0	147.533	147.529	0.0	140.206	140.183	0.0
283052[c+d]	150.652	150.651	0.0	147.506	147.503	0.0	140.257	140.242	0.0
283001[c]	150.753	150.757	0.0	147.594	147.598	0.0	140.320	140.312	0.0
282937[c]	150.706	150.636	-0.1	147.552	147.477	-0.1	140.110	139.906	-0.2
282912[c]	150.679	150.605	-0.1	147.525	147.447	-0.1	140.209	140.046	-0.2
282902[c]	150.676	150.598	-0.1	147.521	147.439	-0.1	140.194	139.945	-0.2
282874	150.641	150.641	0.0	147.498	147.498	0.0	140.157	140.157	0.0
282707	150.511	150.511	0.0	147.358	147.358	0.0	139.929	139.929	0.0
282424	150.448	150.448	0.0	147.299	147.299	0.0	139.966	139.966	0.0
282071	150.344	150.344	0.0	147.204	147.204	0.0	139.950	139.950	0.0
281647[e]	150.199	150.199	0.0	147.087	147.087	0.0	139.888	139.888	0.0
281423	149.960	149.960	0.0	146.886	146.886	0.0	139.748	139.748	0.0
279961	149.301	149.301	0.0	146.289	146.289	0.0	139.302	139.302	0.0
279605	149.191	149.191	0.0	146.183	146.183	0.0	139.215	139.214	0.0
278919	149.039	149.039	0.0	146.033	146.033	0.0	139.088	139.088	0.0

Notes:

a. 'Change' is calculated by subtracting 'Proposed' from 'Corrected' and rounding to one decimal place
b. Located downstream of Gervais Street bridge
c. Area-2 cofferdam
d. Cross section 'P' on Richland County FIRM (FEMA, 2017) and cross section 'M' on Lexington County FIRM (FEMA, 2018)
e. Located upstream of Blossom Street bridge

Conclusion/Summary

The results in Table 4 and Table 5 show the addition of the proposed Area-1 and Area-2 cofferdam structures results in maximum increases in water surface elevations of 0.043, 0.045, and 0.040 ft for the 100-year, 50-year, and 10-year flood events, respectively. These increases are negligible and are considered to be within the accuracy limits of the hydraulic model. It is standard industry practice to report hydraulic model results to the nearest tenth of a foot. Reporting model results or changes in model results to a greater number of decimal places implies a level of accuracy that is simply not practical to achieve.

When the changes in peak water surface elevations are reported to the nearest tenth of a foot, all increases are rounded down to zero, therefore the proposed Area-1 and Area-2 cofferdam structures will result in no-rise in the 100-year BFE within the extents of the model.

References

1. Apex, 2019a: Apex Companies LLC, "Figure 1, Stakeholder Approved MRA Plan Sediment Remediation Areas, Congaree River, Columbia, South Carolina", February 8, 2019.

2. Apex, 2019b: Apex Companies LLC, "Congaree River Topographic and Bathymetric Survey Data" Drawing Name: ACAD-13951-COMBINED.dwg, issued January 2019.

3. FEMA, 2013: Federal Emergency Management Agency, "Procedures for "No-Rise" Certification for Proposed Developments in the Regulatory Floodway," Federal Emergency Management Agency, October 2013.

4. FEMA, 2017: Federal Emergency Management Agency, "Flood Insurance Rate Map, Richland County, South Carolina and Incorporated Areas," Map No. 45079C0356L, Federal Emergency Management Agency, December 21, 2017.

5. FEMA, 2018: Federal Emergency Management Agency, "Flood Insurance Rate Map, Lexington County, South Carolina and Incorporated Areas," Map No. 45063C0281J, Federal Emergency Management Agency, July 5, 2018.

6. NOAA, 2019: National Oceanic and Atmospheric Administration, "VERTCON - North American Vertical Datum Conversion" https://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.prl, Accessed March 2019.

7. SCDNR, 2010: South Carolina Department of Natural Resources, LiDAR Data Products by County, <http://www.dnr.sc.gov/GIS/lidarstatus.html>, Montana DNRC, Date Accessed: January 30, 2019.

8. USACE, 2010: USACE, "HEC-RAS River Analysis System, User's Manual, Version 4.1" Document No. CPD-68, Hydraulic Engineering Center, United States Army Corps of Engineers, January 2010.

9. USGS, 2019: United States Geological Survey, "USGS Gage 02169500 Congaree River at Columbia, SC" <https://waterdata.usgs.gov/usa/nwis/uv?02169500>, Date Accessed: February 5, 2019.

APPENDICES

Appendix A: FEMA Procedures for "No-Rise" Certification for Proposed Developments in the Regulatory Floodway

US Department of Homeland Security
Region X
130 228th Street, SW
Bothell, WA 98021

Procedures for "No-Rise" Certification
For Proposed Developments in the Regulatory Floodway

Section 60.3 (d) (3) of the National Flood Insurance Program (NFIP) regulations states that a community shall "prohibit encroachments, including fill, new construction, substantial improvements and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base (100-year) flood discharge."

Prior to issuing any building, grading or development permits involving activities in a regulatory floodway the community must obtain a certification stating the proposed development will not impact the pre-project base flood elevations, floodway elevations, or floodway data widths. The certification should be obtained from the applicant and be signed and sealed by a professional engineer.

The engineering or "no-rise" certification must be supported by technical data.

The supporting technical data should be based upon hydraulic analyses that utilize the same model used to prepare the effective Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) unless it is demonstrated that the 'effective' hydraulic model is unavailable or its use is inappropriate. If an alternative hydraulic model is used, the new model must be calibrated to reproduce the FIS profiles within 0.5 feet. Hydraulic model used in the analysis must be on FEMA's accepted models list, or documentation must be provided showing the model meets the requirements of NFIP regulation 65.6(a)(6).

October 2013

Although communities are required to review and approve the "no-rise" submittals, they may request, in writing, technical assistance and review from the FEMA regional office. However, if this alternative is chosen, the community must review the technical submittal package and verify that all supporting data, listed in the following paragraphs, are included in the package before forwarding to FEMA.

To support a "no-rise" certification for proposed developments encroaching into the regulatory floodway, a community will require that the following procedures be followed:

1. Current Effective Model: Submit a written request for the effective model for the specified stream and community, identifying the limits of the requested data. A fee will be assessed for providing the data. Data request forms and instructions can obtained at:

   http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping/how-order-technical-administrative-support

   or by writing to:

   FEMA Engineering Library
   847 S. Pickett Street
   Alexandria, VA 22304
   Phone: 1-877-336-2627
   Facsimile: 1-703-212-4090

2. Duplicate Effective Model: Upon receipt of the effective computer model, the engineer should run the original model to duplicate the output in the effective (FIS).

3. Corrected Effective Model: The model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections, or incorporates more detailed topographic information than that used in the current effective model. Floodway limits should be manually set at the new cross-section locations by measuring from the effective FIRM or FBFM. The cumulative reach lengths of the stream should also remain unchanged. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model.

4. Existing, or Pre-Project Conditions Model: Revise the Duplicate Effective or the Corrected Effective model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project. If no modifications have occurred since the date of the effective model, then the model would be identical to the Duplicate Effective or Corrected Effective model. The results of this

Existing Conditions analysis will indicate the 100-yr elevations at the project site.

5. Proposed, or Post-Project Conditions Model: Modify the Existing Condition or Pre-Project Conditions Model (or Duplicate Effective model or Corrected Effective model, as appropriate) to reflect revised or post-project conditions. The overbank roughness coefficients should remain the same unless a reasonable explanation of how the proposed development will impact Manning's "n" values is included with the supporting data. The results of this analysis will indicate the 100-year elevation for proposed conditions at the project site. These results must indicate NO impact on the 100-year floodway elevations when compared to the Existing Conditions or Pre-Project Conditions model. If an increase results the project will require the submittal of a CLOMR prior to the start of the project.

The "no-rise" supporting data and a copy of the engineering certification must be submitted to and reviewed by the appropriate community official prior to issuing a permit.

The "no-rise" supporting data should include, but may not be limited to:

1) Copy of the Duplicate Effective model;

2) Copy of the Corrected Effective model;

3) Existing conditions, or Pre-Project conditions model

4) Proposed conditions or Post-Project conditions model.

5) FIRM and topographic map, showing floodplain and floodway, the additional cross-sections, the site location with the proposed topographic modification superimposed onto the maps, and a copy of the effective FIRM or FBFM showing the current regulatory floodway.

6) Documentation clearly stating analysis procedures. All modifications made to the original FIS model to represent revised existing conditions, as well as those made to the revised existing conditions model to represent proposed conditions, should be well documented and submitted with all supporting data.

7) Copy of effective Floodway Data Table copied from the (FIS) report.

8) Statement defining source of additional cross-section topographic data and supporting information.

9) Cross-section plots, of the added cross sections, for revised existing and proposed conditions.

10) Certified planimetric (boundary survey) information indicating the location of structures on the property.

11) Copy of the source from which input for original FIS model was taken.

12) CD with all input and output files.

13) Printout of output files from EDIT runs for all three floodway models.

The engineering "no-rise" certification and-supporting technical data must stipulate NO impact on the 100-year flood or floodway elevations at the new cross-sections and at all existing cross-sections anywhere in the model. Therefore, the revised computer model should be run for a sufficient distance (usually one mile, depending on hydraulic slope of the stream) upstream and downstream of the development site to insure proper "no-rise" certification.

Attached is a sample "no-rise" certification form that can be completed by a registered professional engineer and supplied to the community along with the supporting technical data when applying for a development permit.

ENGINEERING "NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified engineer licensed to practice in the State of _____.

It is to further certify that the attached technical data supports the fact that proposed _____ will
(Name of Development)
not impact the 100-year flood elevations, floodway elevations and floodway widths on _____ at published sections
(Name of Stream)
in the Flood Insurance Study for _____,
(Name of Community)
dated _____ and will not impact the 100-year flood elevations, floodway elevations, and floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

_____

_____

_____

_____

_____

_____

(Date) _____

(Signature) (Title)

_____

_____

_____

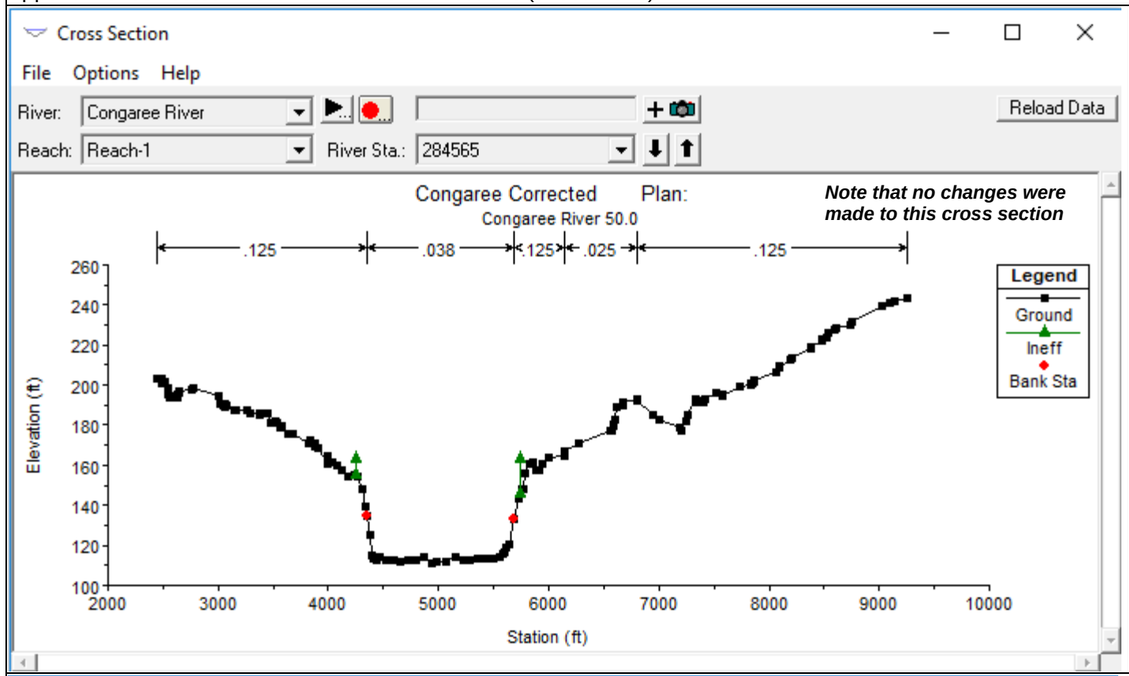
(Address)

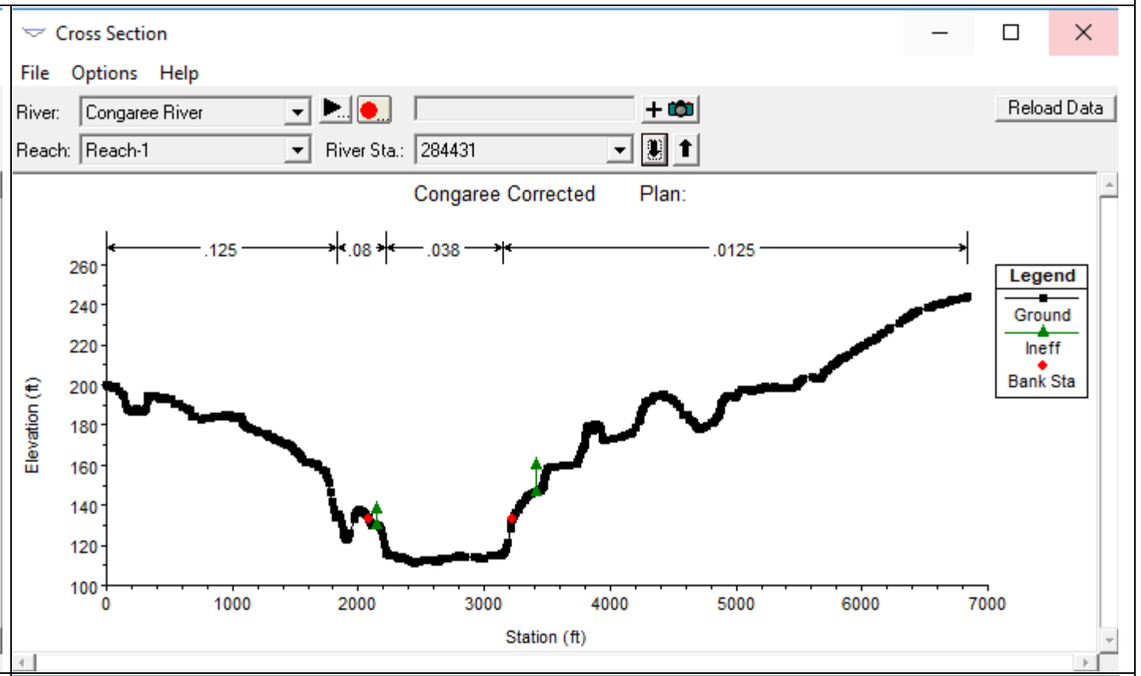
(Seal)

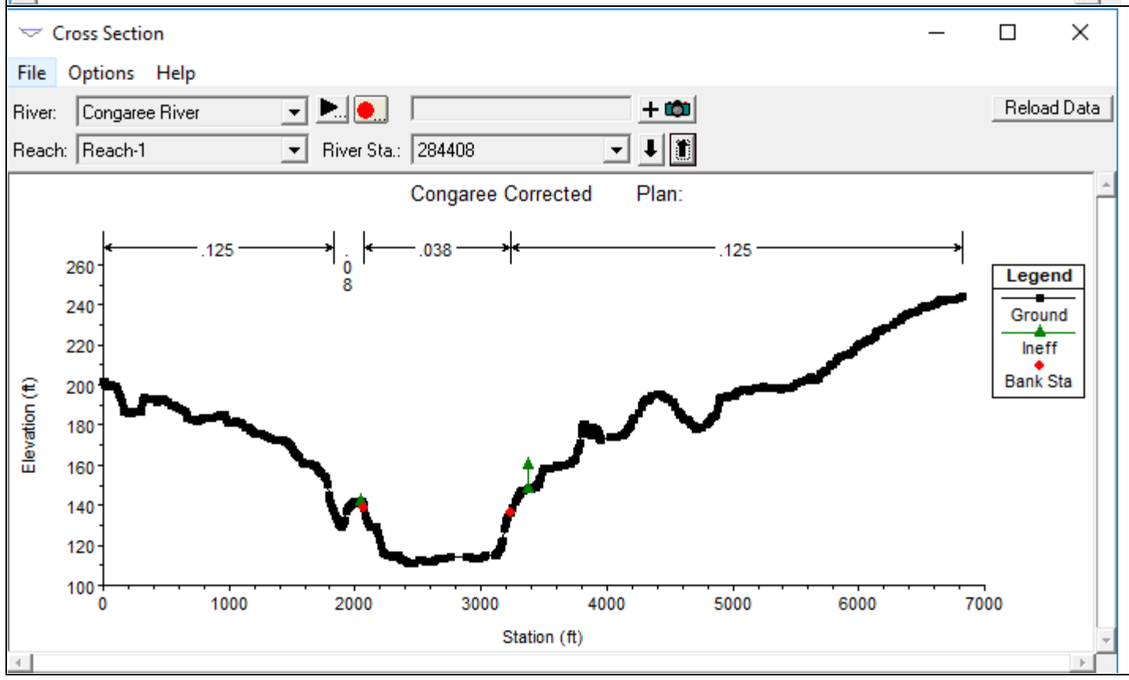
Appendix B: Electronic Files

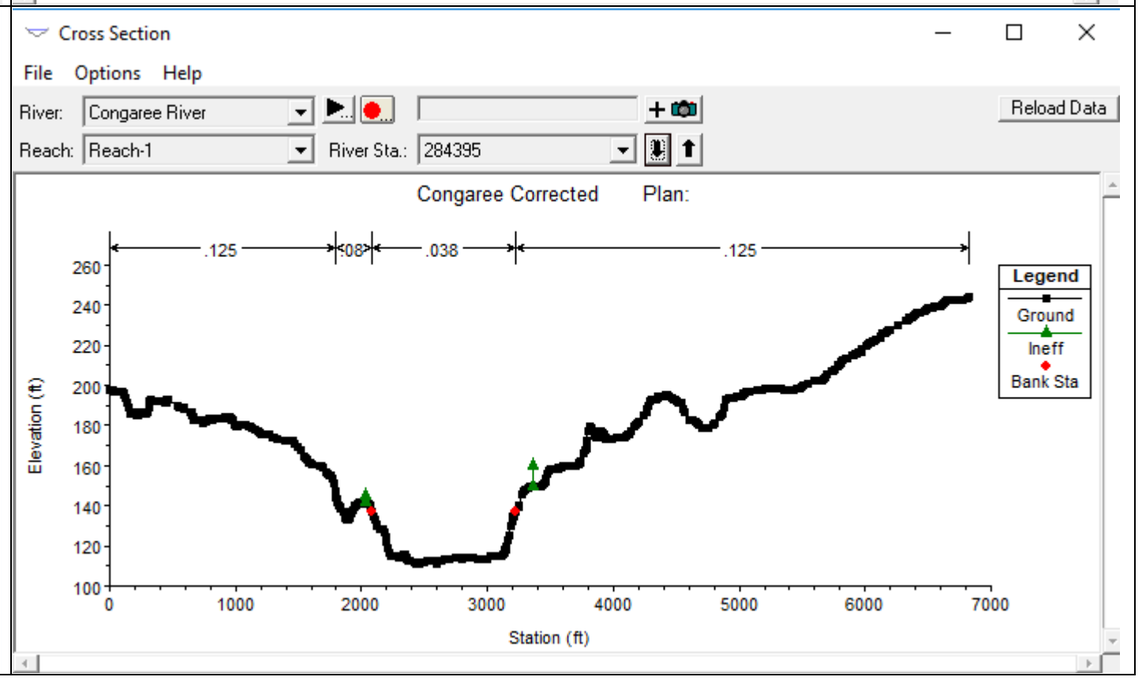
Appendix C: Corrected Effective Model Cross Sections

Appendix C: Corrected Effective Model Cross Sections (Sheet 1 of 8)

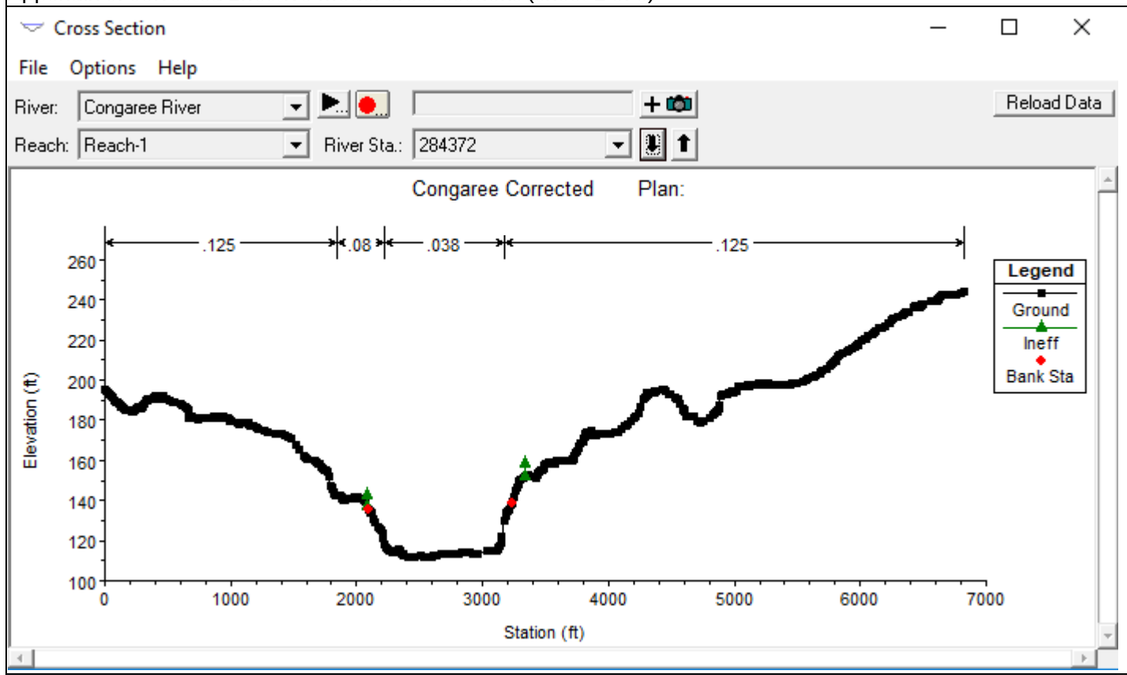


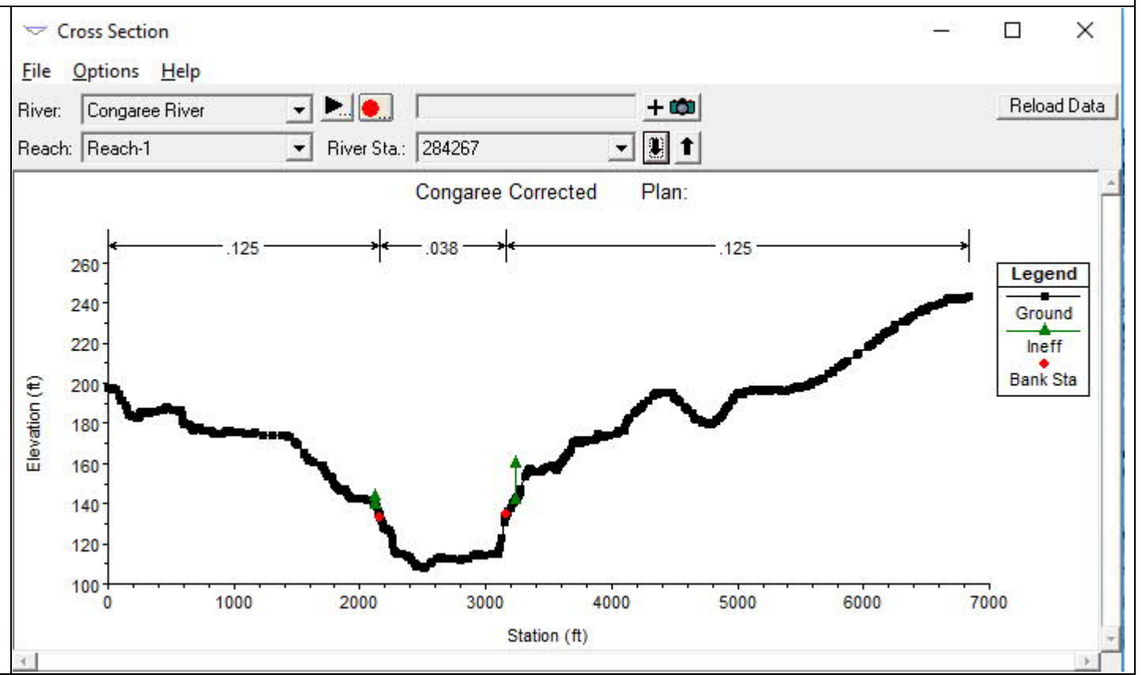


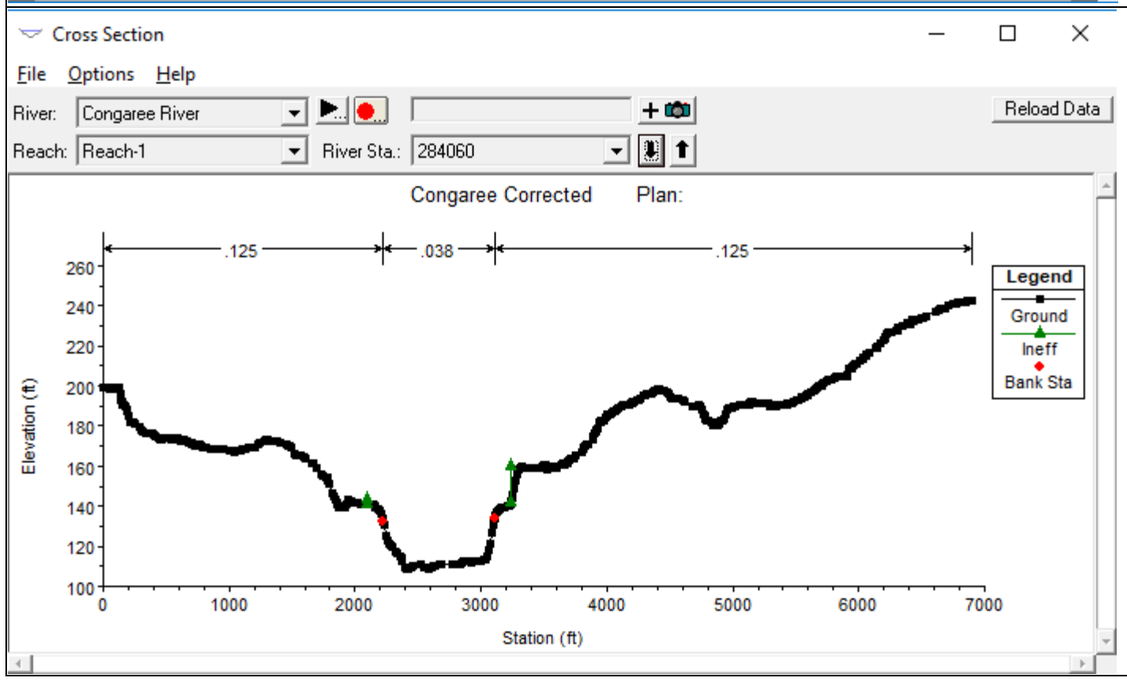


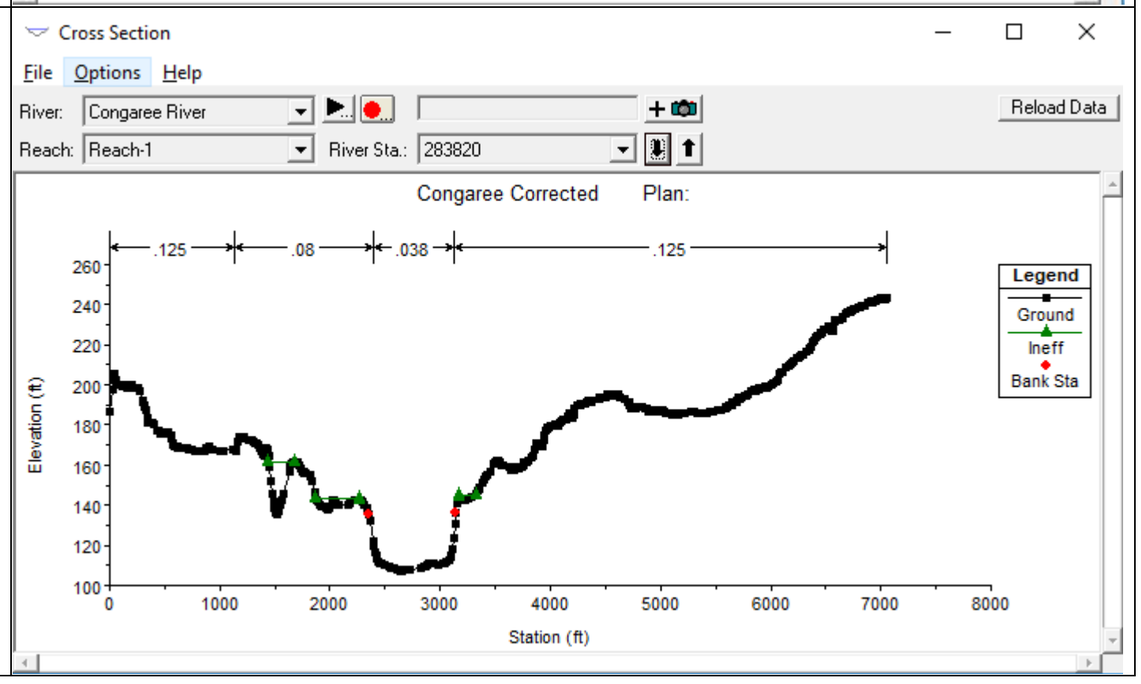


Appendix C: Corrected Effective Model Cross Sections (Sheet 2 of 8)

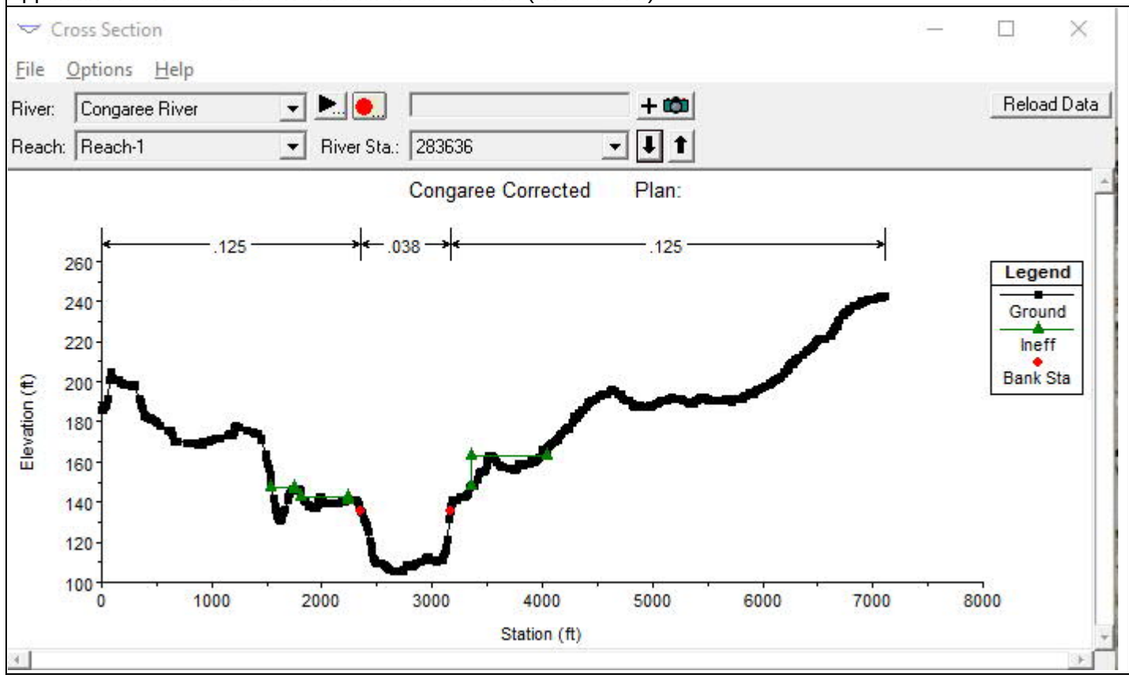


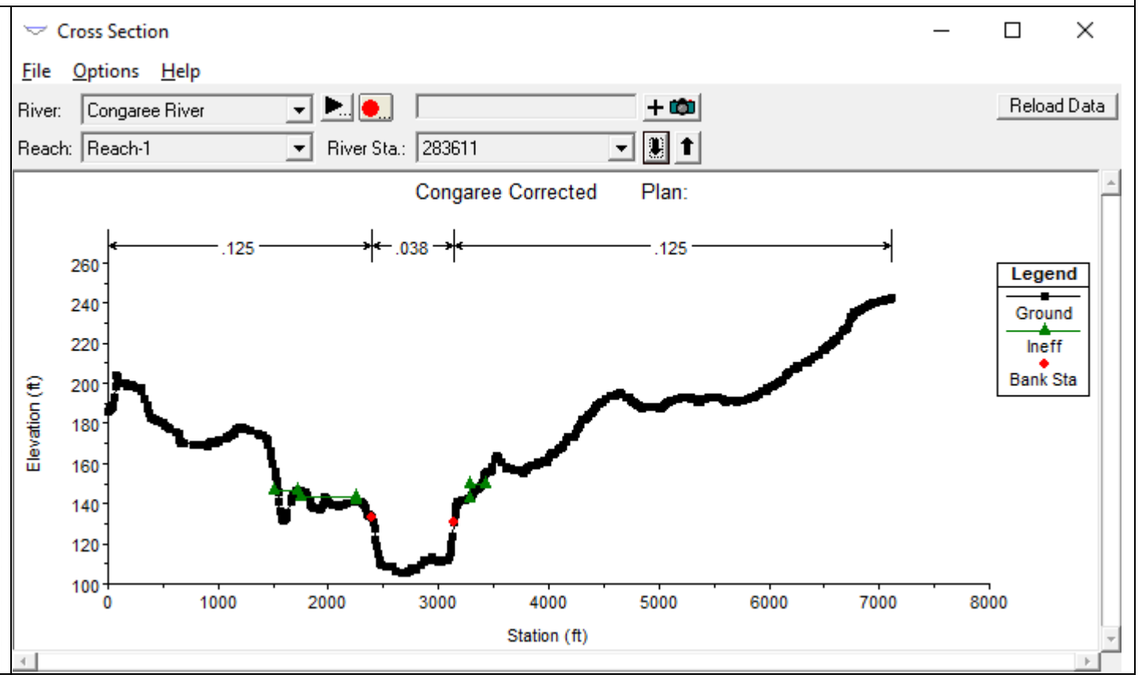


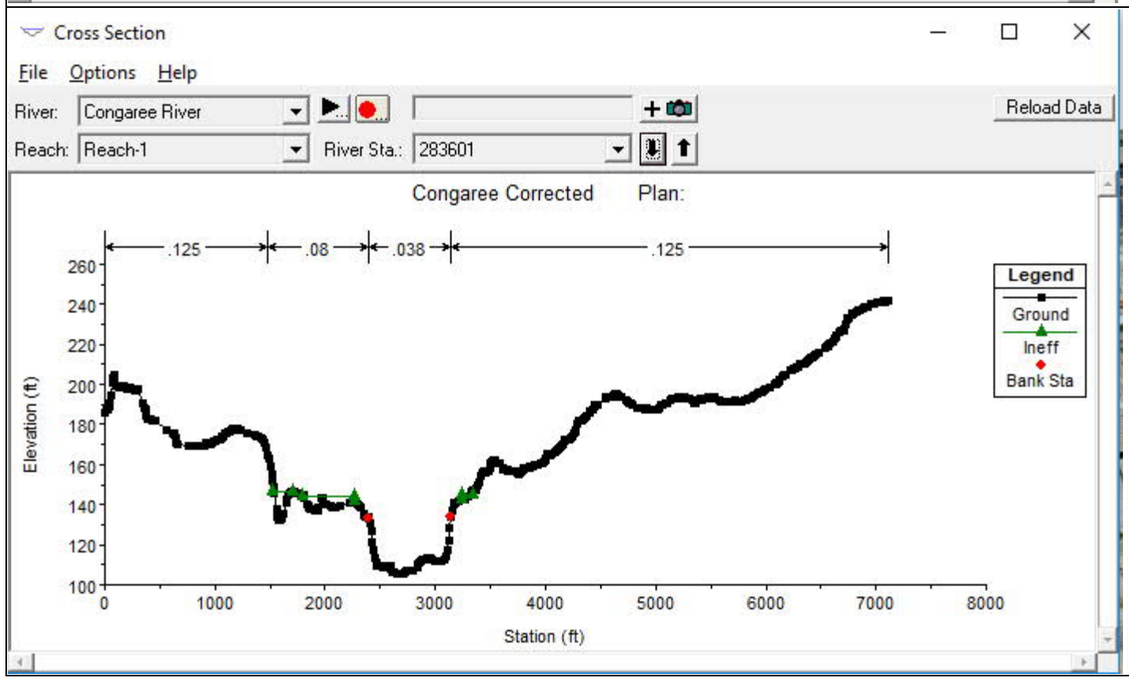


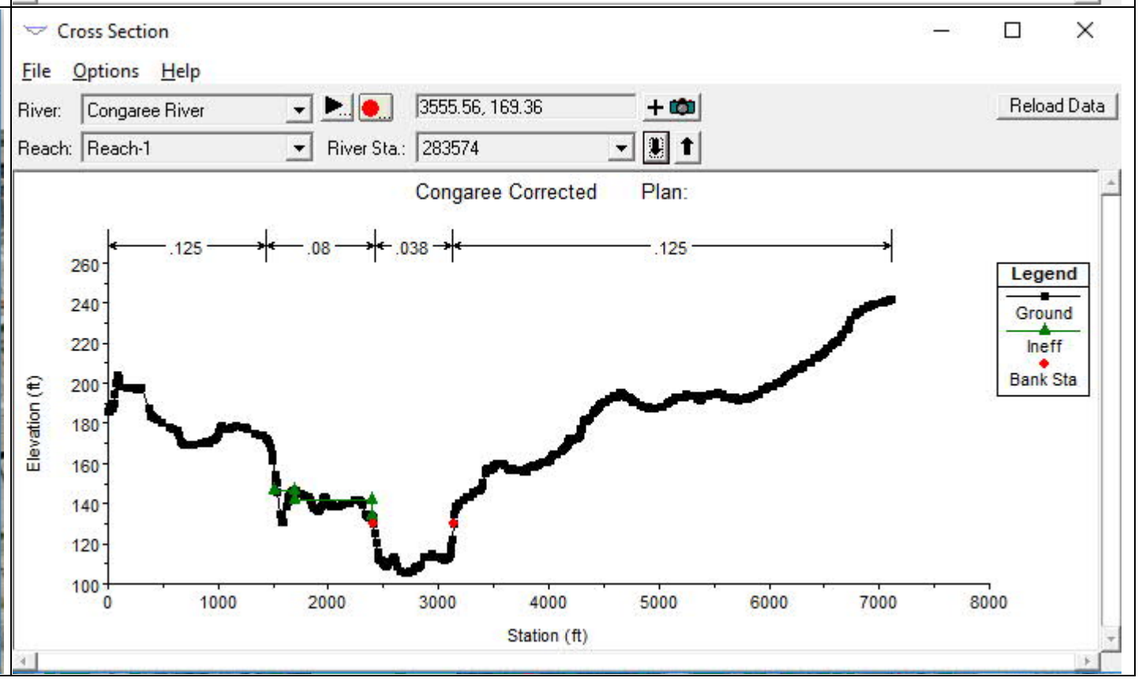


Appendix C: Corrected Effective Model Cross Sections (Sheet 3 of 8)

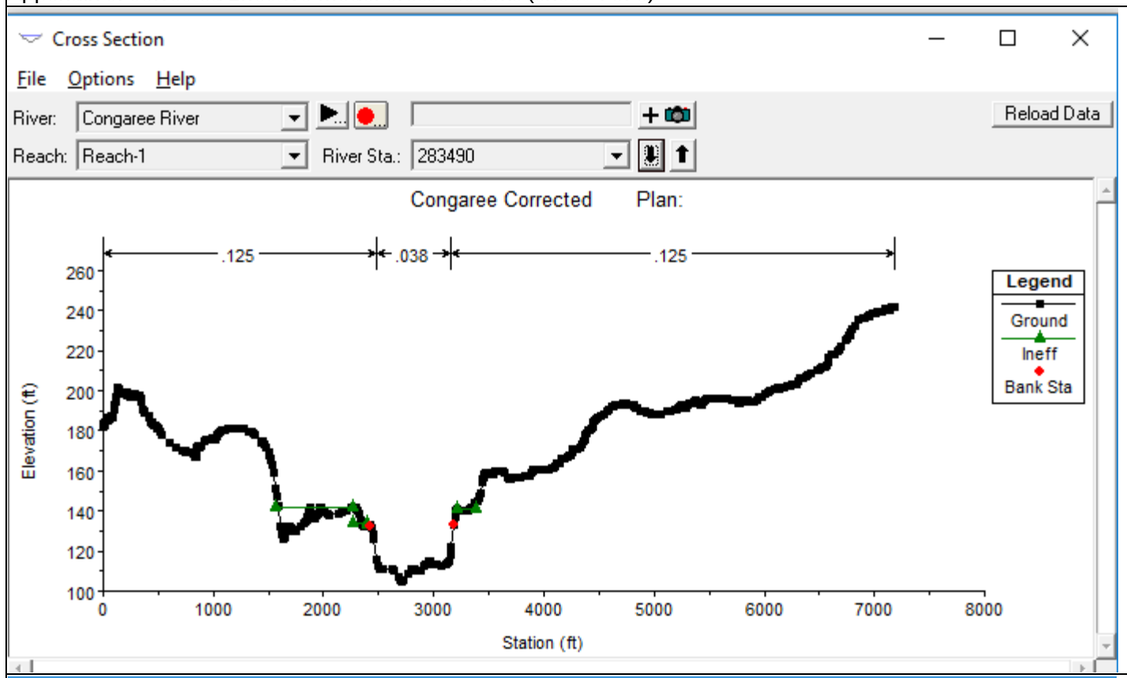


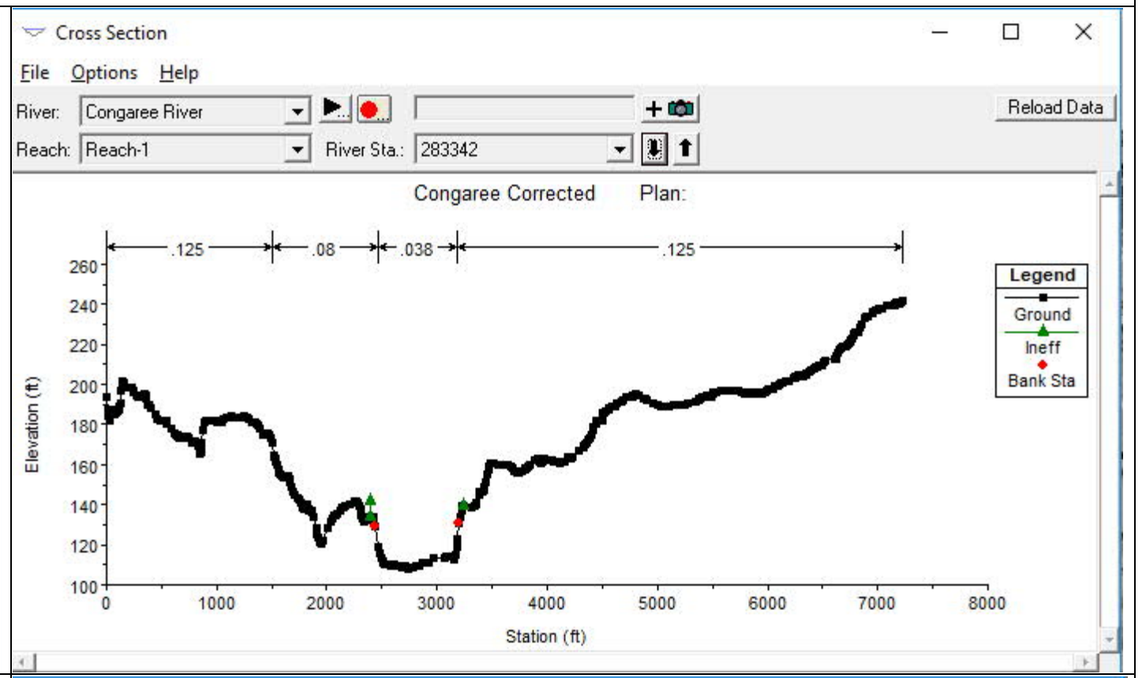


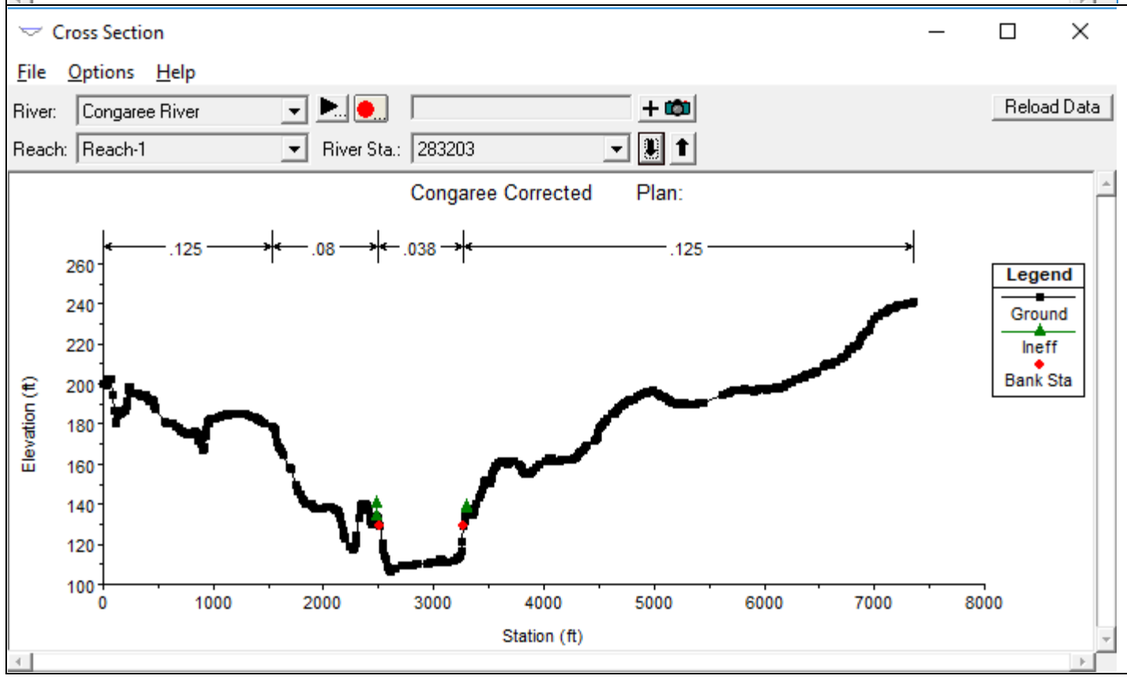


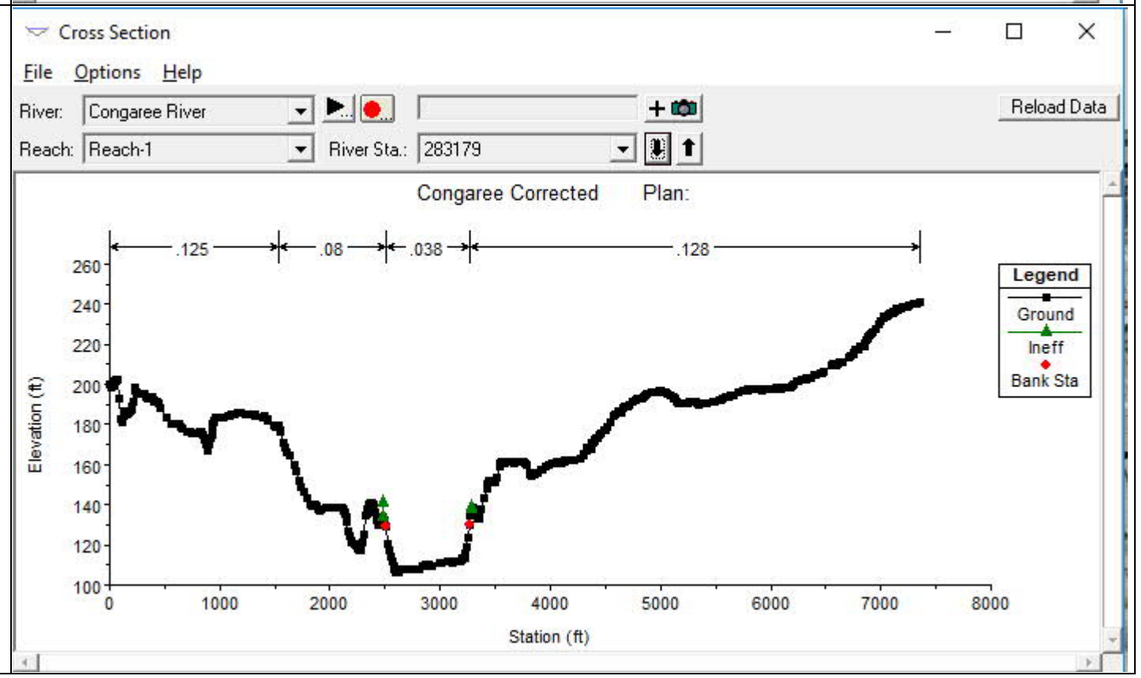


Appendix C: Corrected Effective Model Cross Sections (Sheet 4 of 8)

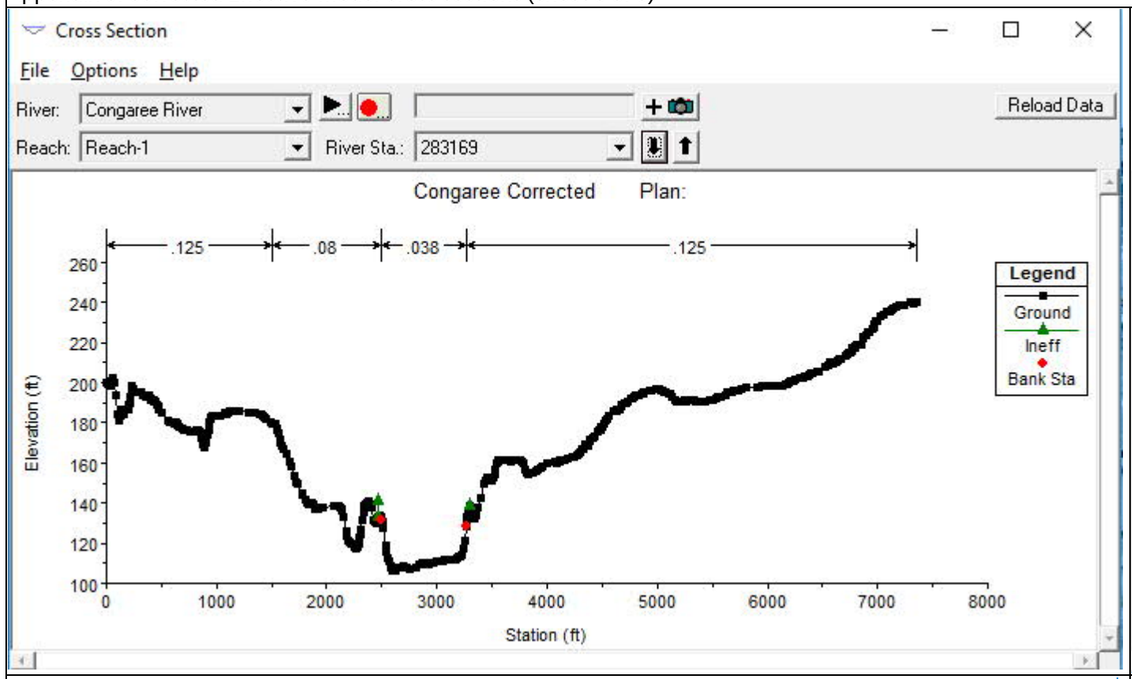


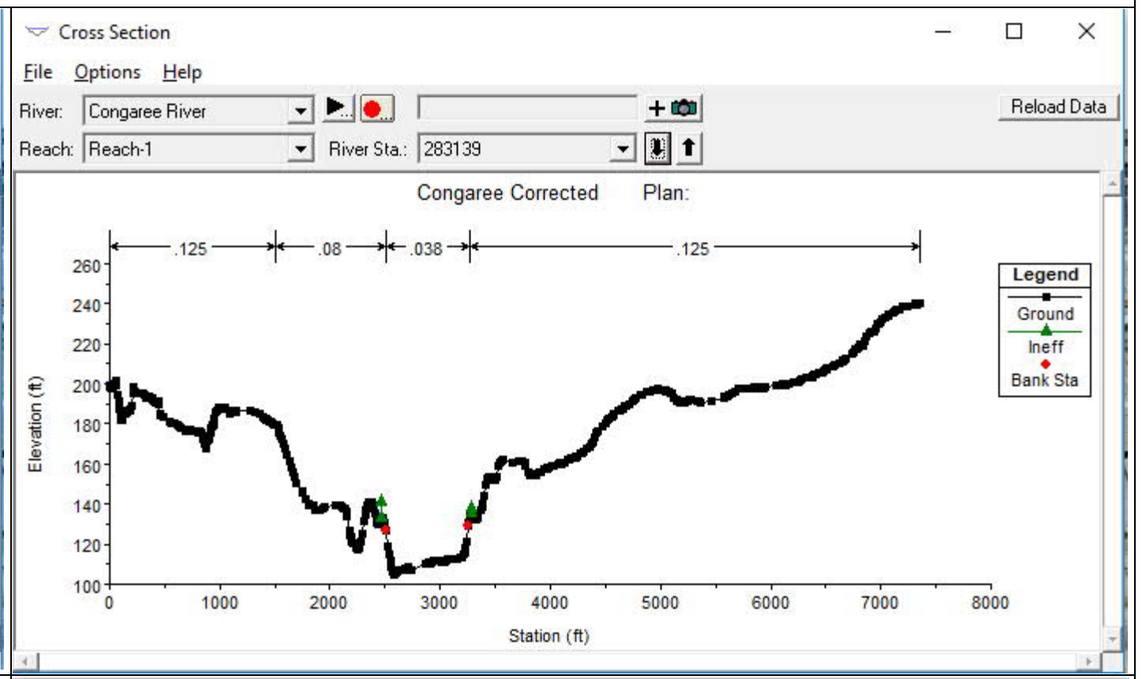


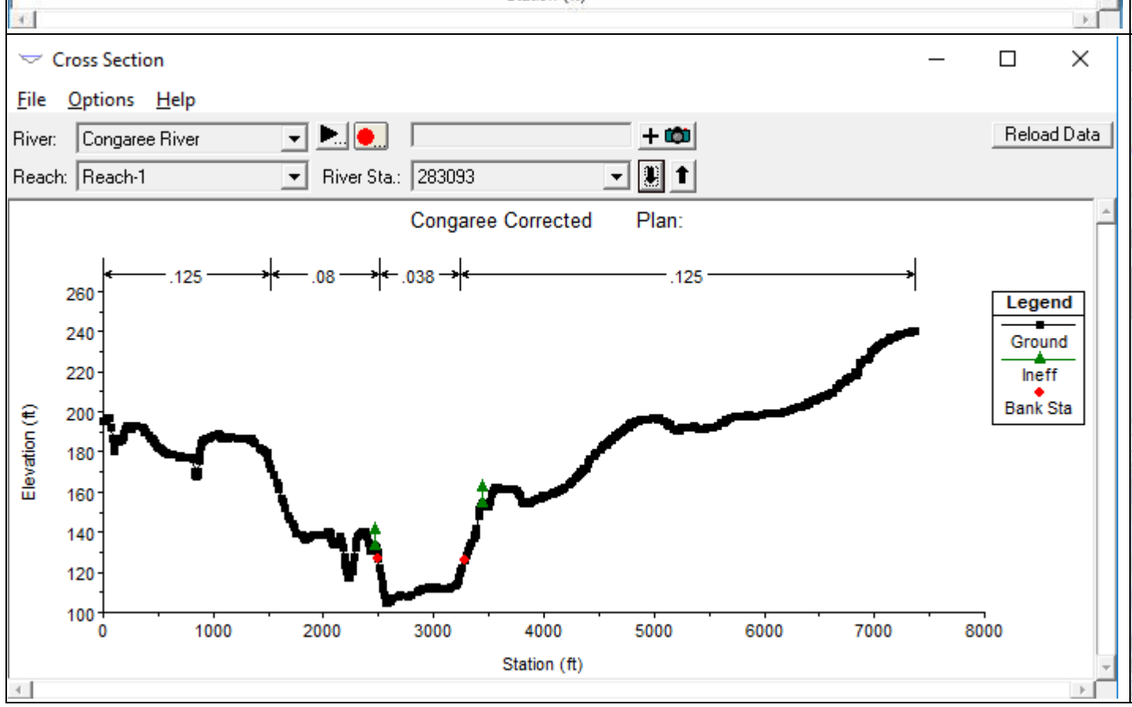


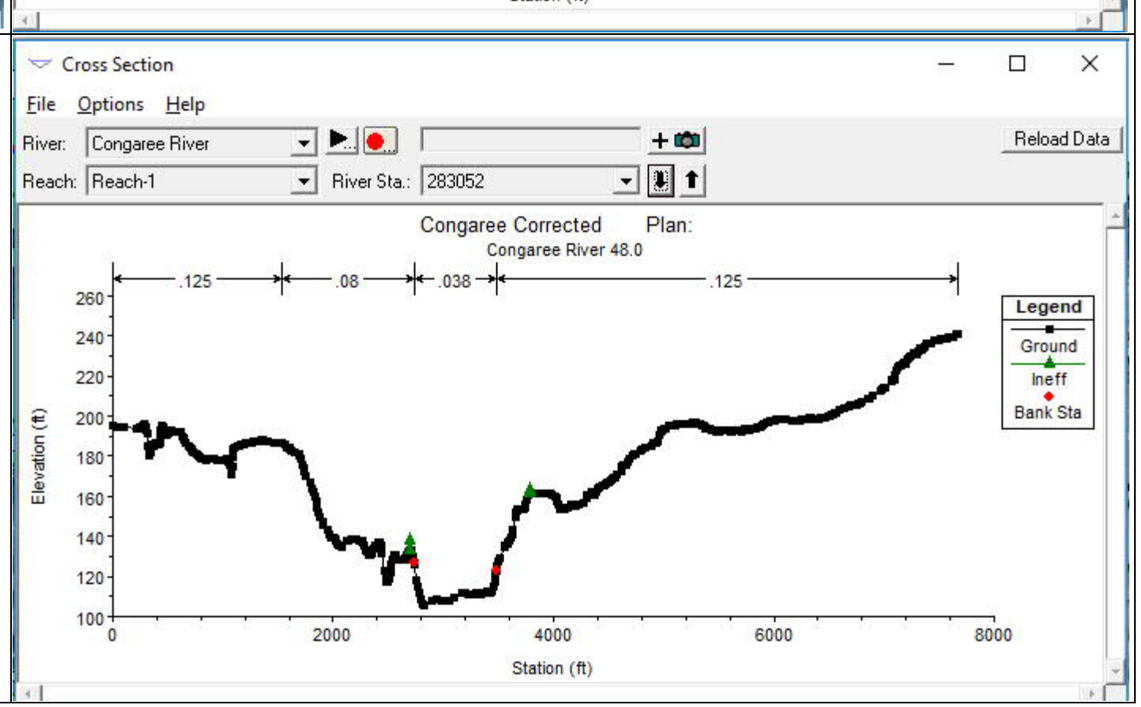


Appendix C: Corrected Effective Model Cross Sections (Sheet 5 of 8)

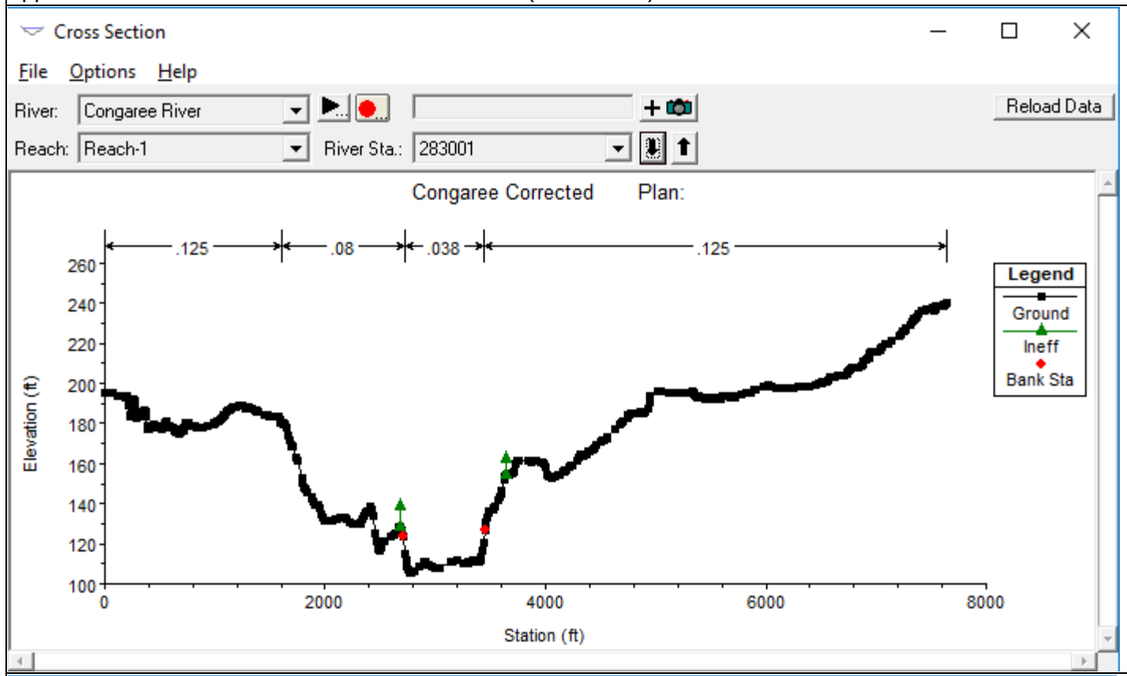


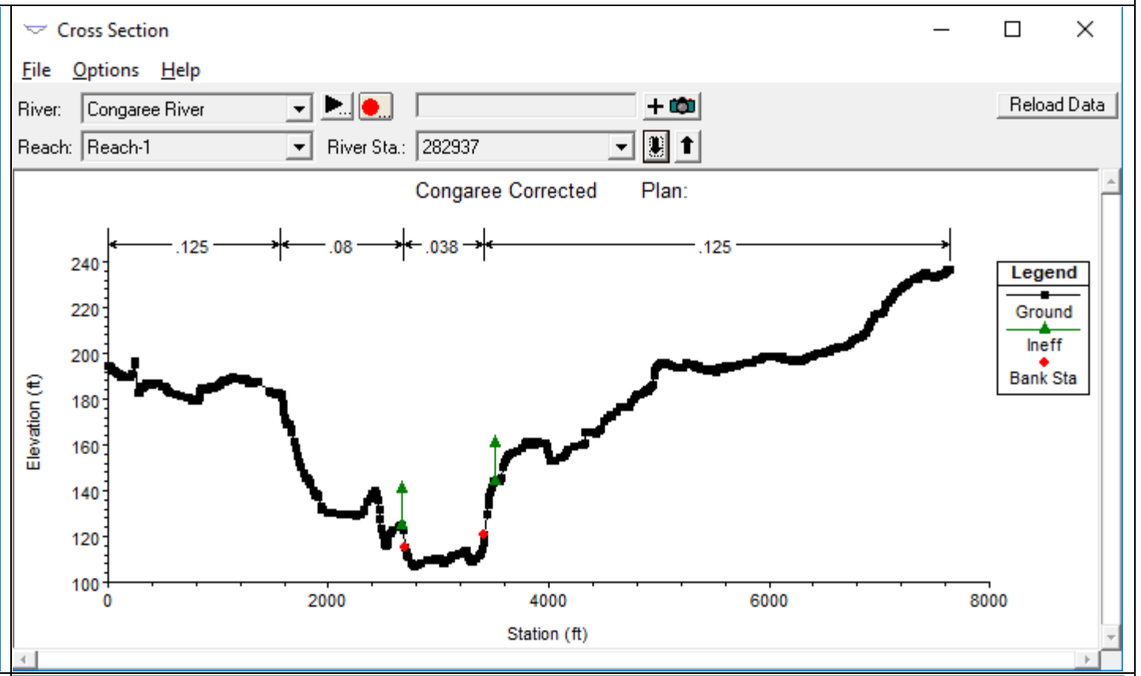


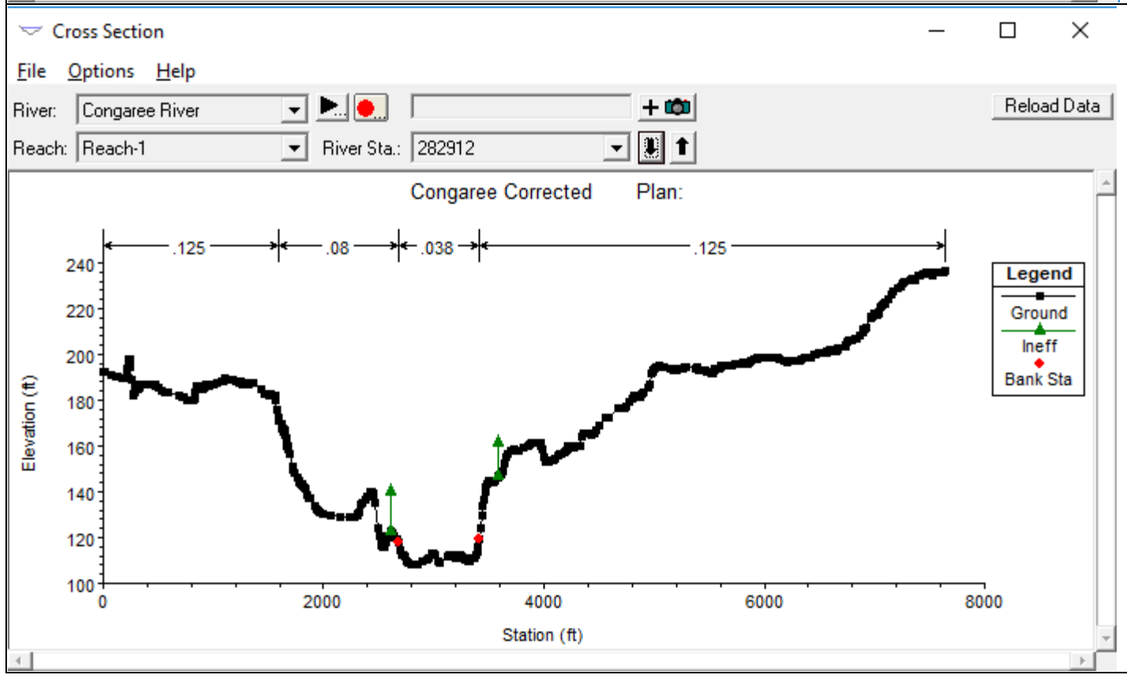


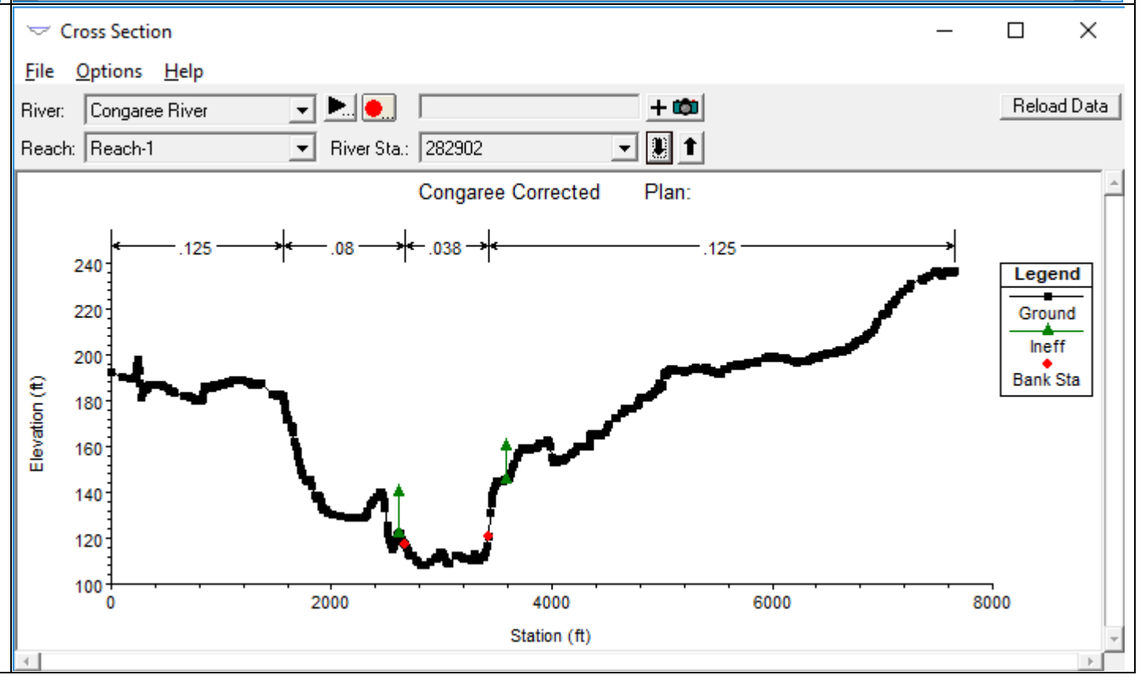


Appendix C: Corrected Effective Model Cross Sections (Sheet 6 of 8)

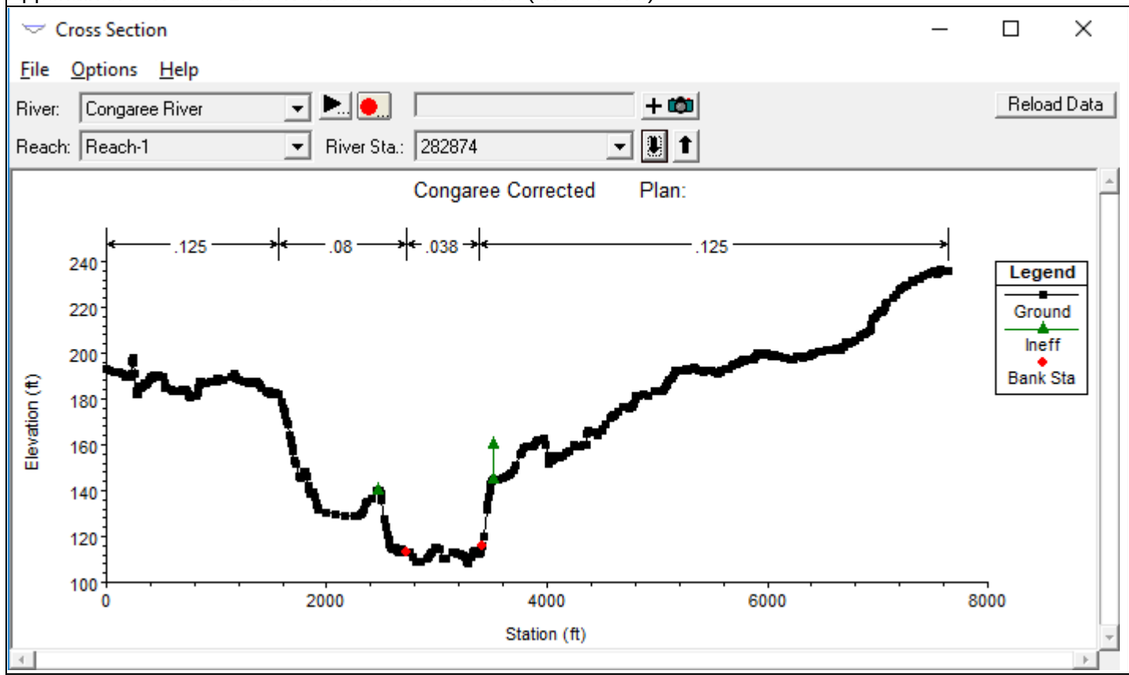


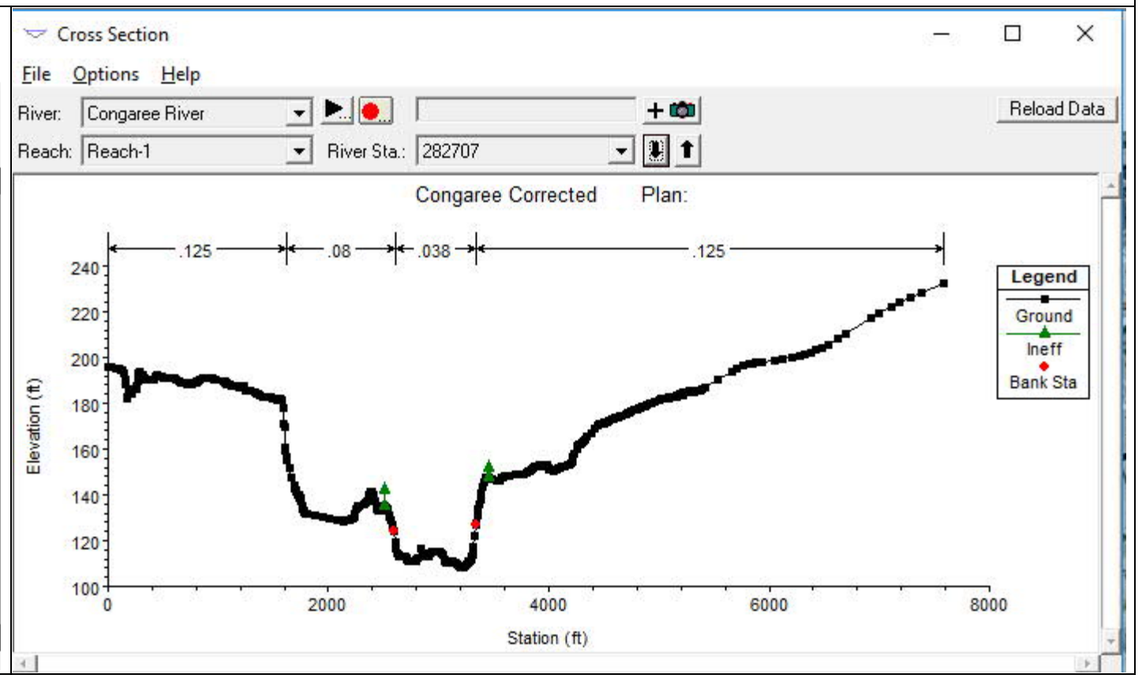


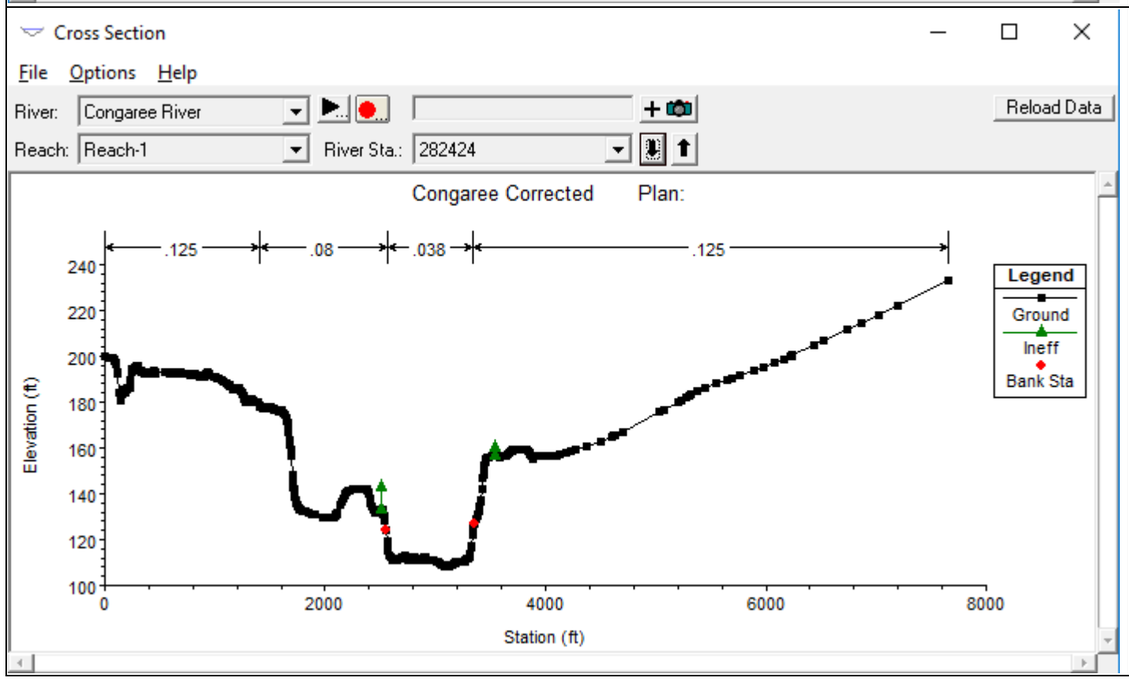


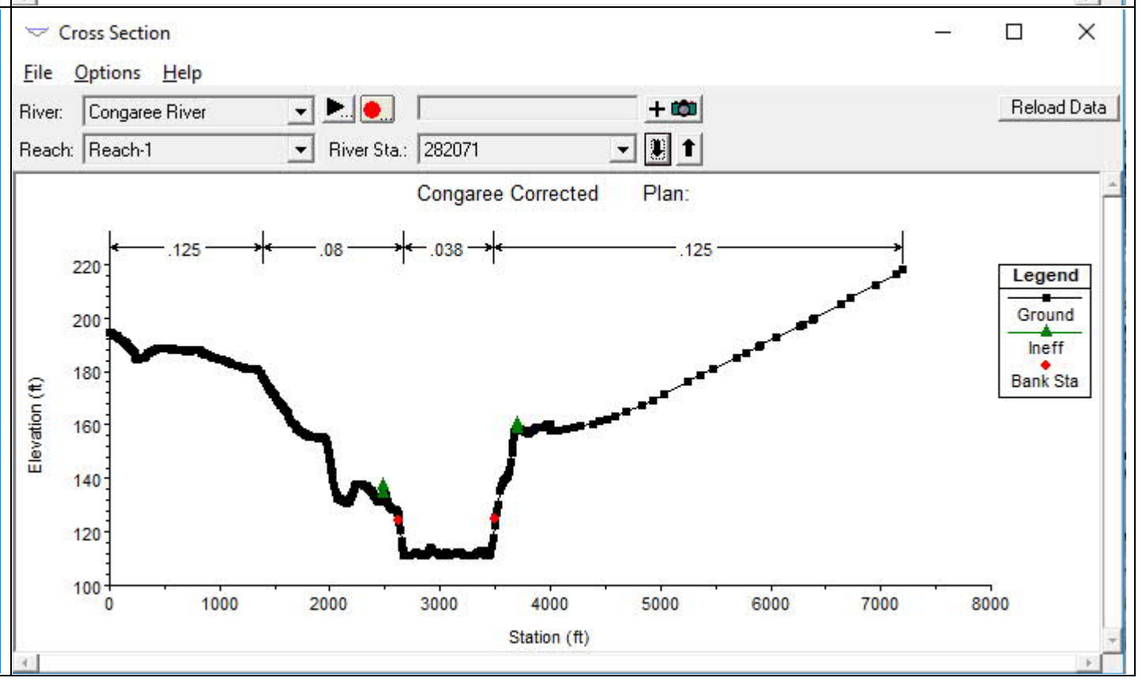


Appendix C: Corrected Effective Model Cross Sections (Sheet 7 of 8)

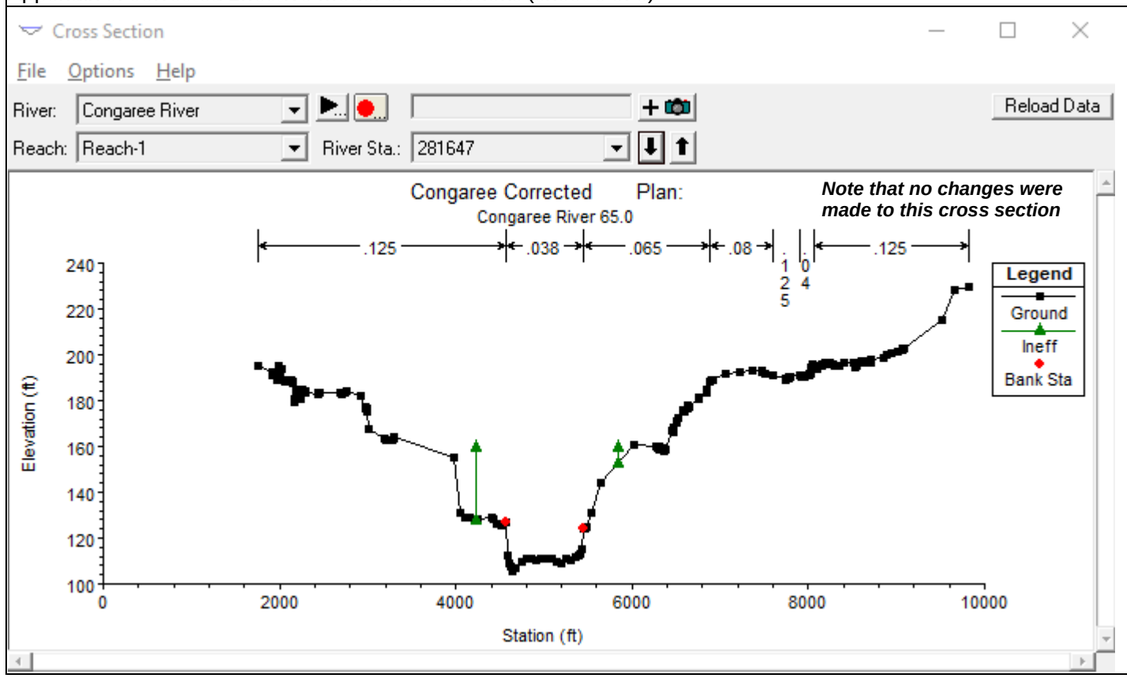






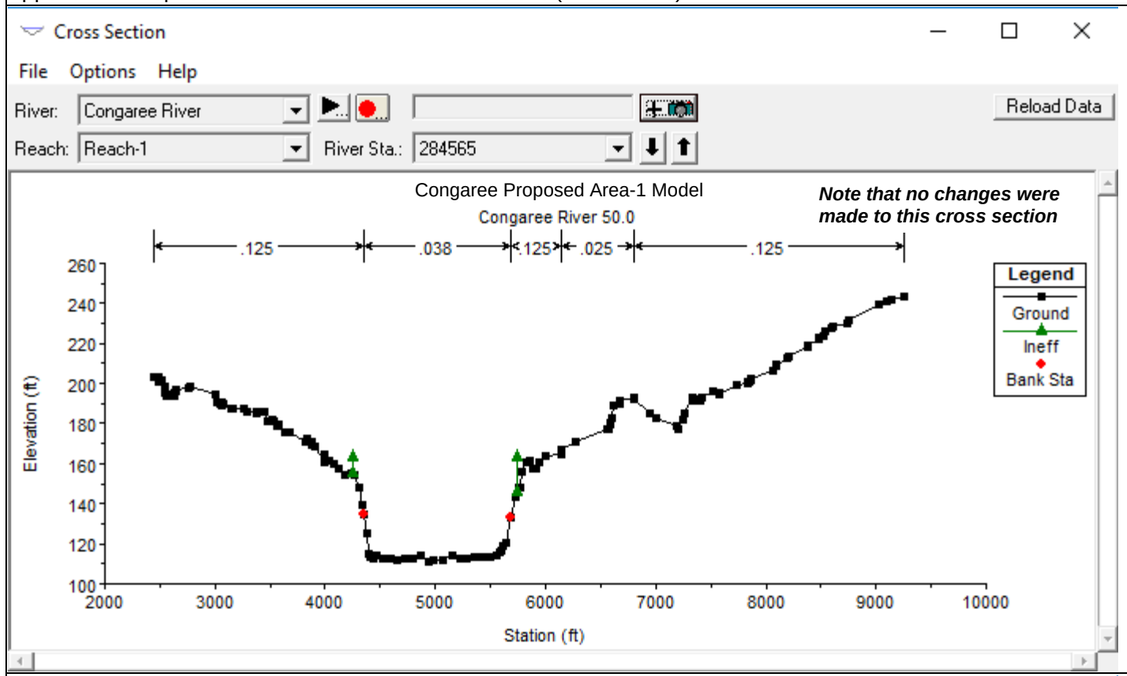


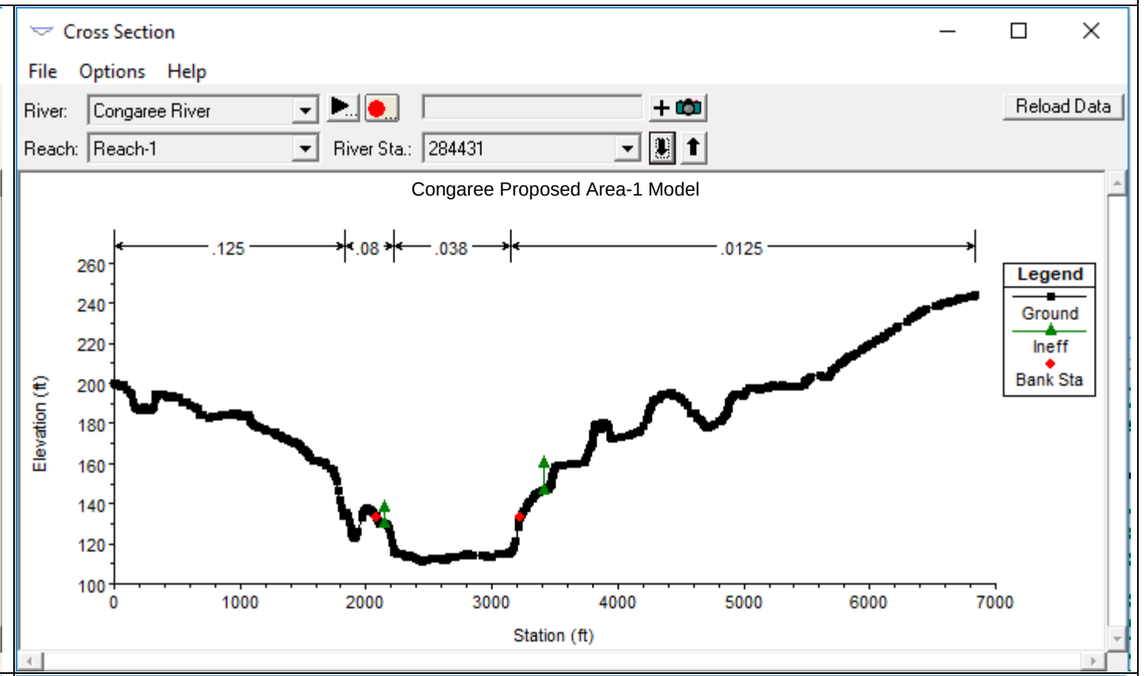
Appendix C: Corrected Effective Model Cross Sections (Sheet 8 of 8)

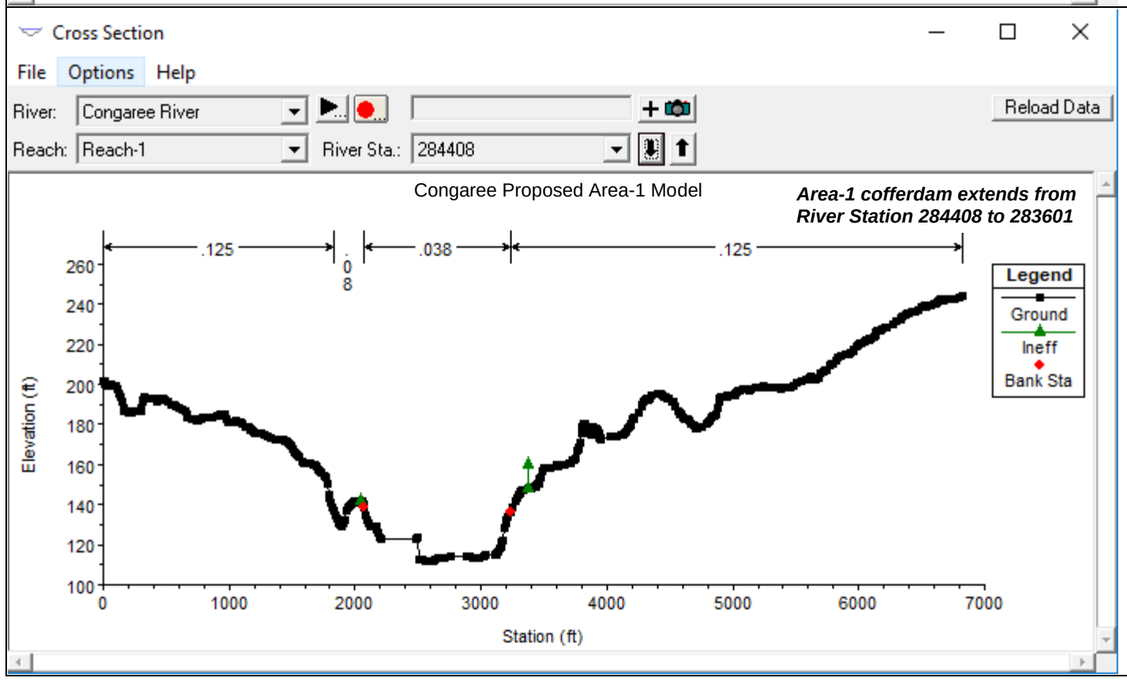


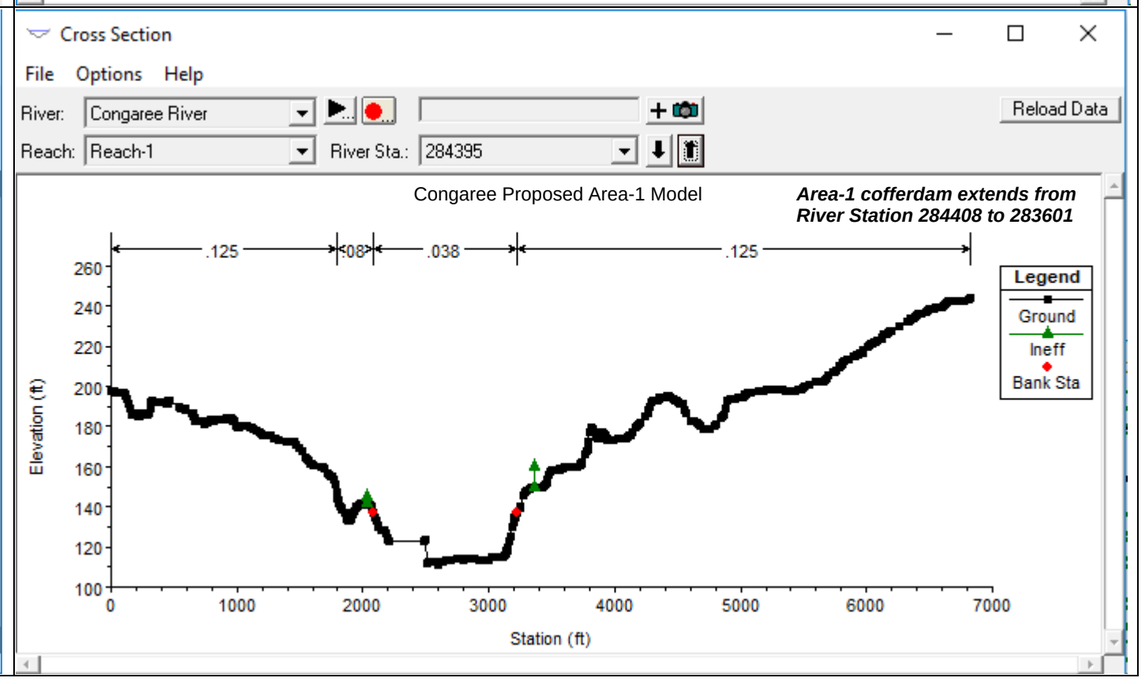
Appendix D: Proposed Condition Models Cross Sections

Appendix D: Proposed Conditions Models Cross Sections (Sheet 1 of 8)

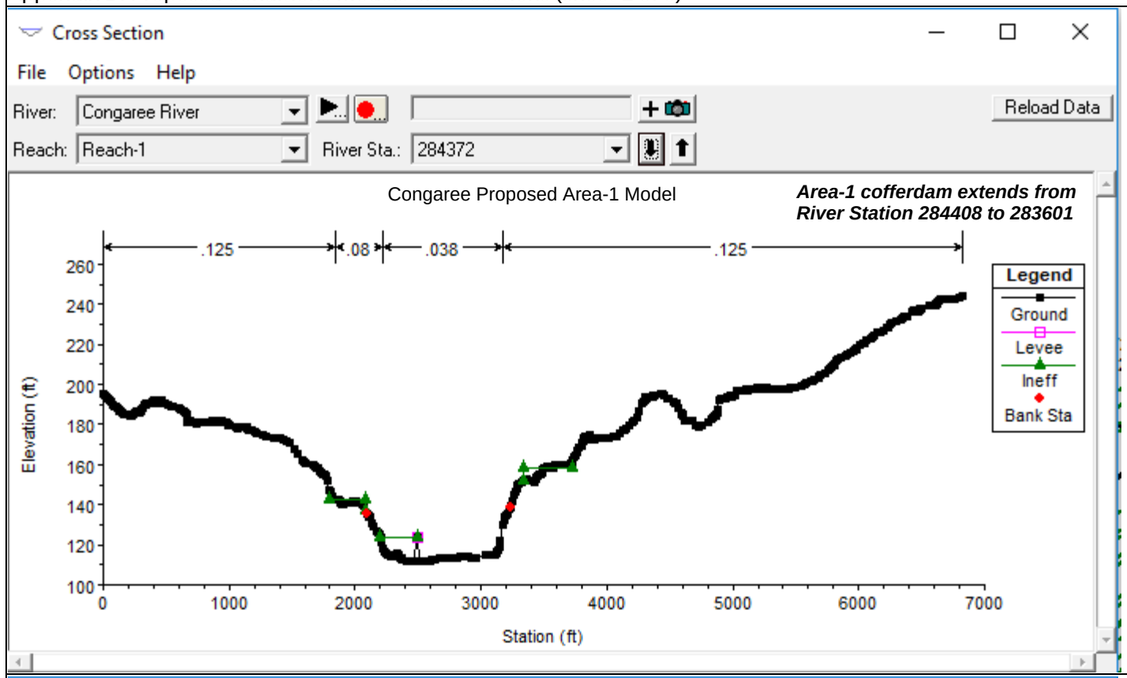


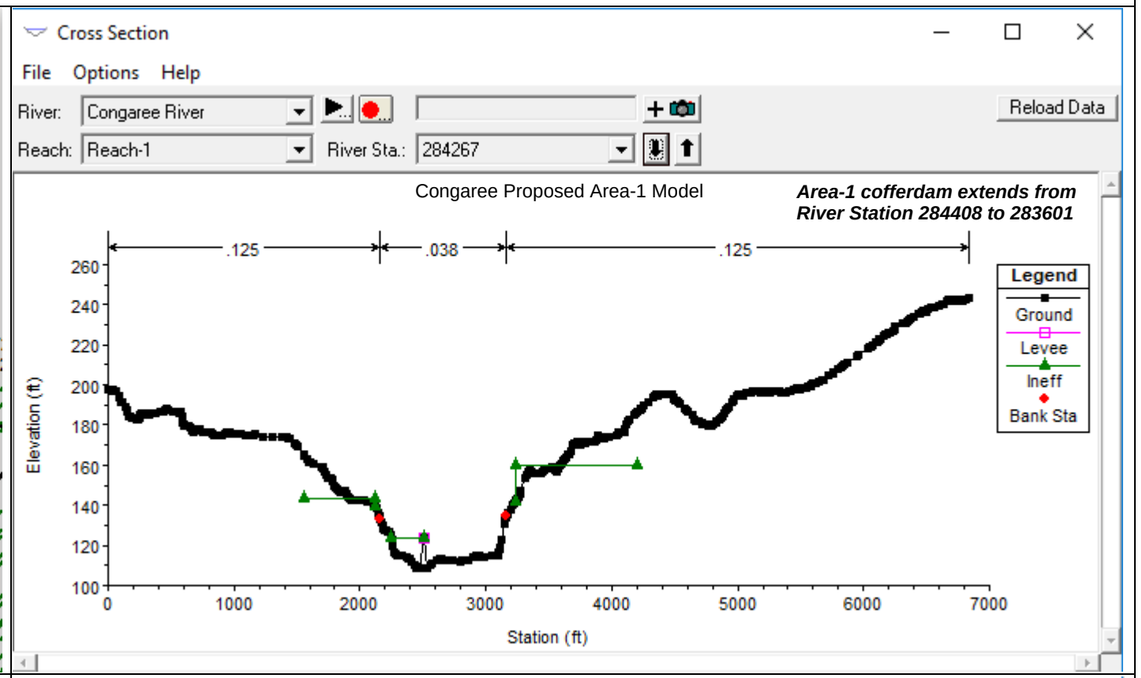


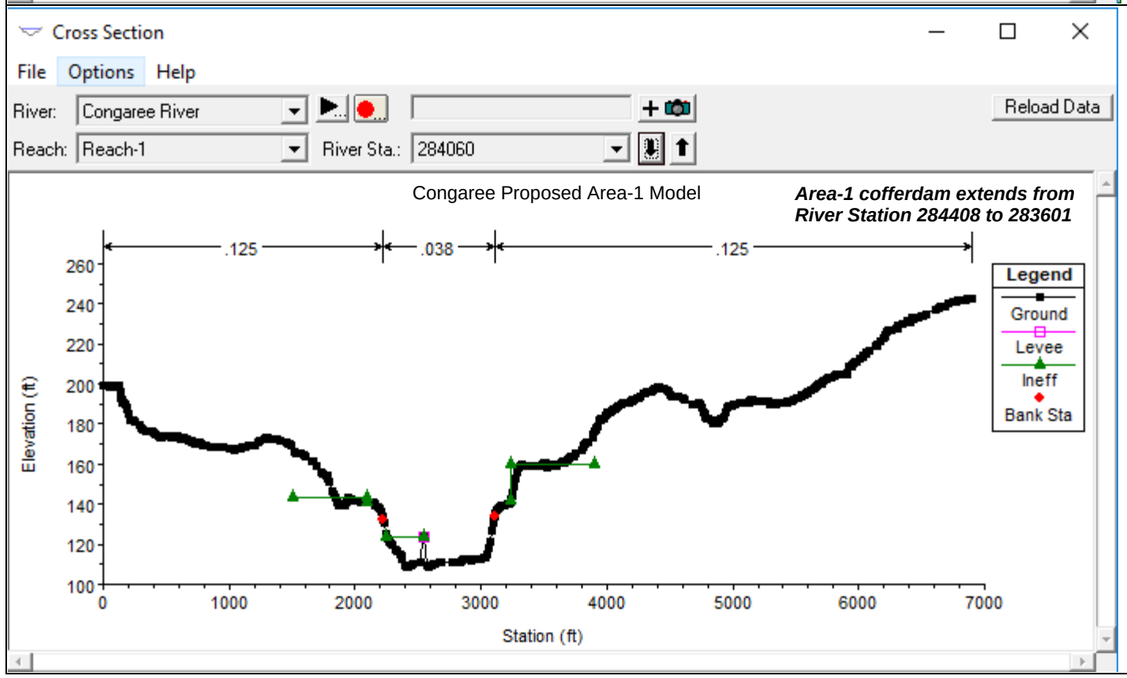


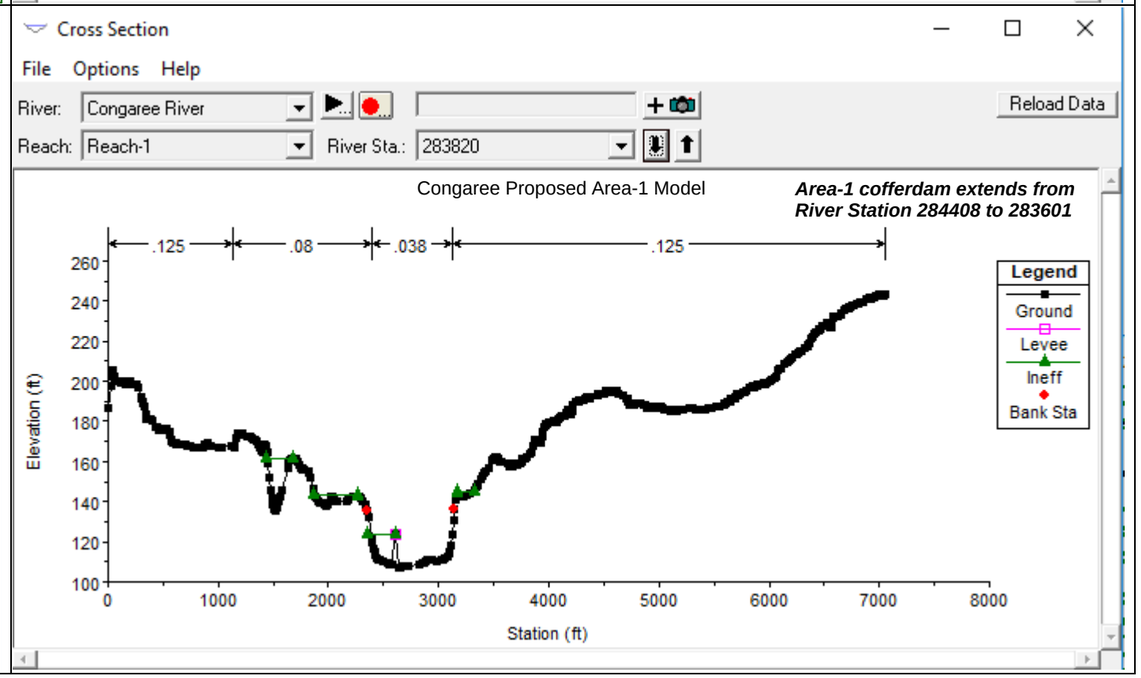


Appendix D: Proposed Conditions Models Cross Sections (Sheet 2 of 8)

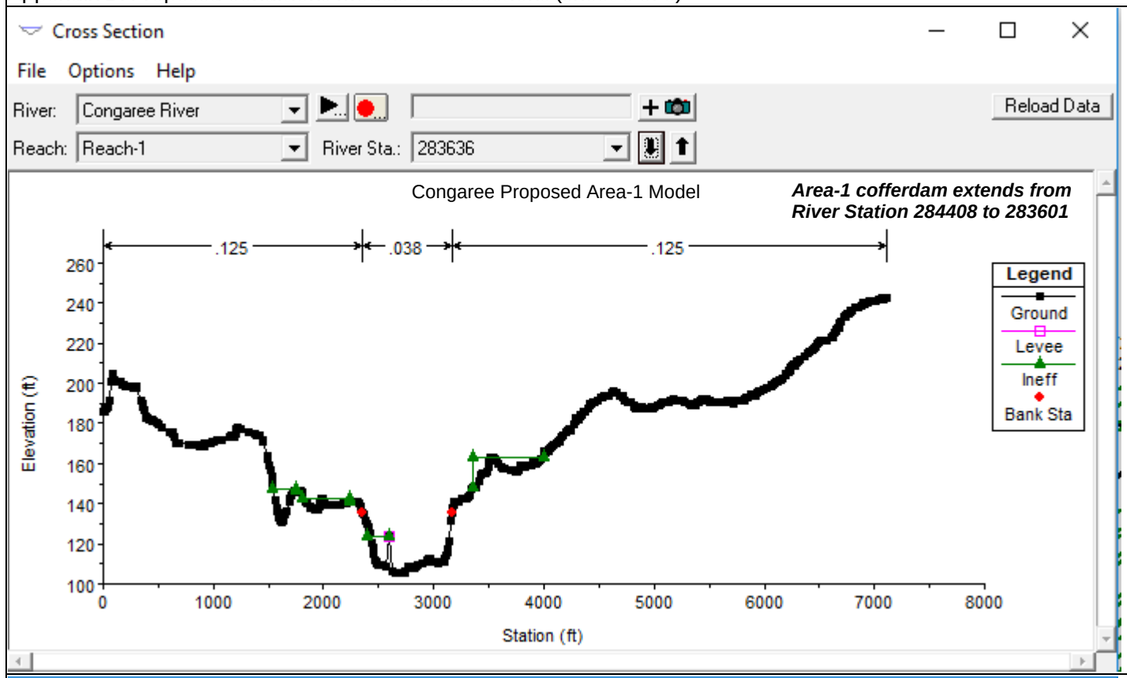


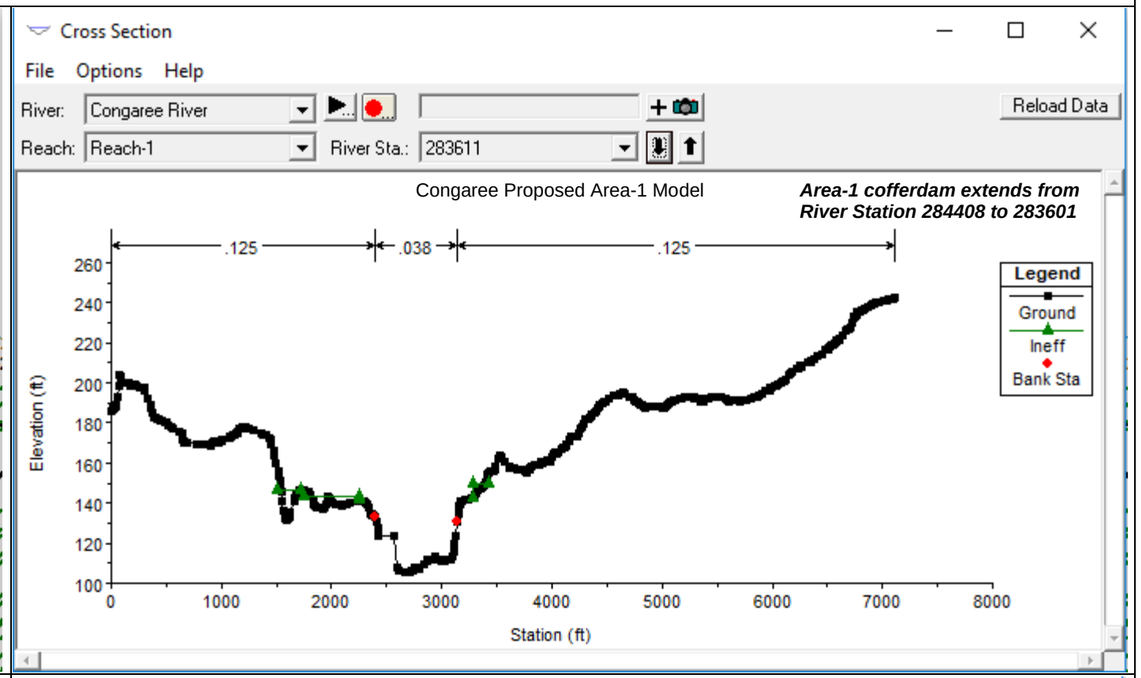


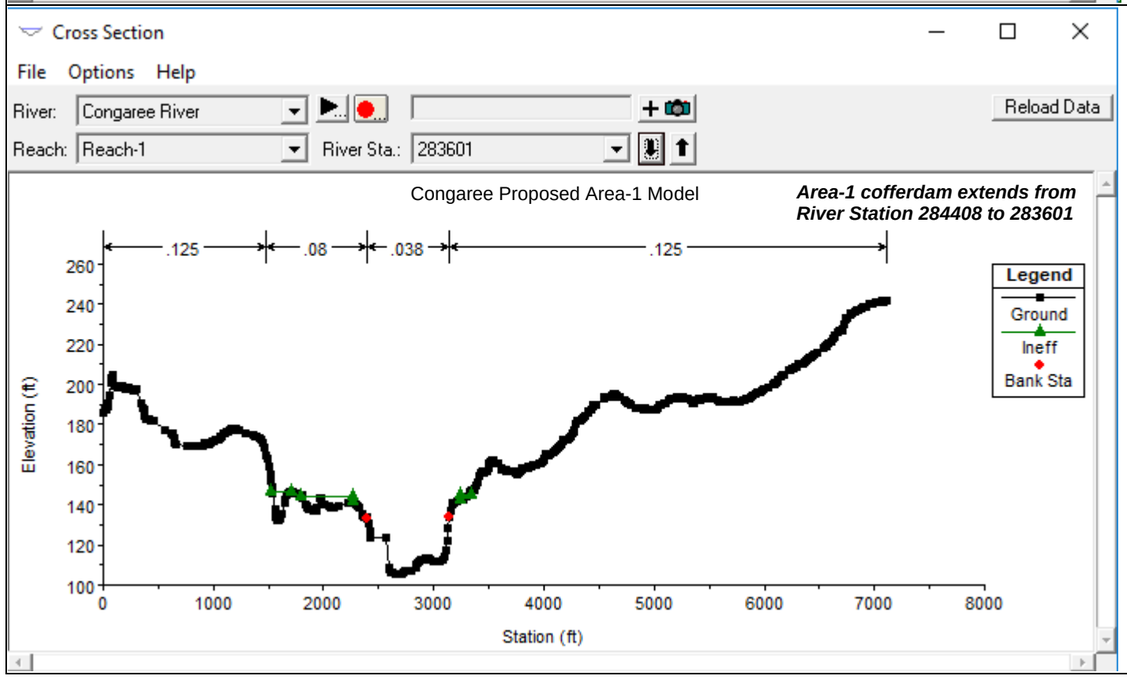


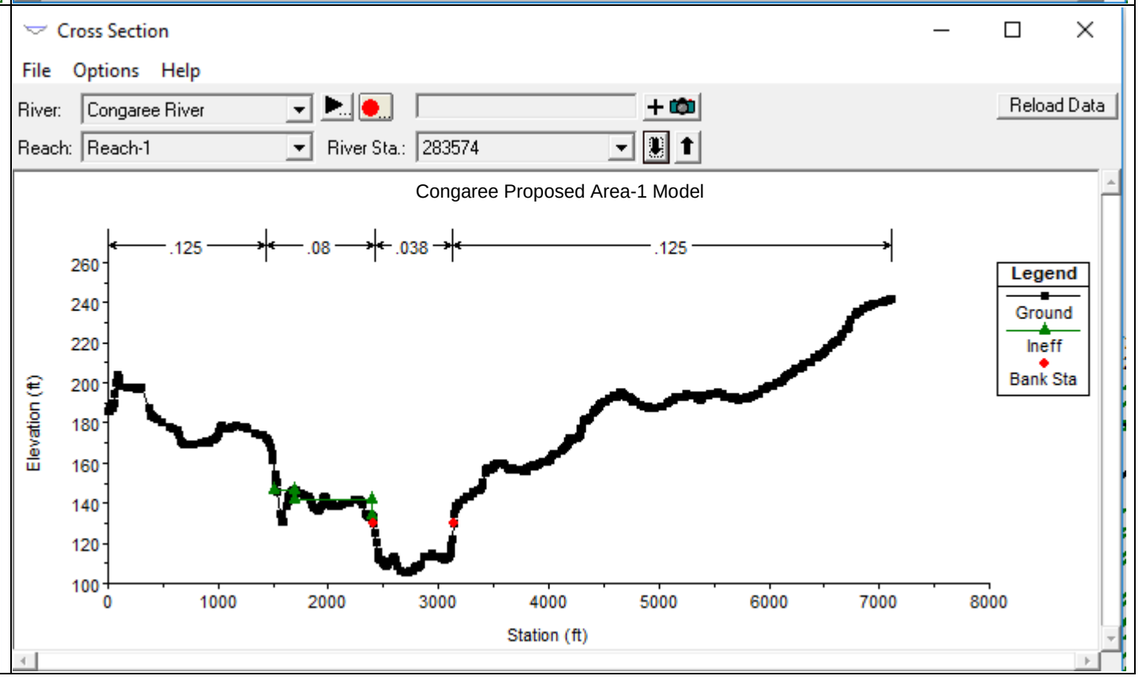


Appendix D: Proposed Conditions Models Cross Sections (Sheet 3 of 8)

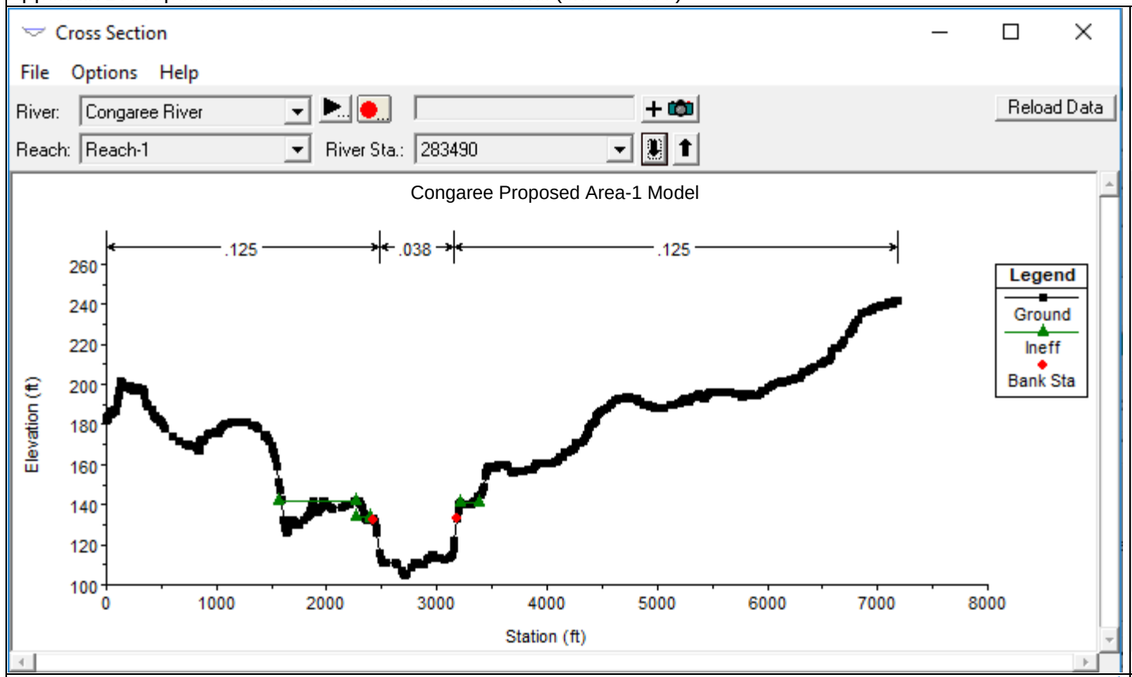


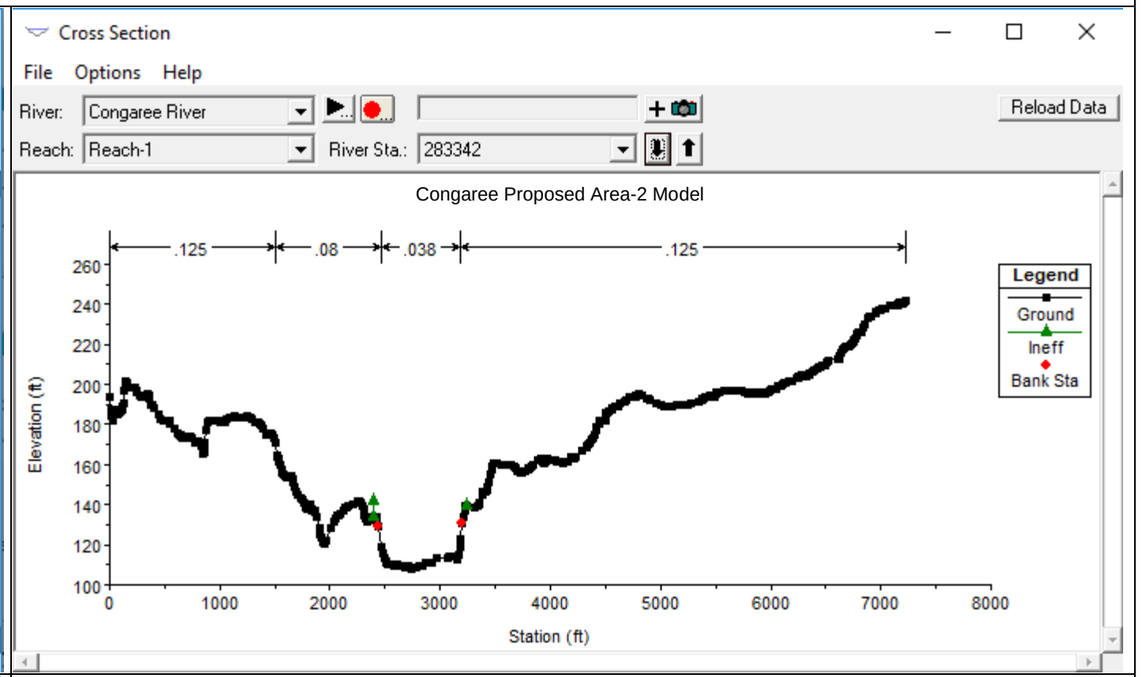


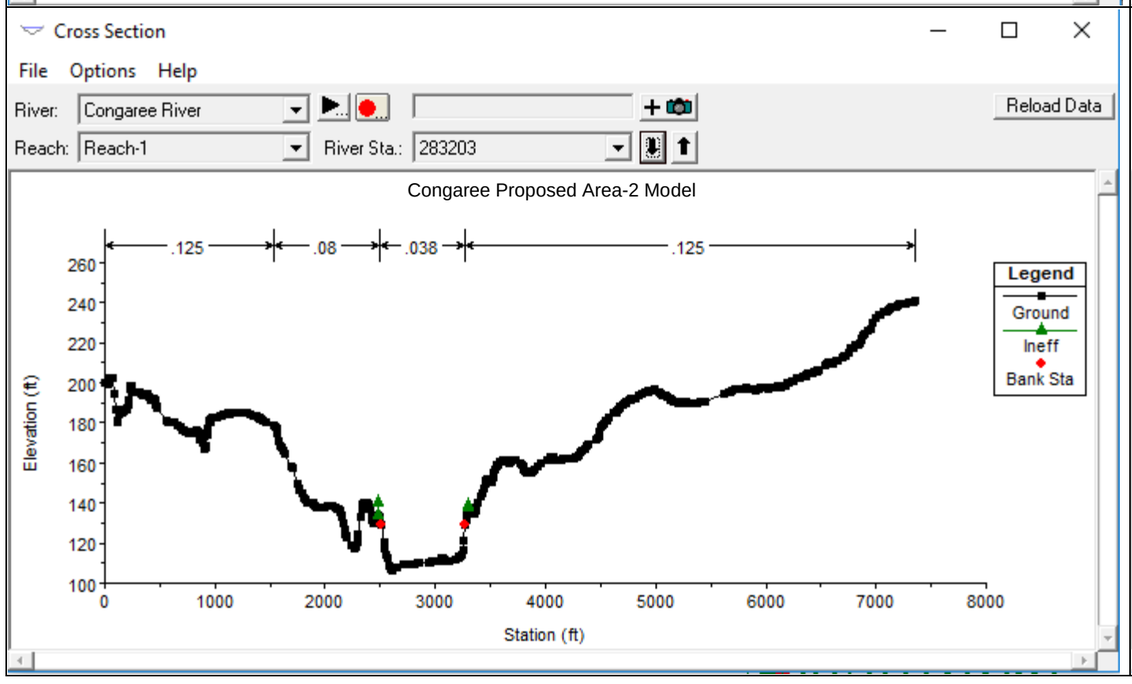


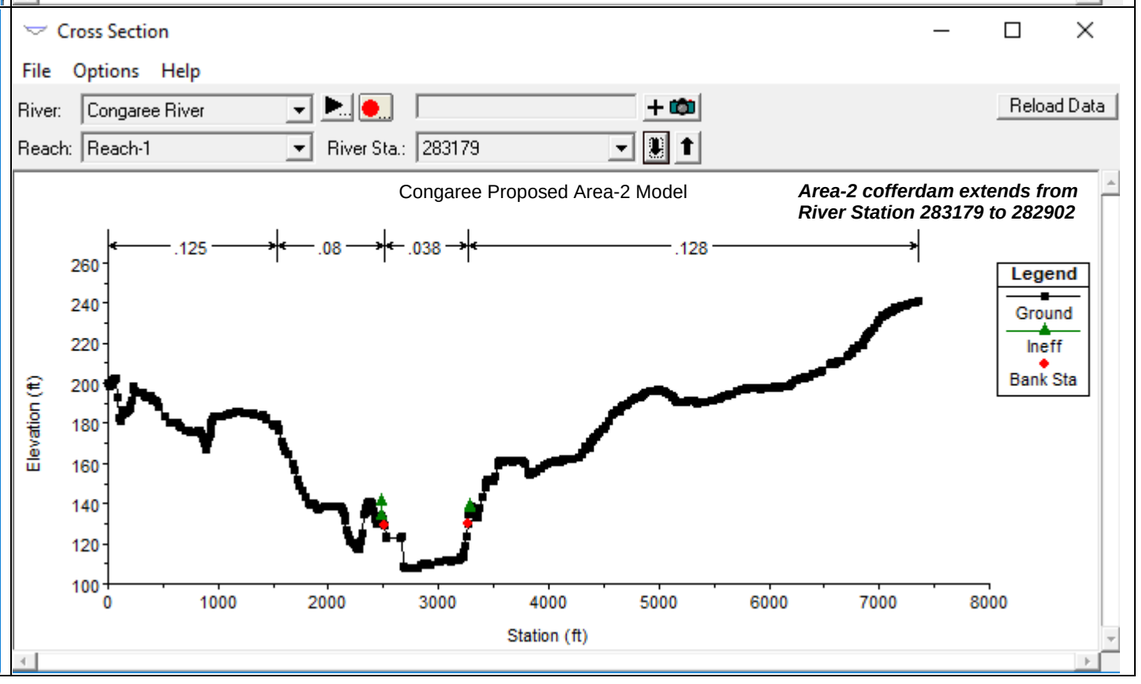


Appendix D: Proposed Conditions Models Cross Sections (Sheet 4 of 8)

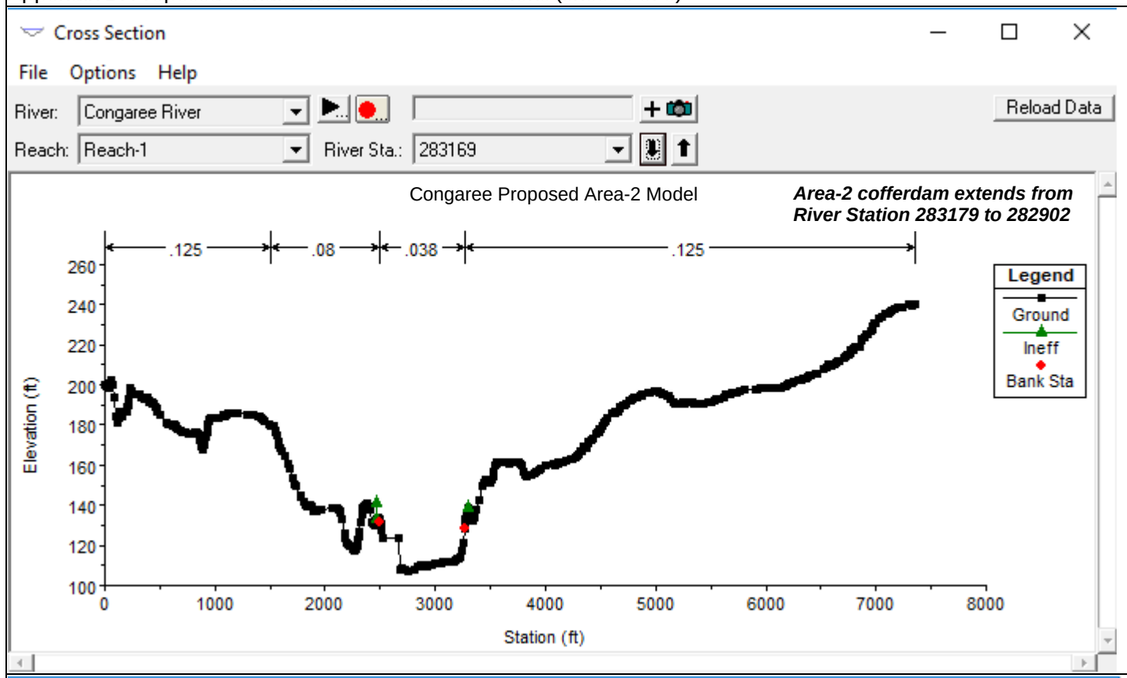


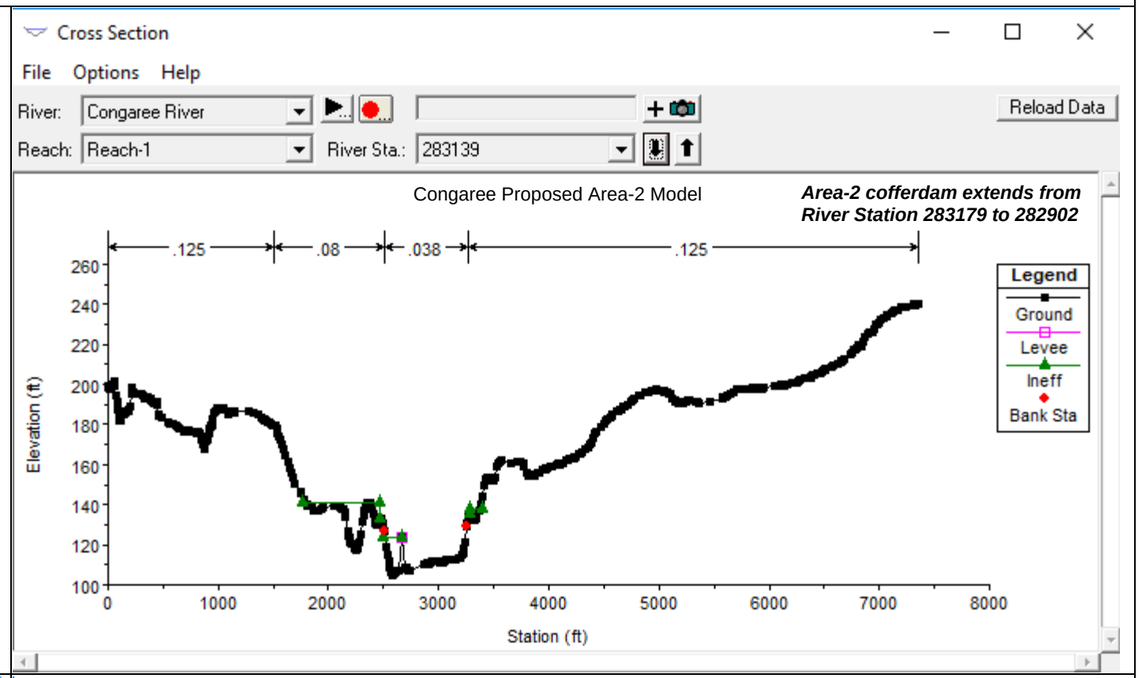


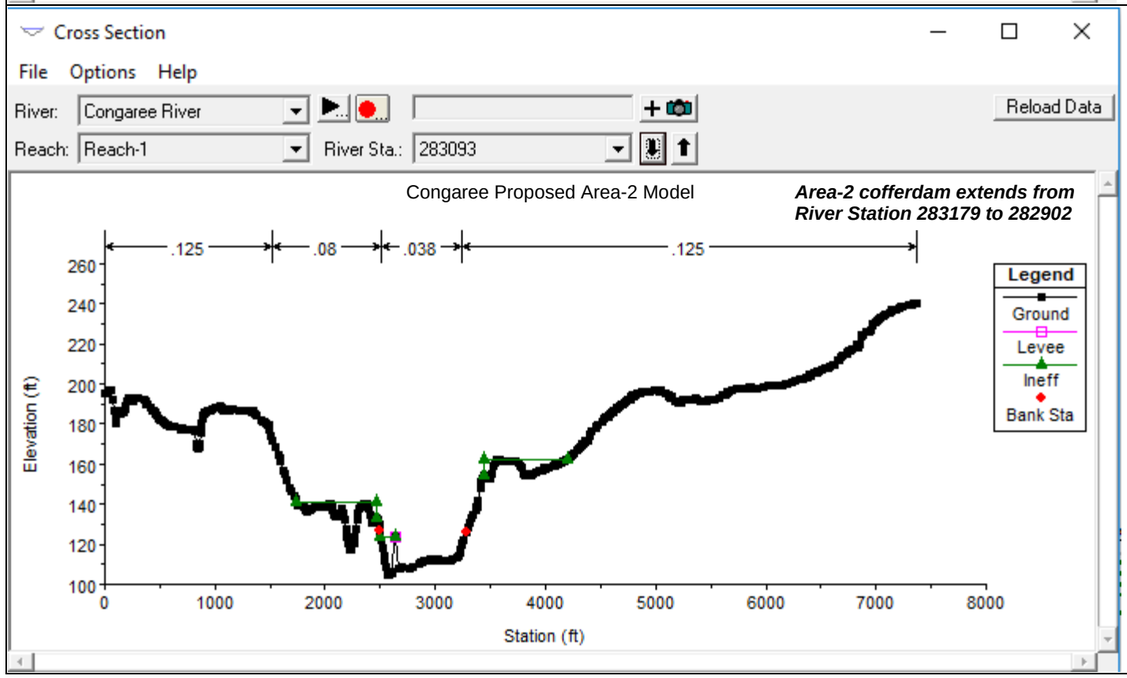


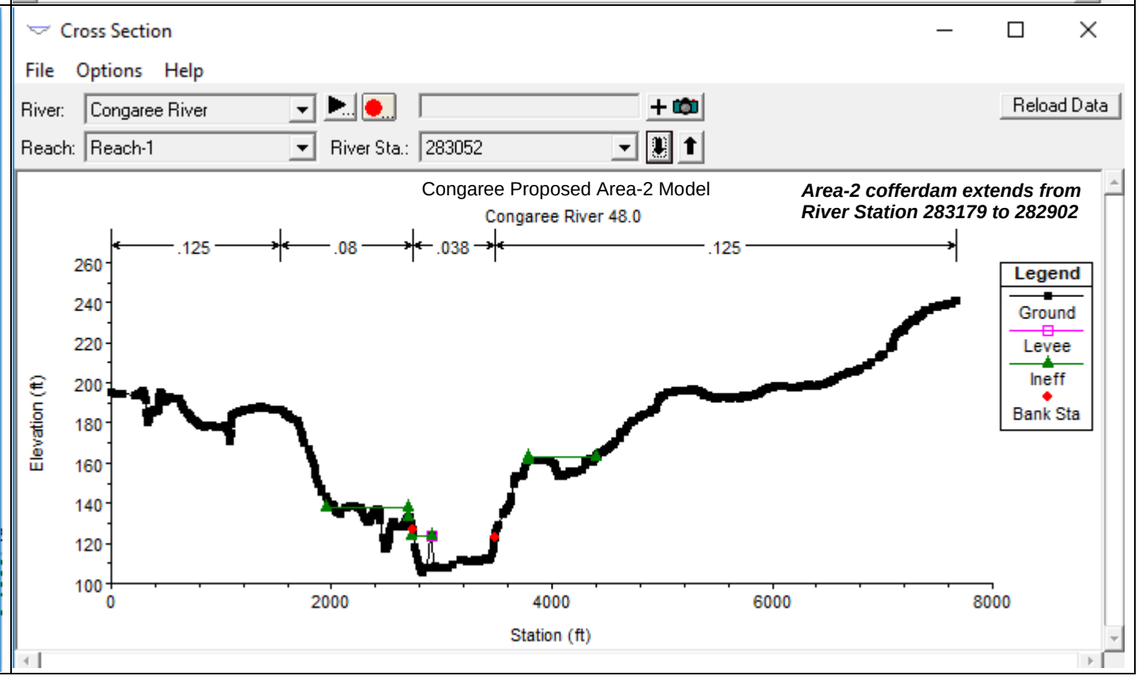


Appendix D: Proposed Conditions Models Cross Sections (Sheet 5 of 8)

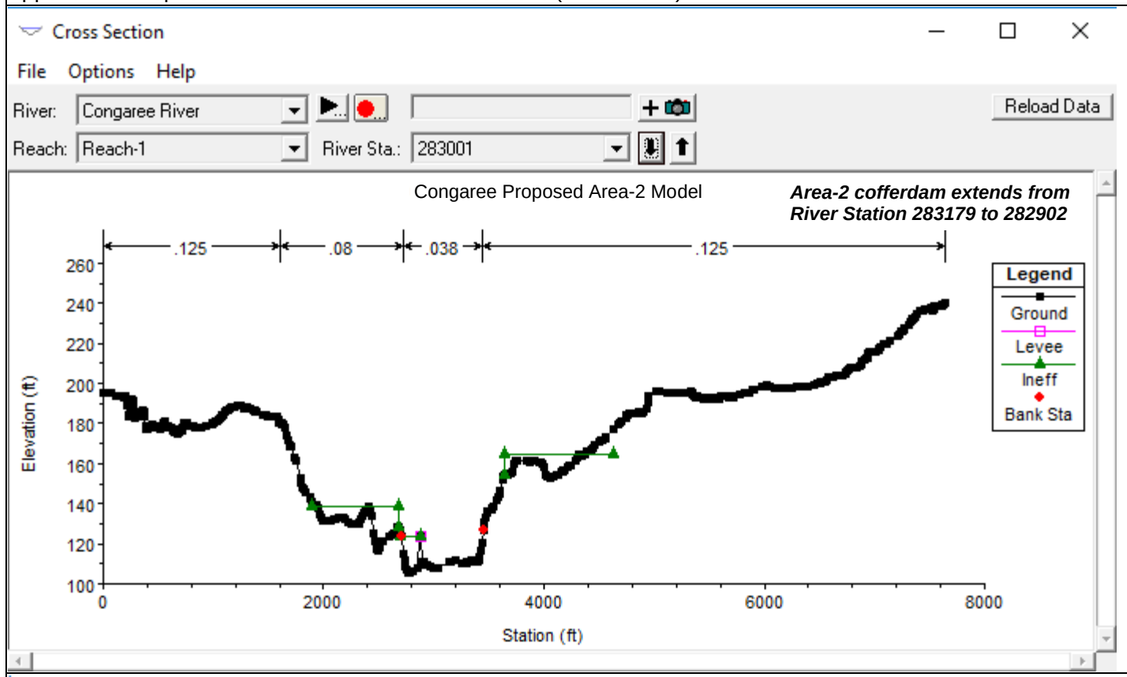


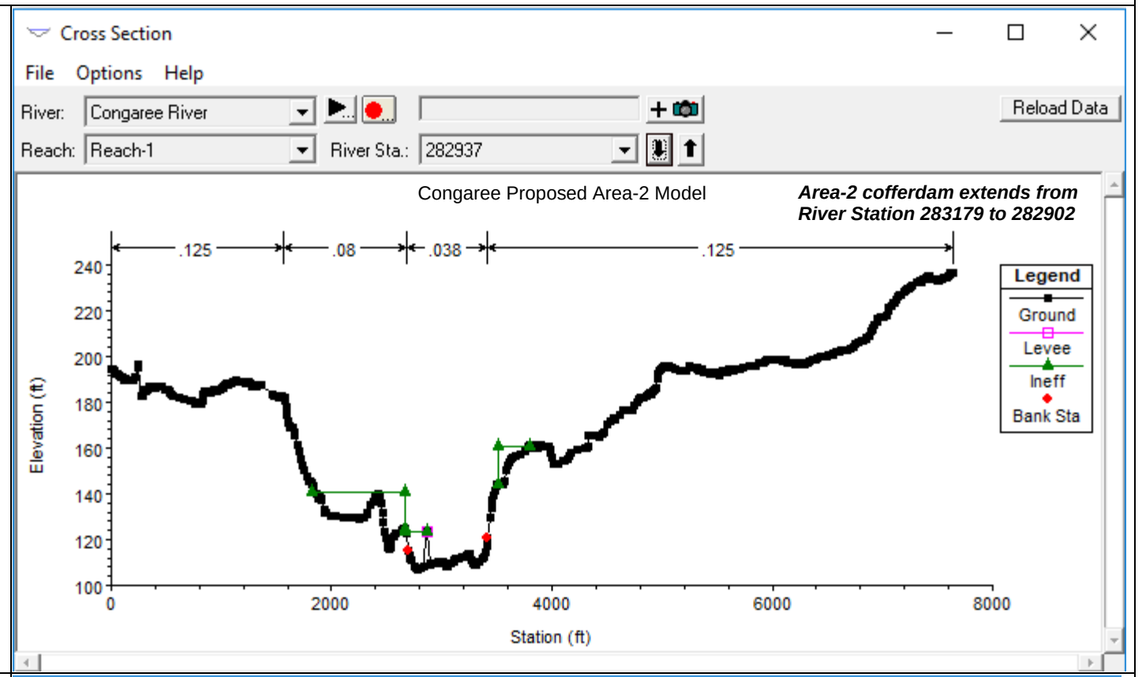


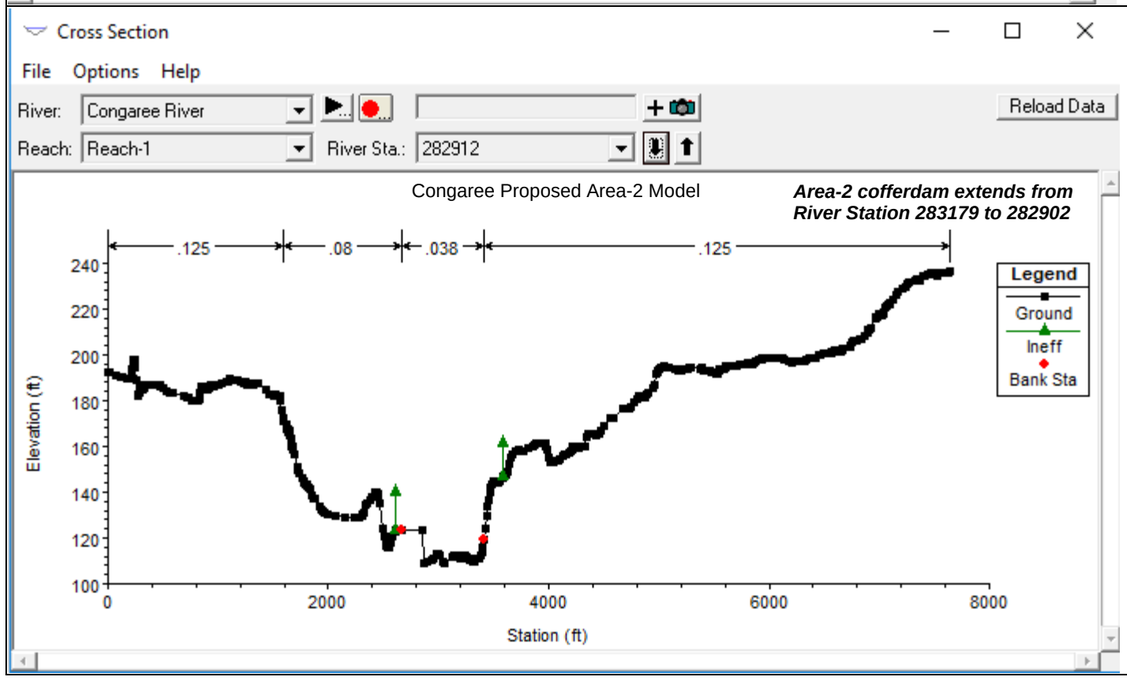


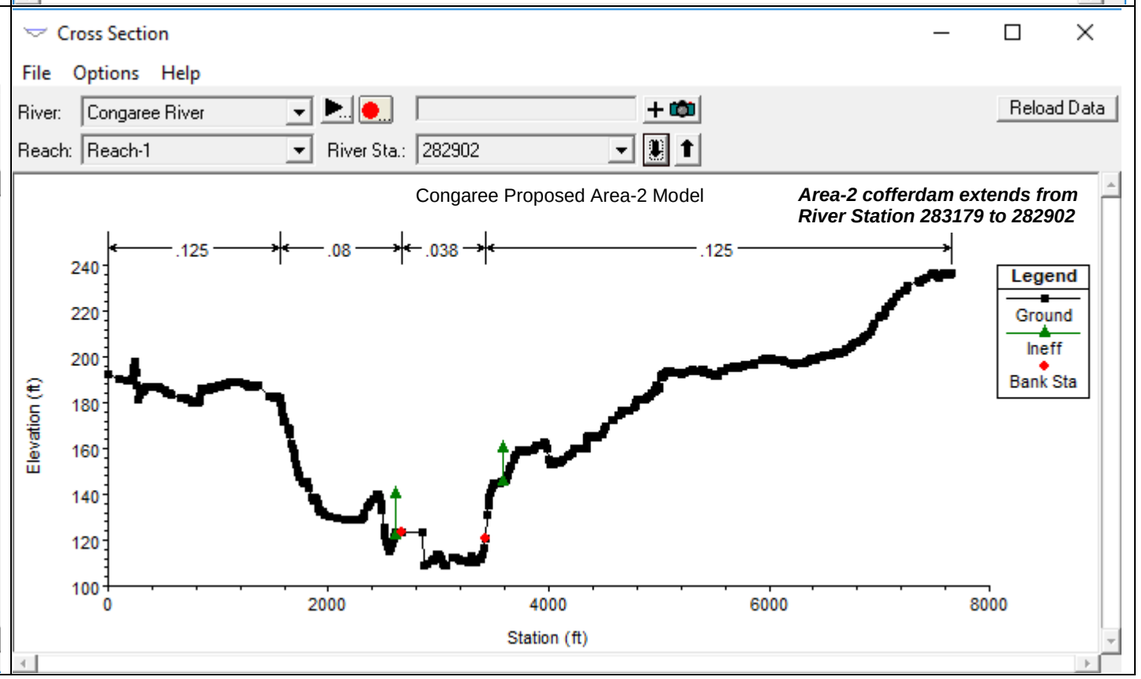


Appendix D: Proposed Conditions Models Cross Sections (Sheet 6 of 8)

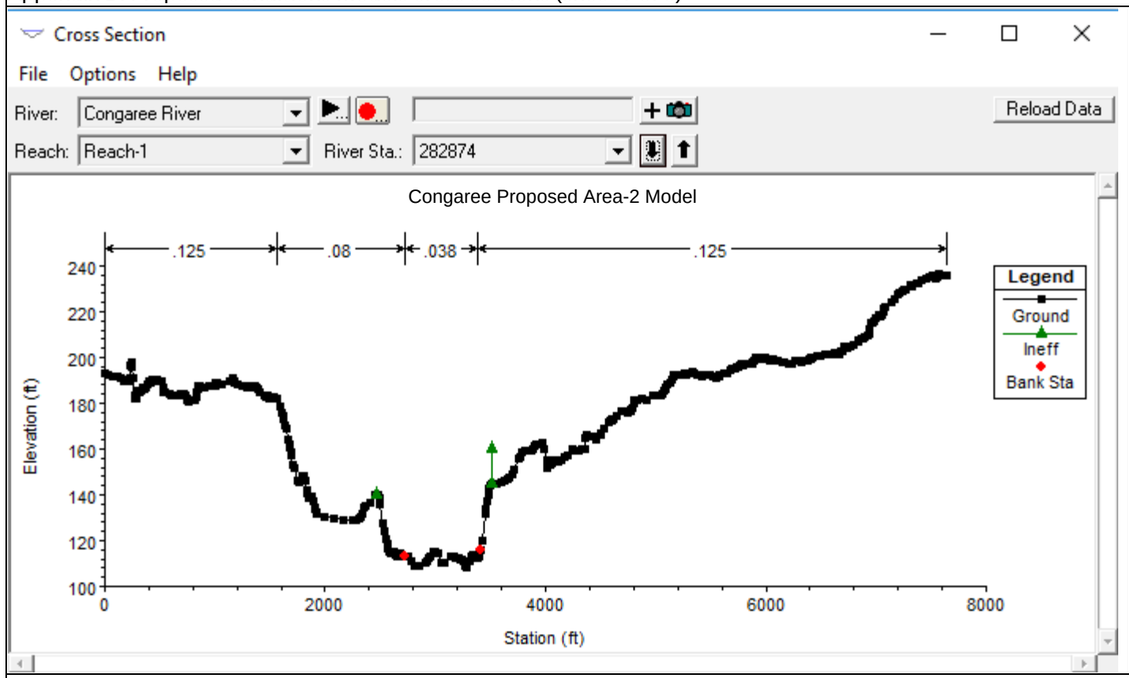


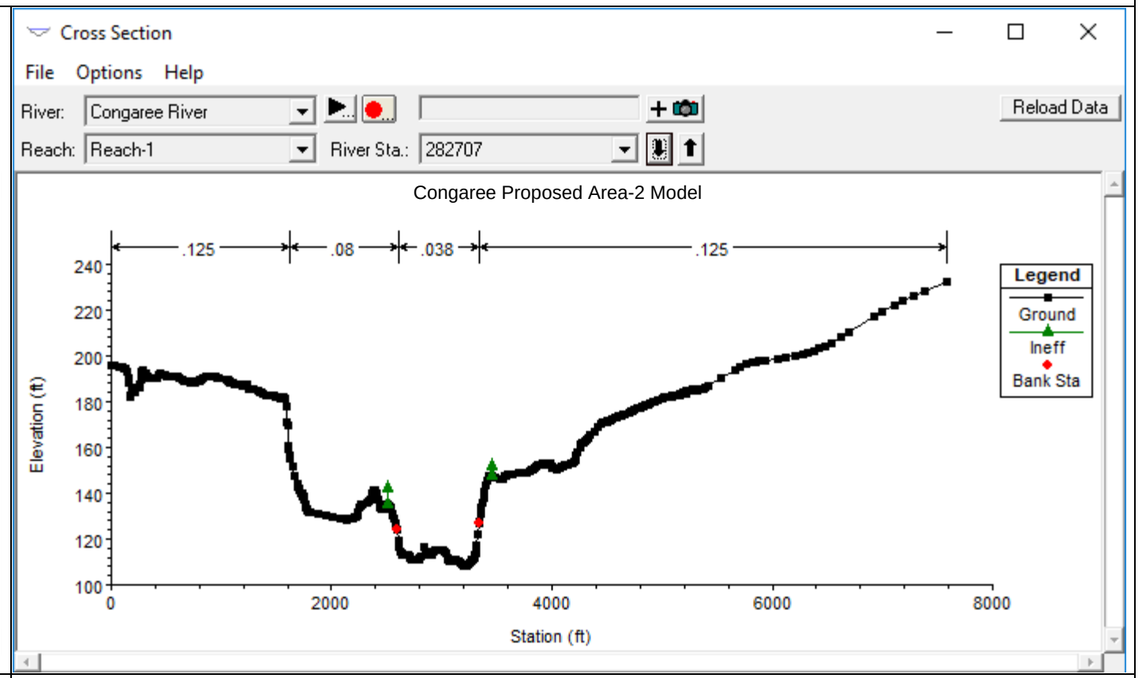


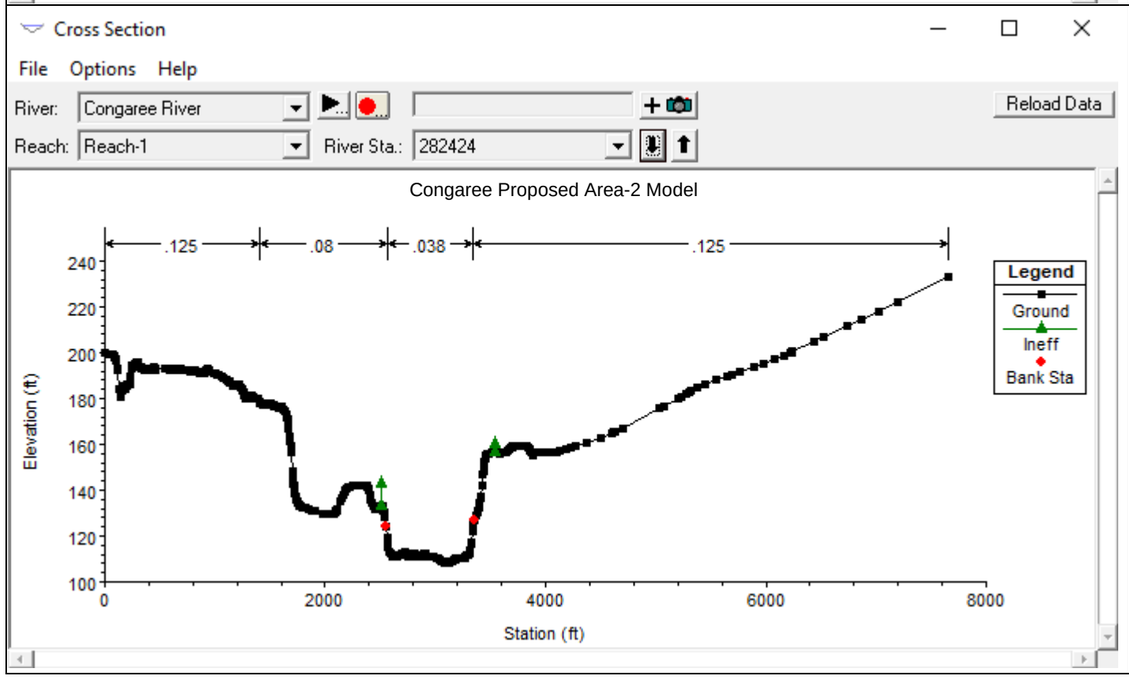


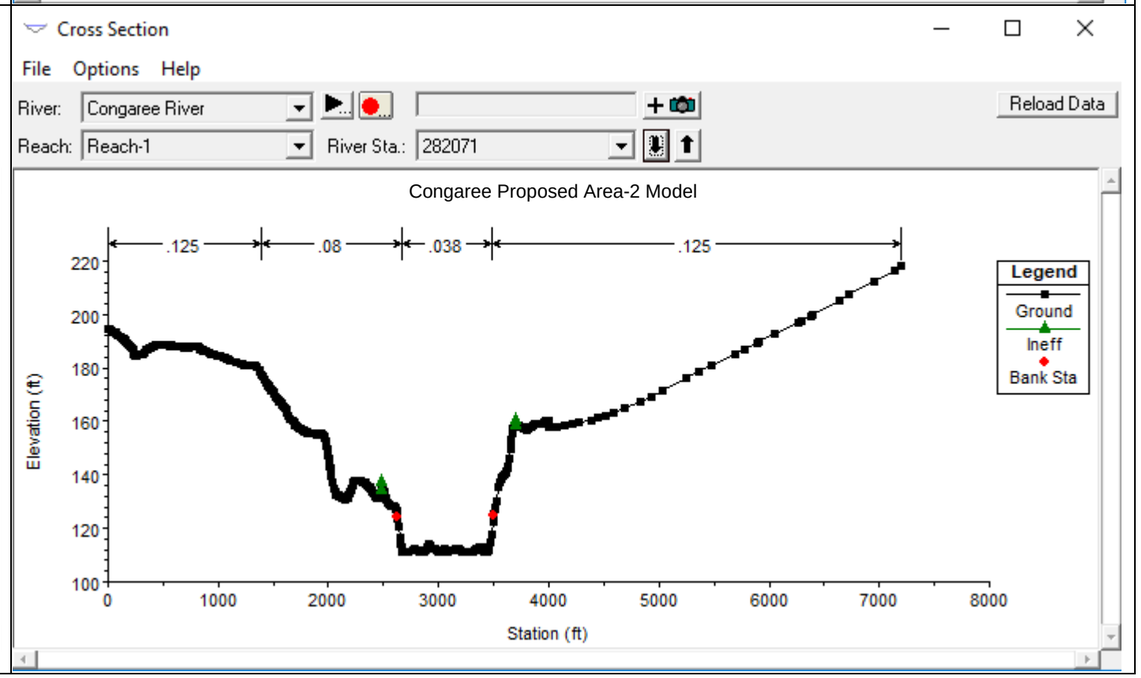


Appendix D: Proposed Conditions Models Cross Sections (Sheet 7 of 8)

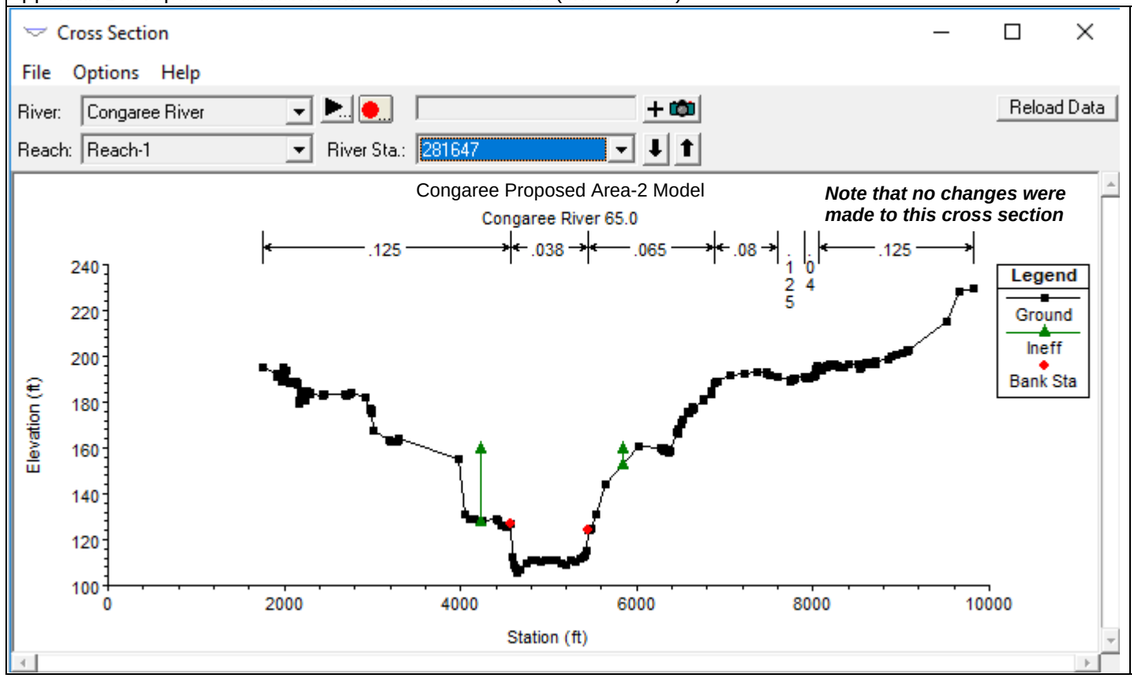








Appendix D: Proposed Conditions Models Cross Sections (Sheet 8 of 8)



Appendix E: HEC-RAS Output Tables

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	288770	Max WS	010yr-CorrectedC	147479.80	128.14	144.313		144.95	0.000713	6.43	23011.70	1517.14	0.29
Reach-1	288770	Max WS	050yr-CorrectedC	239223.40	128.14	151.235		152.03	0.000541	7.17	33605.70	1544.14	0.27
Reach-1	288770	Max WS	100yr-CorrectedC	285861.90	128.14	154.374		155.25	0.000497	7.51	38474.13	1733.32	0.26
Reach-1	287472	Max WS	010yr-CorrectedC	147458.70	125.74	143.609		144.05	0.000680	5.31	27755.09	2367.87	0.27
Reach-1	287472	Max WS	050yr-CorrectedC	239221.90	125.74	151.011		151.43	0.000365	5.21	45898.80	2531.94	0.22
Reach-1	287472	Max WS	100yr-CorrectedC	285863.80	125.74	154.278		154.71	0.000303	5.27	54217.72	2875.12	0.20
Reach-1	286338	Max WS	010yr-CorrectedC	147444.60	117.29	143.308	127.02	143.56	0.000175	4.06	38203.61	2033.90	0.15
Reach-1	286338	Max WS	050yr-CorrectedC	239218.50	117.29	150.776	129.77	151.13	0.000170	4.87	52469.90	2182.61	0.16
Reach-1	286338	Max WS	100yr-CorrectedC	285856.10	117.29	154.040	130.99	154.45	0.000170	5.21	59001.70	2414.95	0.16
Reach-1	286221			Bridge									
Reach-1	286106	Max WS	010yr-CorrectedC	147447.40	117.10	143.055		143.30	0.000172	3.91	38086.05	2033.36	0.15
Reach-1	286106	Max WS	050yr-CorrectedC	239220.80	117.10	150.535		150.88	0.000163	4.59	52321.38	2168.36	0.15
Reach-1	286106	Max WS	100yr-CorrectedC	285857.90	117.10	153.804		154.20	0.000161	4.89	58592.41	2387.70	0.15
Reach-1	284778	Max WS	010yr-CorrectedC	147445.50	112.83	142.829	122.38	143.09	0.000134	4.07	36392.65	1384.32	0.14
Reach-1	284778	Max WS	050yr-CorrectedC	239216.70	112.83	150.234	125.29	150.65	0.000157	5.18	46909.77	1474.37	0.16
Reach-1	284778	Max WS	100yr-CorrectedC	285852.90	112.83	153.465	126.61	153.96	0.000166	5.65	51628.45	1498.76	0.16
Reach-1	284668			Bridge									
Reach-1	284565	Max WS	010yr-CorrectedC	147443.50	111.22	141.140		141.40	0.000135	4.08	36283.32	1383.69	0.14
Reach-1	284565	Max WS	050yr-CorrectedC	239212.50	111.22	148.525		148.94	0.000159	5.19	46751.21	1473.63	0.16
Reach-1	284565	Max WS	100yr-CorrectedC	285851.40	111.22	151.716		152.21	0.000168	5.67	51386.67	1497.71	0.16
Reach-1	284431	Max WS	010yr-CorrectedC	147434.30	111.36	140.999		141.38	0.000281	5.01	31276.15	1505.19	0.18
Reach-1	284431	Max WS	050yr-CorrectedC	239205.70	111.36	148.398		148.95	0.000284	5.99	42910.18	1679.99	0.19
Reach-1	284431	Max WS	100yr-CorrectedC	285850.80	111.36	151.610		152.25	0.000280	6.33	48156.30	1705.94	0.19
Reach-1	284408	Max WS	010yr-CorrectedC	147429.00	111.06	140.947		141.37	0.000253	5.22	28350.43	1374.72	0.19
Reach-1	284408	Max WS	050yr-CorrectedC	239202.00	111.06	148.301		148.92	0.000266	6.38	40381.47	1625.74	0.20
Reach-1	284408	Max WS	100yr-CorrectedC	285851.10	111.06	151.479		152.20	0.000273	6.89	45439.73	1687.00	0.21
Reach-1	284395	Max WS	010yr-CorrectedC	147428.90	111.13	140.937		141.37	0.000257	5.27	28084.23	1347.81	0.19
Reach-1	284395	Max WS	050yr-CorrectedC	239206.00	111.13	148.279		148.92	0.000273	6.47	39440.89	1515.22	0.20
Reach-1	284395	Max WS	100yr-CorrectedC	285843.00	111.13	151.453		152.19	0.000280	6.98	44392.82	1676.59	0.21
Reach-1	284372	Max WS	010yr-CorrectedC	147428.90	111.51	140.922		141.36	0.000257	5.33	27713.86	1253.50	0.19
Reach-1	284372	Max WS	050yr-CorrectedC	239201.90	111.51	148.248		148.91	0.000292	6.58	38306.66	1485.00	0.21
Reach-1	284372	Max WS	100yr-CorrectedC	285845.50	111.51	151.418		152.19	0.000305	7.11	43090.73	1542.98	0.21
Reach-1	284267	Max WS	010yr-CorrectedC	147428.70	108.23	140.827		141.33	0.000282	5.71	26123.84	1132.60	0.20
Reach-1	284267	Max WS	050yr-CorrectedC	239203.30	108.23	148.092		148.89	0.000320	7.18	35631.09	1471.01	0.22
Reach-1	284267	Max WS	100yr-CorrectedC	285844.30	108.23	151.234		152.16	0.000334	7.79	40145.26	1511.37	0.23
Reach-1	284060	Max WS	010yr-CorrectedC	147426.50	108.45	140.691		141.27	0.000304	6.13	24495.76	1157.47	0.21
Reach-1	284060	Max WS	050yr-CorrectedC	239196.10	108.45	147.912		148.83	0.000354	7.74	34480.16	1444.19	0.23
Reach-1	284060	Max WS	100yr-CorrectedC	285843.90	108.45	151.035		152.11	0.000373	8.42	38941.79	1469.03	0.24
Reach-1	283820	Max WS	010yr-CorrectedC	147419.30	107.22	140.537		141.18	0.000431	6.46	22922.52	1125.47	0.21
Reach-1	283820	Max WS	050yr-CorrectedC	239195.80	107.22	147.724		148.74	0.000515	8.19	32810.90	1606.76	0.24
Reach-1	283820	Max WS	100yr-CorrectedC	285843.80	107.22	150.852		152.02	0.000539	8.86	37549.43	1664.50	0.25
Reach-1	283636	Max WS	010yr-CorrectedC	147414.60	105.24	140.467		141.12	0.000321	6.47	22917.94	1310.82	0.21
Reach-1	283636	Max WS	050yr-CorrectedC	239188.20	105.24	147.654		148.66	0.000377	8.15	35818.50	1802.28	0.24
Reach-1	283636	Max WS	100yr-CorrectedC	285843.10	105.24	150.781		151.94	0.000395	8.82	41481.13	1865.29	0.25
Reach-1	283611	Max WS	010yr-CorrectedC	147412.90	105.38	140.406		141.11	0.000332	6.74	22346.18	1272.32	0.22
Reach-1	283611	Max WS	050yr-CorrectedC	239190.40	105.38	147.566		148.67	0.000401	8.56	34650.35	1803.27	0.25
Reach-1	283611	Max WS	100yr-CorrectedC	285840.50	105.38	150.683		151.96	0.000422	9.27	40574.50	1864.84	0.26
Reach-1	283601	Max WS	010yr-CorrectedC	147406.10	105.38	140.392		141.11	0.000345	6.80	22108.90	1263.41	0.22
Reach-1	283601	Max WS	050yr-CorrectedC	239190.50	105.38	147.593		148.67	0.000400	8.49	34531.10	1833.07	0.25
Reach-1	283601	Max WS	100yr-CorrectedC	285843.00	105.38	150.739		151.95	0.000413	9.12	40358.35	1868.29	0.26
Reach-1	283574	Max WS	010yr-CorrectedC	147406.10	105.18	140.323		141.10	0.000452	7.08	21088.56	1241.47	0.23
Reach-1	283574	Max WS	050yr-CorrectedC	239191.30	105.18	147.536		148.67	0.000513	8.76	33880.45	1848.42	0.26
Reach-1	283574	Max WS	100yr-CorrectedC	285833.80	105.18	150.696		151.96	0.000523	9.35	39766.20	1875.26	0.26
Reach-1	283490	Max WS	010yr-CorrectedC	147405.90	104.94	140.268		141.05	0.000710	7.11	21416.96	1505.14	0.24
Reach-1	283490	Max WS	050yr-CorrectedC	239188.00	104.94	147.558		148.61	0.000744	8.52	37011.75	1844.76	0.25
Reach-1	283490	Max WS	100yr-CorrectedC	285842.20	104.94	150.711		151.89	0.000758	9.11	42859.13	1864.14	0.26
Reach-1	283342	Max WS	010yr-CorrectedC	147406.80	107.64	140.233		140.96	0.000489	6.84	22101.73	1495.23	0.23
Reach-1	283342	Max WS	050yr-CorrectedC	239192.70	107.64	147.570		148.49	0.000497	8.05	37797.59	1738.80	0.24
Reach-1	283342	Max WS	100yr-CorrectedC	285834.60	107.64	150.727		151.76	0.000508	8.61	43342.07	1770.32	0.24
Reach-1	283203	Max WS	010yr-CorrectedC	147407.30	106.22	140.257		140.94	0.000332	6.67	22703.93	1535.90	0.22
Reach-1	283203	Max WS	050yr-CorrectedC	239187.30	106.22	147.525		148.43	0.000350	7.94	38751.61	1678.91	0.23
Reach-1	283203	Max WS	100yr-CorrectedC	285836.10	106.22	150.668		151.69	0.000363	8.55	44088.63	1731.46	0.24
Reach-1	283179	Max WS	010yr-CorrectedC	147406.60	106.20	140.206		140.89	0.000325	6.64	22874.14	1527.94	0.22
Reach-1	283179	Max WS	050yr-CorrectedC	239187.50	106.20	147.518		148.42	0.000344	7.92	38980.86	1667.22	0.23
Reach-1	283179	Max WS	100yr-CorrectedC	285837.10	106.20	150.658		151.69	0.000358	8.55	44286.83	1711.10	0.24

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	283169	Max WS	010yr-CorrectedC	147407.70	106.15	140.211		140.88	0.000323	6.60	22959.34	1533.57	0.22
Reach-1	283169	Max WS	050yr-CorrectedC	239192.00	106.15	147.524		148.41	0.000341	7.88	39065.69	1670.43	0.23
Reach-1	283169	Max WS	100yr-CorrectedC	285835.70	106.15	150.665		151.68	0.000355	8.49	44383.46	1714.61	0.24
Reach-1	283139	Max WS	010yr-CorrectedC	147406.60	104.58	140.204		140.89	0.000328	6.66	22922.75	1544.79	0.22
Reach-1	283139	Max WS	050yr-CorrectedC	239192.00	104.58	147.500		148.41	0.000348	7.96	38816.03	1678.74	0.23
Reach-1	283139	Max WS	100yr-CorrectedC	285836.10	104.58	150.642		151.67	0.000362	8.59	44158.17	1723.14	0.24
Reach-1	283093	Max WS	010yr-CorrectedC	147399.20	104.60	140.206		140.86	0.000431	6.51	23487.11	1609.32	0.21
Reach-1	283093	Max WS	050yr-CorrectedC	239191.60	104.60	147.533		148.37	0.000446	7.71	39572.72	1724.33	0.23
Reach-1	283093	Max WS	100yr-CorrectedC	285836.30	104.60	150.688		151.64	0.000459	8.27	45064.88	1756.15	0.23
Reach-1	283052	Max WS	010yr-CorrectedC	147408.00	105.26	140.257		140.85	0.000291	6.36	28615.12	1643.79	0.21
Reach-1	283052	Max WS	050yr-CorrectedC	239192.40	105.26	147.506		148.37	0.000331	7.84	40905.25	1748.19	0.23
Reach-1	283052	Max WS	100yr-CorrectedC	285835.90	105.26	150.652		151.64	0.000344	8.45	46462.37	1783.10	0.24
Reach-1	283001	Max WS	010yr-CorrectedC	147407.60	105.29	140.320		140.83	0.000315	5.99	31219.39	1658.84	0.19
Reach-1	283001	Max WS	050yr-CorrectedC	239191.60	105.29	147.594		148.33	0.000357	7.37	43774.77	1792.21	0.21
Reach-1	283001	Max WS	100yr-CorrectedC	285835.50	105.29	150.753		151.59	0.000370	7.93	49489.82	1824.05	0.22
Reach-1	282937	Max WS	010yr-CorrectedC	147397.60	107.24	140.110		140.81	0.000360	6.76	22438.40	1615.61	0.22
Reach-1	282937	Max WS	050yr-CorrectedC	239189.30	107.24	147.552		148.31	0.000335	7.57	43194.55	1801.50	0.22
Reach-1	282937	Max WS	100yr-CorrectedC	285837.60	107.24	150.706		151.57	0.000348	8.15	48722.18	1844.88	0.23
Reach-1	282912	Max WS	010yr-CorrectedC	147404.50	108.10	140.209		140.89	0.000327	6.69	23251.98	1628.88	0.22
Reach-1	282912	Max WS	050yr-CorrectedC	239192.90	108.10	147.525		148.31	0.000317	7.64	43436.47	1864.73	0.22
Reach-1	282912	Max WS	100yr-CorrectedC	285837.60	108.10	150.679		151.57	0.000328	8.22	49272.49	1914.44	0.23
Reach-1	282902	Max WS	010yr-CorrectedC	147407.20	108.28	140.194		140.87	0.000328	6.65	23324.50	1628.35	0.22
Reach-1	282902	Max WS	050yr-CorrectedC	239190.90	108.28	147.521		148.31	0.000319	7.62	43264.79	1880.63	0.22
Reach-1	282902	Max WS	100yr-CorrectedC	285835.80	108.28	150.676		151.57	0.000329	8.19	49130.20	1927.46	0.23
Reach-1	282874	Max WS	010yr-CorrectedC	147404.40	108.58	140.157		140.82	0.000369	6.78	25316.47	1625.17	0.22
Reach-1	282874	Max WS	050yr-CorrectedC	239191.00	108.58	147.498		148.32	0.000371	7.93	42667.48	1912.09	0.23
Reach-1	282874	Max WS	100yr-CorrectedC	285835.80	108.58	150.641		151.58	0.000386	8.56	48261.62	1994.34	0.24
Reach-1	282707	Max WS	010yr-CorrectedC	147387.60	108.26	139.929		140.73	0.000446	7.22	21250.83	1618.78	0.24
Reach-1	282707	Max WS	050yr-CorrectedC	239183.70	108.26	147.358		148.26	0.000408	8.11	39795.35	1864.88	0.24
Reach-1	282707	Max WS	100yr-CorrectedC	285837.70	108.26	150.511		151.52	0.000414	8.67	45446.73	2184.92	0.25
Reach-1	282424	Max WS	010yr-CorrectedC	147396.40	108.13	139.966		140.60	0.000386	6.44	23642.37	1488.32	0.21
Reach-1	282424	Max WS	050yr-CorrectedC	239183.50	108.13	147.299		148.12	0.000395	7.59	40152.38	1727.45	0.22
Reach-1	282424	Max WS	100yr-CorrectedC	285838.70	108.13	150.448		151.37	0.000406	8.14	45614.16	1740.70	0.23
Reach-1	282071	Max WS	010yr-CorrectedC	147395.10	111.09	139.950		140.47	0.000353	5.91	28582.36	1563.68	0.20
Reach-1	282071	Max WS	050yr-CorrectedC	239178.80	111.09	147.204		147.96	0.000390	7.25	40286.44	1643.15	0.22
Reach-1	282071	Max WS	100yr-CorrectedC	285831.30	111.09	150.344		151.21	0.000403	7.81	45479.27	1664.80	0.22
Reach-1	281647	Max WS	010yr-CorrectedC	147387.50	105.74	139.888	120.14	140.34	0.000225	5.53	31337.71	1583.23	0.18
Reach-1	281647	Max WS	050yr-CorrectedC	239172.00	105.74	147.087	123.91	147.81	0.000272	7.05	41614.27	1712.98	0.21
Reach-1	281647	Max WS	100yr-CorrectedC	285832.00	105.74	150.199	125.64	151.05	0.000290	7.69	46370.62	1794.68	0.22
Reach-1	281538			Bridge									
Reach-1	281423	Max WS	010yr-CorrectedC	147387.50	105.74	139.748		140.20	0.000220	5.46	31335.64	1498.51	0.18
Reach-1	281423	Max WS	050yr-CorrectedC	239172.30	105.74	146.886		147.61	0.000269	6.99	41296.05	1643.80	0.20
Reach-1	281423	Max WS	100yr-CorrectedC	285833.30	105.74	149.960		150.82	0.000289	7.65	45634.39	1717.47	0.22
Reach-1	279961	Max WS	010yr-CorrectedC	147374.00	101.65	139.302		139.87	0.000255	6.13	28465.23	1340.31	0.19
Reach-1	279961	Max WS	050yr-CorrectedC	239158.20	101.65	146.289		147.22	0.000328	7.95	38346.32	1459.87	0.23
Reach-1	279961	Max WS	100yr-CorrectedC	285824.10	101.65	149.301		150.41	0.000357	8.72	42795.31	1504.64	0.24
Reach-1	279605	Max WS	010yr-CorrectedC	147373.70	101.65	139.215		139.78	0.000253	6.15	29451.02	1429.05	0.19
Reach-1	279605	Max WS	050yr-CorrectedC	239159.30	101.65	146.183		147.11	0.000325	7.96	40006.07	1564.21	0.23
Reach-1	279605	Max WS	100yr-CorrectedC	285821.60	101.65	149.191		150.29	0.000353	8.72	44761.06	1594.05	0.24
Reach-1	278919	Max WS	010yr-CorrectedC	147363.80	101.65	139.088		139.61	0.000239	5.92	31344.63	1594.19	0.19
Reach-1	278919	Max WS	050yr-CorrectedC	239159.90	101.65	146.033		146.88	0.000305	7.65	43202.07	1766.93	0.22
Reach-1	278919	Max WS	100yr-CorrectedC	285823.60	101.65	149.039		150.03	0.000329	8.36	48551.63	1809.62	0.23
Reach-1	277724	Max WS	010yr-CorrectedC	147357.40	100.07	138.800	115.50	139.33	0.000213	5.90	29059.61	1369.78	0.18
Reach-1	277724	Max WS	050yr-CorrectedC	239141.20	100.07	145.606	119.83	146.51	0.000293	7.81	38124.52	1756.21	0.22
Reach-1	277724	Max WS	100yr-CorrectedC	285818.90	100.07	148.547	121.81	149.64	0.000325	8.62	42182.76	1774.79	0.23
Reach-1	277625			Bridge									
Reach-1	277512	Max WS	010yr-CorrectedC	147349.40	100.07	138.620		139.16	0.000218	5.97	28410.94	1319.09	0.18
Reach-1	277512	Max WS	050yr-CorrectedC	239132.60	100.07	145.280		146.23	0.000305	7.97	37004.13	1689.61	0.22
Reach-1	277512	Max WS	100yr-CorrectedC	285808.50	100.07	148.129		149.28	0.000341	8.82	40997.18	1804.24	0.24
Reach-1	277500	Max WS	010yr-CorrectedC	147335.90	101.08	138.560	115.95	139.16	0.000246	6.26	25663.64	1165.42	0.19
Reach-1	277500	Max WS	050yr-CorrectedC	239132.40	101.08	145.180	120.50	146.24	0.000343	8.35	32834.86	1700.17	0.23
Reach-1	277500	Max WS	100yr-CorrectedC	285811.20	101.08	147.998	122.60	149.29	0.000385	9.26	35887.39	1769.42	0.25
Reach-1	277397			Bridge									

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	277287	Max WS	010yr-CorrectedC	147320.90	102.92	138.031		138.74	0.000322	6.77	22414.45	903.83	0.22
Reach-1	277287	Max WS	050yr-CorrectedC	239086.30	102.92	144.241		145.50	0.000449	9.05	28701.46	1626.61	0.26
Reach-1	277287	Max WS	100yr-CorrectedC	285750.10	102.92	146.828		148.38	0.000506	10.06	31435.46	1725.74	0.28
Reach-1	276335	Max WS	010yr-CorrectedC	147302.20	101.04	137.508		138.41	0.000384	7.63	19603.96	647.53	0.24
Reach-1	276335	Max WS	050yr-CorrectedC	239047.60	101.04	143.337		145.03	0.000578	10.46	23434.90	666.84	0.30
Reach-1	276335	Max WS	100yr-CorrectedC	285626.10	101.04	145.707		147.84	0.000674	11.75	25023.84	673.87	0.33
Reach-1	276088	Max WS	010yr-CorrectedC	147290.80	101.04	137.260		138.31	0.000432	8.25	18302.92	597.82	0.25
Reach-1	276088	Max WS	050yr-CorrectedC	239001.90	101.04	142.870		144.89	0.000673	11.43	21695.58	611.54	0.32
Reach-1	276088	Max WS	100yr-CorrectedC	285562.40	101.04	145.113		147.68	0.000795	12.90	23073.35	616.90	0.35
Reach-1	275472	Max WS	010yr-CorrectedC	147262.40	101.04	137.067		138.06	0.000420	8.11	21016.67	856.48	0.25
Reach-1	275472	Max WS	050yr-CorrectedC	239014.90	101.04	142.670		144.51	0.000639	11.10	25861.11	872.85	0.31
Reach-1	275472	Max WS	100yr-CorrectedC	285545.70	101.04	144.929		147.24	0.000747	12.46	27840.06	879.45	0.34
Reach-1	274472	Max WS	010yr-CorrectedC	147263.60	101.04	136.884		137.64	0.000357	6.98	22011.79	1010.20	0.23
Reach-1	274472	Max WS	050yr-CorrectedC	238970.80	101.04	142.474		143.84	0.000518	9.44	27645.11	1095.46	0.28
Reach-1	274472	Max WS	100yr-CorrectedC	285519.20	101.04	144.744		146.45	0.000596	10.55	29985.68	1107.77	0.30
Reach-1	273472	Max WS	010yr-CorrectedC	147249.70	99.91	136.557		137.30	0.000328	6.91	21942.79	781.55	0.22
Reach-1	273472	Max WS	050yr-CorrectedC	238957.50	99.91	141.927		143.33	0.000505	9.53	26197.81	802.46	0.28
Reach-1	273472	Max WS	100yr-CorrectedC	285407.20	99.91	144.070		145.85	0.000594	10.74	27926.57	810.34	0.30
Reach-1	272318	Max WS	010yr-CorrectedC	147200.00	99.91	135.785		136.85	0.000464	8.33	18735.01	784.12	0.26
Reach-1	272318	Max WS	050yr-CorrectedC	238872.70	99.91	140.722		142.72	0.000728	11.49	27272.14	3121.76	0.33
Reach-1	272318	Max WS	100yr-CorrectedC	285196.20	99.91	142.748		145.18	0.000838	12.77	31836.61	3193.62	0.36
Reach-1	271472	Max WS	010yr-CorrectedC	147190.30	99.91	135.697		136.51	0.000328	7.22	20706.56	1217.79	0.24
Reach-1	271472	Max WS	050yr-CorrectedC	238867.00	99.91	140.599		142.09	0.000500	9.88	30067.37	4083.93	0.30
Reach-1	271472	Max WS	100yr-CorrectedC	285160.20	99.91	142.597		144.41	0.000572	10.97	35141.74	4211.40	0.32
Reach-1	270472	Max WS	010yr-CorrectedC	147160.00	99.91	135.366		136.18	0.000326	7.26	23098.06	2529.72	0.23
Reach-1	270472	Max WS	050yr-CorrectedC	238840.90	99.91	140.170		141.58	0.000482	9.75	36089.37	3549.20	0.29
Reach-1	270472	Max WS	100yr-CorrectedC	285073.50	99.91	142.118		143.81	0.000549	10.80	41561.01	3830.24	0.31
Reach-1	269529	Max WS	010yr-CorrectedC	147149.80	100.75	135.092		135.87	0.000308	7.12	23902.15	2427.62	0.23
Reach-1	269529	Max WS	050yr-CorrectedC	238805.30	100.75	139.737		141.10	0.000463	9.60	38689.80	4454.92	0.29
Reach-1	269529	Max WS	100yr-CorrectedC	284970.70	100.75	141.634		143.25	0.000526	10.60	45279.05	4786.65	0.31
Reach-1	268320	Max WS	010yr-CorrectedC	147129.40	100.75	134.779		135.50	0.000308	6.94	29501.03	4034.90	0.23
Reach-1	268320	Max WS	050yr-CorrectedC	238779.50	100.75	139.320		140.52	0.000445	9.18	46654.06	5410.89	0.28
Reach-1	268320	Max WS	100yr-CorrectedC	284889.80	100.75	141.182		142.58	0.000497	10.06	54227.17	5525.28	0.30
Reach-1	267678	Max WS	010yr-CorrectedC	147124.20	100.75	134.680		135.29	0.000283	6.50	36886.72	4603.25	0.22
Reach-1	267678	Max WS	050yr-CorrectedC	238764.00	100.75	139.198		140.17	0.000394	8.47	56222.45	5471.77	0.26
Reach-1	267678	Max WS	100yr-CorrectedC	284885.00	100.75	141.053		142.17	0.000435	9.25	64528.61	5478.37	0.28
Reach-1	266472	Max WS	010yr-CorrectedC	147108.80	100.75	134.462		134.88	0.000227	5.73	53612.21	7843.55	0.19
Reach-1	266472	Max WS	050yr-CorrectedC	238751.80	100.75	138.883		139.55	0.000314	7.45	76763.93	9109.70	0.23
Reach-1	266472	Max WS	100yr-CorrectedC	284869.50	100.75	140.709		141.46	0.000344	8.09	86539.19	9221.11	0.25
Reach-1	265472	Max WS	010yr-CorrectedC	147094.40	100.76	134.330		134.65	0.000188	5.22	60975.20	6827.86	0.17
Reach-1	265472	Max WS	050yr-CorrectedC	238734.40	100.76	138.730		139.19	0.000246	6.59	83242.39	7375.45	0.20
Reach-1	265472	Max WS	100yr-CorrectedC	284850.80	100.76	140.545		141.07	0.000268	7.14	92660.09	7511.22	0.22
Reach-1	264426	Max WS	010yr-CorrectedC	147089.90	100.76	134.024		134.50	0.000245	5.98	51096.71	5902.00	0.20
Reach-1	264426	Max WS	050yr-CorrectedC	238718.70	100.76	138.320		139.03	0.000328	7.62	73477.94	6339.98	0.24
Reach-1	264426	Max WS	100yr-CorrectedC	284691.40	100.76	140.090		140.90	0.000363	8.30	82970.76	6428.58	0.25
Reach-1	263569	Max WS	010yr-CorrectedC	147077.50	100.76	133.818		134.28	0.000242	5.75	49273.84	7021.54	0.20
Reach-1	263569	Max WS	050yr-CorrectedC	238691.50	100.76	138.067		138.73	0.000311	7.20	75564.52	7103.31	0.23
Reach-1	263569	Max WS	100yr-CorrectedC	284664.40	100.76	139.819		140.56	0.000339	7.81	86418.59	13542.00	0.24
Reach-1	262577	Max WS	010yr-CorrectedC	147067.70	100.76	133.753		134.02	0.000162	4.61	68471.43	6716.41	0.16
Reach-1	262577	Max WS	050yr-CorrectedC	238696.40	100.76	137.963		138.37	0.000218	5.93	94394.10	8420.51	0.19
Reach-1	262577	Max WS	100yr-CorrectedC	284671.00	100.76	139.700		140.18	0.000241	6.48	105356.40	8792.22	0.20
Reach-1	261551	Max WS	010yr-CorrectedC	147062.70	97.61	133.495		133.87	0.000206	5.22	57392.20	8411.56	0.18
Reach-1	261551	Max WS	050yr-CorrectedC	238678.20	97.61	137.642		138.17	0.000265	6.56	84939.59	9668.16	0.21
Reach-1	261551	Max WS	100yr-CorrectedC	284655.40	97.61	139.352		139.95	0.000289	7.11	96319.00	10643.66	0.22
Reach-1	260635	Max WS	010yr-CorrectedC	147052.50	97.61	133.238		133.71	0.000242	5.97	55668.54	8663.70	0.20
Reach-1	260635	Max WS	050yr-CorrectedC	238666.90	97.61	137.318		137.98	0.000316	7.47	83237.05	10211.08	0.23
Reach-1	260635	Max WS	100yr-CorrectedC	284634.80	97.61	139.002		139.74	0.000346	8.08	94631.17	10651.24	0.24
Reach-1	259263	Max WS	010yr-CorrectedC	147039.90	97.61	132.916	114.28	133.35	0.000242	5.75	50292.25	11611.55	0.20
Reach-1	259263	Max WS	050yr-CorrectedC	238643.00	97.61	136.819	118.95	137.52	0.000347	7.56	67293.16	12250.86	0.24
Reach-1	259263	Max WS	100yr-CorrectedC	284589.90	97.61	138.420	121.11	139.26	0.000394	8.34	74319.13	12366.44	0.26
Reach-1	259032			Bridge									
Reach-1	258805	Max WS	010yr-CorrectedC	147035.70	98.28	132.766		133.18	0.000249	5.71	53363.28	11101.31	0.20
Reach-1	258805	Max WS	050yr-CorrectedC	238639.80	98.28	136.615		137.28	0.000354	7.49	70815.92	11506.80	0.24
Reach-1	258805	Max WS	100yr-CorrectedC	284565.30	98.28	138.198		138.99	0.000400	8.25	78027.05	11659.79	0.26
Reach-1	257368	Max WS	010yr-CorrectedC	147027.40	97.61	132.390		132.46	0.000700	2.85	83743.14	11632.18	0.10

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	257368	Max WS	050yr-CorrectedC	238620.20	97.61	136.266		136.35	0.000748	3.21	113507.90	11970.58	0.10
Reach-1	257368	Max WS	100yr-CorrectedC	284553.20	97.61	137.862		137.96	0.000775	3.38	125787.50	16456.71	0.10
Reach-1	254766	Max WS	010yr-CorrectedC	147009.20	99.27	131.486		131.67	0.000148	4.31	93477.11	13304.67	0.15
Reach-1	254766	Max WS	050yr-CorrectedC	238589.50	99.27	135.288		135.52	0.000177	5.20	130374.40	13505.33	0.17
Reach-1	254766	Max WS	100yr-CorrectedC	284494.60	99.27	136.844		137.10	0.000189	5.58	145552.30	13538.36	0.18
Reach-1	250071	Max WS	010yr-CorrectedC	146979.30	84.54	130.192		131.11	0.000583	8.25	45395.07	9221.38	0.30
Reach-1	250071	Max WS	050yr-CorrectedC	238550.70	84.54	133.974		134.96	0.000626	9.44	80188.63	9859.23	0.32
Reach-1	250071	Max WS	100yr-CorrectedC	284415.70	84.54	135.497		136.52	0.000643	9.93	94218.60	10466.64	0.33
Reach-1	248531	Max WS	010yr-CorrectedC	146952.30	84.54	129.238		130.51	0.000580	10.10	47025.89	8104.17	0.32
Reach-1	248531	Max WS	050yr-CorrectedC	238515.70	84.54	132.874		134.37	0.000719	12.09	77893.71	8922.63	0.36
Reach-1	248531	Max WS	100yr-CorrectedC	284343.90	84.54	134.362		135.90	0.000756	12.74	91127.08	9296.53	0.37
Reach-1	246078	Max WS	010yr-CorrectedC	146942.90	98.13	128.829		129.29	0.000322	6.32	47051.42	8654.22	0.23
Reach-1	246078	Max WS	050yr-CorrectedC	238501.10	98.13	132.384		132.91	0.000355	7.26	73213.32	9759.91	0.24
Reach-1	246078	Max WS	100yr-CorrectedC	284303.00	98.13	133.838		134.41	0.000368	7.65	84569.50	10275.57	0.25
Reach-1	244614	Max WS	010yr-CorrectedC	146925.60	98.13	128.191		129.00	0.000449	7.76	45493.01	8811.87	0.27
Reach-1	244614	Max WS	050yr-CorrectedC	238467.50	98.13	131.577		132.69	0.000599	9.73	70959.34	9720.39	0.32
Reach-1	244614	Max WS	100yr-CorrectedC	284208.10	98.13	132.973		134.20	0.000652	10.48	81662.14	9879.45	0.33
Reach-1	242472	Max WS	010yr-CorrectedC	146850.20	94.20	126.807		126.97	0.001465	3.97	49998.58	9572.66	0.14
Reach-1	242472	Max WS	050yr-CorrectedC	238407.50	94.20	130.469		130.64	0.001163	3.86	75533.43	10980.13	0.12
Reach-1	242472	Max WS	100yr-CorrectedC	284083.50	94.20	131.938		132.12	0.001074	3.83	86331.13	11515.22	0.12
Reach-1	241833	Max WS	010yr-CorrectedC	146783.90	93.70	126.015		126.72	0.000407	7.48	52566.25	9546.80	0.26
Reach-1	241833	Max WS	050yr-CorrectedC	238346.50	93.70	129.678		130.59	0.000514	9.17	80769.97	11403.21	0.30
Reach-1	241833	Max WS	100yr-CorrectedC	283965.20	93.70	131.143		132.14	0.000555	9.83	93239.11	11750.53	0.31
Reach-1	240531	Max WS	010yr-CorrectedC	146776.10	93.60	125.797		126.20	0.000269	5.96	76837.30	9951.34	0.21
Reach-1	240531	Max WS	050yr-CorrectedC	238322.20	93.60	129.422		129.92	0.000325	7.15	112790.40	24494.30	0.23
Reach-1	240531	Max WS	100yr-CorrectedC	283922.50	93.60	130.868		131.40	0.000350	7.67	127149.50	24652.89	0.24
Reach-1	235176	Max WS	010yr-CorrectedC	146656.80	92.80	124.905		125.67	0.000405	7.76	56945.58	9949.48	0.26
Reach-1	235176	Max WS	050yr-CorrectedC	238250.00	92.80	128.482		129.38	0.000492	9.25	93623.69	10671.59	0.29
Reach-1	235176	Max WS	100yr-CorrectedC	283758.90	92.80	129.903		130.85	0.000523	9.82	109015.60	23827.55	0.30
Reach-1	232472	Max WS	010yr-CorrectedC	146568.30	91.70	124.206		124.79	0.000309	6.78	63469.26	22623.85	0.23
Reach-1	232472	Max WS	050yr-CorrectedC	238158.30	91.70	127.616		128.35	0.000392	8.25	98795.27	23089.54	0.26
Reach-1	232472	Max WS	100yr-CorrectedC	283652.30	91.70	128.968		129.76	0.000427	8.85	112897.10	23128.65	0.27
Reach-1	231472	Max WS	010yr-CorrectedC	146506.70	91.70	123.683		124.53	0.000516	7.97	48221.88	22378.70	0.29
Reach-1	231472	Max WS	050yr-CorrectedC	238098.50	91.70	126.998		128.02	0.000626	9.57	80727.70	22666.15	0.32
Reach-1	231472	Max WS	100yr-CorrectedC	283562.50	91.70	128.312		129.40	0.000668	10.19	93749.85	22712.27	0.33
Reach-1	230472	Max WS	010yr-CorrectedC	146439.10	91.60	123.115		124.06	0.000540	8.38	45831.73	20661.80	0.29
Reach-1	230472	Max WS	050yr-CorrectedC	238035.40	91.60	126.293		127.47	0.000684	10.20	76995.58	22383.29	0.33
Reach-1	230472	Max WS	100yr-CorrectedC	283458.10	91.60	127.558		128.82	0.000736	10.89	89420.69	22464.31	0.35
Reach-1	229472	Max WS	010yr-CorrectedC	146406.90	89.34	122.810		123.42	0.000349	6.90	51205.07	20783.54	0.23
Reach-1	229472	Max WS	050yr-CorrectedC	237999.70	89.34	125.902		126.61	0.000425	8.19	83647.25	22014.37	0.26
Reach-1	229472	Max WS	100yr-CorrectedC	283410.80	89.34	127.141		127.87	0.000450	8.66	96687.50	22198.49	0.27
Reach-1	228472	Max WS	010yr-CorrectedC	146380.40	90.08	122.560		123.10	0.000304	6.65	59467.36	19532.06	0.22
Reach-1	228472	Max WS	050yr-CorrectedC	237968.90	90.08	125.600		126.21	0.000371	7.86	94975.97	23245.78	0.25
Reach-1	228472	Max WS	100yr-CorrectedC	283380.80	90.08	126.821		127.46	0.000394	8.32	109246.90	23497.86	0.26
Reach-1	227472	Max WS	010yr-CorrectedC	146344.20	90.79	122.155		122.83	0.000390	7.45	56976.79	21484.16	0.25
Reach-1	227472	Max WS	050yr-CorrectedC	237930.70	90.79	125.164		125.86	0.000444	8.49	96225.02	24386.51	0.27
Reach-1	227472	Max WS	100yr-CorrectedC	283323.30	90.79	126.374		127.06	0.000460	8.87	112200.90	24515.88	0.27
Reach-1	226472	Max WS	010yr-CorrectedC	146318.30	91.17	121.834		122.41	0.000353	6.96	64267.22	20649.90	0.24
Reach-1	226472	Max WS	050yr-CorrectedC	237900.80	91.17	124.793		125.38	0.000398	7.93	106354.30	24783.48	0.26
Reach-1	226472	Max WS	100yr-CorrectedC	283288.50	91.17	125.989		126.58	0.000411	8.27	123509.00	24876.49	0.26
Reach-1	225472	Max WS	010yr-CorrectedC	146292.80	89.79	121.540		122.06	0.000324	6.85	72556.38	23178.75	0.23
Reach-1	225472	Max WS	050yr-CorrectedC	237871.00	89.79	124.433		125.00	0.000388	8.01	114393.10	23483.93	0.26
Reach-1	225472	Max WS	100yr-CorrectedC	283259.30	89.79	125.607		126.19	0.000410	8.45	131598.70	23607.86	0.26
Reach-1	224472	Max WS	010yr-CorrectedC	146269.10	90.65	121.080		121.85	0.000489	7.80	60382.95	24053.47	0.28
Reach-1	224472	Max WS	050yr-CorrectedC	237844.00	90.65	123.943		124.74	0.000553	8.93	108070.90	25289.26	0.30
Reach-1	224472	Max WS	100yr-CorrectedC	283226.70	90.65	125.111		125.90	0.000566	9.29	127691.80	25312.95	0.31
Reach-1	223472	Max WS	010yr-CorrectedC	146241.50	91.51	120.629		121.31	0.000632	7.71	67204.45	21375.91	0.30
Reach-1	223472	Max WS	050yr-CorrectedC	237820.00	91.51	123.525		124.09	0.000582	8.09	118050.40	25708.02	0.30
Reach-1	223472	Max WS	100yr-CorrectedC	283206.00	91.51	124.701		125.23	0.000566	8.25	138759.20	25794.03	0.30
Reach-1	222472	Max WS	010yr-CorrectedC	146226.40	90.62	120.243		120.66	0.000361	5.91	76158.17	21541.10	0.23
Reach-1	222472	Max WS	050yr-CorrectedC	237796.30	90.62	123.098		123.54	0.000396	6.77	127897.70	23333.19	0.25
Reach-1	222472	Max WS	100yr-CorrectedC	283187.70	90.62	124.265		124.72	0.000406	7.09	149088.80	24059.21	0.26
Reach-1	220272	Max WS	010yr-CorrectedC	146209.30	93.07	119.811		120.18	0.000428	5.53	73950.73	25550.86	0.25
Reach-1	220272	Max WS	050yr-CorrectedC	237789.60	93.07	122.715		123.06	0.000417	5.99	129736.50	27277.00	0.24
Reach-1	220272	Max WS	100yr-CorrectedC	283166.40	93.07	123.892		124.23	0.000414	6.18	152394.70	27395.77	0.24

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	217472	Max WS	010yr-CorrectedC	146193.00	91.92	118.856		119.15	0.000447	6.10	99399.62	23068.22	0.25
Reach-1	217472	Max WS	050yr-CorrectedC	237774.00	91.92	121.830		122.08	0.000407	6.42	153134.90	25855.44	0.24
Reach-1	217472	Max WS	100yr-CorrectedC	283154.70	91.92	123.014		123.26	0.000405	6.63	174644.70	26117.52	0.24
Reach-1	216472	Max WS	010yr-CorrectedC	146191.90	91.48	118.365	107.27	118.80	0.000400	6.45	86861.05	25810.94	0.25
Reach-1	216472	Max WS	050yr-CorrectedC	237772.00	91.48	121.364	115.99	121.76	0.000400	7.02	145766.00	27383.30	0.25
Reach-1	216472	Max WS	100yr-CorrectedC	283153.30	91.48	122.551	117.03	122.94	0.000400	7.25	169405.90	27458.83	0.25

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	288770	Max WS	010yr-ProposedD1	147484.60	128.14	144.341		144.98	0.000708	6.41	23054.02	1517.26	0.29
Reach-1	288770	Max WS	050yr-ProposedD1	239229.50	128.14	151.273		152.07	0.000538	7.16	33664.70	1544.29	0.27
Reach-1	288770	Max WS	100yr-ProposedD1	285866.40	128.14	154.412		155.28	0.000495	7.49	38533.95	1734.23	0.26
Reach-1	287472	Max WS	010yr-ProposedD1	147451.70	125.74	143.644		144.08	0.000673	5.30	27838.46	2368.63	0.27
Reach-1	287472	Max WS	050yr-ProposedD1	239226.20	125.74	151.052		151.47	0.000362	5.20	46003.12	2532.22	0.22
Reach-1	287472	Max WS	100yr-ProposedD1	285865.30	125.74	154.318		154.75	0.000302	5.26	54320.93	2879.78	0.20
Reach-1	286338	Max WS	010yr-ProposedD1	147454.30	117.29	143.345	127.02	143.60	0.000174	4.05	38275.05	2034.23	0.15
Reach-1	286338	Max WS	050yr-ProposedD1	239220.00	117.29	150.819	129.76	151.17	0.000170	4.86	52553.97	2184.18	0.16
Reach-1	286338	Max WS	100yr-ProposedD1	285861.50	117.29	154.081	130.99	154.49	0.000169	5.21	59084.10	2415.82	0.16
Reach-1	286221			Bridge									
Reach-1	286106	Max WS	010yr-ProposedD1	147450.10	117.10	143.094		143.33	0.000171	3.90	38158.44	2033.69	0.15
Reach-1	286106	Max WS	050yr-ProposedD1	239225.10	117.10	150.578		150.92	0.000162	4.58	52403.38	2169.18	0.15
Reach-1	286106	Max WS	100yr-ProposedD1	285858.30	117.10	153.846		154.24	0.000160	4.89	58672.67	2389.78	0.15
Reach-1	284778	Max WS	010yr-ProposedD1	147443.00	112.83	142.869	122.38	143.12	0.000133	4.06	36447.06	1384.63	0.14
Reach-1	284778	Max WS	050yr-ProposedD1	239217.90	112.83	150.278	125.29	150.69	0.000157	5.17	46973.34	1474.70	0.16
Reach-1	284778	Max WS	100yr-ProposedD1	285853.50	112.83	153.508	126.60	154.00	0.000166	5.64	51691.20	1499.09	0.16
Reach-1	284668			Bridge									
Reach-1	284565	Max WS	010yr-ProposedD1	147446.10	111.22	141.180		141.44	0.000135	4.07	36338.11	1384.00	0.14
Reach-1	284565	Max WS	050yr-ProposedD1	239216.50	111.22	148.569		148.99	0.000158	5.18	46814.73	1473.96	0.16
Reach-1	284565	Max WS	100yr-ProposedD1	285851.40	111.22	151.759		152.26	0.000168	5.66	51449.25	1498.04	0.16
Reach-1	284431	Max WS	010yr-ProposedD1	147431.60	111.36	141.039		141.42	0.000279	5.00	31336.95	1505.77	0.18
Reach-1	284431	Max WS	050yr-ProposedD1	239209.60	111.36	148.443		148.99	0.000282	5.98	42983.49	1680.60	0.18
Reach-1	284431	Max WS	100yr-ProposedD1	285850.60	111.36	151.653		152.29	0.000278	6.32	48227.57	1706.22	0.19
Reach-1	284408	Max WS	010yr-ProposedD1	147431.80	111.58	140.888		141.41	0.000362	5.80	25489.67	1372.81	0.22
Reach-1	284408	Max WS	050yr-ProposedD1	239202.30	111.58	148.248		148.97	0.000348	6.90	37508.03	1623.81	0.22
Reach-1	284408	Max WS	100yr-ProposedD1	285844.70	111.58	151.423		152.25	0.000347	7.38	42561.29	1686.53	0.23
Reach-1	284395	Max WS	010yr-ProposedD1	147431.70	111.37	140.876		141.41	0.000367	5.85	25272.61	1346.07	0.22
Reach-1	284395	Max WS	050yr-ProposedD1	239201.70	111.37	148.222		148.97	0.000357	7.00	36615.23	1514.50	0.23
Reach-1	284395	Max WS	100yr-ProposedD1	285844.30	111.37	151.393		152.24	0.000357	7.49	41558.41	1675.85	0.23
Reach-1	284372	Max WS	010yr-ProposedD1	147434.90	111.51	140.953		141.40	0.000269	5.38	27461.49	1257.22	0.19
Reach-1	284372	Max WS	050yr-ProposedD1	239205.40	111.51	148.282		148.96	0.000302	6.63	38068.23	1485.31	0.21
Reach-1	284372	Max WS	100yr-ProposedD1	285844.60	111.51	151.449		152.23	0.000315	7.15	42850.68	1543.84	0.21
Reach-1	284267	Max WS	010yr-ProposedD1	147432.10	108.30	140.847		141.37	0.000303	5.81	25682.09	1133.35	0.20
Reach-1	284267	Max WS	050yr-ProposedD1	239203.40	108.30	148.113		148.93	0.000339	7.27	35197.77	1471.40	0.22
Reach-1	284267	Max WS	100yr-ProposedD1	285845.10	108.30	151.251		152.20	0.000353	7.89	39708.36	1511.57	0.23
Reach-1	284060	Max WS	010yr-ProposedD1	147424.30	108.45	140.705		141.31	0.000325	6.23	24112.05	1160.52	0.21
Reach-1	284060	Max WS	050yr-ProposedD1	239196.20	108.45	147.928		148.87	0.000374	7.84	34103.82	1444.32	0.24
Reach-1	284060	Max WS	100yr-ProposedD1	285843.50	108.45	151.048		152.15	0.000393	8.51	38561.97	1469.13	0.25
Reach-1	283820	Max WS	010yr-ProposedD1	147423.50	107.22	140.535		141.21	0.000470	6.60	22434.69	1124.98	0.22
Reach-1	283820	Max WS	050yr-ProposedD1	239196.80	107.22	147.724		148.77	0.000552	8.32	32325.04	1606.76	0.25
Reach-1	283820	Max WS	100yr-ProposedD1	285844.30	107.22	150.850		152.06	0.000575	8.99	37062.04	1664.47	0.26
Reach-1	283636	Max WS	010yr-ProposedD1	147406.60	105.24	140.306		141.12	0.000481	7.26	20415.04	1292.84	0.25
Reach-1	283636	Max WS	050yr-ProposedD1	239189.80	105.24	147.503		148.70	0.000517	8.89	33182.77	1800.18	0.28
Reach-1	283636	Max WS	100yr-ProposedD1	285833.80	105.24	150.641		151.99	0.000524	9.53	38864.38	1863.63	0.28
Reach-1	283611	Max WS	010yr-ProposedD1	147406.60	105.38	140.255		141.12	0.000468	7.45	20228.79	1252.46	0.25
Reach-1	283611	Max WS	050yr-ProposedD1	239188.60	105.38	147.423		148.71	0.000523	9.24	32415.56	1799.75	0.28
Reach-1	283611	Max WS	100yr-ProposedD1	285835.40	105.38	150.546		152.00	0.000537	9.93	38333.07	1863.66	0.29
Reach-1	283601	Max WS	010yr-ProposedD1	147406.40	105.38	140.236		141.11	0.000485	7.52	20006.43	1246.11	0.26
Reach-1	283601	Max WS	050yr-ProposedD1	239188.40	105.38	147.459		148.70	0.000520	9.16	32318.01	1830.97	0.28
Reach-1	283601	Max WS	100yr-ProposedD1	285835.30	105.38	150.618		151.99	0.000521	9.74	38164.18	1867.17	0.28
Reach-1	283574	Max WS	010yr-ProposedD1	147406.00	105.18	140.323		141.10	0.000452	7.08	21088.56	1241.47	0.23
Reach-1	283574	Max WS	050yr-ProposedD1	239190.40	105.18	147.536		148.67	0.000513	8.76	33880.45	1848.42	0.26
Reach-1	283574	Max WS	100yr-ProposedD1	285842.30	105.18	150.696		151.96	0.000523	9.35	39766.20	1875.26	0.26
Reach-1	283490	Max WS	010yr-ProposedD1	147407.60	104.94	140.268		141.05	0.000710	7.11	21416.96	1505.14	0.24
Reach-1	283490	Max WS	050yr-ProposedD1	239188.40	104.94	147.558		148.61	0.000744	8.52	37011.75	1844.76	0.25
Reach-1	283490	Max WS	100yr-ProposedD1	285836.10	104.94	150.711		151.89	0.000758	9.11	42859.30	1864.14	0.26
Reach-1	283342	Max WS	010yr-ProposedD1	147407.80	107.64	140.233		140.96	0.000489	6.84	22101.73	1495.23	0.23
Reach-1	283342	Max WS	050yr-ProposedD1	239187.60	107.64	147.570		148.49	0.000497	8.05	37797.77	1738.80	0.24
Reach-1	283342	Max WS	100yr-ProposedD1	285842.00	107.64	150.727		151.76	0.000508	8.61	43342.07	1770.32	0.24
Reach-1	283203	Max WS	010yr-ProposedD1	147404.10	106.22	140.257		140.94	0.000332	6.66	22703.93	1535.90	0.22
Reach-1	283203	Max WS	050yr-ProposedD1	239187.80	106.22	147.525		148.43	0.000350	7.94	38751.76	1678.91	0.23
Reach-1	283203	Max WS	100yr-ProposedD1	285837.30	106.22	150.668		151.69	0.000363	8.55	44088.63	1731.46	0.24
Reach-1	283179	Max WS	010yr-ProposedD1	147404.00	106.20	140.206		140.89	0.000325	6.64	22874.23	1527.95	0.22
Reach-1	283179	Max WS	050yr-ProposedD1	239188.80	106.20	147.518		148.42	0.000344	7.92	38981.01	1667.22	0.23
Reach-1	283179	Max WS	100yr-ProposedD1	285835.50	106.20	150.658		151.69	0.000358	8.55	44286.83	1711.10	0.24

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	283169	Max WS	010yr-ProposedD1	147407.30	106.15	140.211		140.88	0.000323	6.60	22959.34	1533.57	0.22
Reach-1	283169	Max WS	050yr-ProposedD1	239190.90	106.15	147.524		148.41	0.000341	7.88	39065.69	1670.43	0.23
Reach-1	283169	Max WS	100yr-ProposedD1	285837.30	106.15	150.665		151.68	0.000355	8.50	44383.46	1714.61	0.24
Reach-1	283139	Max WS	010yr-ProposedD1	147407.50	104.58	140.204		140.89	0.000328	6.66	22922.75	1544.79	0.22
Reach-1	283139	Max WS	050yr-ProposedD1	239191.20	104.58	147.500		148.41	0.000348	7.96	38816.03	1678.74	0.23
Reach-1	283139	Max WS	100yr-ProposedD1	285837.40	104.58	150.642		151.67	0.000362	8.59	44158.17	1723.14	0.24
Reach-1	283093	Max WS	010yr-ProposedD1	147407.20	104.60	140.206		140.86	0.000432	6.51	23487.11	1609.32	0.21
Reach-1	283093	Max WS	050yr-ProposedD1	239191.40	104.60	147.533		148.37	0.000446	7.71	39572.72	1724.33	0.23
Reach-1	283093	Max WS	100yr-ProposedD1	285837.50	104.60	150.688		151.64	0.000459	8.27	45064.88	1756.15	0.23
Reach-1	283052	Max WS	010yr-ProposedD1	147407.30	105.26	140.257		140.85	0.000291	6.36	28615.12	1643.79	0.21
Reach-1	283052	Max WS	050yr-ProposedD1	239186.40	105.26	147.506		148.37	0.000331	7.84	40905.25	1748.19	0.23
Reach-1	283052	Max WS	100yr-ProposedD1	285836.80	105.26	150.652		151.64	0.000344	8.45	46462.37	1783.10	0.24
Reach-1	283001	Max WS	010yr-ProposedD1	147407.20	105.29	140.320		140.83	0.000315	5.99	31219.39	1658.84	0.19
Reach-1	283001	Max WS	050yr-ProposedD1	239191.50	105.29	147.594		148.33	0.000357	7.37	43774.77	1792.21	0.21
Reach-1	283001	Max WS	100yr-ProposedD1	285836.90	105.29	150.753		151.59	0.000370	7.93	49489.82	1824.05	0.22
Reach-1	282937	Max WS	010yr-ProposedD1	147404.10	107.24	140.110		140.81	0.000360	6.76	22438.40	1615.61	0.22
Reach-1	282937	Max WS	050yr-ProposedD1	239188.00	107.24	147.552		148.31	0.000335	7.57	43194.55	1801.50	0.22
Reach-1	282937	Max WS	100yr-ProposedD1	285835.30	107.24	150.706		151.57	0.000348	8.15	48722.18	1844.88	0.23
Reach-1	282912	Max WS	010yr-ProposedD1	147407.10	108.10	140.209		140.89	0.000327	6.69	23251.98	1628.88	0.22
Reach-1	282912	Max WS	050yr-ProposedD1	239187.10	108.10	147.525		148.31	0.000317	7.64	43436.47	1864.73	0.22
Reach-1	282912	Max WS	100yr-ProposedD1	285835.80	108.10	150.679		151.57	0.000328	8.22	49272.70	1914.44	0.23
Reach-1	282902	Max WS	010yr-ProposedD1	147403.50	108.28	140.194		140.87	0.000328	6.65	23324.50	1628.35	0.22
Reach-1	282902	Max WS	050yr-ProposedD1	239190.20	108.28	147.521		148.31	0.000319	7.62	43264.79	1880.63	0.22
Reach-1	282902	Max WS	100yr-ProposedD1	285838.20	108.28	150.676		151.57	0.000329	8.19	49130.20	1927.46	0.23
Reach-1	282874	Max WS	010yr-ProposedD1	147407.00	108.58	140.157		140.82	0.000369	6.78	25316.47	1625.17	0.22
Reach-1	282874	Max WS	050yr-ProposedD1	239190.10	108.58	147.498		148.32	0.000371	7.93	42667.64	1912.10	0.23
Reach-1	282874	Max WS	100yr-ProposedD1	285837.90	108.58	150.641		151.58	0.000386	8.56	48261.62	1994.34	0.24
Reach-1	282707	Max WS	010yr-ProposedD1	147395.30	108.26	139.929		140.73	0.000446	7.22	21250.83	1618.78	0.24
Reach-1	282707	Max WS	050yr-ProposedD1	239184.30	108.26	147.358		148.26	0.000408	8.11	39795.35	1864.88	0.24
Reach-1	282707	Max WS	100yr-ProposedD1	285836.20	108.26	150.511		151.52	0.000414	8.67	45446.93	2184.92	0.25
Reach-1	282424	Max WS	010yr-ProposedD1	147398.20	108.13	139.966		140.60	0.000386	6.44	23642.37	1488.32	0.21
Reach-1	282424	Max WS	050yr-ProposedD1	239187.70	108.13	147.299		148.12	0.000395	7.59	40152.38	1727.45	0.22
Reach-1	282424	Max WS	100yr-ProposedD1	285836.50	108.13	150.448		151.37	0.000406	8.14	45614.16	1740.70	0.23
Reach-1	282071	Max WS	010yr-ProposedD1	147400.80	111.09	139.950		140.47	0.000353	5.91	28582.36	1563.68	0.20
Reach-1	282071	Max WS	050yr-ProposedD1	239184.70	111.09	147.204		147.96	0.000390	7.25	40286.44	1643.15	0.22
Reach-1	282071	Max WS	100yr-ProposedD1	285833.20	111.09	150.344		151.21	0.000403	7.81	45479.27	1664.80	0.22
Reach-1	281647	Max WS	010yr-ProposedD1	147384.10	105.74	139.888	120.14	140.34	0.000225	5.53	31337.71	1583.23	0.18
Reach-1	281647	Max WS	050yr-ProposedD1	239180.30	105.74	147.087	123.91	147.81	0.000272	7.05	41614.27	1712.98	0.21
Reach-1	281647	Max WS	100yr-ProposedD1	285832.40	105.74	150.199	125.63	151.05	0.000290	7.69	46370.62	1794.68	0.22
Reach-1	281538			Bridge									
Reach-1	281423	Max WS	010yr-ProposedD1	147384.60	105.74	139.748		140.20	0.000220	5.46	31335.79	1498.51	0.18
Reach-1	281423	Max WS	050yr-ProposedD1	239174.00	105.74	146.886		147.61	0.000269	6.99	41296.05	1643.80	0.20
Reach-1	281423	Max WS	100yr-ProposedD1	285831.40	105.74	149.960		150.82	0.000289	7.65	45634.39	1717.47	0.22
Reach-1	279961	Max WS	010yr-ProposedD1	147373.50	101.65	139.302		139.87	0.000255	6.13	28465.23	1340.31	0.19
Reach-1	279961	Max WS	050yr-ProposedD1	239158.40	101.65	146.289		147.22	0.000328	7.95	38346.32	1459.87	0.23
Reach-1	279961	Max WS	100yr-ProposedD1	285820.60	101.65	149.301		150.41	0.000357	8.72	42795.31	1504.64	0.24
Reach-1	279605	Max WS	010yr-ProposedD1	147362.90	101.65	139.215		139.78	0.000253	6.15	29451.02	1429.05	0.19
Reach-1	279605	Max WS	050yr-ProposedD1	239152.10	101.65	146.183		147.11	0.000325	7.96	40006.07	1564.21	0.23
Reach-1	279605	Max WS	100yr-ProposedD1	285820.80	101.65	149.191		150.29	0.000353	8.72	44761.06	1594.05	0.24
Reach-1	278919	Max WS	010yr-ProposedD1	147364.30	101.65	139.088		139.61	0.000239	5.92	31344.63	1594.19	0.19
Reach-1	278919	Max WS	050yr-ProposedD1	239156.40	101.65	146.033		146.88	0.000305	7.65	43202.07	1766.93	0.22
Reach-1	278919	Max WS	100yr-ProposedD1	285823.30	101.65	149.039		150.03	0.000329	8.36	48551.63	1809.62	0.23
Reach-1	277724	Max WS	010yr-ProposedD1	147347.10	100.07	138.800	115.50	139.33	0.000213	5.90	29059.61	1369.78	0.18
Reach-1	277724	Max WS	050yr-ProposedD1	239137.00	100.07	145.606	119.82	146.51	0.000293	7.81	38124.52	1756.21	0.22
Reach-1	277724	Max WS	100yr-ProposedD1	285820.40	100.07	148.547	121.78	149.64	0.000325	8.62	42182.76	1774.79	0.23
Reach-1	277625			Bridge									
Reach-1	277512	Max WS	010yr-ProposedD1	147347.40	100.07	138.620		139.16	0.000218	5.97	28410.94	1319.09	0.18
Reach-1	277512	Max WS	050yr-ProposedD1	239138.50	100.07	145.280		146.23	0.000305	7.97	37004.13	1689.61	0.22
Reach-1	277512	Max WS	100yr-ProposedD1	285811.60	100.07	148.129		149.28	0.000341	8.82	40997.18	1804.24	0.24
Reach-1	277500	Max WS	010yr-ProposedD1	147347.00	101.08	138.560	115.95	139.16	0.000246	6.26	25663.64	1165.42	0.19
Reach-1	277500	Max WS	050yr-ProposedD1	239137.10	101.08	145.180	120.49	146.24	0.000343	8.35	32834.86	1700.17	0.23
Reach-1	277500	Max WS	100yr-ProposedD1	285805.00	101.08	147.998	122.59	149.29	0.000385	9.26	35887.39	1769.42	0.25
Reach-1	277397			Bridge									

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	277287	Max WS	010yr-ProposedD1	147322.50	102.92	138.031		138.74	0.000322	6.77	22414.54	903.86	0.22
Reach-1	277287	Max WS	050yr-ProposedD1	239086.00	102.92	144.241		145.50	0.000449	9.05	28701.46	1626.61	0.26
Reach-1	277287	Max WS	100yr-ProposedD1	285750.50	102.92	146.828		148.38	0.000506	10.06	31435.46	1725.74	0.28
Reach-1	276335	Max WS	010yr-ProposedD1	147294.60	101.04	137.508		138.41	0.000384	7.63	19603.96	647.53	0.24
Reach-1	276335	Max WS	050yr-ProposedD1	239039.90	101.04	143.337		145.03	0.000578	10.46	23434.90	666.84	0.30
Reach-1	276335	Max WS	100yr-ProposedD1	285637.80	101.04	145.707		147.84	0.000674	11.75	25023.84	673.87	0.33
Reach-1	276088	Max WS	010yr-ProposedD1	147279.80	101.04	137.260		138.31	0.000432	8.25	18302.92	597.82	0.25
Reach-1	276088	Max WS	050yr-ProposedD1	239003.40	101.04	142.870		144.89	0.000673	11.43	21695.58	611.54	0.32
Reach-1	276088	Max WS	100yr-ProposedD1	285589.50	101.04	145.113		147.68	0.000795	12.90	23073.28	616.90	0.35
Reach-1	275472	Max WS	010yr-ProposedD1	147271.80	101.04	137.067		138.06	0.000421	8.11	21016.67	856.48	0.25
Reach-1	275472	Max WS	050yr-ProposedD1	239004.60	101.04	142.670		144.51	0.000639	11.10	25861.11	872.85	0.31
Reach-1	275472	Max WS	100yr-ProposedD1	285523.80	101.04	144.929		147.24	0.000747	12.46	27840.06	879.45	0.34
Reach-1	274472	Max WS	010yr-ProposedD1	147258.40	101.04	136.884		137.64	0.000357	6.98	22011.79	1010.20	0.23
Reach-1	274472	Max WS	050yr-ProposedD1	239001.90	101.04	142.474		143.84	0.000519	9.44	27645.11	1095.46	0.28
Reach-1	274472	Max WS	100yr-ProposedD1	285519.30	101.04	144.744		146.45	0.000596	10.55	29985.78	1107.77	0.30
Reach-1	273472	Max WS	010yr-ProposedD1	147233.10	99.91	136.557		137.30	0.000328	6.91	21942.79	781.55	0.22
Reach-1	273472	Max WS	050yr-ProposedD1	238966.60	99.91	141.927		143.33	0.000505	9.53	26197.81	802.46	0.28
Reach-1	273472	Max WS	100yr-ProposedD1	285416.00	99.91	144.070		145.85	0.000594	10.74	27926.57	810.34	0.30
Reach-1	272318	Max WS	010yr-ProposedD1	147187.10	99.91	135.785		136.85	0.000464	8.33	18735.01	784.12	0.26
Reach-1	272318	Max WS	050yr-ProposedD1	238866.00	99.91	140.722		142.72	0.000728	11.49	27272.14	3121.76	0.33
Reach-1	272318	Max WS	100yr-ProposedD1	285195.90	99.91	142.748		145.18	0.000838	12.77	31836.61	3193.62	0.36
Reach-1	271472	Max WS	010yr-ProposedD1	147180.10	99.91	135.697		136.51	0.000328	7.22	20706.56	1217.79	0.24
Reach-1	271472	Max WS	050yr-ProposedD1	238860.90	99.91	140.599		142.09	0.000500	9.88	30067.37	4083.93	0.30
Reach-1	271472	Max WS	100yr-ProposedD1	285158.80	99.91	142.597		144.41	0.000572	10.97	35141.74	4211.40	0.32
Reach-1	270472	Max WS	010yr-ProposedD1	147159.80	99.91	135.366		136.18	0.000326	7.26	23098.06	2529.72	0.23
Reach-1	270472	Max WS	050yr-ProposedD1	238832.30	99.91	140.170		141.58	0.000482	9.75	36089.37	3549.20	0.29
Reach-1	270472	Max WS	100yr-ProposedD1	285078.70	99.91	142.118		143.81	0.000549	10.80	41561.01	3830.24	0.31
Reach-1	269529	Max WS	010yr-ProposedD1	147153.80	100.75	135.092		135.87	0.000308	7.12	23902.15	2427.62	0.23
Reach-1	269529	Max WS	050yr-ProposedD1	238809.30	100.75	139.737		141.10	0.000463	9.60	38689.80	4454.92	0.29
Reach-1	269529	Max WS	100yr-ProposedD1	284971.10	100.75	141.634		143.25	0.000526	10.60	45279.05	4786.65	0.31
Reach-1	268320	Max WS	010yr-ProposedD1	147130.90	100.75	134.779		135.50	0.000308	6.94	29501.03	4034.90	0.23
Reach-1	268320	Max WS	050yr-ProposedD1	238774.80	100.75	139.320		140.52	0.000445	9.18	46654.06	5410.89	0.28
Reach-1	268320	Max WS	100yr-ProposedD1	284891.10	100.75	141.182		142.58	0.000497	10.06	54227.17	5525.28	0.30
Reach-1	267678	Max WS	010yr-ProposedD1	147112.20	100.75	134.680		135.29	0.000283	6.50	36886.72	4603.25	0.22
Reach-1	267678	Max WS	050yr-ProposedD1	238773.30	100.75	139.198		140.17	0.000394	8.47	56222.45	5471.77	0.26
Reach-1	267678	Max WS	100yr-ProposedD1	284885.30	100.75	141.053		142.17	0.000435	9.25	64528.61	5478.37	0.28
Reach-1	266472	Max WS	010yr-ProposedD1	147111.30	100.75	134.462		134.88	0.000227	5.73	53612.21	7843.55	0.19
Reach-1	266472	Max WS	050yr-ProposedD1	238747.60	100.75	138.883		139.55	0.000314	7.45	76763.93	9109.70	0.23
Reach-1	266472	Max WS	100yr-ProposedD1	284872.50	100.75	140.709		141.46	0.000344	8.09	86539.19	9221.11	0.25
Reach-1	265472	Max WS	010yr-ProposedD1	147102.20	100.76	134.330		134.65	0.000188	5.22	60975.20	6827.86	0.17
Reach-1	265472	Max WS	050yr-ProposedD1	238734.50	100.76	138.730		139.19	0.000246	6.59	83242.39	7375.45	0.20
Reach-1	265472	Max WS	100yr-ProposedD1	284839.30	100.76	140.545		141.07	0.000268	7.14	92660.09	7511.22	0.22
Reach-1	264426	Max WS	010yr-ProposedD1	147087.70	100.76	134.024		134.50	0.000245	5.98	51096.71	5902.00	0.20
Reach-1	264426	Max WS	050yr-ProposedD1	238713.80	100.76	138.320		139.03	0.000328	7.62	73477.94	6339.98	0.24
Reach-1	264426	Max WS	100yr-ProposedD1	284701.20	100.76	140.090		140.90	0.000363	8.30	82970.76	6428.58	0.25
Reach-1	263569	Max WS	010yr-ProposedD1	147078.90	100.76	133.818		134.28	0.000242	5.75	49273.84	7021.54	0.20
Reach-1	263569	Max WS	050yr-ProposedD1	238702.40	100.76	138.067		138.73	0.000311	7.20	75564.52	7103.31	0.23
Reach-1	263569	Max WS	100yr-ProposedD1	284672.70	100.76	139.819		140.56	0.000339	7.81	86418.59	13542.00	0.24
Reach-1	262577	Max WS	010yr-ProposedD1	147069.60	100.76	133.753		134.02	0.000162	4.61	68471.43	6716.41	0.16
Reach-1	262577	Max WS	050yr-ProposedD1	238697.50	100.76	137.963		138.37	0.000218	5.93	94394.10	8420.51	0.19
Reach-1	262577	Max WS	100yr-ProposedD1	284675.30	100.76	139.700		140.18	0.000241	6.48	105356.40	8792.22	0.20
Reach-1	261551	Max WS	010yr-ProposedD1	147064.20	97.61	133.495		133.87	0.000206	5.22	57392.20	8411.56	0.18
Reach-1	261551	Max WS	050yr-ProposedD1	238683.50	97.61	137.642		138.17	0.000265	6.56	84939.59	9668.16	0.21
Reach-1	261551	Max WS	100yr-ProposedD1	284646.60	97.61	139.352		139.95	0.000289	7.11	96319.00	10643.66	0.22
Reach-1	260635	Max WS	010yr-ProposedD1	147052.50	97.61	133.238		133.71	0.000242	5.97	55668.54	8663.70	0.20
Reach-1	260635	Max WS	050yr-ProposedD1	238668.10	97.61	137.318		137.98	0.000316	7.47	83237.05	10211.08	0.23
Reach-1	260635	Max WS	100yr-ProposedD1	284632.50	97.61	139.002		139.74	0.000346	8.08	94631.17	10651.24	0.24
Reach-1	259263	Max WS	010yr-ProposedD1	147043.60	97.61	132.916	114.28	133.35	0.000242	5.75	50292.25	11611.55	0.20
Reach-1	259263	Max WS	050yr-ProposedD1	238642.90	97.61	136.819	118.94	137.52	0.000347	7.56	67293.16	12250.86	0.24
Reach-1	259263	Max WS	100yr-ProposedD1	284593.70	97.61	138.420	121.11	139.26	0.000394	8.34	74319.13	12366.44	0.26
Reach-1	259032			Bridge									
Reach-1	258805	Max WS	010yr-ProposedD1	147036.20	98.28	132.766		133.18	0.000249	5.71	53363.28	11101.31	0.20
Reach-1	258805	Max WS	050yr-ProposedD1	238639.60	98.28	136.615		137.28	0.000354	7.49	70815.92	11506.80	0.24
Reach-1	258805	Max WS	100yr-ProposedD1	284575.50	98.28	138.198		138.99	0.000400	8.25	78027.05	11659.79	0.26
Reach-1	257368	Max WS	010yr-ProposedD1	147028.70	97.61	132.390		132.46	0.000700	2.85	83743.14	11632.18	0.10

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	257368	Max WS	050yr-ProposedD1	238623.40	97.61	136.266		136.35	0.000748	3.21	113507.90	11970.58	0.10
Reach-1	257368	Max WS	100yr-ProposedD1	284554.50	97.61	137.862		137.96	0.000775	3.38	125787.50	16456.71	0.10
Reach-1	254766	Max WS	010yr-ProposedD1	147003.20	99.27	131.486		131.67	0.000148	4.31	93477.11	13304.67	0.15
Reach-1	254766	Max WS	050yr-ProposedD1	238589.40	99.27	135.288		135.52	0.000177	5.20	130374.40	13505.33	0.17
Reach-1	254766	Max WS	100yr-ProposedD1	284484.10	99.27	136.844		137.10	0.000189	5.58	145552.30	13538.36	0.18
Reach-1	250071	Max WS	010yr-ProposedD1	146979.20	84.54	130.192		131.11	0.000583	8.25	45395.07	9221.38	0.30
Reach-1	250071	Max WS	050yr-ProposedD1	238545.70	84.54	133.974		134.96	0.000626	9.44	80188.63	9859.23	0.32
Reach-1	250071	Max WS	100yr-ProposedD1	284418.20	84.54	135.497		136.52	0.000643	9.93	94218.60	10466.64	0.33
Reach-1	248531	Max WS	010yr-ProposedD1	146951.00	84.54	129.238		130.51	0.000580	10.10	47025.89	8104.17	0.32
Reach-1	248531	Max WS	050yr-ProposedD1	238515.70	84.54	132.874		134.37	0.000719	12.09	77893.71	8922.63	0.36
Reach-1	248531	Max WS	100yr-ProposedD1	284333.40	84.54	134.362		135.90	0.000756	12.74	91127.08	9296.53	0.37
Reach-1	246078	Max WS	010yr-ProposedD1	146938.00	98.13	128.829		129.29	0.000322	6.32	47051.42	8654.22	0.23
Reach-1	246078	Max WS	050yr-ProposedD1	238490.20	98.13	132.384		132.91	0.000355	7.26	73213.32	9759.91	0.24
Reach-1	246078	Max WS	100yr-ProposedD1	284292.70	98.13	133.838		134.41	0.000368	7.65	84569.50	10275.57	0.25
Reach-1	244614	Max WS	010yr-ProposedD1	146920.40	98.13	128.191		129.00	0.000449	7.76	45493.01	8811.87	0.27
Reach-1	244614	Max WS	050yr-ProposedD1	238458.10	98.13	131.577		132.69	0.000599	9.73	70960.05	9720.40	0.32
Reach-1	244614	Max WS	100yr-ProposedD1	284215.10	98.13	132.973		134.20	0.000652	10.48	81662.14	9879.45	0.33
Reach-1	242472	Max WS	010yr-ProposedD1	146846.90	94.20	126.808		126.97	0.001465	3.97	49999.21	9572.70	0.14
Reach-1	242472	Max WS	050yr-ProposedD1	238407.90	94.20	130.469		130.64	0.001163	3.86	75533.43	10980.13	0.12
Reach-1	242472	Max WS	100yr-ProposedD1	284089.10	94.20	131.938		132.12	0.001074	3.83	86331.13	11515.22	0.12
Reach-1	241833	Max WS	010yr-ProposedD1	146788.30	93.70	126.015		126.72	0.000407	7.48	52566.25	9546.80	0.26
Reach-1	241833	Max WS	050yr-ProposedD1	238347.90	93.70	129.678		130.59	0.000514	9.17	80769.97	11403.21	0.30
Reach-1	241833	Max WS	100yr-ProposedD1	283977.30	93.70	131.143		132.14	0.000555	9.83	93239.11	11750.53	0.31
Reach-1	240531	Max WS	010yr-ProposedD1	146770.20	93.60	125.797		126.20	0.000269	5.96	76837.30	9951.34	0.21
Reach-1	240531	Max WS	050yr-ProposedD1	238325.60	93.60	129.422		129.92	0.000325	7.15	112790.40	24494.30	0.23
Reach-1	240531	Max WS	100yr-ProposedD1	283928.80	93.60	130.868		131.40	0.000350	7.67	127149.50	24652.89	0.24
Reach-1	235176	Max WS	010yr-ProposedD1	146655.60	92.80	124.905		125.67	0.000405	7.76	56945.58	9949.48	0.26
Reach-1	235176	Max WS	050yr-ProposedD1	238253.80	92.80	128.482		129.38	0.000492	9.25	93623.69	10671.59	0.29
Reach-1	235176	Max WS	100yr-ProposedD1	283770.70	92.80	129.903		130.85	0.000523	9.82	109015.60	23827.55	0.30
Reach-1	232472	Max WS	010yr-ProposedD1	146565.60	91.70	124.206		124.79	0.000309	6.78	63469.26	22623.85	0.23
Reach-1	232472	Max WS	050yr-ProposedD1	238168.00	91.70	127.616		128.35	0.000392	8.25	98795.27	23089.54	0.26
Reach-1	232472	Max WS	100yr-ProposedD1	283659.90	91.70	128.968		129.76	0.000427	8.85	112897.10	23128.65	0.27
Reach-1	231472	Max WS	010yr-ProposedD1	146503.30	91.70	123.683		124.53	0.000516	7.97	48221.88	22378.70	0.29
Reach-1	231472	Max WS	050yr-ProposedD1	238109.30	91.70	126.998		128.02	0.000627	9.57	80727.70	22666.15	0.32
Reach-1	231472	Max WS	100yr-ProposedD1	283568.30	91.70	128.312		129.40	0.000668	10.19	93749.85	22712.27	0.33
Reach-1	230472	Max WS	010yr-ProposedD1	146433.90	91.60	123.115		124.06	0.000540	8.38	45831.73	20661.80	0.29
Reach-1	230472	Max WS	050yr-ProposedD1	238039.80	91.60	126.293		127.47	0.000685	10.20	76995.58	22383.29	0.33
Reach-1	230472	Max WS	100yr-ProposedD1	283467.70	91.60	127.558		128.82	0.000736	10.89	89420.69	22464.31	0.35
Reach-1	229472	Max WS	010yr-ProposedD1	146406.60	89.34	122.810		123.42	0.000349	6.90	51205.07	20783.54	0.23
Reach-1	229472	Max WS	050yr-ProposedD1	237993.60	89.34	125.902		126.61	0.000425	8.19	83647.25	22014.37	0.26
Reach-1	229472	Max WS	100yr-ProposedD1	283401.80	89.34	127.141		127.87	0.000450	8.66	96687.50	22198.49	0.27
Reach-1	228472	Max WS	010yr-ProposedD1	146382.50	90.08	122.560		123.10	0.000304	6.65	59467.36	19532.06	0.22
Reach-1	228472	Max WS	050yr-ProposedD1	237964.30	90.08	125.600		126.21	0.000371	7.86	94975.97	23245.78	0.25
Reach-1	228472	Max WS	100yr-ProposedD1	283383.10	90.08	126.821		127.46	0.000394	8.32	109246.90	23497.86	0.26
Reach-1	227472	Max WS	010yr-ProposedD1	146338.80	90.79	122.155		122.83	0.000390	7.45	56976.79	21484.16	0.25
Reach-1	227472	Max WS	050yr-ProposedD1	237921.20	90.79	125.164		125.86	0.000444	8.49	96225.02	24386.51	0.27
Reach-1	227472	Max WS	100yr-ProposedD1	283324.70	90.79	126.374		127.06	0.000460	8.87	112200.90	24515.88	0.27
Reach-1	226472	Max WS	010yr-ProposedD1	146315.20	91.17	121.834		122.41	0.000353	6.96	64267.22	20649.90	0.24
Reach-1	226472	Max WS	050yr-ProposedD1	237897.40	91.17	124.793		125.38	0.000398	7.93	106354.30	24783.48	0.26
Reach-1	226472	Max WS	100yr-ProposedD1	283281.60	91.17	125.989		126.58	0.000411	8.27	123509.00	24876.49	0.26
Reach-1	225472	Max WS	010yr-ProposedD1	146297.50	89.79	121.540		122.06	0.000324	6.85	72556.38	23178.75	0.23
Reach-1	225472	Max WS	050yr-ProposedD1	237871.00	89.79	124.433		125.00	0.000388	8.01	114393.10	23483.93	0.26
Reach-1	225472	Max WS	100yr-ProposedD1	283265.00	89.79	125.607		126.19	0.000410	8.45	131598.70	23607.86	0.26
Reach-1	224472	Max WS	010yr-ProposedD1	146266.00	90.65	121.080		121.85	0.000489	7.80	60382.95	24053.47	0.28
Reach-1	224472	Max WS	050yr-ProposedD1	237846.40	90.65	123.943		124.74	0.000553	8.93	108070.90	25289.26	0.30
Reach-1	224472	Max WS	100yr-ProposedD1	283231.20	90.65	125.111		125.90	0.000566	9.29	127691.80	25312.95	0.31
Reach-1	223472	Max WS	010yr-ProposedD1	146237.00	91.51	120.629		121.31	0.000632	7.71	67204.45	21375.91	0.30
Reach-1	223472	Max WS	050yr-ProposedD1	237820.10	91.51	123.525		124.09	0.000582	8.09	118050.40	25708.02	0.30
Reach-1	223472	Max WS	100yr-ProposedD1	283201.30	91.51	124.701		125.23	0.000566	8.25	138759.20	25794.03	0.30
Reach-1	222472	Max WS	010yr-ProposedD1	146222.40	90.62	120.243		120.66	0.000361	5.91	76158.17	21541.10	0.23
Reach-1	222472	Max WS	050yr-ProposedD1	237801.00	90.62	123.098		123.54	0.000396	6.77	127897.70	23333.19	0.25
Reach-1	222472	Max WS	100yr-ProposedD1	283185.60	90.62	124.265		124.72	0.000406	7.09	149088.80	24059.21	0.26
Reach-1	220272	Max WS		146206.80	93.07	119.811		120.18	0.000428	5.53	73950.73	25550.86	0.25
Reach-1	220272	Max WS	050yr-ProposedD1	237785.20	93.07	122.715		123.06	0.000417	5.99	129736.50	27277.00	0.24
Reach-1	220272	Max WS	100yr-ProposedD1	283170.50	93.07	123.892		124.23	0.000414	6.18	152394.70	27395.77	0.24

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	217472	Max WS	010yr-ProposedD1	146193.30	91.92	118.856		119.15	0.000447	6.10	99399.62	23068.22	0.25
Reach-1	217472	Max WS	050yr-ProposedD1	237772.00	91.92	121.830		122.08	0.000407	6.42	153136.70	25855.44	0.24
Reach-1	217472	Max WS	100yr-ProposedD1	283156.60	91.92	123.014		123.26	0.000405	6.63	174644.70	26117.52	0.25
Reach-1	216472	Max WS	010yr-ProposedD1	146192.00	91.48	118.365	107.27	118.80	0.000400	6.45	86862.89	25811.07	0.25
Reach-1	216472	Max WS	050yr-ProposedD1	237772.20	91.48	121.364	115.98	121.76	0.000400	7.02	145766.00	27383.30	0.25
Reach-1	216472	Max WS	100yr-ProposedD1	283153.70	91.48	122.551	117.03	122.94	0.000400	7.25	169405.90	27458.83	0.25

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	288770	Max WS	010yr-ProposedD2	147475.10	128.14	144.320		144.96	0.000711	6.42	23023.06	1517.17	0.29
Reach-1	288770	Max WS	050yr-ProposedD2	239238.80	128.14	151.251		152.05	0.000540	7.17	33629.95	1544.20	0.27
Reach-1	288770	Max WS	100yr-ProposedD2	285868.00	128.14	154.389		155.26	0.000496	7.50	38498.34	1733.69	0.26
Reach-1	287472	Max WS	010yr-ProposedD2	147451.00	125.74	143.619		144.06	0.000678	5.31	27777.35	2368.07	0.27
Reach-1	287472	Max WS	050yr-ProposedD2	239227.50	125.74	151.028		151.45	0.000364	5.21	45941.84	2532.05	0.22
Reach-1	287472	Max WS	100yr-ProposedD2	285865.80	125.74	154.294		154.73	0.000303	5.27	54259.29	2877.00	0.20
Reach-1	286338	Max WS	010yr-ProposedD2	147445.60	117.29	143.318	127.02	143.57	0.000175	4.06	38222.70	2033.99	0.15
Reach-1	286338	Max WS	050yr-ProposedD2	239220.50	117.29	150.794	129.77	151.15	0.000170	4.87	52504.49	2183.26	0.16
Reach-1	286338	Max WS	100yr-ProposedD2	285856.40	117.29	154.057	130.99	154.46	0.000170	5.21	59035.05	2415.30	0.16
Reach-1	286221			Bridge									
Reach-1	286106	Max WS	010yr-ProposedD2	147444.20	117.10	143.066		143.31	0.000172	3.91	38105.31	2033.45	0.15
Reach-1	286106	Max WS	050yr-ProposedD2	239224.00	117.10	150.553		150.90	0.000162	4.59	52355.08	2168.70	0.15
Reach-1	286106	Max WS	100yr-ProposedD2	285856.80	117.10	153.821		154.22	0.000161	4.89	58624.95	2388.54	0.15
Reach-1	284778	Max WS	010yr-ProposedD2	147438.80	112.83	142.840	122.38	143.10	0.000134	4.07	36407.20	1384.40	0.14
Reach-1	284778	Max WS	050yr-ProposedD2	239210.80	112.83	150.253	125.28	150.67	0.000157	5.17	46936.05	1474.51	0.16
Reach-1	284778	Max WS	100yr-ProposedD2	285856.20	112.83	153.482	126.61	153.98	0.000166	5.65	51653.88	1498.90	0.16
Reach-1	284668			Bridge									
Reach-1	284565	Max WS	010yr-ProposedD2	147434.10	111.22	141.151		141.41	0.000135	4.08	36298.00	1383.77	0.14
Reach-1	284565	Max WS	050yr-ProposedD2	239206.10	111.22	148.544		148.96	0.000158	5.19	46777.34	1473.76	0.16
Reach-1	284565	Max WS	100yr-ProposedD2	285851.30	111.22	151.733		152.23	0.000168	5.67	51411.97	1497.84	0.16
Reach-1	284431	Max WS	010yr-ProposedD2	147433.70	111.36	141.009		141.39	0.000280	5.01	31292.38	1505.34	0.18
Reach-1	284431	Max WS	050yr-ProposedD2	239211.30	111.36	148.416		148.96	0.000283	5.99	42940.30	1680.24	0.19
Reach-1	284431	Max WS	100yr-ProposedD2	285850.40	111.36	151.627		152.27	0.000279	6.33	48185.13	1706.05	0.19
Reach-1	284408	Max WS	010yr-ProposedD2	147428.80	111.06	140.958		141.38	0.000252	5.21	28363.45	1375.07	0.19
Reach-1	284408	Max WS	050yr-ProposedD2	239206.50	111.06	148.319		148.94	0.000266	6.38	40410.99	1626.41	0.20
Reach-1	284408	Max WS	100yr-ProposedD2	285850.40	111.06	151.496		152.21	0.000272	6.88	45468.00	1687.15	0.21
Reach-1	284395	Max WS	010yr-ProposedD2	147429.20	111.13	140.947		141.38	0.000257	5.26	28097.25	1348.12	0.19
Reach-1	284395	Max WS	050yr-ProposedD2	239209.40	111.13	148.297		148.94	0.000273	6.47	39469.09	1515.46	0.20
Reach-1	284395	Max WS	100yr-ProposedD2	285845.90	111.13	151.470		152.21	0.000280	6.98	44420.91	1676.80	0.21
Reach-1	284372	Max WS	010yr-ProposedD2	147429.30	111.51	140.933		141.37	0.000257	5.33	27726.37	1254.80	0.19
Reach-1	284372	Max WS	050yr-ProposedD2	239206.00	111.51	148.267		148.93	0.000291	6.58	38334.45	1485.18	0.21
Reach-1	284372	Max WS	100yr-ProposedD2	285846.10	111.51	151.436		152.21	0.000304	7.10	43118.21	1543.33	0.21
Reach-1	284267	Max WS	010yr-ProposedD2	147425.40	108.23	140.838		141.34	0.000282	5.71	26135.50	1133.02	0.20
Reach-1	284267	Max WS	050yr-ProposedD2	239206.20	108.23	148.111		148.90	0.000320	7.17	35658.01	1471.37	0.22
Reach-1	284267	Max WS	100yr-ProposedD2	285841.90	108.23	151.252		152.18	0.000334	7.79	40171.30	1511.57	0.23
Reach-1	284060	Max WS	010yr-ProposedD2	147423.90	108.45	140.702		141.28	0.000304	6.12	24507.64	1159.90	0.21
Reach-1	284060	Max WS	050yr-ProposedD2	239196.40	108.45	147.931		148.85	0.000354	7.74	34507.45	1444.35	0.23
Reach-1	284060	Max WS	100yr-ProposedD2	285845.00	108.45	151.053		152.13	0.000372	8.41	38968.07	1469.17	0.24
Reach-1	283820	Max WS	010yr-ProposedD2	147414.90	107.22	140.549		141.20	0.000430	6.46	22932.07	1126.85	0.21
Reach-1	283820	Max WS	050yr-ProposedD2	239196.00	107.22	147.744		148.76	0.000514	8.18	32840.24	1607.18	0.24
Reach-1	283820	Max WS	100yr-ProposedD2	285844.10	107.22	150.870		152.04	0.000538	8.85	37578.12	1664.83	0.25
Reach-1	283636	Max WS	010yr-ProposedD2	147415.70	105.24	140.479		141.13	0.000321	6.46	22928.57	1312.20	0.21
Reach-1	283636	Max WS	050yr-ProposedD2	239192.80	105.24	147.675		148.68	0.000377	8.14	35856.70	1802.58	0.24
Reach-1	283636	Max WS	100yr-ProposedD2	285843.80	105.24	150.800		151.96	0.000394	8.81	41517.27	1865.53	0.25
Reach-1	283611	Max WS	010yr-ProposedD2	147413.70	105.38	140.418		141.12	0.000332	6.74	22356.08	1273.82	0.22
Reach-1	283611	Max WS	050yr-ProposedD2	239188.40	105.38	147.586		148.69	0.000400	8.55	34685.29	1806.89	0.25
Reach-1	283611	Max WS	100yr-ProposedD2	285835.30	105.38	150.702		151.98	0.000421	9.27	40610.30	1865.01	0.26
Reach-1	283601	Max WS	010yr-ProposedD2	147406.10	105.38	140.403		141.12	0.000344	6.79	22118.89	1264.73	0.22
Reach-1	283601	Max WS	050yr-ProposedD2	239188.20	105.38	147.613		148.69	0.000399	8.49	34568.13	1833.38	0.25
Reach-1	283601	Max WS	100yr-ProposedD2	285843.70	105.38	150.758		151.97	0.000412	9.11	40394.24	1868.47	0.26
Reach-1	283574	Max WS	010yr-ProposedD2	147409.20	105.18	140.334		141.11	0.000452	7.08	21097.75	1243.17	0.23
Reach-1	283574	Max WS	050yr-ProposedD2	239187.70	105.18	147.557		148.69	0.000512	8.75	33919.25	1848.62	0.26
Reach-1	283574	Max WS	100yr-ProposedD2	285833.10	105.18	150.716		151.97	0.000522	9.35	39802.77	1875.41	0.26
Reach-1	283490	Max WS	010yr-ProposedD2	147406.30	104.94	140.279		141.06	0.000709	7.10	21427.46	1509.98	0.24
Reach-1	283490	Max WS	050yr-ProposedD2	239187.30	104.94	147.578		148.63	0.000742	8.51	37049.38	1844.90	0.25
Reach-1	283490	Max WS	100yr-ProposedD2	285836.30	104.94	150.730		151.90	0.000757	9.10	42895.28	1864.25	0.26
Reach-1	283342	Max WS	010yr-ProposedD2	147406.70	107.64	140.245		140.97	0.000488	6.84	22113.11	1496.40	0.23
Reach-1	283342	Max WS	050yr-ProposedD2	239187.30	107.64	147.590		148.51	0.000496	8.04	37833.25	1739.05	0.24
Reach-1	283342	Max WS	100yr-ProposedD2	285842.80	107.64	150.747		151.78	0.000507	8.61	43376.24	1770.49	0.24
Reach-1	283203	Max WS	010yr-ProposedD2	147407.70	106.22	140.268		140.95	0.000332	6.66	22714.64	1538.60	0.22
Reach-1	283203	Max WS	050yr-ProposedD2	239187.80	106.22	147.544		148.44	0.000349	7.94	38784.51	1679.13	0.23
Reach-1	283203	Max WS	100yr-ProposedD2	285836.90	106.22	150.686		151.71	0.000362	8.55	44120.68	1732.19	0.24
Reach-1	283179	Max WS	010yr-ProposedD2	147399.30	107.82	140.085		140.91	0.000448	7.29	20856.00	1507.46	0.25
Reach-1	283179	Max WS	050yr-ProposedD2	239189.20	107.82	147.452		148.46	0.000432	8.44	36962.81	1666.24	0.26
Reach-1	283179	Max WS	100yr-ProposedD2	285836.10	107.82	150.594		151.73	0.000441	9.04	42270.18	1710.14	0.26

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	283169	Max WS	010yr-ProposedD2	147399.60	107.38	140.081		140.90	0.000454	7.30	20806.22	1527.22	0.25
Reach-1	283169	Max WS	050yr-ProposedD2	239189.00	107.38	147.453		148.46	0.000435	8.42	36912.44	1669.41	0.26
Reach-1	283169	Max WS	100yr-ProposedD2	285836.00	107.38	150.597		151.72	0.000442	9.01	42232.02	1713.82	0.26
Reach-1	283139	Max WS	010yr-ProposedD2	147405.50	104.58	140.182		140.90	0.000362	6.82	22399.93	1543.80	0.23
Reach-1	283139	Max WS	050yr-ProposedD2	239188.50	104.58	147.498		148.43	0.000375	8.09	38308.50	1678.70	0.24
Reach-1	283139	Max WS	100yr-ProposedD2	285835.10	104.58	150.639		151.70	0.000387	8.70	43651.39	1723.10	0.25
Reach-1	283093	Max WS	010yr-ProposedD2	147396.70	104.60	140.183		140.87	0.000476	6.68	22929.51	1608.13	0.22
Reach-1	283093	Max WS	050yr-ProposedD2	239187.60	104.60	147.529		148.40	0.000480	7.83	39029.63	1724.28	0.23
Reach-1	283093	Max WS	100yr-ProposedD2	285836.90	104.60	150.685		151.66	0.000491	8.38	44523.08	1756.13	0.24
Reach-1	283052	Max WS	010yr-ProposedD2	147407.50	105.26	140.242		140.86	0.000319	6.49	28096.19	1643.56	0.21
Reach-1	283052	Max WS	050yr-ProposedD2	239185.90	105.26	147.503		148.39	0.000355	7.95	40406.89	1748.16	0.23
Reach-1	283052	Max WS	100yr-ProposedD2	285835.50	105.26	150.651		151.65	0.000367	8.55	45965.34	1783.08	0.24
Reach-1	283001	Max WS	010yr-ProposedD2	147407.80	105.29	140.312		140.84	0.000337	6.08	30806.07	1658.68	0.20
Reach-1	283001	Max WS	050yr-ProposedD2	239190.60	105.29	147.598		148.34	0.000376	7.44	43381.66	1792.25	0.22
Reach-1	283001	Max WS	100yr-ProposedD2	285835.70	105.29	150.757		151.60	0.000389	8.00	49097.55	1824.09	0.22
Reach-1	282937	Max WS	010yr-ProposedD2	147397.10	107.24	139.906		140.84	0.000608	7.80	19496.13	1600.84	0.27
Reach-1	282937	Max WS	050yr-ProposedD2	239190.00	107.24	147.477		148.35	0.000475	8.19	40287.49	1800.48	0.25
Reach-1	282937	Max WS	100yr-ProposedD2	285836.70	107.24	150.636		151.61	0.000478	8.73	45822.02	1843.95	0.25
Reach-1	282912	Max WS	010yr-ProposedD2	147397.50	108.80	140.046		140.92	0.000502	7.58	20468.07	1617.68	0.26
Reach-1	282912	Max WS	050yr-ProposedD2	239188.50	108.80	147.447		148.35	0.000422	8.23	40643.31	1862.96	0.25
Reach-1	282912	Max WS	100yr-ProposedD2	285835.70	108.80	150.605		151.61	0.000425	8.77	46485.43	1913.50	0.26
Reach-1	282902	Max WS	010yr-ProposedD2	147397.70	108.80	139.945		140.82	0.000508	7.57	20464.64	1612.30	0.26
Reach-1	282902	Max WS	050yr-ProposedD2	239190.90	108.80	147.439		148.34	0.000425	8.23	40466.94	1878.71	0.25
Reach-1	282902	Max WS	100yr-ProposedD2	285837.40	108.80	150.598		151.60	0.000426	8.76	46338.98	1926.71	0.26
Reach-1	282874	Max WS	010yr-ProposedD2	147404.20	108.58	140.157		140.82	0.000369	6.78	25316.38	1625.17	0.22
Reach-1	282874	Max WS	050yr-ProposedD2	239191.00	108.58	147.498		148.32	0.000371	7.93	42667.48	1912.09	0.23
Reach-1	282874	Max WS	100yr-ProposedD2	285837.70	108.58	150.641		151.58	0.000386	8.56	48261.62	1994.34	0.24
Reach-1	282707	Max WS	010yr-ProposedD2	147393.00	108.26	139.929		140.73	0.000446	7.22	21250.75	1618.78	0.24
Reach-1	282707	Max WS	050yr-ProposedD2	239188.40	108.26	147.358		148.26	0.000408	8.11	39795.35	1864.88	0.24
Reach-1	282707	Max WS	100yr-ProposedD2	285837.00	108.26	150.511		151.52	0.000414	8.67	45446.93	2184.92	0.25
Reach-1	282424	Max WS	010yr-ProposedD2	147397.50	108.13	139.966		140.60	0.000386	6.44	23642.37	1488.32	0.21
Reach-1	282424	Max WS	050yr-ProposedD2	239184.40	108.13	147.299		148.12	0.000395	7.59	40152.38	1727.45	0.22
Reach-1	282424	Max WS	100yr-ProposedD2	285837.60	108.13	150.448		151.37	0.000406	8.14	45614.16	1740.70	0.23
Reach-1	282071	Max WS	010yr-ProposedD2	147397.50	111.09	139.950		140.47	0.000353	5.91	28582.36	1563.68	0.20
Reach-1	282071	Max WS	050yr-ProposedD2	239180.00	111.09	147.204		147.96	0.000390	7.25	40286.44	1643.15	0.22
Reach-1	282071	Max WS	100yr-ProposedD2	285837.60	111.09	150.344		151.21	0.000403	7.81	45479.27	1664.80	0.22
Reach-1	281647	Max WS	010yr-ProposedD2	147395.60	105.74	139.888	120.13	140.34	0.000225	5.53	31337.56	1583.23	0.18
Reach-1	281647	Max WS	050yr-ProposedD2	239182.00	105.74	147.087	123.90	147.81	0.000272	7.05	41614.27	1712.98	0.21
Reach-1	281647	Max WS	100yr-ProposedD2	285834.10	105.74	150.199	125.64	151.05	0.000290	7.69	46370.62	1794.68	0.22
Reach-1	281538			Bridge									
Reach-1	281423	Max WS	010yr-ProposedD2	147394.60	105.74	139.748		140.20	0.000220	5.46	31335.64	1498.51	0.18
Reach-1	281423	Max WS	050yr-ProposedD2	239180.10	105.74	146.886		147.61	0.000269	6.99	41296.05	1643.80	0.20
Reach-1	281423	Max WS	100yr-ProposedD2	285832.40	105.74	149.960		150.82	0.000289	7.65	45634.39	1717.47	0.22
Reach-1	279961	Max WS	010yr-ProposedD2	147373.90	101.65	139.302		139.87	0.000255	6.13	28465.23	1340.31	0.19
Reach-1	279961	Max WS	050yr-ProposedD2	239157.80	101.65	146.289		147.22	0.000328	7.95	38346.32	1459.87	0.23
Reach-1	279961	Max WS	100yr-ProposedD2	285824.00	101.65	149.301		150.41	0.000357	8.72	42795.31	1504.64	0.24
Reach-1	279605	Max WS	010yr-ProposedD2	147374.20	101.65	139.214		139.78	0.000253	6.15	29450.89	1429.04	0.19
Reach-1	279605	Max WS	050yr-ProposedD2	239160.30	101.65	146.183		147.11	0.000325	7.96	40006.07	1564.21	0.23
Reach-1	279605	Max WS	100yr-ProposedD2	285824.50	101.65	149.191		150.29	0.000353	8.72	44761.06	1594.05	0.24
Reach-1	278919	Max WS	010yr-ProposedD2	147367.70	101.65	139.088		139.61	0.000239	5.92	31344.63	1594.19	0.19
Reach-1	278919	Max WS	050yr-ProposedD2	239153.30	101.65	146.033		146.88	0.000305	7.65	43202.07	1766.93	0.22
Reach-1	278919	Max WS	100yr-ProposedD2	285823.00	101.65	149.039		150.03	0.000329	8.36	48551.63	1809.62	0.23
Reach-1	277724	Max WS	010yr-ProposedD2	147344.70	100.07	138.800	115.50	139.33	0.000213	5.90	29059.61	1369.78	0.18
Reach-1	277724	Max WS	050yr-ProposedD2	239140.90	100.07	145.606	119.83	146.51	0.000293	7.81	38124.52	1756.21	0.22
Reach-1	277724	Max WS	100yr-ProposedD2	285820.60	100.07	148.547	121.80	149.64	0.000325	8.62	42182.76	1774.79	0.23
Reach-1	277625			Bridge									
Reach-1	277512	Max WS	010yr-ProposedD2	147346.90	100.07	138.620		139.16	0.000218	5.97	28410.82	1319.09	0.18
Reach-1	277512	Max WS	050yr-ProposedD2	239131.90	100.07	145.280		146.23	0.000305	7.97	37004.13	1689.61	0.22
Reach-1	277512	Max WS	100yr-ProposedD2	285808.40	100.07	148.129		149.28	0.000341	8.82	40997.18	1804.24	0.24
Reach-1	277500	Max WS	010yr-ProposedD2	147344.50	101.08	138.560	115.95	139.16	0.000246	6.26	25663.64	1165.42	0.19
Reach-1	277500	Max WS	050yr-ProposedD2	239131.80	101.08	145.180	120.51	146.24	0.000343	8.35	32834.86	1700.17	0.23
Reach-1	277500	Max WS	100yr-ProposedD2	285806.10	101.08	147.998	122.61	149.29	0.000385	9.26	35887.39	1769.42	0.25
Reach-1	277397			Bridge									

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	277287	Max WS	010yr-ProposedD2	147319.40	102.92	138.031		138.74	0.000322	6.77	22414.45	903.83	0.22
Reach-1	277287	Max WS	050yr-ProposedD2	239086.40	102.92	144.241		145.50	0.000449	9.05	28701.46	1626.61	0.26
Reach-1	277287	Max WS	100yr-ProposedD2	285750.30	102.92	146.828		148.38	0.000506	10.06	31435.46	1725.74	0.28
Reach-1	276335	Max WS	010yr-ProposedD2	147291.90	101.04	137.508		138.41	0.000384	7.63	19603.96	647.53	0.24
Reach-1	276335	Max WS	050yr-ProposedD2	239038.20	101.04	143.337		145.03	0.000578	10.46	23434.96	666.84	0.30
Reach-1	276335	Max WS	100yr-ProposedD2	285665.70	101.04	145.707		147.84	0.000674	11.76	25023.84	673.87	0.33
Reach-1	276088	Max WS	010yr-ProposedD2	147281.60	101.04	137.260		138.31	0.000432	8.25	18302.92	597.82	0.25
Reach-1	276088	Max WS	050yr-ProposedD2	239002.00	101.04	142.870		144.89	0.000673	11.43	21695.58	611.54	0.32
Reach-1	276088	Max WS	100yr-ProposedD2	285562.60	101.04	145.113		147.68	0.000795	12.90	23073.35	616.90	0.35
Reach-1	275472	Max WS	010yr-ProposedD2	147269.60	101.04	137.067		138.06	0.000420	8.11	21016.67	856.48	0.25
Reach-1	275472	Max WS	050yr-ProposedD2	239003.10	101.04	142.670		144.51	0.000639	11.10	25861.11	872.85	0.31
Reach-1	275472	Max WS	100yr-ProposedD2	285516.10	101.04	144.929		147.24	0.000747	12.46	27840.06	879.45	0.34
Reach-1	274472	Max WS	010yr-ProposedD2	147256.60	101.04	136.884		137.64	0.000357	6.98	22011.79	1010.20	0.23
Reach-1	274472	Max WS	050yr-ProposedD2	238980.60	101.04	142.474		143.84	0.000518	9.44	27645.11	1095.46	0.28
Reach-1	274472	Max WS	100yr-ProposedD2	285531.10	101.04	144.744		146.45	0.000596	10.55	29985.68	1107.77	0.30
Reach-1	273472	Max WS	010yr-ProposedD2	147236.50	99.91	136.557		137.30	0.000328	6.91	21942.79	781.55	0.22
Reach-1	273472	Max WS	050yr-ProposedD2	238944.10	99.91	141.927		143.33	0.000505	9.53	26197.81	802.46	0.28
Reach-1	273472	Max WS	100yr-ProposedD2	285405.60	99.91	144.070		145.85	0.000594	10.74	27926.57	810.34	0.30
Reach-1	272318	Max WS	010yr-ProposedD2	147188.00	99.91	135.785		136.85	0.000464	8.33	18735.01	784.12	0.26
Reach-1	272318	Max WS	050yr-ProposedD2	238876.10	99.91	140.722		142.72	0.000728	11.49	27272.14	3121.76	0.33
Reach-1	272318	Max WS	100yr-ProposedD2	285196.40	99.91	142.748		145.18	0.000838	12.77	31836.61	3193.62	0.36
Reach-1	271472	Max WS	010yr-ProposedD2	147179.00	99.91	135.698		136.51	0.000328	7.22	20706.67	1217.83	0.24
Reach-1	271472	Max WS	050yr-ProposedD2	238859.40	99.91	140.599		142.09	0.000500	9.88	30067.37	4083.93	0.30
Reach-1	271472	Max WS	100yr-ProposedD2	285160.10	99.91	142.597		144.41	0.000572	10.97	35141.74	4211.40	0.32
Reach-1	270472	Max WS	010yr-ProposedD2	147160.10	99.91	135.366		136.18	0.000326	7.26	23098.06	2529.72	0.23
Reach-1	270472	Max WS	050yr-ProposedD2	238836.80	99.91	140.170		141.58	0.000482	9.75	36089.37	3549.20	0.29
Reach-1	270472	Max WS	100yr-ProposedD2	285079.20	99.91	142.118		143.81	0.000549	10.80	41561.01	3830.24	0.31
Reach-1	269529	Max WS	010yr-ProposedD2	147141.90	100.75	135.092		135.87	0.000308	7.12	23902.35	2427.67	0.23
Reach-1	269529	Max WS	050yr-ProposedD2	238810.80	100.75	139.737		141.10	0.000463	9.60	38689.80	4454.92	0.29
Reach-1	269529	Max WS	100yr-ProposedD2	284970.20	100.75	141.634		143.25	0.000526	10.60	45279.05	4786.65	0.31
Reach-1	268320	Max WS	010yr-ProposedD2	147130.20	100.75	134.779		135.50	0.000308	6.94	29501.03	4034.90	0.23
Reach-1	268320	Max WS	050yr-ProposedD2	238772.80	100.75	139.320		140.52	0.000445	9.18	46654.06	5410.89	0.28
Reach-1	268320	Max WS	100yr-ProposedD2	284890.10	100.75	141.182		142.58	0.000497	10.06	54227.17	5525.28	0.30
Reach-1	267678	Max WS	010yr-ProposedD2	147124.10	100.75	134.680		135.29	0.000283	6.50	36886.72	4603.25	0.22
Reach-1	267678	Max WS	050yr-ProposedD2	238766.30	100.75	139.198		140.17	0.000394	8.47	56222.45	5471.77	0.26
Reach-1	267678	Max WS	100yr-ProposedD2	284885.60	100.75	141.053		142.17	0.000435	9.25	64528.61	5478.37	0.28
Reach-1	266472	Max WS	010yr-ProposedD2	147110.50	100.75	134.462		134.88	0.000227	5.73	53612.21	7843.55	0.19
Reach-1	266472	Max WS	050yr-ProposedD2	238751.10	100.75	138.883		139.55	0.000314	7.45	76763.93	9109.70	0.23
Reach-1	266472	Max WS	100yr-ProposedD2	284869.40	100.75	140.709		141.46	0.000344	8.09	86539.19	9221.11	0.25
Reach-1	265472	Max WS	010yr-ProposedD2	147102.80	100.76	134.330		134.65	0.000188	5.22	60975.20	6827.86	0.17
Reach-1	265472	Max WS	050yr-ProposedD2	238731.70	100.76	138.730		139.19	0.000246	6.59	83242.39	7375.45	0.20
Reach-1	265472	Max WS	100yr-ProposedD2	284848.50	100.76	140.545		141.07	0.000268	7.14	92660.09	7511.22	0.22
Reach-1	264426	Max WS	010yr-ProposedD2	147082.50	100.76	134.024		134.50	0.000245	5.98	51096.71	5902.00	0.20
Reach-1	264426	Max WS	050yr-ProposedD2	238721.30	100.76	138.320		139.03	0.000328	7.62	73477.94	6339.98	0.24
Reach-1	264426	Max WS	100yr-ProposedD2	284700.70	100.76	140.090		140.90	0.000363	8.30	82970.76	6428.58	0.25
Reach-1	263569	Max WS	010yr-ProposedD2	147079.80	100.76	133.818		134.28	0.000242	5.75	49273.84	7021.54	0.20
Reach-1	263569	Max WS	050yr-ProposedD2	238695.40	100.76	138.067		138.73	0.000311	7.20	75564.52	7103.31	0.23
Reach-1	263569	Max WS	100yr-ProposedD2	284672.90	100.76	139.819		140.56	0.000339	7.81	86418.59	13542.00	0.24
Reach-1	262577	Max WS	010yr-ProposedD2	147071.20	100.76	133.753		134.02	0.000162	4.61	68471.43	6716.41	0.16
Reach-1	262577	Max WS	050yr-ProposedD2	238696.90	100.76	137.963		138.37	0.000218	5.93	94394.10	8420.51	0.19
Reach-1	262577	Max WS	100yr-ProposedD2	284661.70	100.76	139.700		140.18	0.000241	6.48	105356.40	8792.22	0.20
Reach-1	261551	Max WS	010yr-ProposedD2	147064.60	97.61	133.495		133.87	0.000206	5.22	57392.20	8411.56	0.18
Reach-1	261551	Max WS	050yr-ProposedD2	238677.70	97.61	137.642		138.17	0.000265	6.56	84939.59	9668.16	0.21
Reach-1	261551	Max WS	100yr-ProposedD2	284646.20	97.61	139.352		139.95	0.000289	7.11	96319.00	10643.66	0.22
Reach-1	260635	Max WS	010yr-ProposedD2	147043.60	97.61	133.238		133.71	0.000242	5.97	55668.54	8663.70	0.20
Reach-1	260635	Max WS	050yr-ProposedD2	238667.40	97.61	137.318		137.98	0.000316	7.47	83237.05	10211.08	0.23
Reach-1	260635	Max WS	100yr-ProposedD2	284632.30	97.61	139.002		139.74	0.000346	8.08	94631.17	10651.24	0.24
Reach-1	259263	Max WS	010yr-ProposedD2	147035.70	97.61	132.916	114.27	133.35	0.000242	5.75	50292.65	11611.58	0.20
Reach-1	259263	Max WS	050yr-ProposedD2	238643.00	97.61	136.819	118.95	137.52	0.000347	7.56	67293.16	12250.86	0.24
Reach-1	259263	Max WS	100yr-ProposedD2	284592.00	97.61	138.420	121.10	139.26	0.000394	8.34	74319.13	12366.44	0.26
Reach-1	259032			Bridge									
Reach-1	258805	Max WS	010yr-ProposedD2	147036.90	98.28	132.766		133.18	0.000249	5.71	53363.28	11101.31	0.20
Reach-1	258805	Max WS	050yr-ProposedD2	238636.50	98.28	136.615		137.28	0.000354	7.48	70815.92	11506.80	0.24
Reach-1	258805	Max WS	100yr-ProposedD2	284572.70	98.28	138.198		138.99	0.000400	8.25	78027.05	11659.79	0.26
Reach-1	257368	Max WS	010yr-ProposedD2	147032.70	97.61	132.390		132.46	0.000700	2.85	83743.14	11632.18	0.10

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	257368	Max WS	050yr-ProposedD2	238622.00	97.61	136.266		136.35	0.000748	3.21	113507.90	11970.58	0.10
Reach-1	257368	Max WS	100yr-ProposedD2	284554.20	97.61	137.862		137.96	0.000775	3.38	125787.50	16456.71	0.10
Reach-1	254766	Max WS	010yr-ProposedD2	147008.80	99.27	131.486		131.67	0.000148	4.31	93477.11	13304.67	0.15
Reach-1	254766	Max WS	050yr-ProposedD2	238589.10	99.27	135.288		135.52	0.000177	5.20	130374.40	13505.33	0.17
Reach-1	254766	Max WS	100yr-ProposedD2	284480.80	99.27	136.844		137.10	0.000189	5.57	145552.30	13538.36	0.18
Reach-1	250071	Max WS	010yr-ProposedD2	146976.10	84.54	130.192		131.11	0.000583	8.25	45395.07	9221.38	0.30
Reach-1	250071	Max WS	050yr-ProposedD2	238545.80	84.54	133.974		134.96	0.000626	9.44	80188.63	9859.23	0.32
Reach-1	250071	Max WS	100yr-ProposedD2	284416.10	84.54	135.497		136.52	0.000643	9.93	94218.60	10466.64	0.33
Reach-1	248531	Max WS	010yr-ProposedD2	146950.80	84.54	129.238		130.51	0.000580	10.10	47025.89	8104.17	0.32
Reach-1	248531	Max WS	050yr-ProposedD2	238515.40	84.54	132.874		134.37	0.000719	12.09	77893.71	8922.63	0.36
Reach-1	248531	Max WS	100yr-ProposedD2	284334.60	84.54	134.362		135.90	0.000756	12.74	91127.08	9296.53	0.37
Reach-1	246078	Max WS	010yr-ProposedD2	146943.00	98.13	128.829		129.29	0.000322	6.32	47051.42	8654.22	0.23
Reach-1	246078	Max WS	050yr-ProposedD2	238495.50	98.13	132.384		132.91	0.000355	7.26	73213.32	9759.91	0.24
Reach-1	246078	Max WS	100yr-ProposedD2	284286.10	98.13	133.838		134.41	0.000368	7.65	84569.50	10275.57	0.25
Reach-1	244614	Max WS	010yr-ProposedD2	146925.20	98.13	128.191		129.00	0.000449	7.76	45493.01	8811.87	0.27
Reach-1	244614	Max WS	050yr-ProposedD2	238458.00	98.13	131.577		132.69	0.000599	9.73	70960.05	9720.40	0.32
Reach-1	244614	Max WS	100yr-ProposedD2	284215.40	98.13	132.973		134.20	0.000652	10.48	81662.14	9879.45	0.33
Reach-1	242472	Max WS	010yr-ProposedD2	146847.30	94.20	126.808		126.97	0.001465	3.97	49999.21	9572.70	0.14
Reach-1	242472	Max WS	050yr-ProposedD2	238407.00	94.20	130.469		130.64	0.001163	3.86	75533.43	10980.13	0.12
Reach-1	242472	Max WS	100yr-ProposedD2	284089.80	94.20	131.938		132.12	0.001074	3.83	86331.13	11515.22	0.12
Reach-1	241833	Max WS	010yr-ProposedD2	146790.50	93.70	126.015		126.72	0.000407	7.48	52566.25	9546.80	0.26
Reach-1	241833	Max WS	050yr-ProposedD2	238347.10	93.70	129.678		130.59	0.000514	9.17	80769.97	11403.21	0.30
Reach-1	241833	Max WS	100yr-ProposedD2	283973.60	93.70	131.143		132.14	0.000555	9.83	93239.11	11750.53	0.31
Reach-1	240531	Max WS	010yr-ProposedD2	146760.90	93.60	125.797		126.20	0.000268	5.96	76838.35	9951.36	0.21
Reach-1	240531	Max WS	050yr-ProposedD2	238323.20	93.60	129.422		129.92	0.000325	7.15	112790.40	24494.30	0.23
Reach-1	240531	Max WS	100yr-ProposedD2	283922.70	93.60	130.868		131.40	0.000350	7.67	127149.50	24652.89	0.24
Reach-1	235176	Max WS	010yr-ProposedD2	146666.20	92.80	124.905		125.67	0.000405	7.76	56945.58	9949.48	0.26
Reach-1	235176	Max WS	050yr-ProposedD2	238255.90	92.80	128.482		129.38	0.000492	9.25	93623.69	10671.59	0.29
Reach-1	235176	Max WS	100yr-ProposedD2	283767.60	92.80	129.903		130.85	0.000523	9.82	109015.60	23827.55	0.30
Reach-1	232472	Max WS	010yr-ProposedD2	146572.00	91.70	124.206		124.79	0.000309	6.78	63469.26	22623.85	0.23
Reach-1	232472	Max WS	050yr-ProposedD2	238165.10	91.70	127.616		128.35	0.000392	8.25	98795.27	23089.54	0.26
Reach-1	232472	Max WS	100yr-ProposedD2	283653.60	91.70	128.968		129.76	0.000427	8.85	112897.10	23128.65	0.27
Reach-1	231472	Max WS	010yr-ProposedD2	146512.50	91.70	123.683		124.53	0.000516	7.97	48221.88	22378.70	0.29
Reach-1	231472	Max WS	050yr-ProposedD2	238106.40	91.70	126.998		128.02	0.000627	9.57	80727.70	22666.15	0.32
Reach-1	231472	Max WS	100yr-ProposedD2	283564.80	91.70	128.312		129.40	0.000668	10.19	93749.85	22712.27	0.33
Reach-1	230472	Max WS	010yr-ProposedD2	146434.80	91.60	123.115		124.06	0.000540	8.38	45832.69	20661.90	0.29
Reach-1	230472	Max WS	050yr-ProposedD2	238037.30	91.60	126.293		127.47	0.000684	10.20	76995.58	22383.29	0.33
Reach-1	230472	Max WS	100yr-ProposedD2	283463.30	91.60	127.558		128.82	0.000736	10.89	89420.69	22464.31	0.35
Reach-1	229472	Max WS	010yr-ProposedD2	146404.80	89.34	122.810		123.42	0.000349	6.90	51205.07	20783.54	0.23
Reach-1	229472	Max WS	050yr-ProposedD2	237992.60	89.34	125.902		126.61	0.000425	8.19	83647.25	22014.37	0.26
Reach-1	229472	Max WS	100yr-ProposedD2	283416.00	89.34	127.141		127.87	0.000450	8.66	96687.50	22198.49	0.27
Reach-1	228472	Max WS	010yr-ProposedD2	146377.90	90.08	122.560		123.10	0.000303	6.64	59467.36	19532.06	0.22
Reach-1	228472	Max WS	050yr-ProposedD2	237963.80	90.08	125.600		126.21	0.000371	7.86	94975.97	23245.78	0.25
Reach-1	228472	Max WS	100yr-ProposedD2	283381.10	90.08	126.821		127.46	0.000394	8.32	109246.90	23497.86	0.26
Reach-1	227472	Max WS	010yr-ProposedD2	146343.30	90.79	122.155		122.83	0.000390	7.45	56976.79	21484.16	0.25
Reach-1	227472	Max WS	050yr-ProposedD2	237931.20	90.79	125.164		125.86	0.000444	8.49	96225.02	24386.51	0.27
Reach-1	227472	Max WS	100yr-ProposedD2	283325.60	90.79	126.374		127.06	0.000460	8.87	112200.90	24515.88	0.27
Reach-1	226472	Max WS	010yr-ProposedD2	146315.90	91.17	121.834		122.41	0.000353	6.96	64267.22	20649.90	0.24
Reach-1	226472	Max WS	050yr-ProposedD2	237895.50	91.17	124.793		125.38	0.000398	7.93	106354.30	24783.48	0.26
Reach-1	226472	Max WS	100yr-ProposedD2	283290.70	91.17	125.989		126.58	0.000411	8.27	123509.00	24876.49	0.26
Reach-1	225472	Max WS	010yr-ProposedD2	146299.10	89.79	121.540		122.06	0.000324	6.85	72556.38	23178.75	0.23
Reach-1	225472	Max WS	050yr-ProposedD2	237872.80	89.79	124.433		125.00	0.000388	8.01	114393.10	23483.93	0.26
Reach-1	225472	Max WS	100yr-ProposedD2	283260.40	89.79	125.607		126.19	0.000410	8.45	131598.70	23607.86	0.26
Reach-1	224472	Max WS	010yr-ProposedD2	146266.20	90.65	121.080		121.85	0.000489	7.80	60382.95	24053.47	0.28
Reach-1	224472	Max WS	050yr-ProposedD2	237844.80	90.65	123.943		124.74	0.000553	8.93	108070.90	25289.26	0.30
Reach-1	224472	Max WS	100yr-ProposedD2	283229.80	90.65	125.111		125.90	0.000566	9.29	127691.80	25312.95	0.31
Reach-1	223472	Max WS	010yr-ProposedD2	146238.70	91.51	120.629		121.31	0.000632	7.71	67204.45	21375.91	0.30
Reach-1	223472	Max WS	050yr-ProposedD2	237820.10	91.51	123.525		124.09	0.000582	8.09	118050.40	25708.02	0.30
Reach-1	223472	Max WS	100yr-ProposedD2	283206.70	91.51	124.701		125.23	0.000566	8.25	138759.20	25794.03	0.30
Reach-1	222472	Max WS	010yr-ProposedD2	146227.20	90.62	120.243		120.66	0.000361	5.91	76158.17	21541.10	0.23
Reach-1	222472	Max WS	050yr-ProposedD2	237800.40	90.62	123.098		123.54	0.000396	6.77	127897.70	23333.19	0.25
Reach-1	222472	Max WS	100yr-ProposedD2	283183.40	90.62	124.265		124.72	0.000406	7.09	149088.80	24059.21	0.26
Reach-1	220272	Max WS	010yr-ProposedD2	146205.80	93.07	119.811		120.18	0.000428	5.53	73950.73	25550.86	0.25
Reach-1	220272	Max WS	050yr-ProposedD2	237783.30	93.07	122.715		123.06	0.000417	5.99	129736.50	27277.00	0.24
Reach-1	220272	Max WS	100yr-ProposedD2	283172.90	93.07	123.892		124.23	0.000414	6.18	152394.70	27395.77	0.24

HEC-RAS River: Congaree River Reach: Reach-1 Profile: Max WS (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	217472	Max WS	010yr-ProposedD2	146193.80	91.92	118.856		119.15	0.000447	6.10	99399.62	23068.22	0.25
Reach-1	217472	Max WS	050yr-ProposedD2	237774.50	91.92	121.830		122.08	0.000407	6.42	153134.90	25855.44	0.24
Reach-1	217472	Max WS	100yr-ProposedD2	283156.70	91.92	123.014		123.26	0.000405	6.63	174644.70	26117.52	0.25
Reach-1	216472	Max WS	010yr-ProposedD2	146192.40	91.48	118.365	107.27	118.80	0.000400	6.45	86862.89	25811.07	0.25
Reach-1	216472	Max WS	050yr-ProposedD2	237772.20	91.48	121.364	115.98	121.76	0.000400	7.02	145766.00	27383.30	0.25
Reach-1	216472	Max WS	100yr-ProposedD2	283153.70	91.48	122.551	117.03	122.94	0.000400	7.25	169405.90	27458.83	0.25

ENGINEERING "NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified engineer licensed to practice in the State of South Carolina.

It is to further certify that the attached technical data supports the fact that proposed Congaree River Remediation Project will *(Name of Development)* not impact the 100-year flood elevations, floodway elevations and floodway widths on Congaree River at published sections *(Name of Stream)* in the Flood Insurance Study for Richland County, *(Name of Community)* dated December 21, 2017 and will not impact the 100-year flood elevations, floodway elevations, and floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

Congaree River Remediation Project Hydraulic Analysis Memo, April 12, 2019

(Date) 4/12/2019

(Signature) John P. Osterle (Title) Project Manager

WSP USA

11 Stanwix, Suite 950

Pittsburgh, PA 15222

(Address)

(Seal)

ENGINEERING "NO-RISE" CERTIFICATION

This is to certify that I am a duly qualified engineer licensed to practice in the State of South Carolina.

It is to further certify that the attached technical data supports the fact that proposed Congaree River Remediation Project (Name of Development) will not impact the 100-year flood elevations, floodway elevations and floodway widths on Congaree River (Name of Stream) at published sections in the Flood Insurance Study for Lexington County (Name of Community), dated July 5, 2018 and will not impact the 100-year flood elevations, floodway elevations, and floodway widths at unpublished cross-sections in the vicinity of the proposed development.

Attached are the following documents that support my findings:

Congaree River Remediation Project Hydraulic Analysis Memo, April 2019

(Date) 8/13/2019

(Signature) John P. Osterle (Title) Project Manager

WSP USA

11 Stanwix, Suite 950

Pittsburgh, PA 15222

(Address)

(Seal)