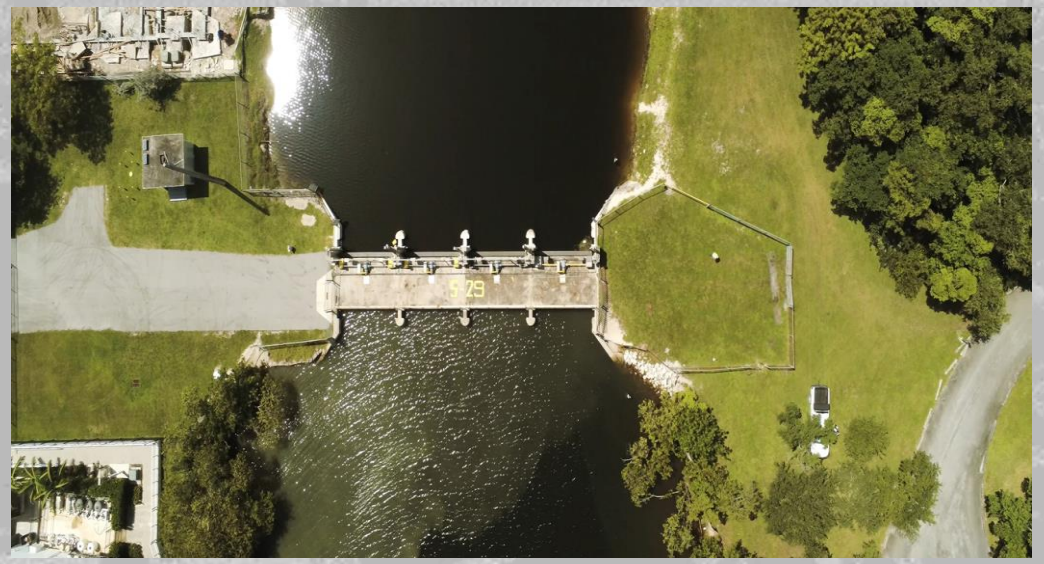
CENTRAL AND SOUTHERN FLORIDA (C&SF) FLOOD RESILIENCY STUDY



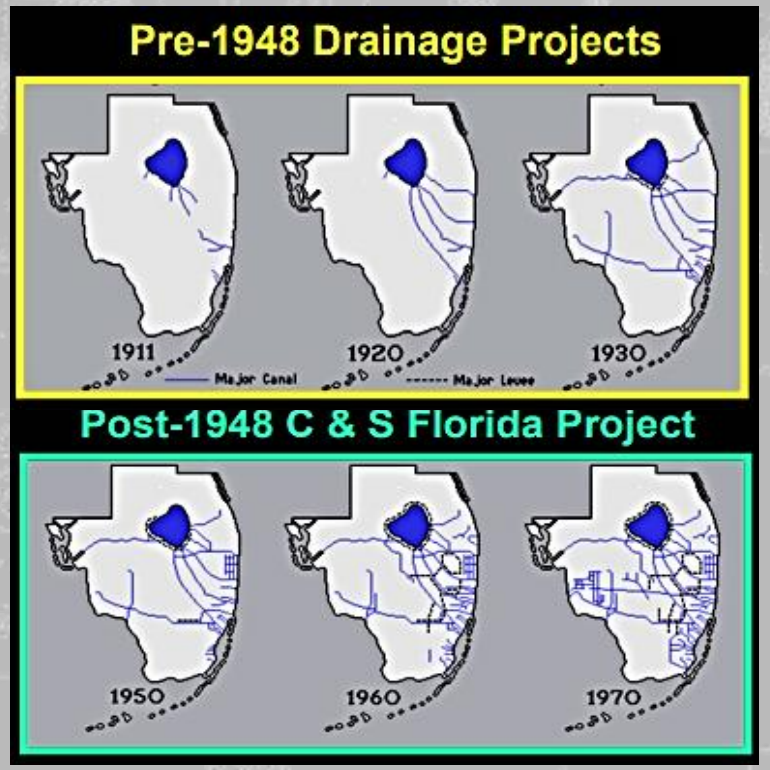
H&H MODEL OUTPUT

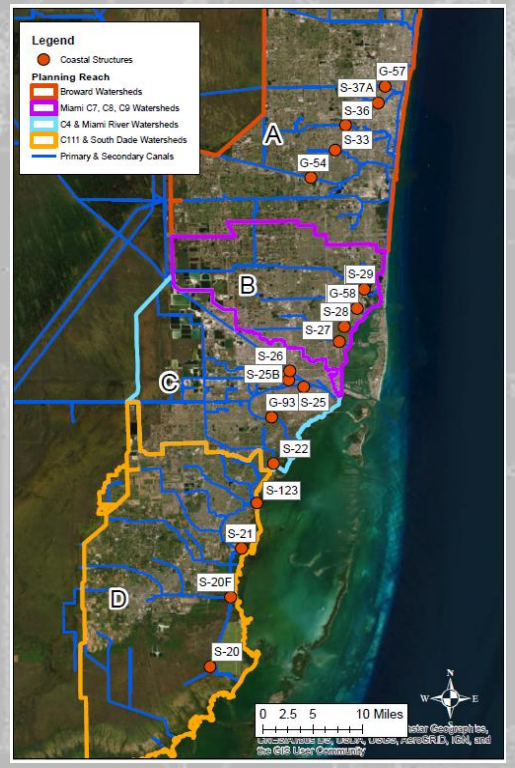
Public Meeting

12 April 2024

Virtual Meeting

Working Today to Build a Better Tomorrow





U.S.ARMY

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

HOUSEKEEPING ITEMS

- This meeting is being **recorded and livestreamed**.
- There will be **opportunities for questions** throughout today's discussion.
  - Please use the **Q&A function** to submit questions during a presentation.
  - During the Q&A period, please use the '**raise hand**' function at the bottom of your screen and we call on you to unmute.
- You are welcome to **submit follow up questions and additional comments** after the webinar by via email to CSFFRSComments@usace.army.mil.
- Federal Advisory Committee Act (FACA, see slide 5 of this presentation)
- Recommend workshop attendance per reach
  - **Model Set Up (figures and tables explanations)**
  - Reach A – start at 11:40 AM (30 mins of presentation, 15 mins of discussion, ~5 min break)
  - Break for Lunch 12:30 PM
  - Reach B – start at 1:00 PM
  - Reach C – start at 1:50 PM
  - Reach D – start at 2:40 PM
  - Public comments – 3:30 PM
  - Overview and Next steps – 3:45 PM
  - Adjourn – 4:00 PM

Moderator: Jennifer Smith

1. OPENING REMARKS

Presenter: Ana Carolina Coelho Maran, Ph.D., P.E., Chief of District Resiliency, SFWMD, and Jason Engle, P.E., Chief, Water Resources Engineering Branch, USACE

2. WORKSHOP GOALS AND PROJECT OVERVIEW

Presenter: Tim Gysan, Senior Resilience Project Manager, USACE

STATEMENT OF INTENT

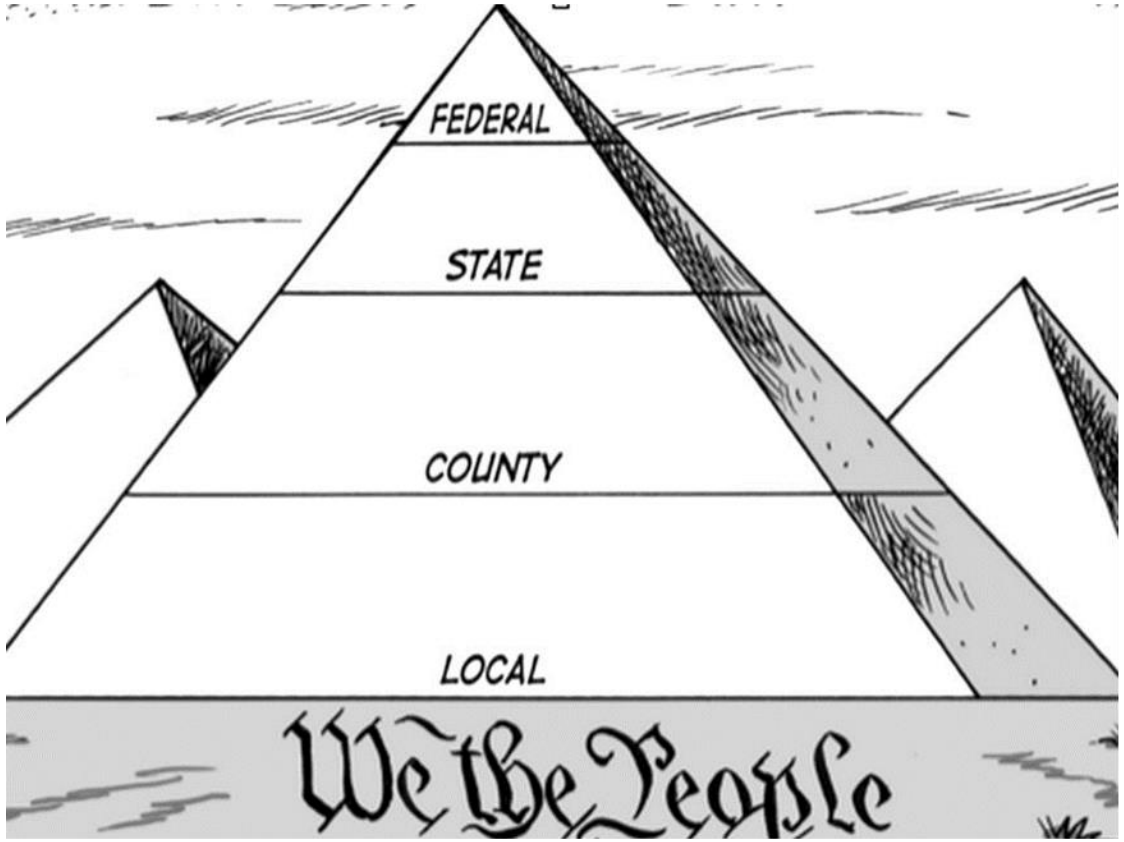
The intent of this forum is to allow federal, state and local agencies, and tribal governments to exchange views, information or advice relating to the Central and Southern Florida (C&SF) Flood Resiliency Study.

This meeting is not a forum for official policy discussion or formulation.
The PDT performs technical staff functions. Members are encouraged to participate and share their technical skills and knowledge.

Comments from the public will be accepted at a designated time that is separate from the interagency discussions.

BUILDING COMMUNITY RESILIENCE

A COMPREHENSIVE AND COLLABORATIVE APPROACH



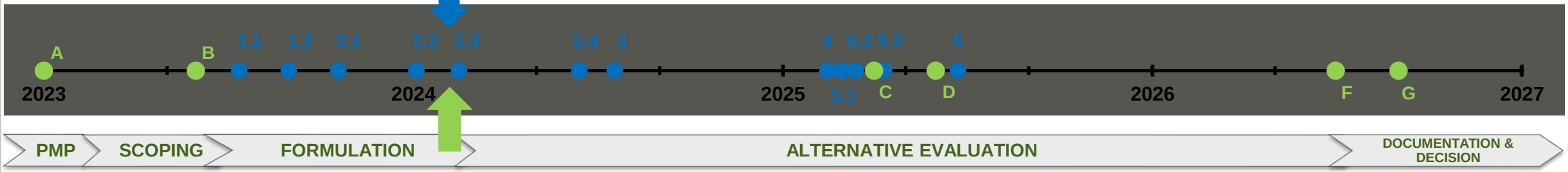
Water Resource infrastructure is the connector

C&SF FLOOD RESILIENCY STUDY & C-7 FLOOD PROTECTION LEVEL OF SERVICE (FPLOS) PHASE II STUDY

C-7 FPLOS Phase II Study

- **Basinwide Assessment** – include primary and secondary system flood protection infrastructure
- **Broader selection of mitigation and adaptation alternatives**, addressing compound flood drivers and including inland storage
- Performance Metrics: level of service assessment (canal, structure discharges and levels, overland extent/duration), and flood damage BCA

Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Alternative Mitigation Plans & Project Workplan 1.1 Workshop 1.2 Project Workplan	**H&H Evaluation for Mitigation Projects** 2.1 Model Tool, Model Development, Cal/Val 2.2 Model set-up & Base Conditions 2.3 FWOP Model set-up 2.4 FWP Model set-up	**Cost Estimates and Expected Annual Damages** 3. Mitigation and Adaptation Alternatives Cost estimates & Flood Damage Assessment	**Tentatively Selected Plan & Projects Sequencing** 4. TSP Project Selection & Sequence H&H Workplan & Modeling results Report & Models	**Dynamic Adaptation Pathway Planning (DAPP) and Associated Impacts** 5.1 DAPP results & Workshop 5.2 WQ Report 5.3 Cascading Impact Assessment Coordination	**Final Report**



Milestone A	Milestone B	Milestone C	Milestone D	Milestone E	Milestone F	Milestone G
Scoping Meetings	Alternatives Milestone Meeting (AMM)	Tentatively Selected Plan (TSP)	Draft Integrated Report Release	Agency Decision Milestone (TBC)	Final Integrated Report Release	Chief's Report

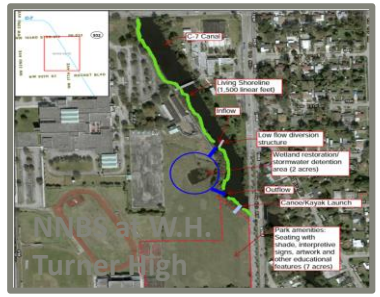
C&SF Flood Resiliency Study (Section 216)

- Focus on **highly vulnerable infrastructure** along primary C&SF system (coastal structure and canal enhancement)
- Mitigation and adaptation alternatives within **Flood Risk Management authority** (mostly rainfall driven)
- Performance Metrics: National & Regional Economic Development (NED, RED), Environmental Quality (EQ), Other Social Effects (OSE)

C&SF FLOOD RESILIENCY STUDY & C-7 FPLOS PHASE STUDY

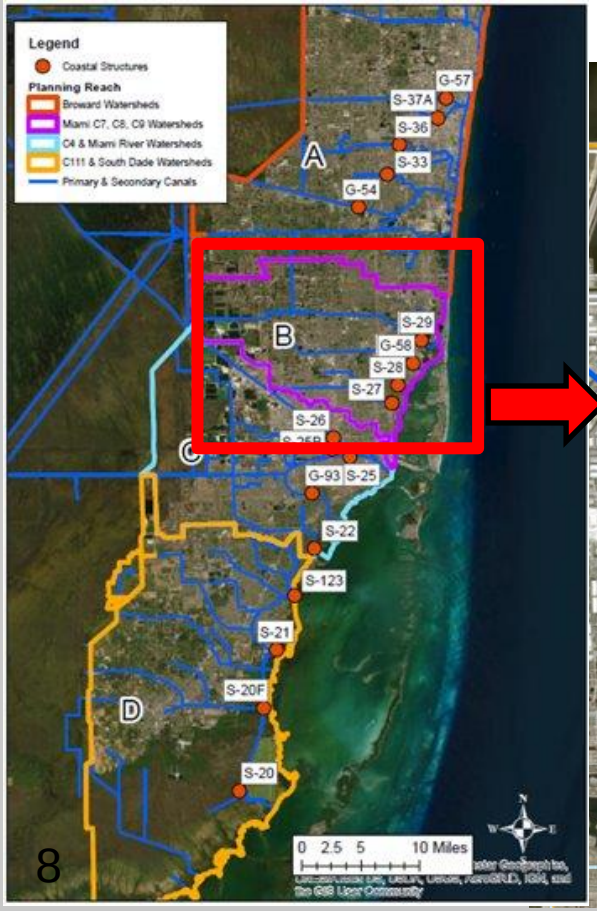
C&SF Resilience Study

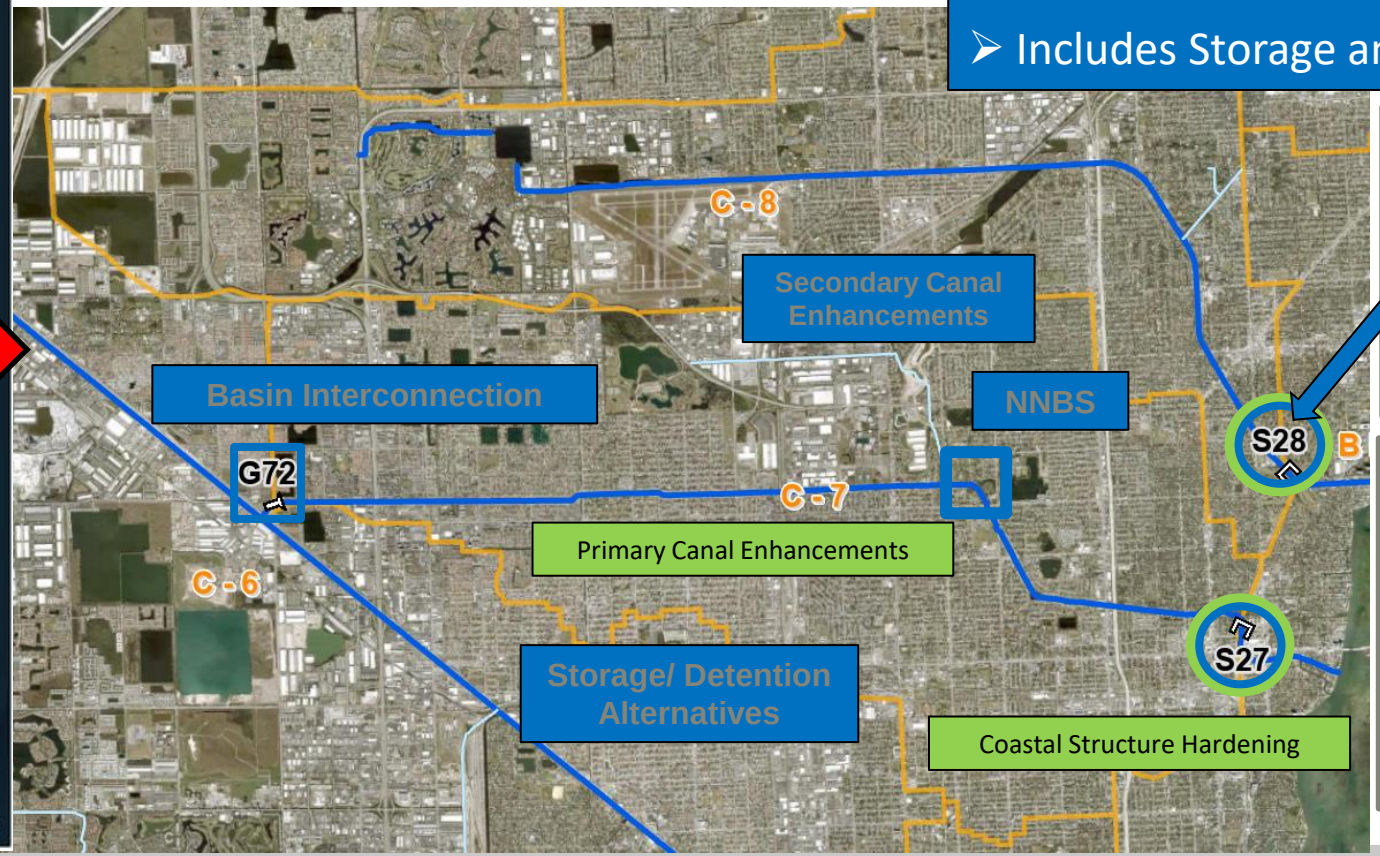
- Primary Canals
- Primary Structures

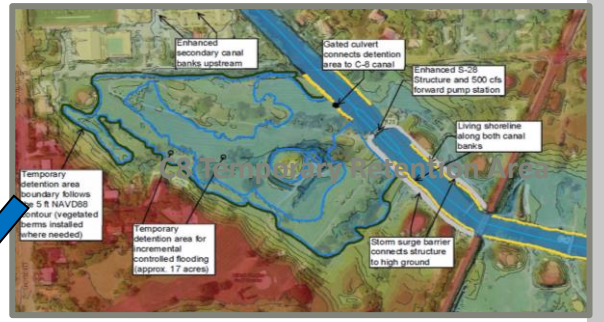


C7 Adaptation and Mitigation Study (2023 –2025)

- Develop comprehensive basin-wide strategies
- Includes projects from regional and local level
- Includes GI / Natural/Nature Based Solutions
- Includes Storage and Conveyance





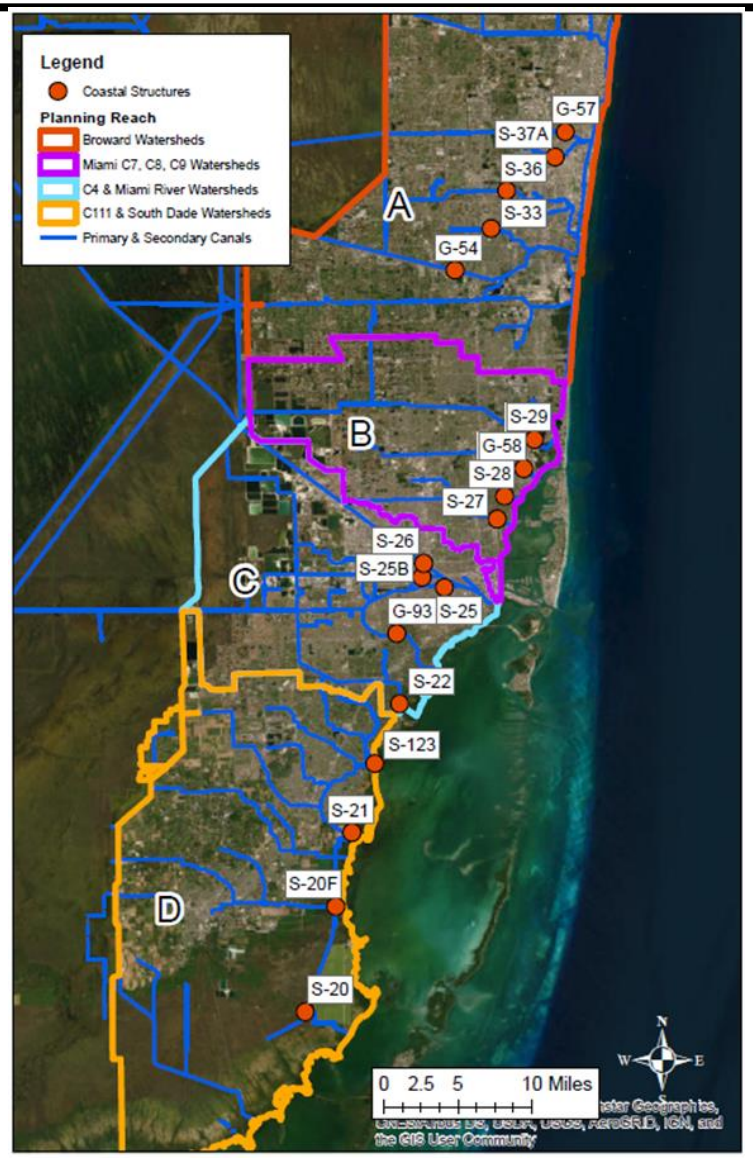


AGENDA

- Project Overview and Meeting Purpose
- H&H Data Use in Economic Analysis
- Model Assumptions and Brief Overview

- Review of MIKE SHE/Hydro Model Output
  - Reach A: Broward and Hillsboro Basins
    - G-57, S-37A, S-36, S-33 and G-54
  - Reach B: Little River and Nearby Basins
    - S-29, G-58, S-28 and S-27
  - Reach C: Miami River and Nearby Basins
    - S-26, S-25B, G-93, S-25 and S-22
  - Reach D: South Miami Basins
    - S-123, S-21, S-20F and S-20

- Public Comment
- Overview and Next Steps

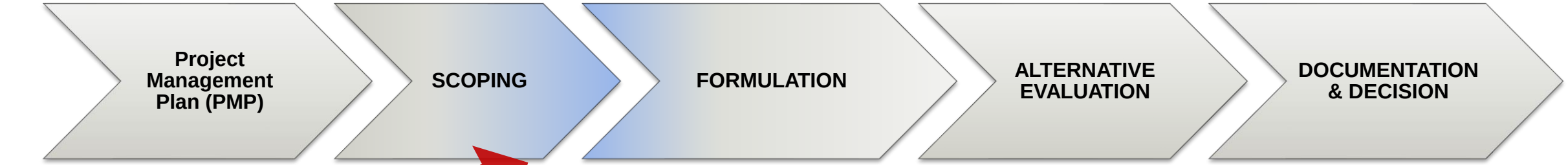


WORKSHOP GOAL

- Present how H&H Modeling Output will be utilized to evaluate Performance Metrics (NED, RED, EQ and OSE)
- Present H&H Modeling Assumptions and Approach
- Present H&H Modeling Example Output and Preliminary Results

C&SF FLOOD RESILIENCY STUDY

SCHEDULE AND NEXT STEPS



September 2022

WE ARE HERE

September 2026

MILESTONE	DATE
Scoping Meetings	✓ January 2023
Alternatives Milestone Meeting (AMM)	✓ June 2023
Tentatively Selected Plan (TSP)	April 2025
Draft Integrated Report Release	June 2025
Agency Decision Milestone (ADM)	
Final Integrated Report Release	July 2026
Chief's Report	September 2026

90 DAY LOOK AHEAD

April 2024
- Model Development completed
- Base condition and Future Without Project (FWOP) modeling
- Continue compilation of Performance Evaluation tools
- Hydrologic & Hydraulic Model Meeting

May 2024
- Economic Damages modeling for Future Without Project (FWOP) completed
- Performance metrics priorities

June 2024
- Identify study priorities

3. H&H DATA USE IN ECONOMIC ANALYSIS

Presenter: Colin Rawls, Chief of Socioeconomics, USACE

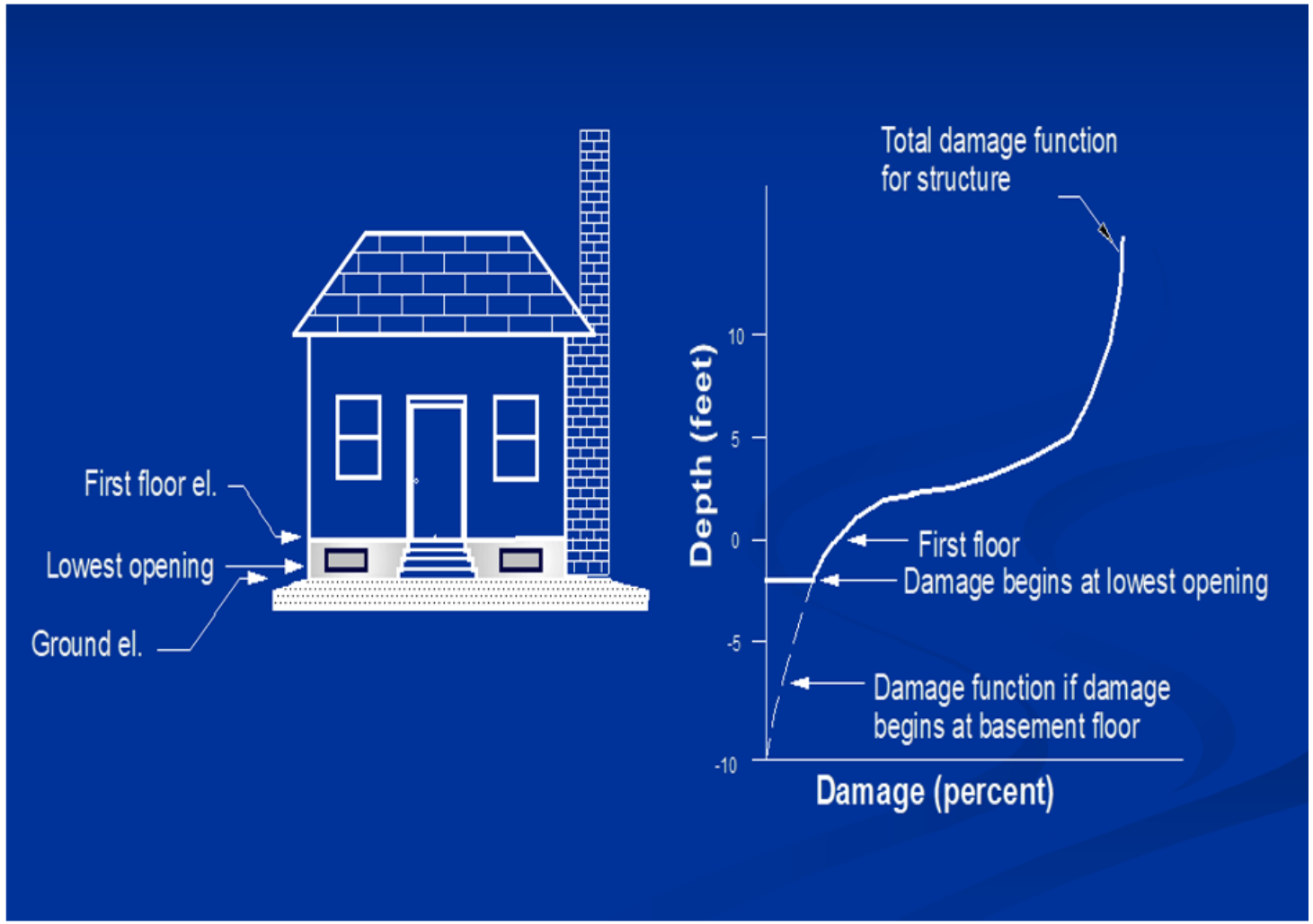
FLOOD RISK MANAGEMENT- ECONOMIC ANALYSIS

- Helps answer the question “which proposed flood damage reduction plan is the best from an economic standpoint?”
  - Evaluate the existing condition
  - Evaluate the future without project condition
  - Analyze alternative damage reduction plans
- Compare plans using expected annual flood damage and flood damage reduction benefits

EXISTING AND FUTURE WITHOUT PROJECT DAMAGES

Broadly Defined Steps

1. Delineate Affected Area
2. Determine Floodplain Characteristics
   - Identify damage reaches
   - Inventory Occupancy Types: Residential, Commercial, Industrial, Public, Others
   - Estimate first floor elevations – with uncertainty
3. Estimate structure/content values
4. Apply depth-damage curves
5. Estimate Damages ($)

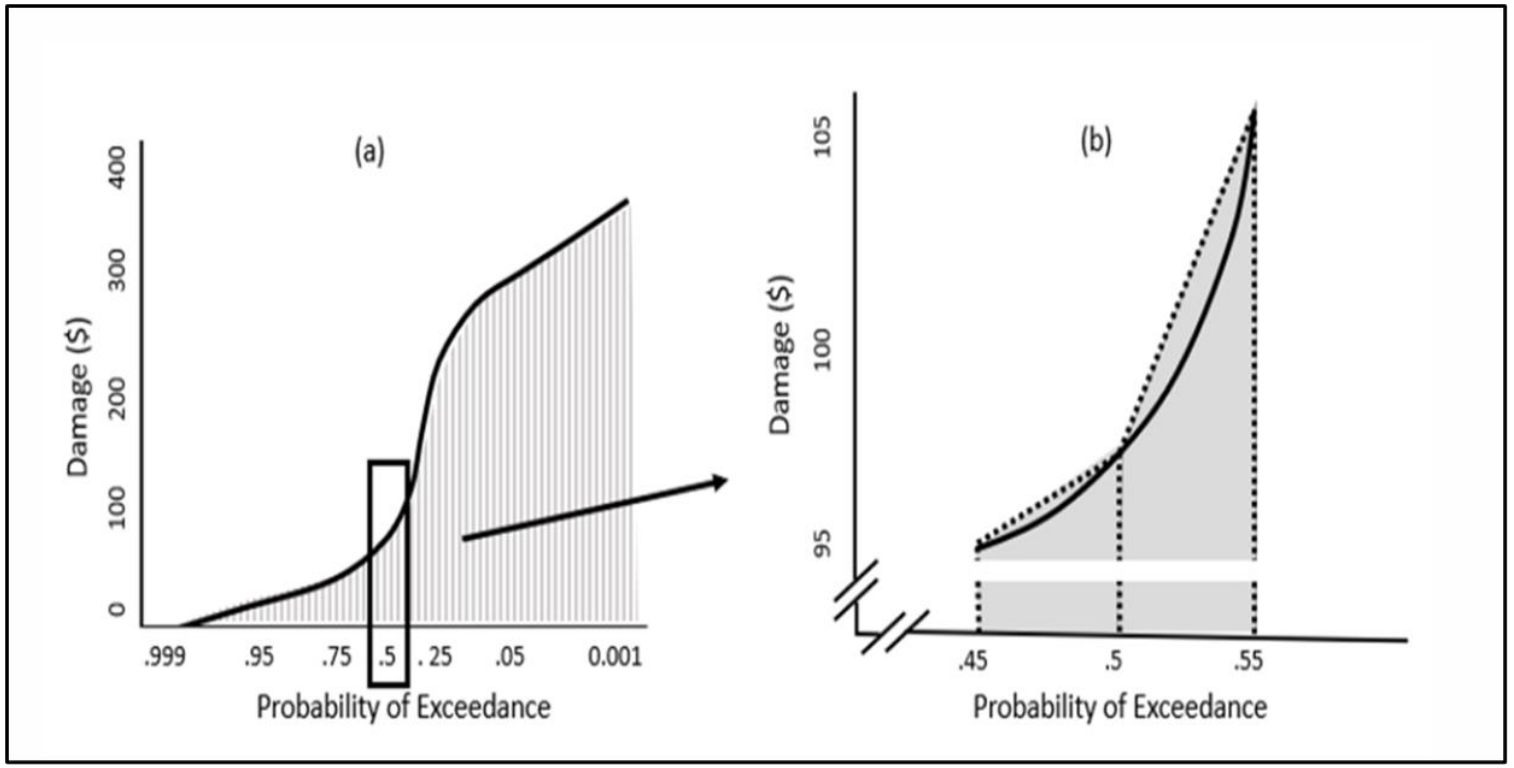


Conceptual layout of depth-relationship for a residential structure

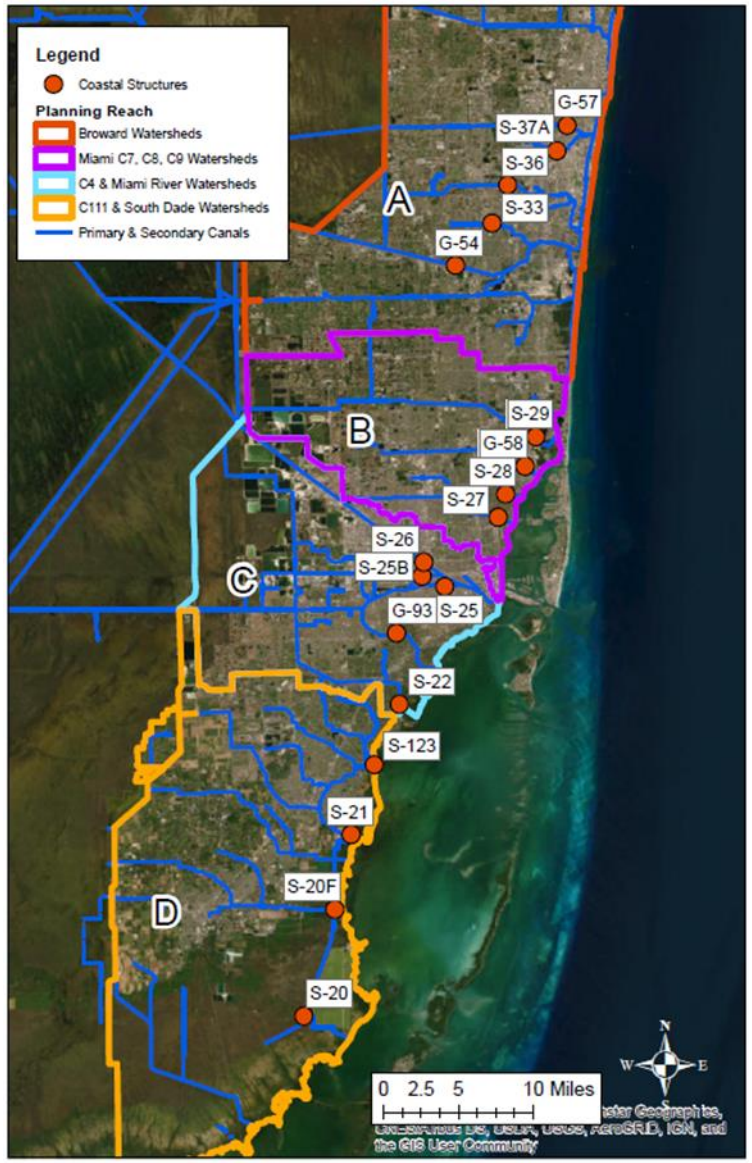
THE ECONOMIC MODEL: HEC-FDA

Hydrologic Engineering Center's Flood Damage Analysis software (HEC-FDA)

- Developed by USACE Hydrologic Engineering Center, Institute for Water Resources
- Integrates hydrology/hydraulics/economics in a single model.
- Incorporates risk analysis and uncertainty
- On 216 Study will incorporate flood stage data for **eight distinct probably events** from MIKE-SHE outputs to estimate ***Expected Annual Damage*** **(EAD)**



MODELING THE 216 STUDY IN HEC-FDA



Structure Inventory Summary	Reach A	Reach B	Reach C	Reach D	
Agriculture, structure only	874	206	996	7,211	
Retail, structure only	4,562	2,763	3,238	1,514	
Prof/Tech Services	4,802	2,630	2,735	898	
Other Commercial	4,152	1,940	2,080	1,074	
Hospital	146	106	80	15	
Education	3,213	1,575	1,141	786	
Government Services	1,186	1,534	2,006	1,921	
Industrial	6741	3,442	4,843	1,116	
Religious	1,486	942	634	407	
Residential	383,785	208,194	190,204	132,136	
Utility	142	72	56	36	**Total Inventory**
Total	**411,089**	**223,404**	**208,013**	**147,114**	**989,620**

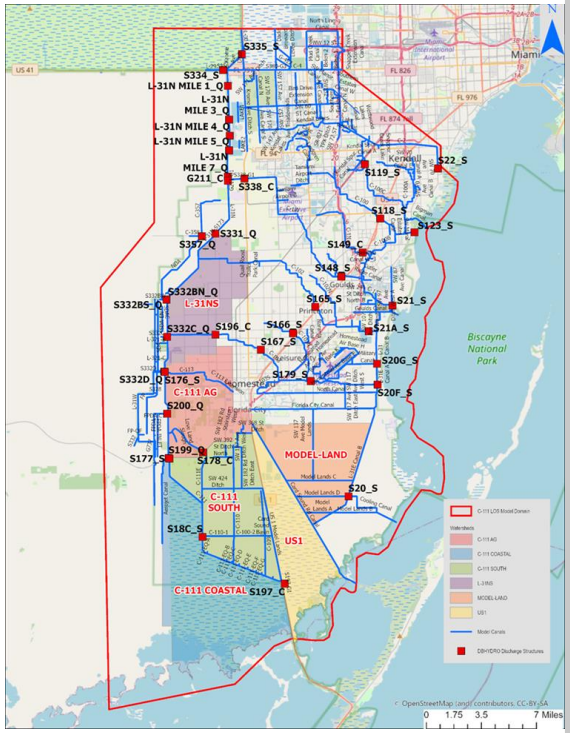
4. MODEL ASSUMPTIONS, BRIEF OVERVIEW OF METHODOLOGY

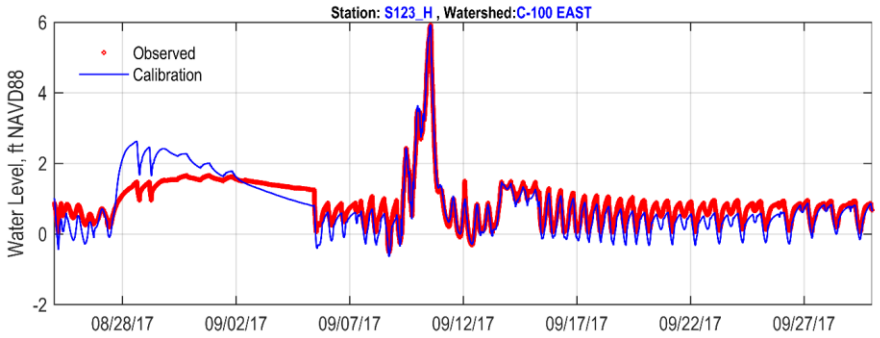
Presenter: Amanda Bredesen, P.E., H&H Model Subteam Lead, USACE

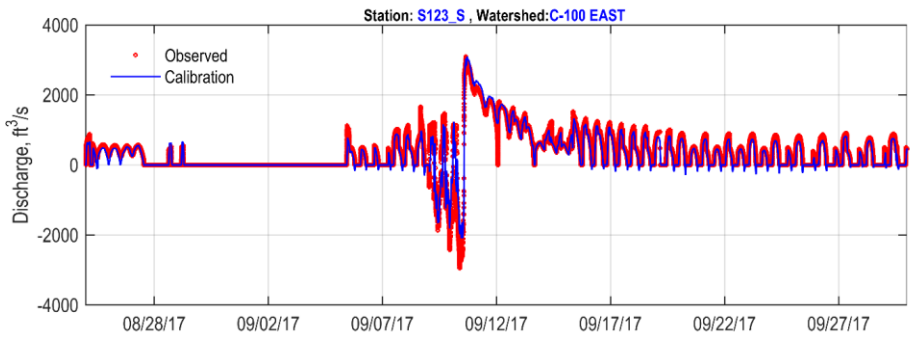
HYDROLOGIC & HYDRAULIC MODELING TOOL

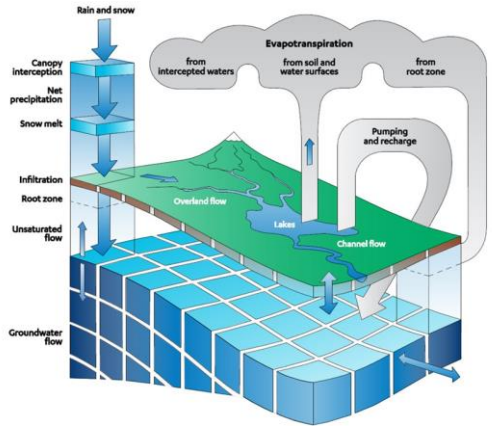
The integrated/coupled surface-groundwater model MIKE SHE/MIKE Hydro (2022) will be used to simulate the hydraulics and hydrology for the project area.

- Capability of conducting sub-regional scale simulations
- Simulate surface water and groundwater interactions
  - Allows for the accounting of rising water tables and reduced soil storage
- Able to simulate the effects of different boundary conditions such as tidal and storm surge-influenced tailwater conditions with current and future sea-level rise scenarios
- Comprehensive operational flexibility, can simulate structure gate operating rules and can use calibrated flow parameters for canal structures

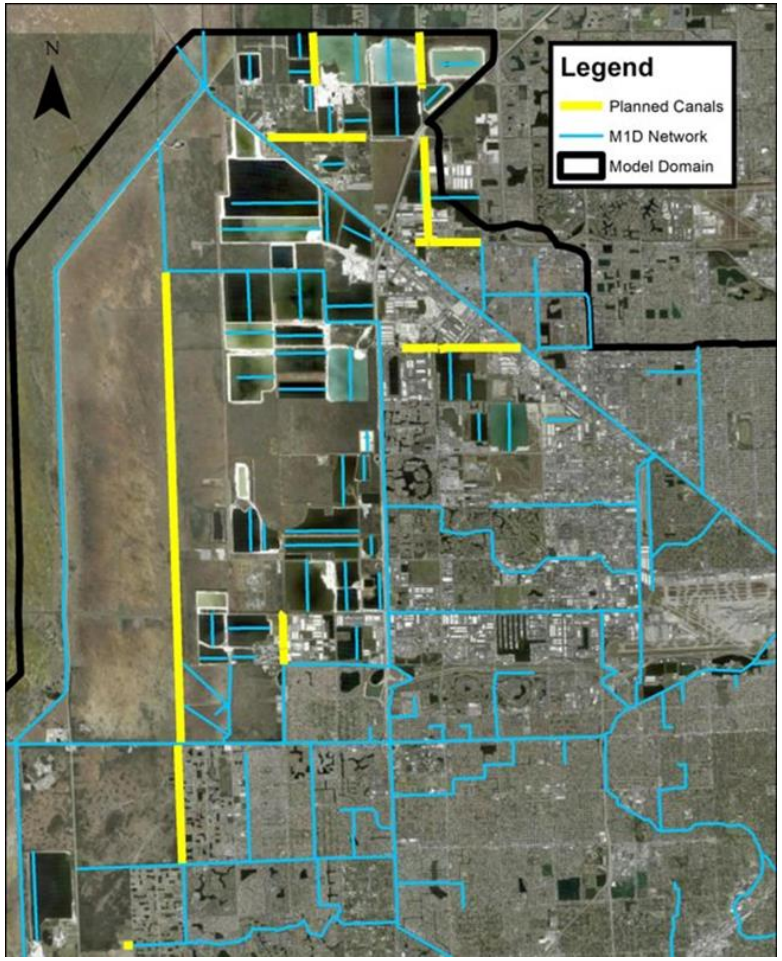








H&H MODEL ADAPTATION



- Models were expanded to include the downstream tidal reaches to the intracoastal/bay
- Future land use was updated with changes to parameterization in the model including topography, where appropriate, to the scale of the model
- The focus of this study is on the primary system with a high level of detail placed on the secondary/tertiary canal systems; new canals and proposed extensions from Miami Dade County were included. Broward County Resiliency model additional canal network was also included

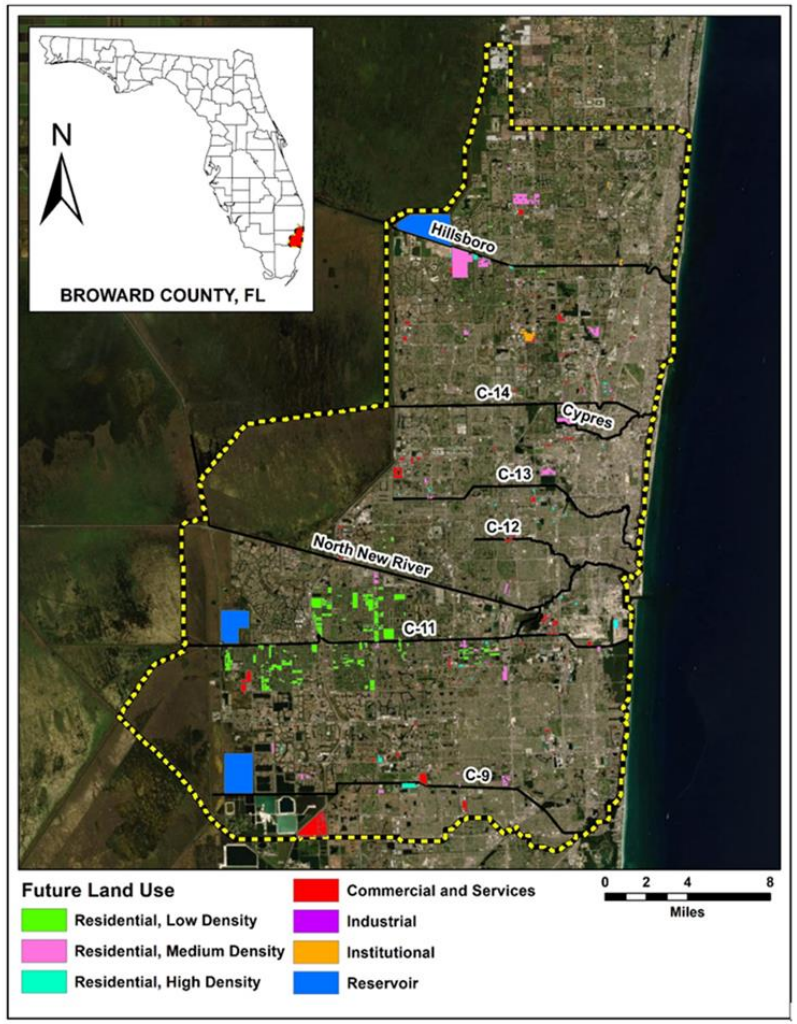


Figure 2.2-1: Areas of Future Land Use Change

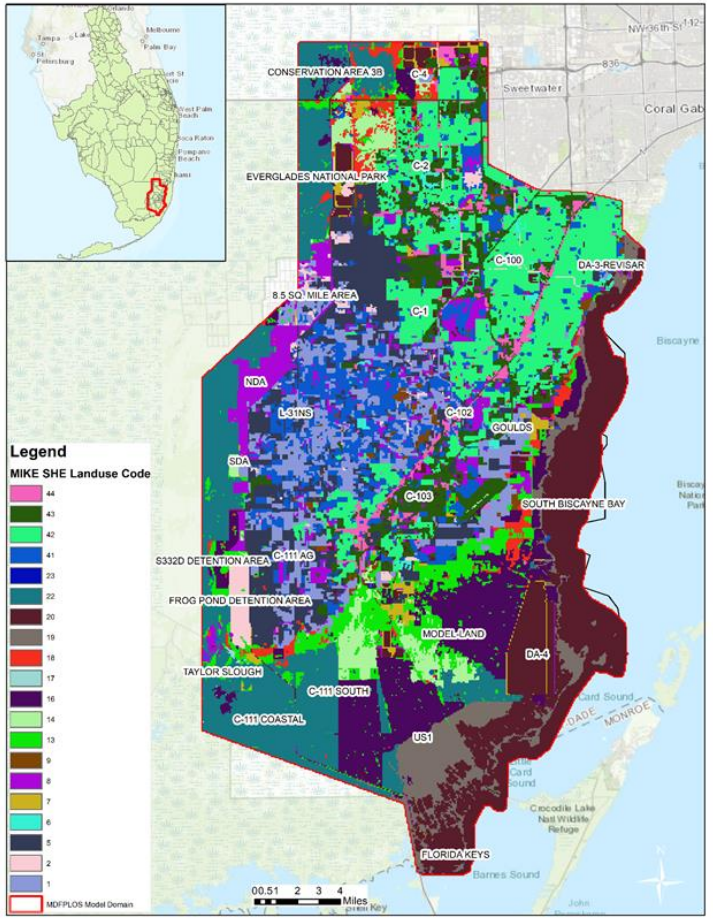
LAND USE AND LAND COVER

Broward

- Combination of SFWMD 2014-2016 Land Use dataset and the 2019 Broward County Current Conditions model, which was developed from the SFWMD Land Use Land Cover data with minor changes based on satellite imagery from 2015 with 2018.
- The future conditions land use map was developed by modifying the current conditions land use map to reflect projected future conditions land use maps for 2040 from the Broward County Planning Council, Palm Beach County Planning, Zoning and Building Department.

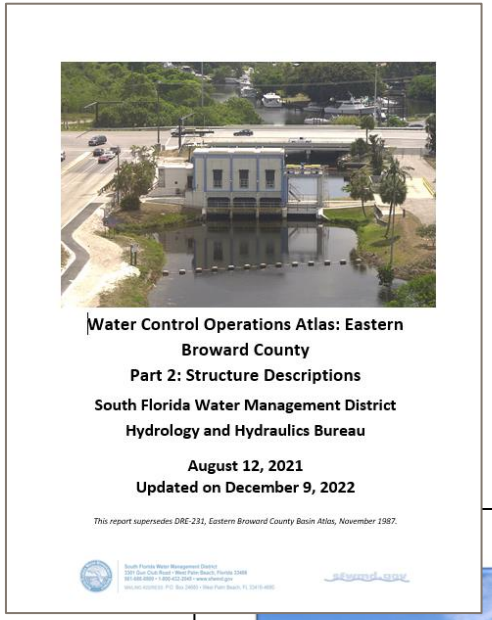
Miami-Dade

- Reach C land-use based on the Florida Land Use Cover Classification System (FLUCCS) categorization codes is available for the model domain through the Florida Department of Environmental Protection (FDEP) for a range of years between 2017 and 2019. Reach B and D Land Use and Land Cover Classification use 2014-2016 Land Use dataset as prepared by the SFWMD.
- The future land use was informed by Miami-Dade County Future Land Use 2030.



CANAL CONFIGURATION AND OPERATIONS

- The focus of this study is on the primary system with a high level of detail placed on the secondary/tertiary canal systems
- Assumes high rainfall and pre-storm drawdown operations by operating tidal structures in low range to meet control elevations in the primary canals
- Tidal structures assume salinity operations (spillway gates close when tailwater at the structure is higher than headwater for the prevention of saltwater intrusion)
- SFWMD structure flow parameters from SFWMD flow rating analysis reports and the SFWMD Atlas of Flow Computations (2015)

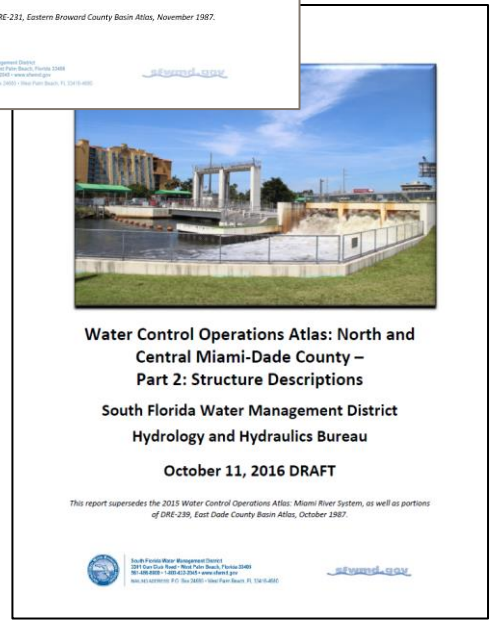


Broward

- C&SF system and operating rules for SFWMD structures from Eastern Broward County Water Control Operations Atlas updated Dec. 9, 2022
- Broward County and South Broward Drainage District structures operations from the 2019 Broward County Current Conditions model which has operating criteria inherited from the 2014 FEMA model and verified/updated based on stakeholder data and the SBDD Facilities Report, 2013, GIS database and Water Control Plan

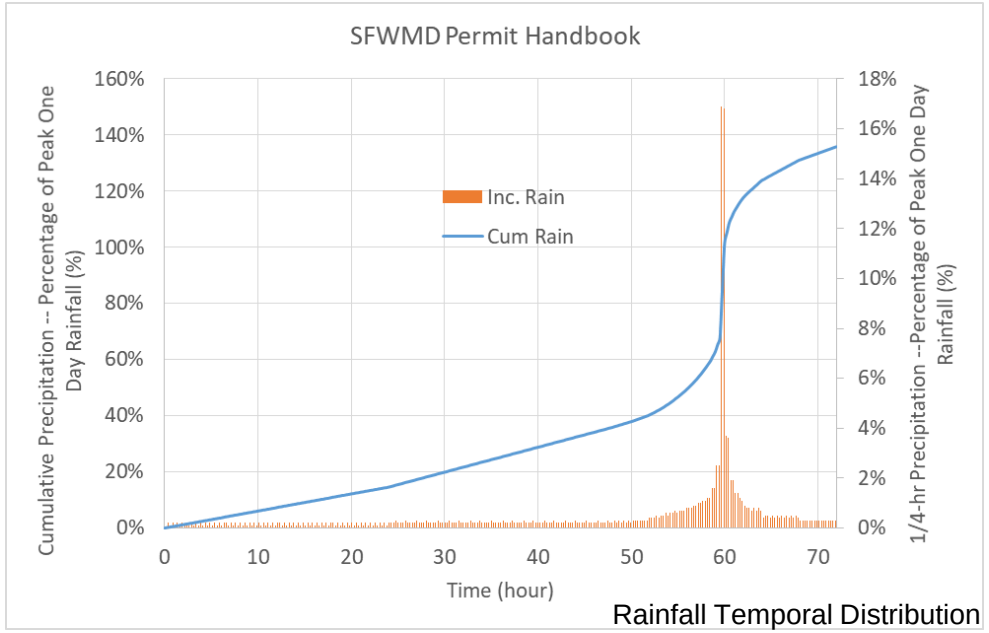
Miami-Dade

- C&SF system and operating rules for SFWMD structures from the Water Control Operations Atlas, North and Central Miami-Dade County, Part 2, May 2016.
- Miami Dade County Flood Mitigation Program, C-4 Basin Operating Plan (SFWMD, 2010) will be utilized to develop a simulated representation utilizing the “Logical Operands” parameterization scheme within the MIKE framework for operation of the C-4 Emergency Detention Basin



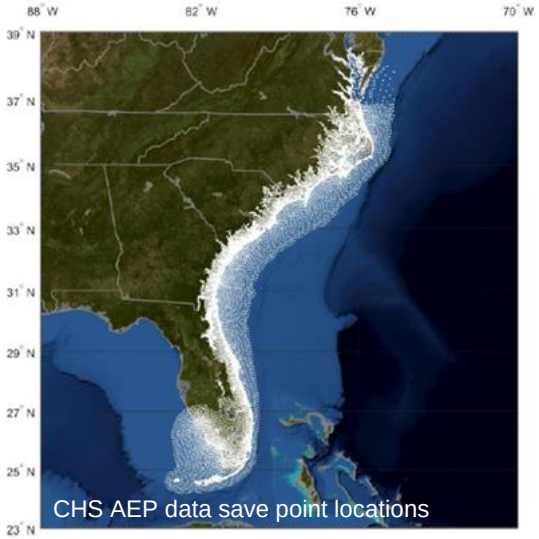
MODEL INPUT DATA

- **Rainfall:** The design storm will use spatially distributed gridded input derived from National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rainfall depths that are temporally distributed based on the South Florida Water Management District (SFWMD) 3-day distribution.
    - The 72-hour rainfall distribution is found in the District's Surface Water Environmental Resource Permit Manual (SFWMD, Environmental Resource Permit Applicant's Handbook Volume II (2016).

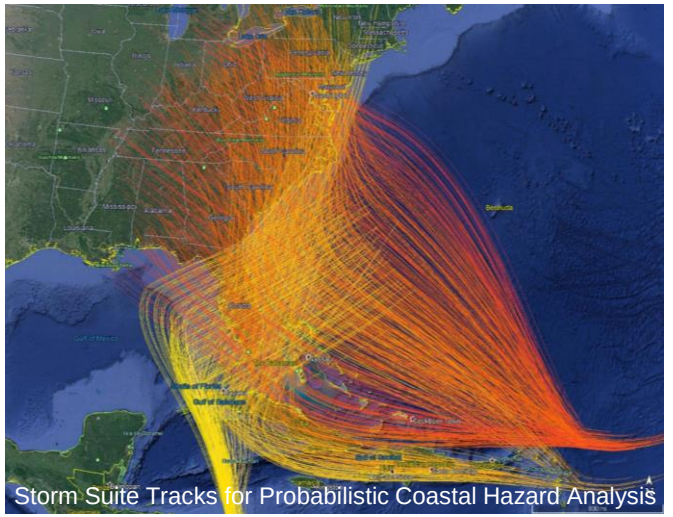


Rainfall Temporal Distribution

- **Coastal Boundary:** The South Atlantic Coastal Study (SACS) Coastal Hazard System (CHS) provides numerical and probabilistic modeling results for coastal forcings, including storm surge. The CHS stage-hydrographs will be applied as a downstream boundary condition within the MIKE model.



CHS AEP data save point locations


Storm Suite Tracks for Probabilistic Coastal Hazard Analysis

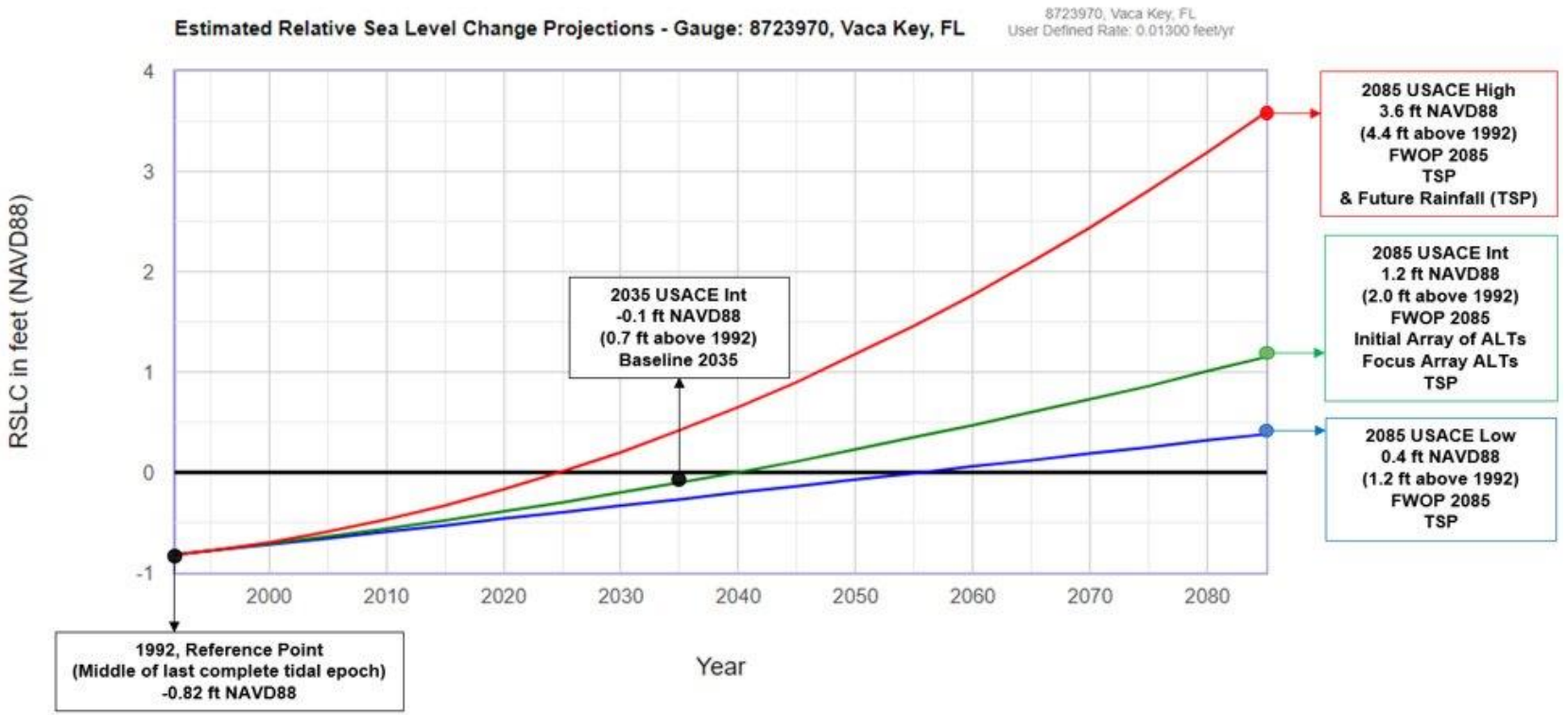
CLIMATE CHANGE STRATEGY

Inland Hydrology

- Future Extreme Rainfall: Existing USGS/SFWMD study will be used as a sensitivity run for the tentatively selected plan.
- Potential to use in adaptation strategy

Sea Level Change

- Vaca Key gauge
- SLC will be incorporated into the modeling as a boundary condition. The coastal water level for the Base Year (2035) was modified using linear superposition, using the Int. curve. The Future conditions will assess project performance for the Low, Int., and High curves for 2085



COMPOUND FLOODING

- The total water level (i.e., compound flooding) due to multiple flood sources, including rainfall runoff, groundwater and coastal forcings will be simulated.

- Hydrologic & Hydraulic model simulations include an array of rainfall and coastal return frequency events. Sea level change is included in the coastal water level data.

Coastal water level Return Period (CHS data)	Rainfall return period (NOAA Atlas14)
2-year	5-year
2-year	10-year
10-year	10-year
2-year	25-year
20-year	25-year
2-year	100-year
100-year	100-year
2-year	500-year

MODELING APPROACH

- C&SF Flood Resiliency (Section 216) Study Focus
  - Flood Risk Management (FRM) recommendations to increase the resilience and function of vulnerable coastal structures and the conveyance of the primary inflow canals.

- H&H model output is being assessed to support metric evaluation of most vulnerable areas
  - Flood inundation
  - Canal peak stage profile
  - Structure performance
  - Flood duration (next steps)

MODEL RESULTS DISCLAIMER

The content of the slides should not be used to make personal decisions about flood risk now or in the future. Nor should the content replace flood risk maps from governmental agencies such as the Federal Emergency Management Agency.

The maps, projections, and data on the slides were compiled for use by the Project Delivery Team that is studying a complex system. They represent the results of data collection and modeling assumptions about future conditions designed to assist in evaluating flood risk over a large project footprint. The U.S. Army Corps of Engineers and the South Florida Water Management District make no representations as to the suitability or accuracy of the data for any other purpose.

ACRONYMS

ECB	Existing Condition Baseline (2035 cond.)
FWOPl	Future without project (2085) low sea level rise
FWOPi	Future without project (2085) intermediate sea level rise
FWOPh	Future without project (2085) high sea level rise
HW	Headwater
TW	Tailwater
Q	Discharge
20S25R	20-year surge boundary with 25-year rainfall
2S25R	2-year surge boundary with 25-year rainfall
35i	ECB year and intermediate sea level rise
85l, 85i, and 85h	Future year 2085 and low, intermediate, high sea level rise, respectively
RSLC	Relative Sea Level Change

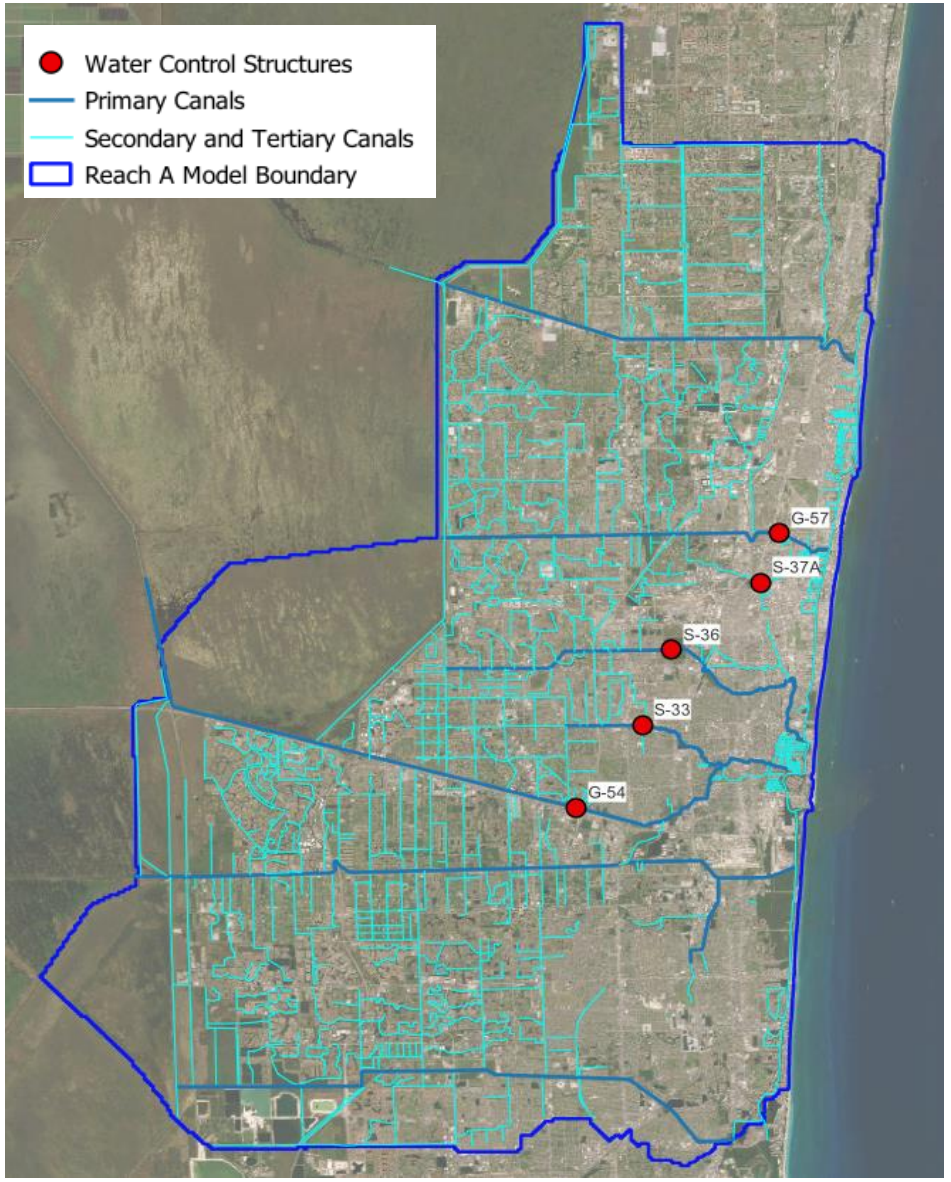
5. REACH A

Presenter: Amanda Bredesen, P.E., H&H Model Subteam Lead, USACE
Carol Ballard, P.E. CFM, H&H Model Subteam Lead, SFWMD
Model Team: Michael Tadesse, PhD., Lead Modeler, Hazen-Sawyer
Hongying Zhao, PhD., P.E. Technical Lead, SFWMD

PLANNING REACH OVERVIEW

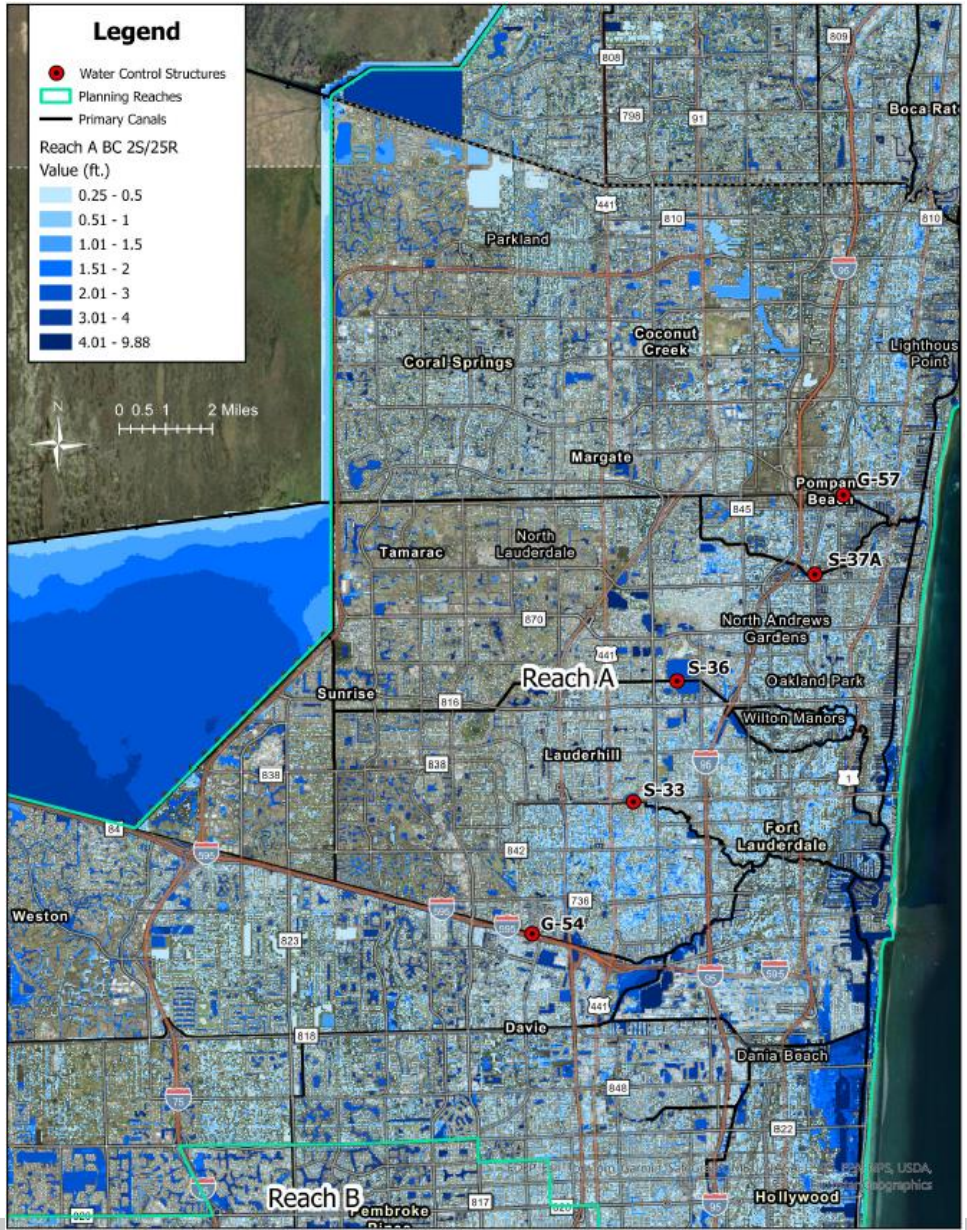
- Reach A model domain includes all urban development within Broward County and portions of Palm Beach County in the North, Miami-Dade County in the South, and Water Conservation Areas in the West.

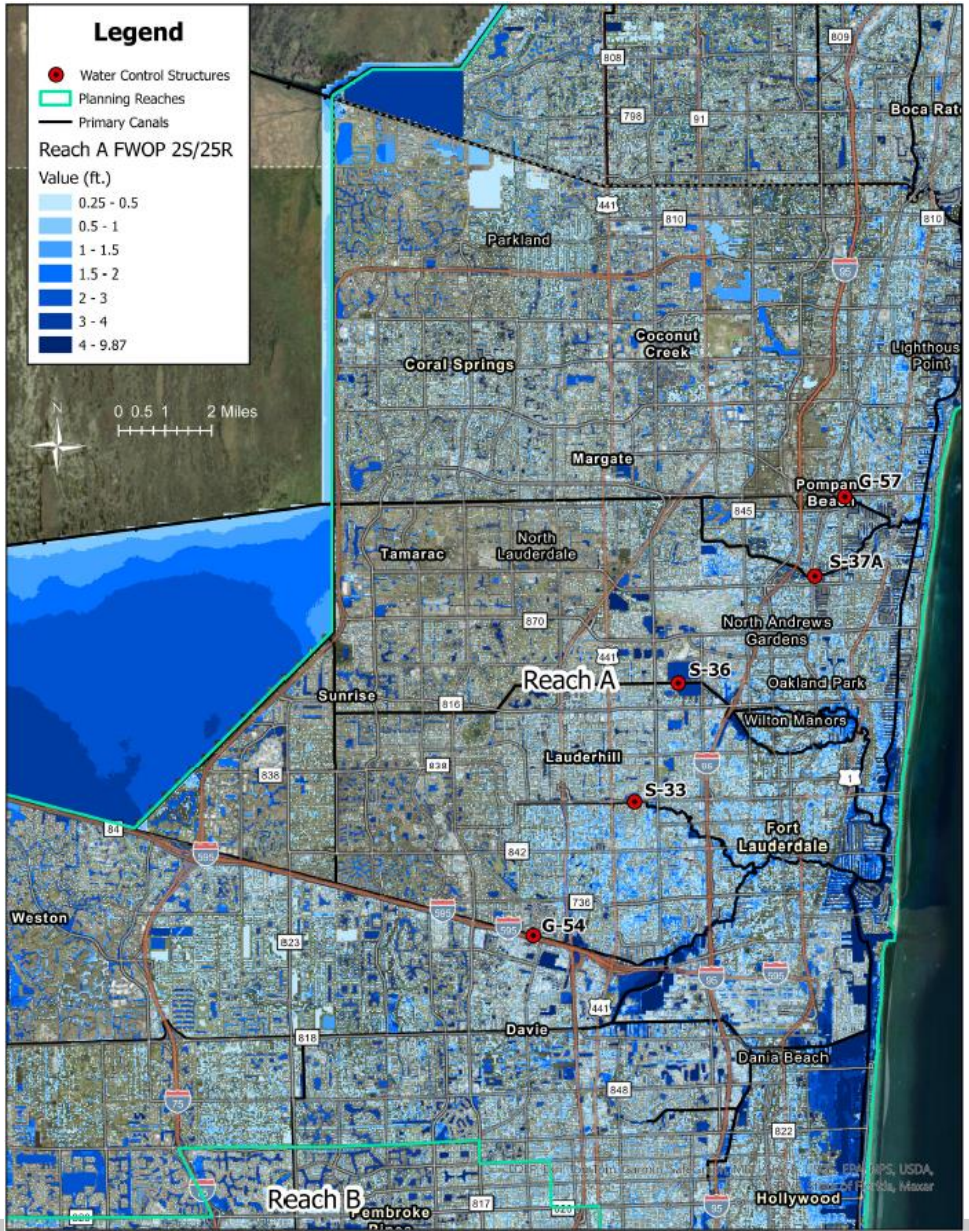
- Section 216 Focus: Pompano Canal/G-57, C-14/S-37A, C-13/S-36, C-12/S-33 and North New River Canal/G-54



MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 2-YEAR SURGE

Base Year 2035

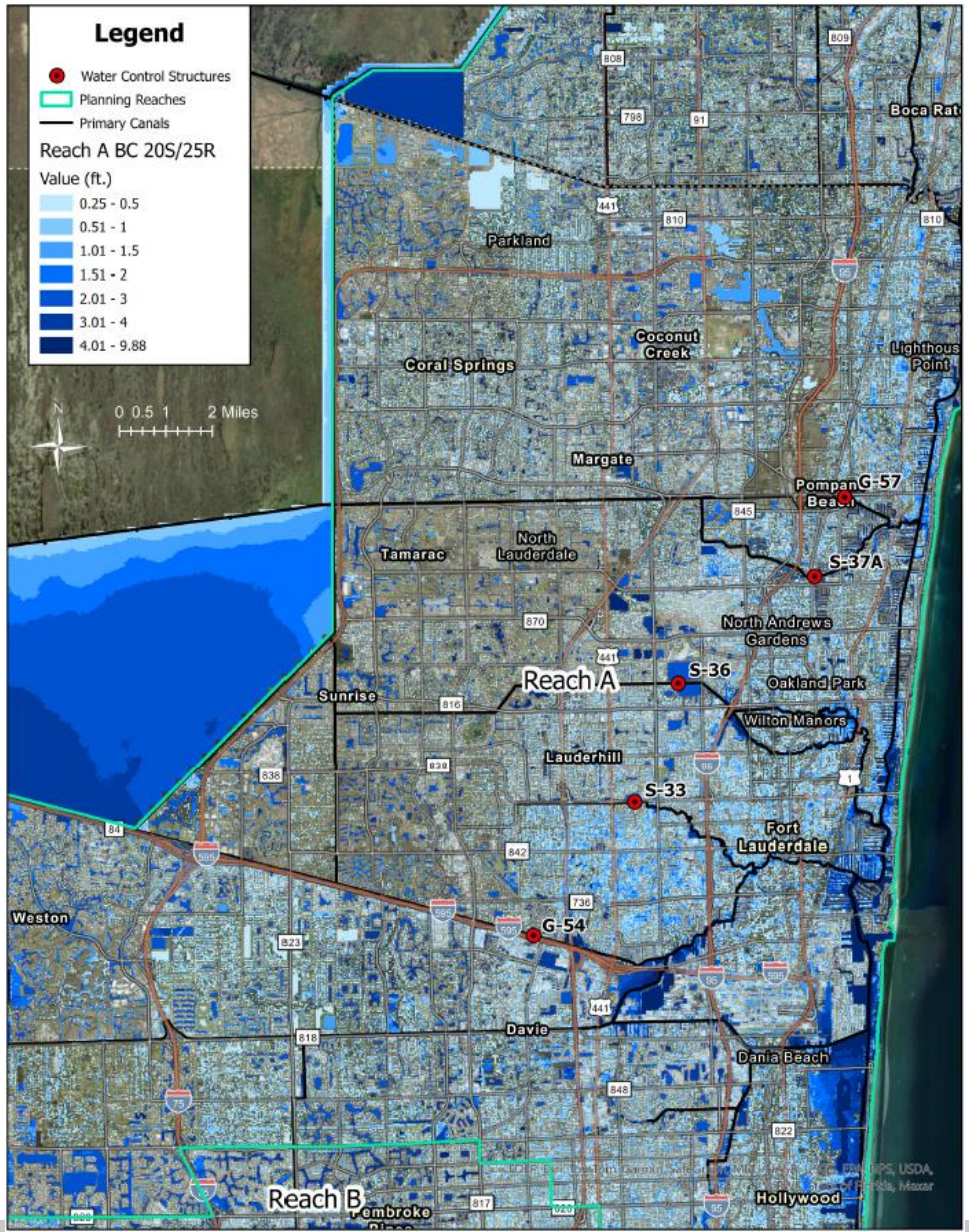


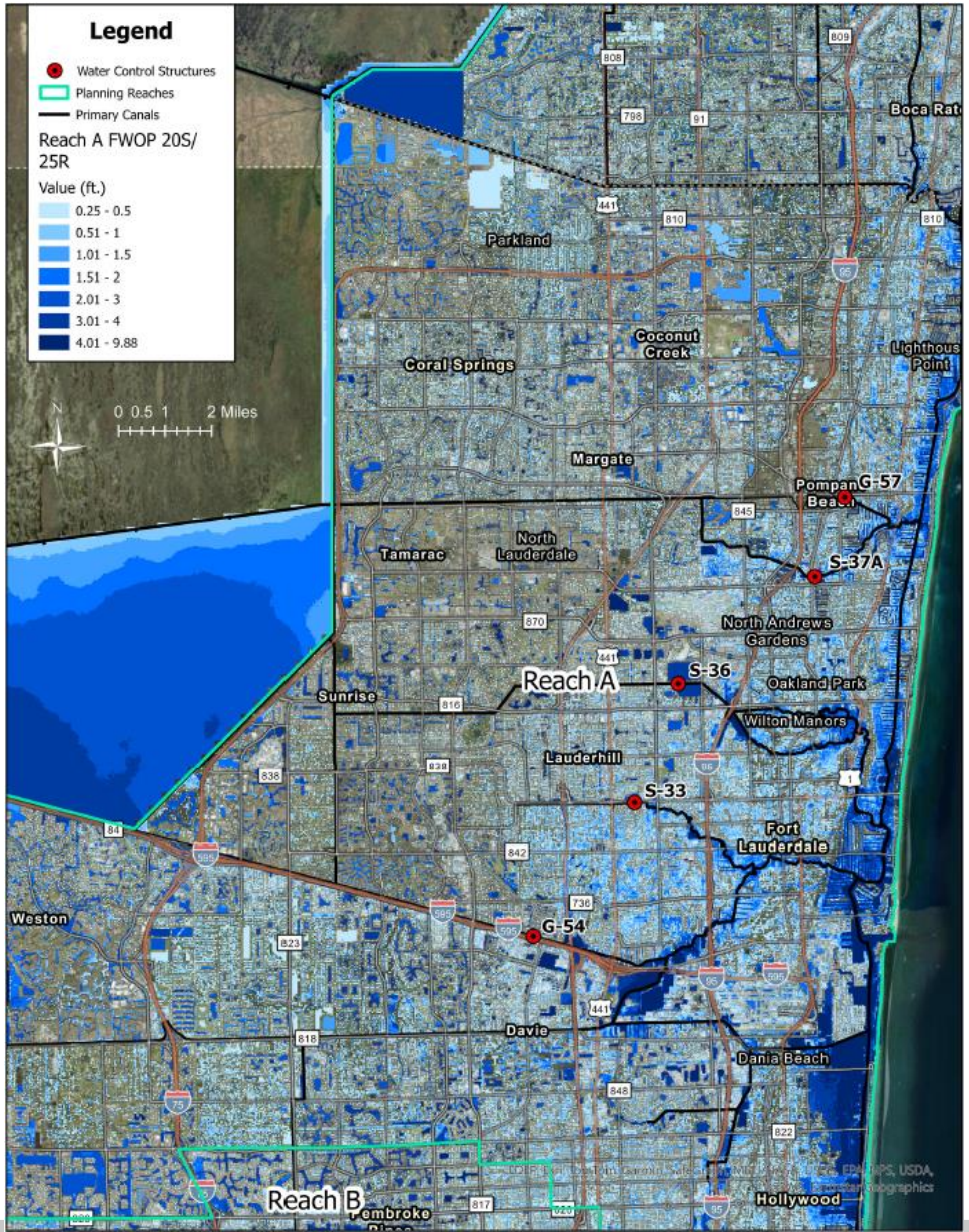


Future Without Project Int SLR 2085

MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 20-YEAR SURGE

Base Year 2035

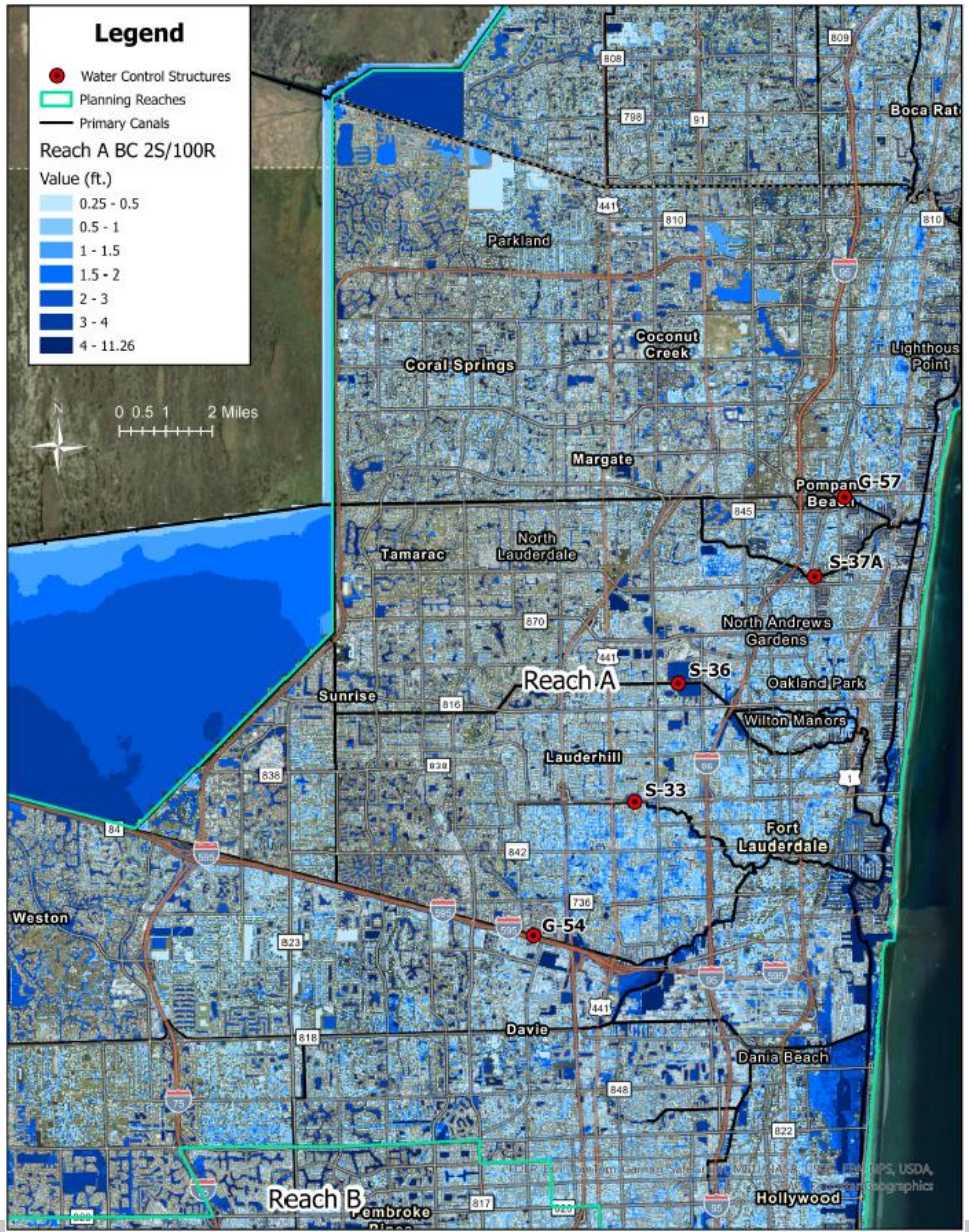




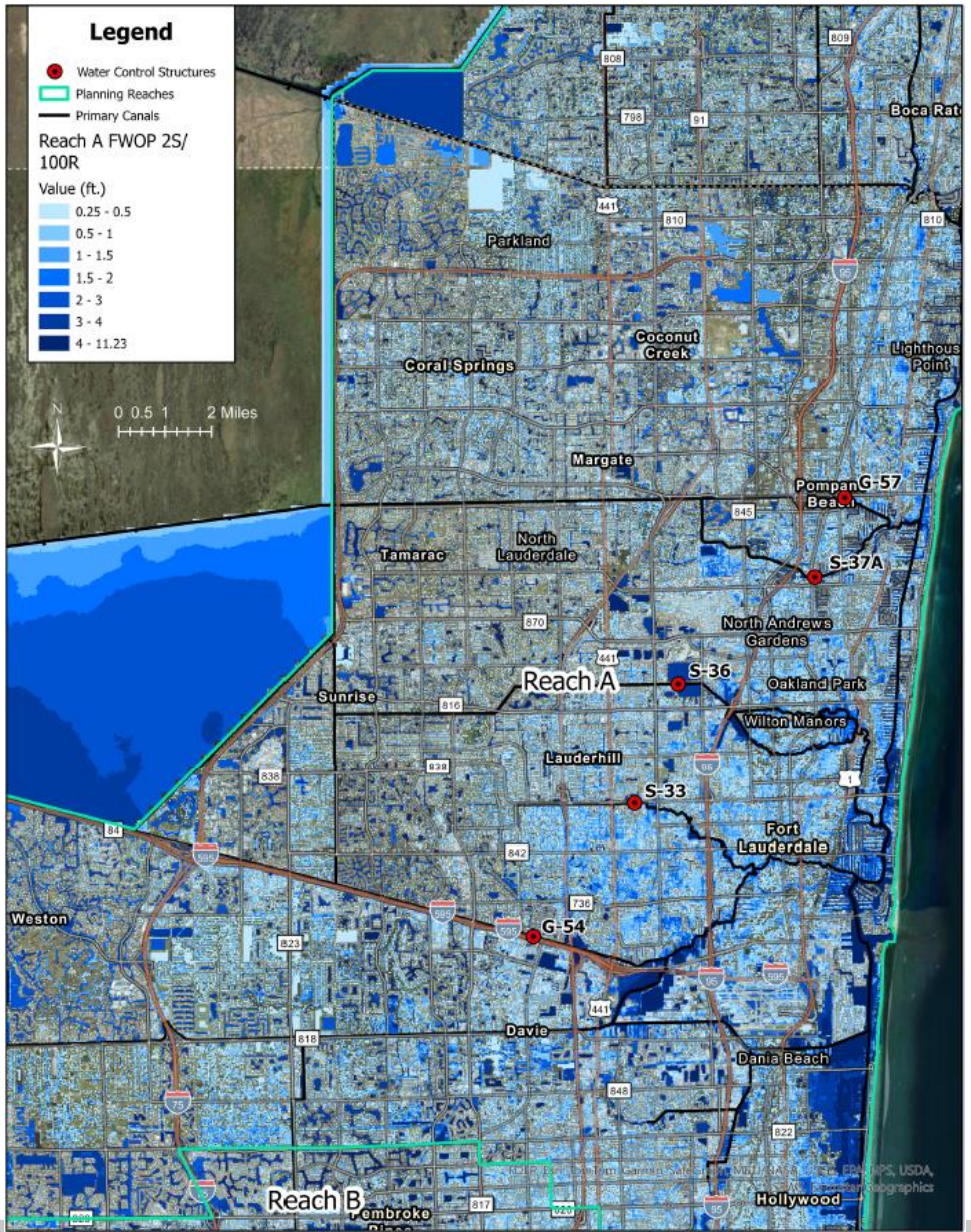
FWOP Int SLR 2085

MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 2-YEAR SURGE

Base Year 2035

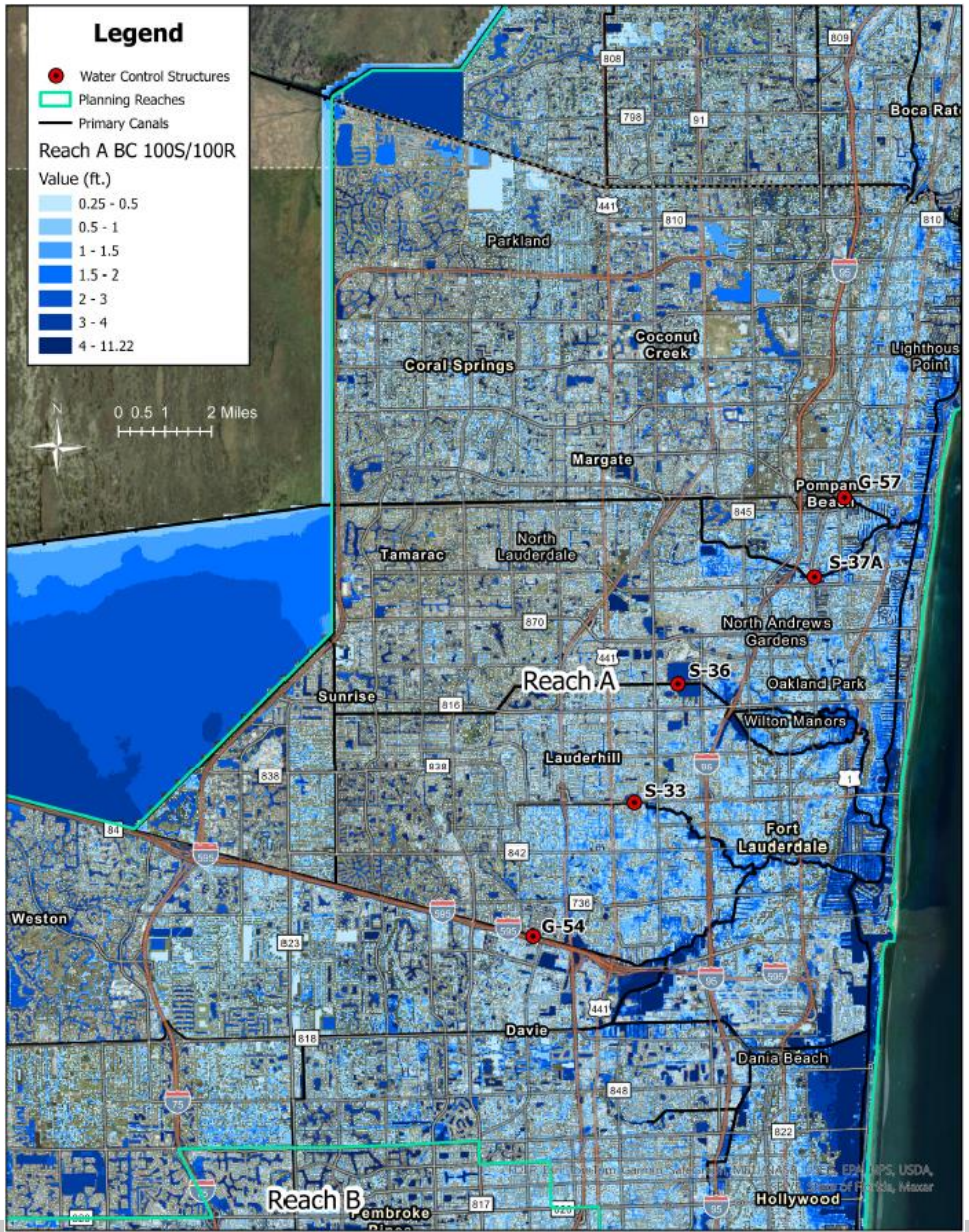


FWOP Int SLR 2085

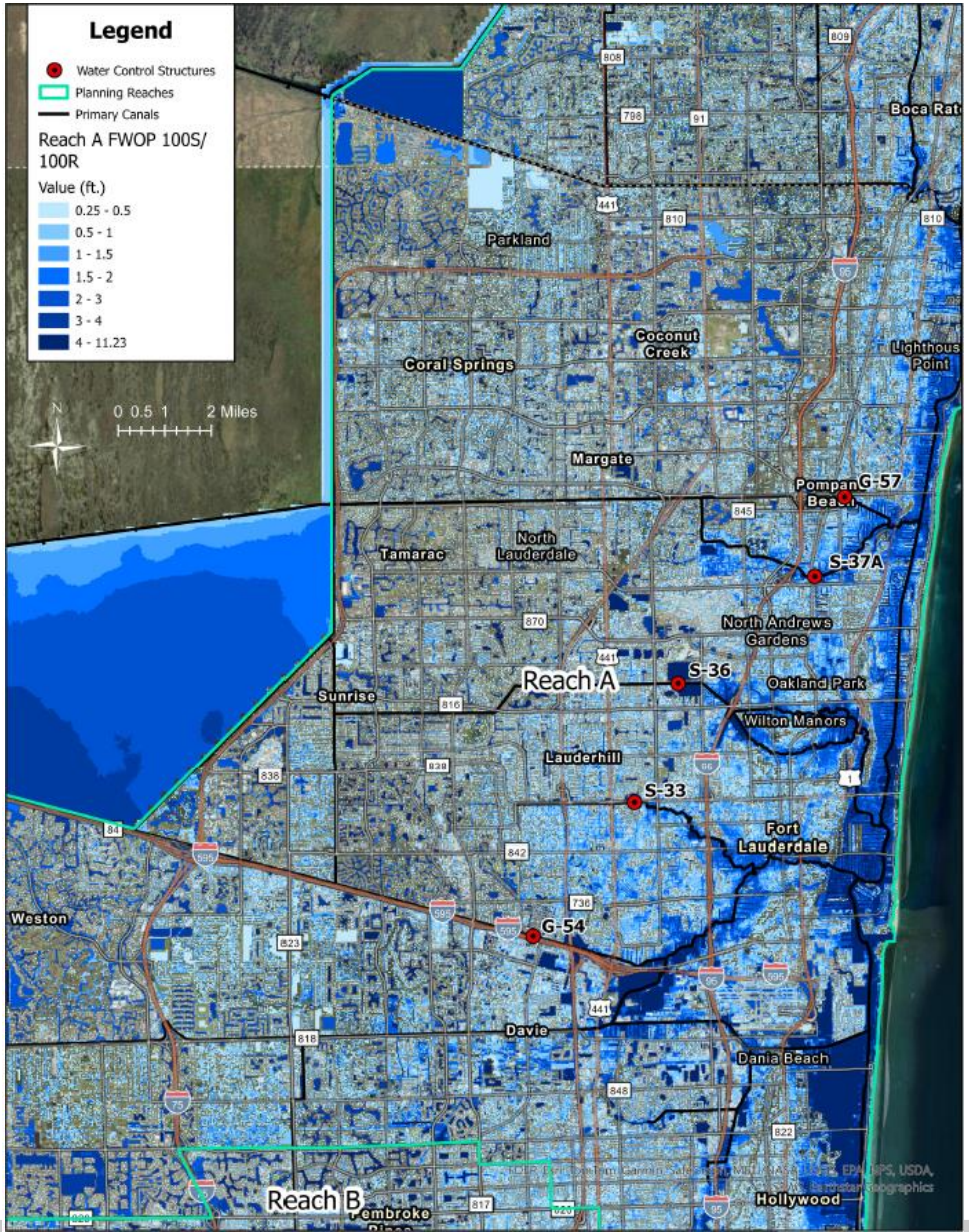


MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 100-YEAR SURGE

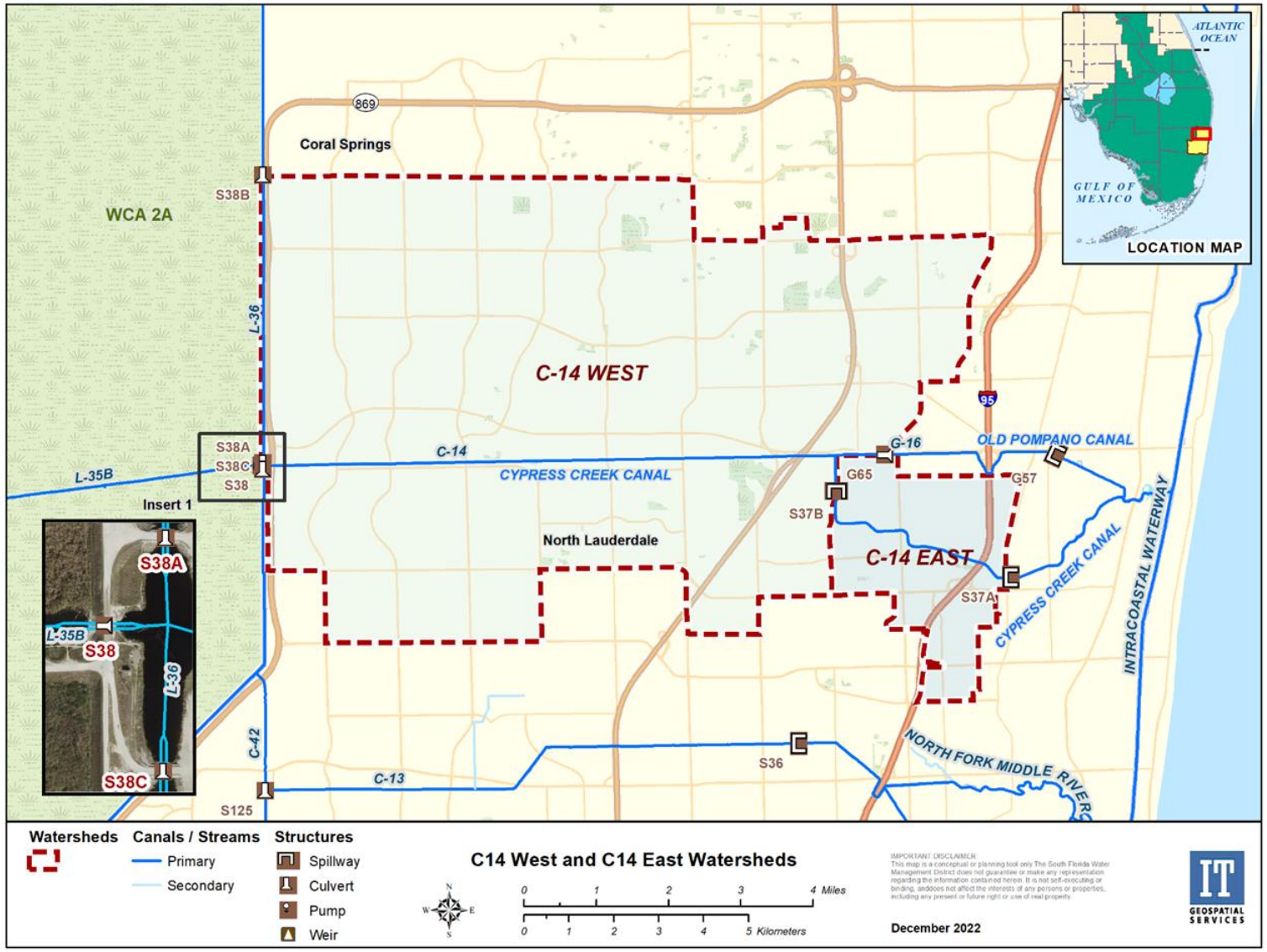
Base Year 2035



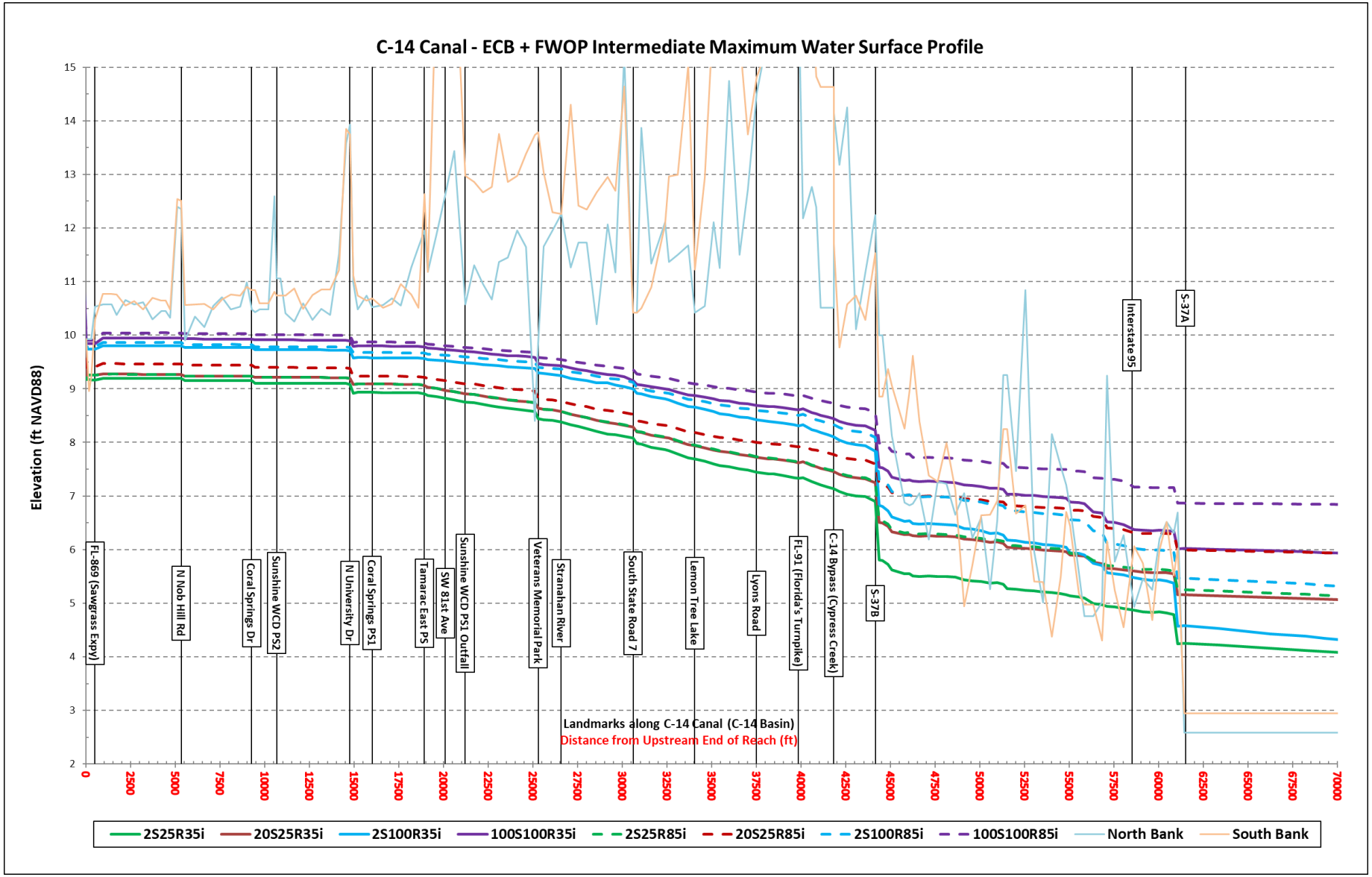
FWOP Int SLR 2085



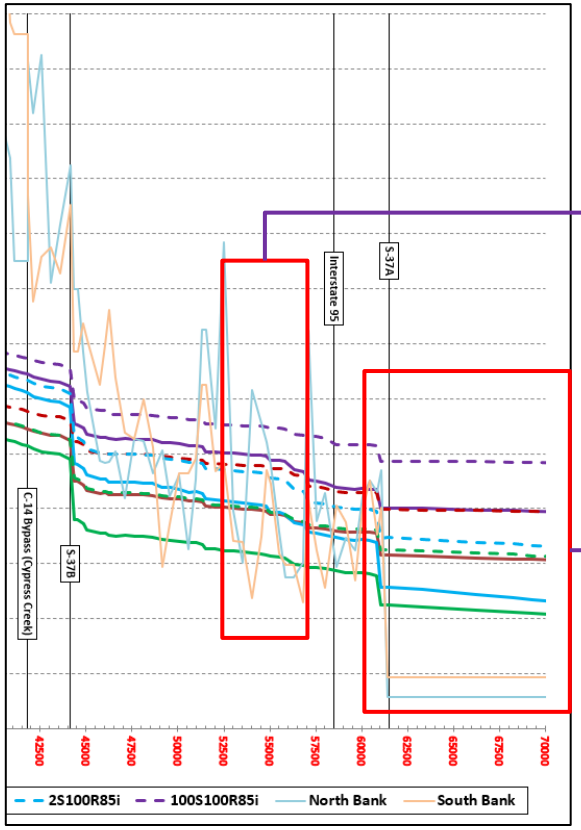
C-14, CYPRESS CREEK/ S37A

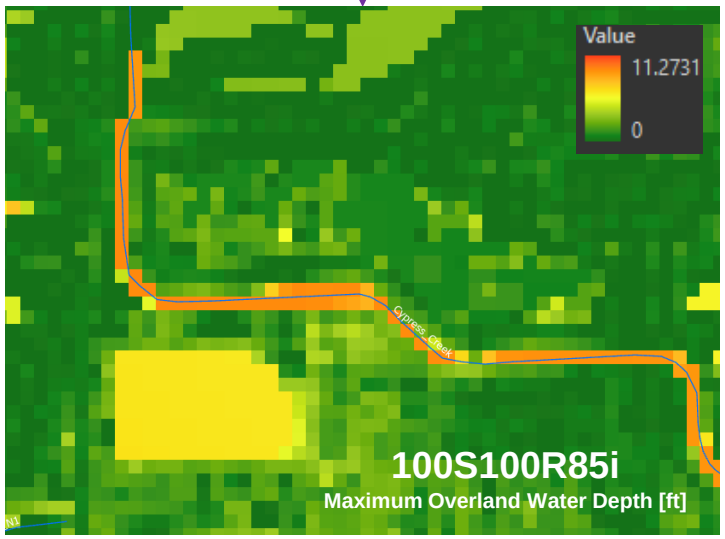


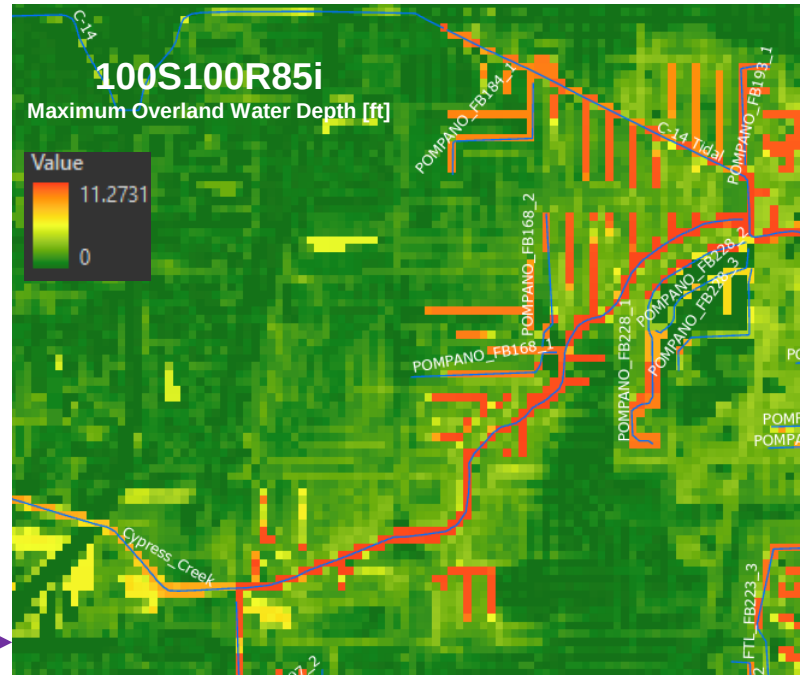
MAXIMUM STAGE PROFILE PLOT – C-14/CYPRESS CREEK



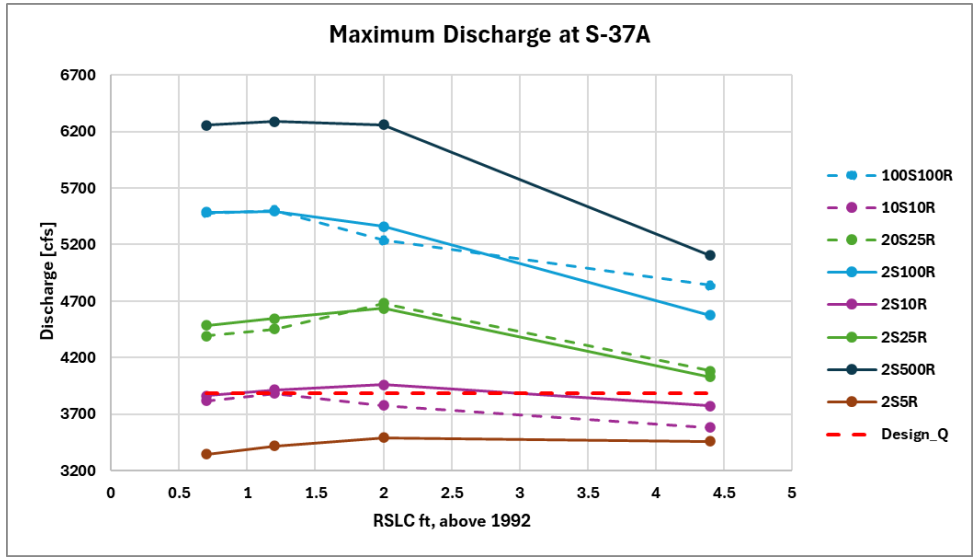
MAXIMUM STAGE PROFILE PLOT – CYPRESS CREEK

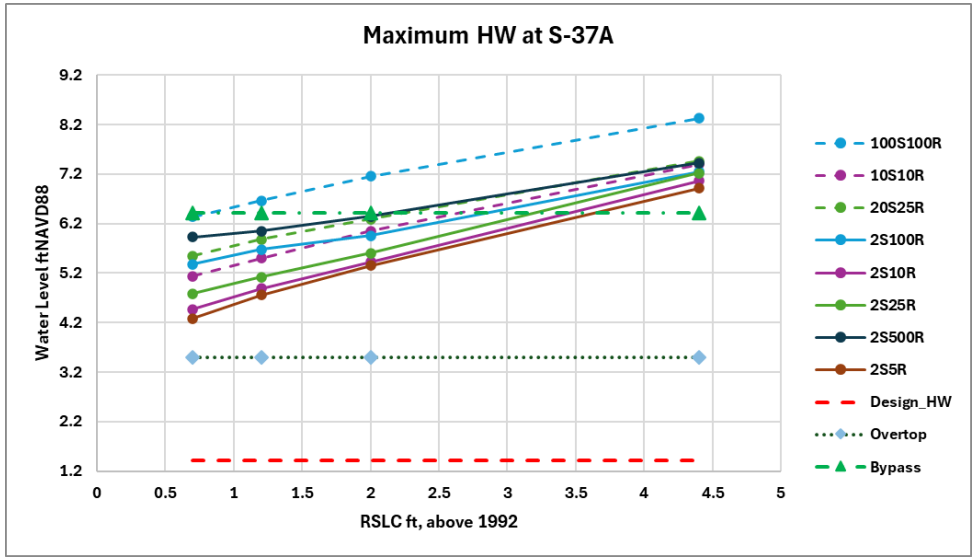


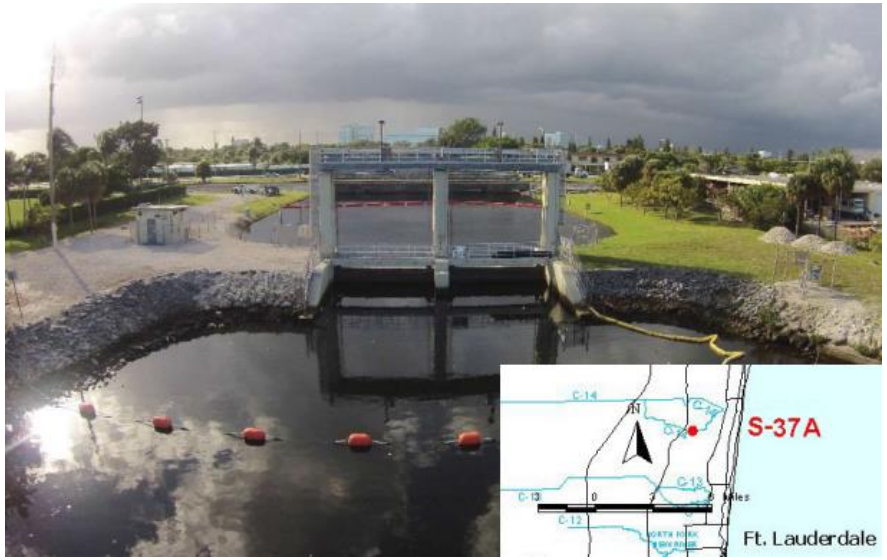


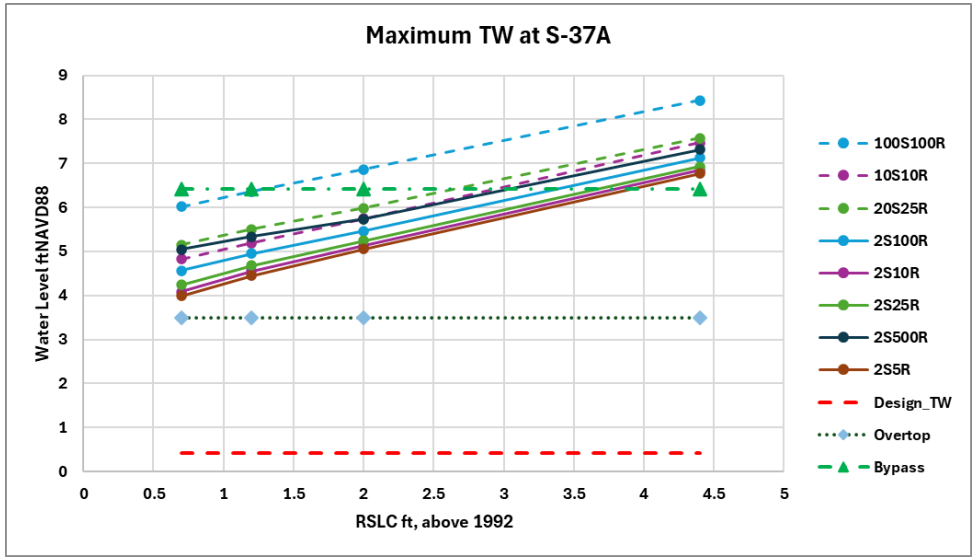


STRUCTURE PERFORMANCE, S37A

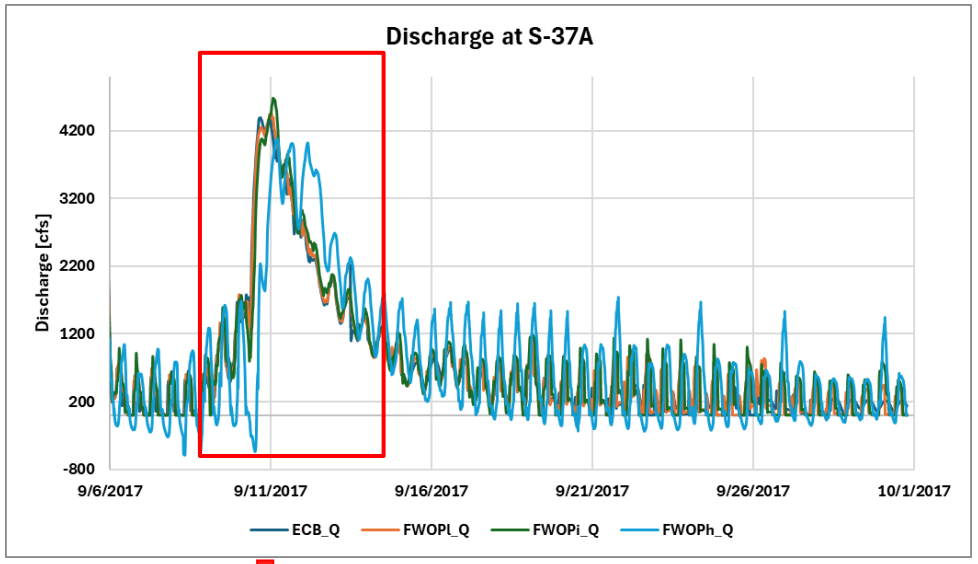


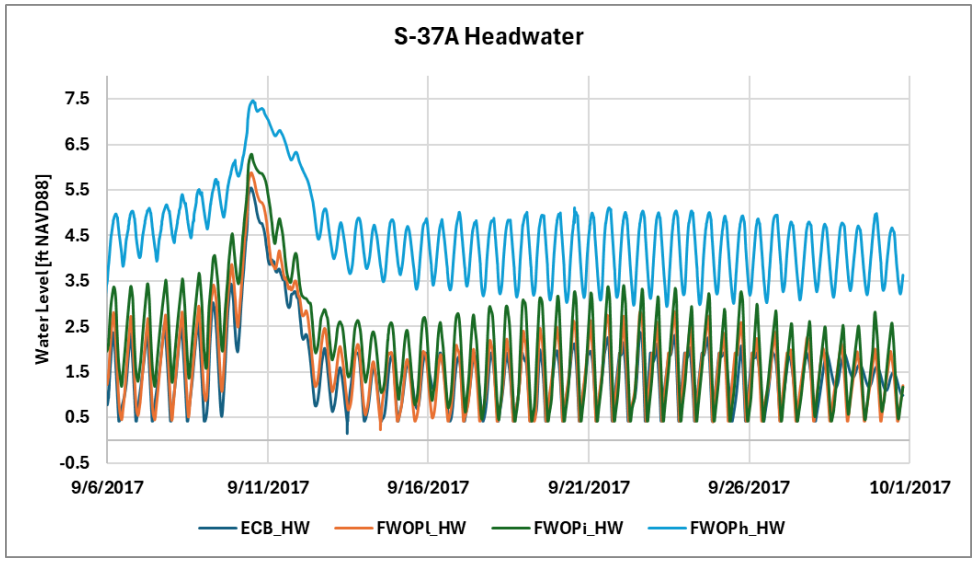


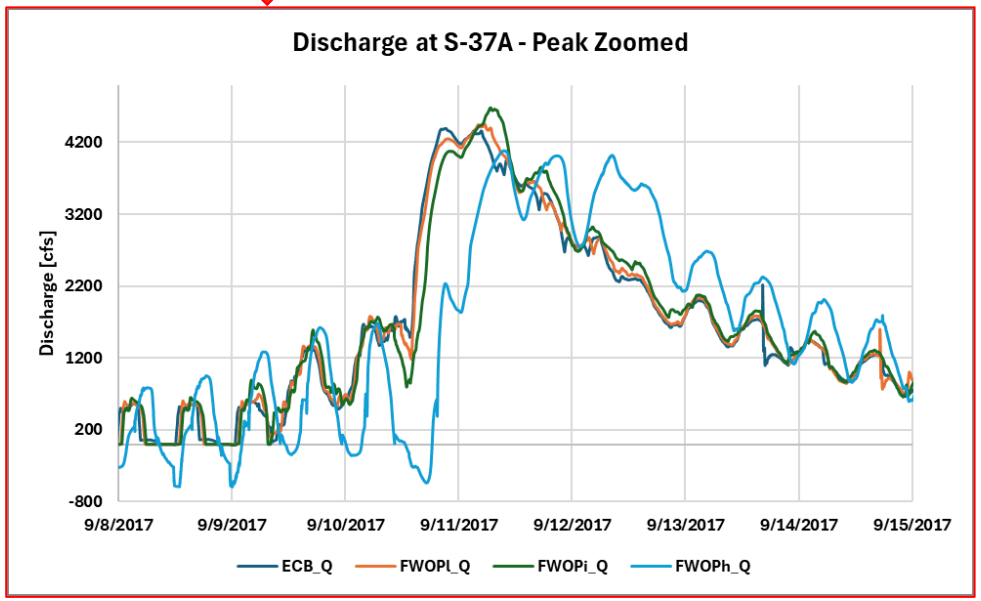


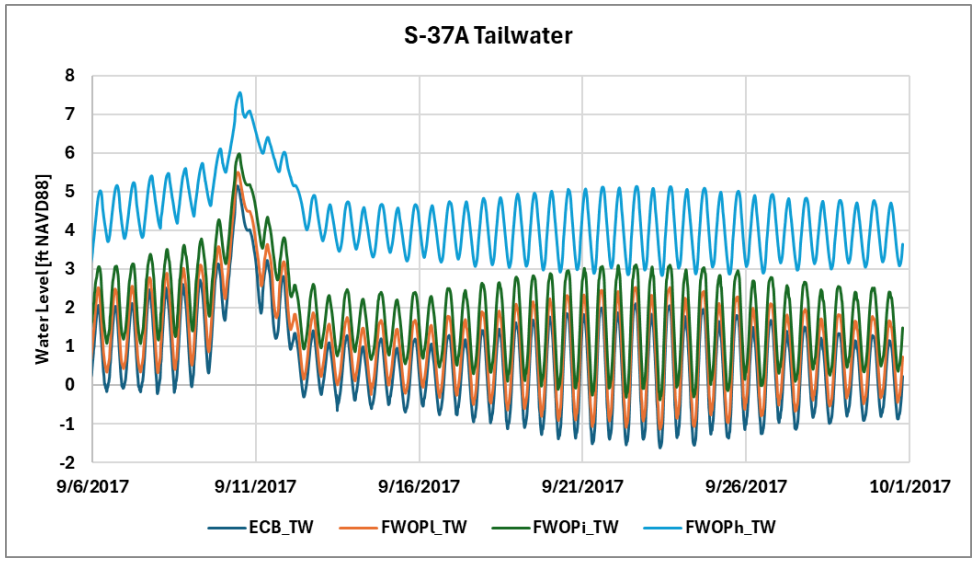


STRUCTURE PERFORMANCE, S37A – 20S25R

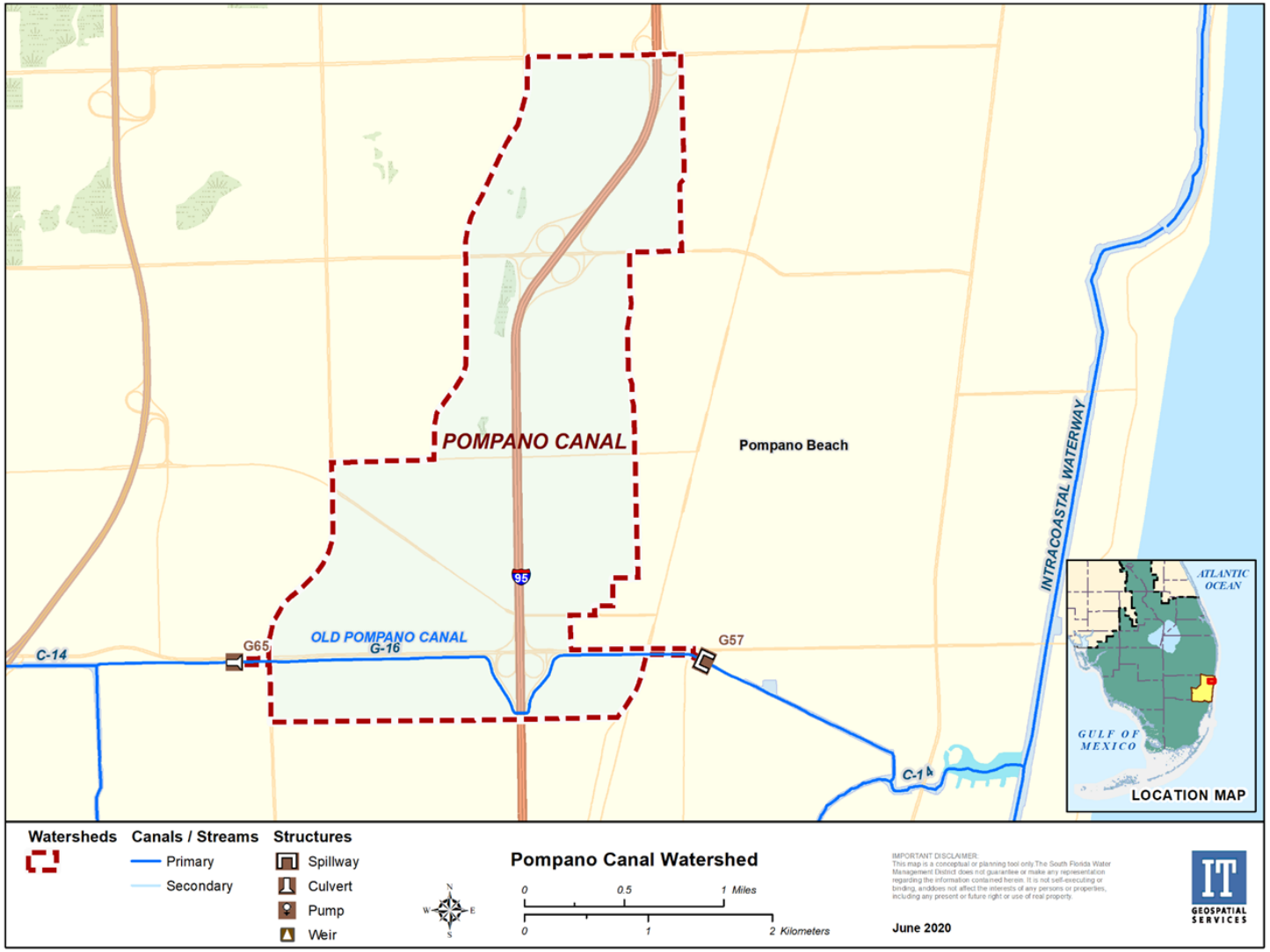




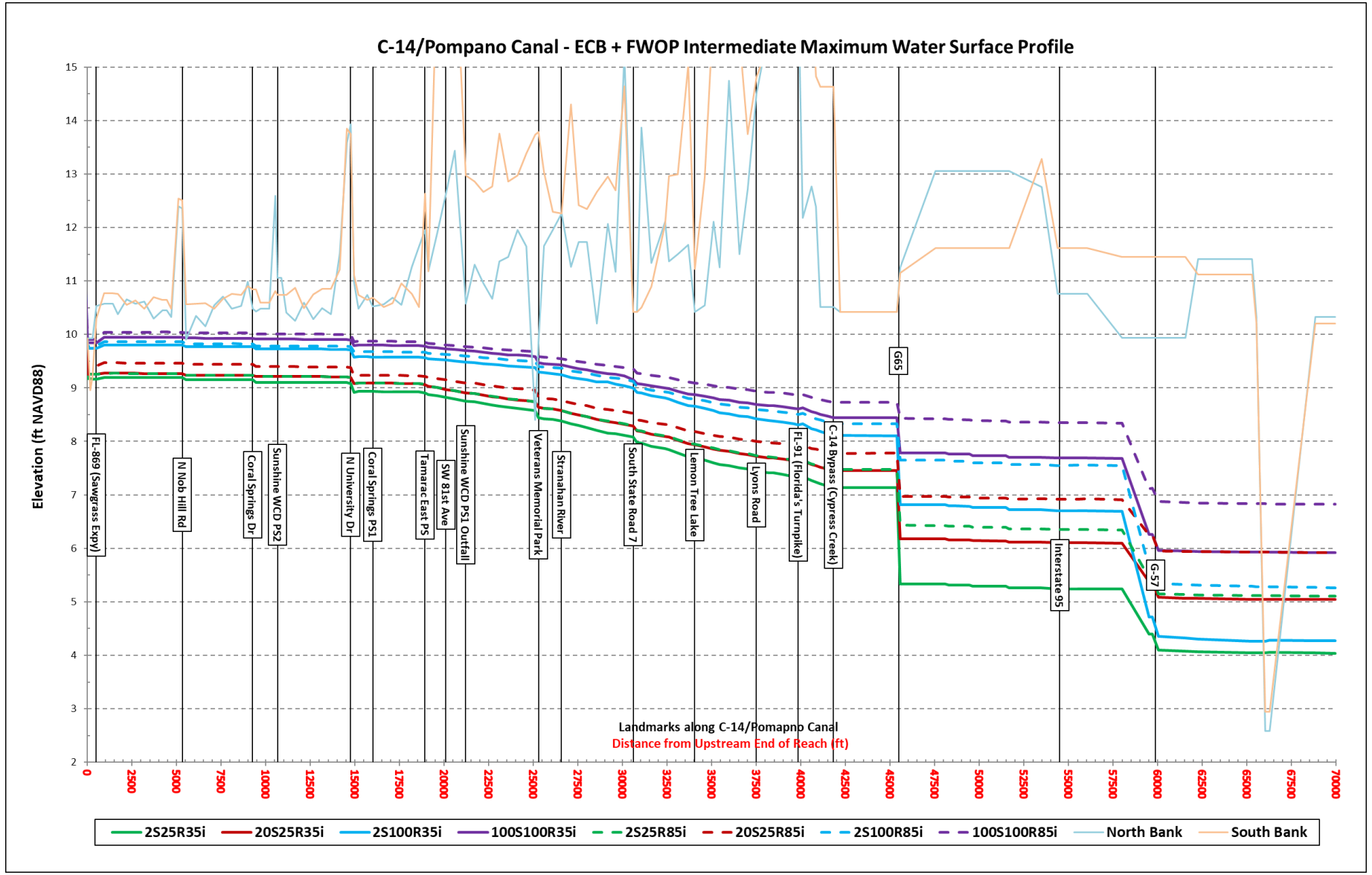




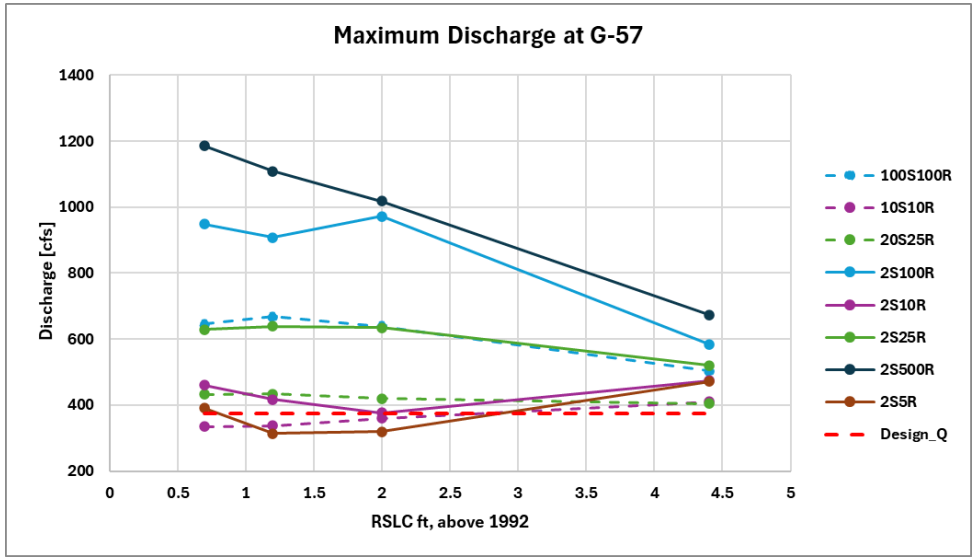
C-14, POMPANO CANAL/ G57

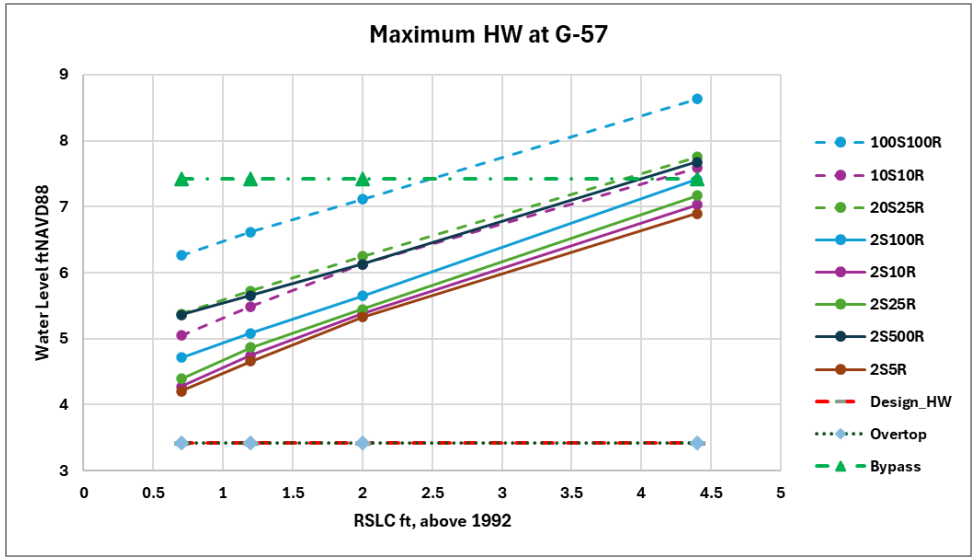


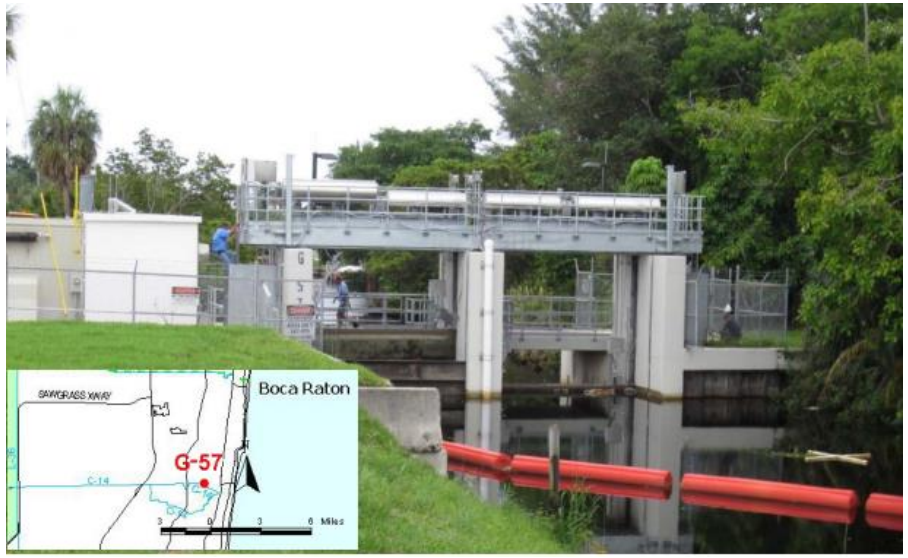
MAXIMUM STAGE PROFILE PLOT – C-14/POMPANO CANAL

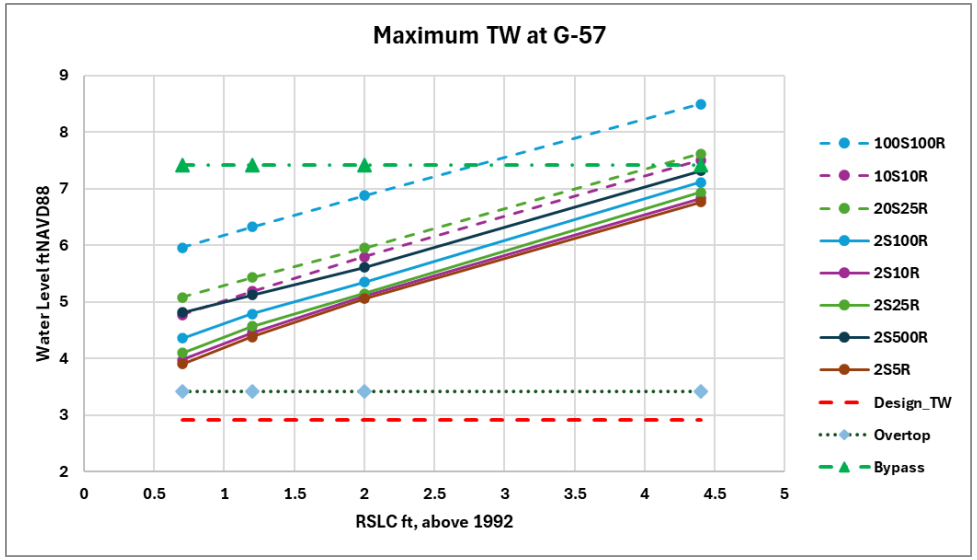


STRUCTURE PERFORMANCE, G57

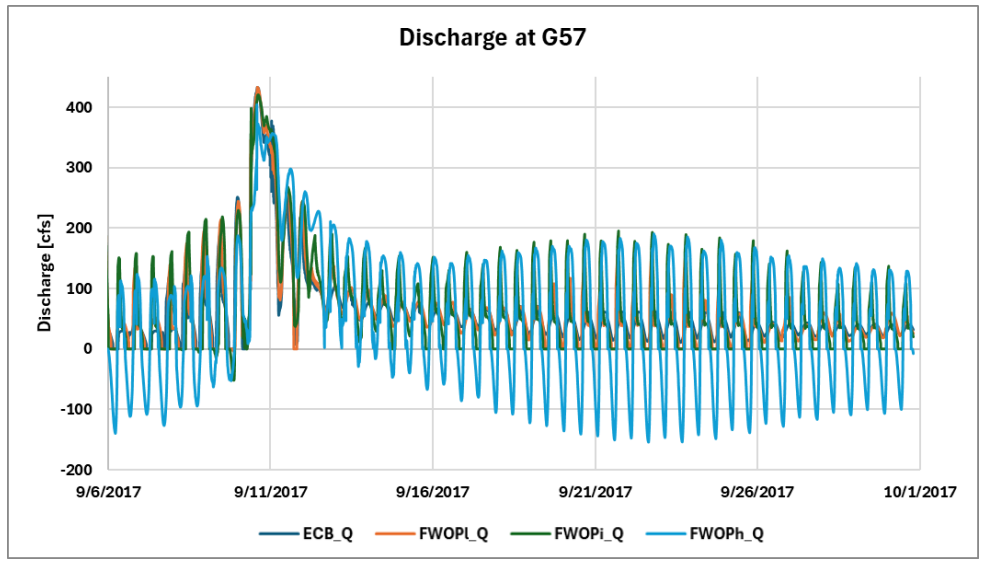


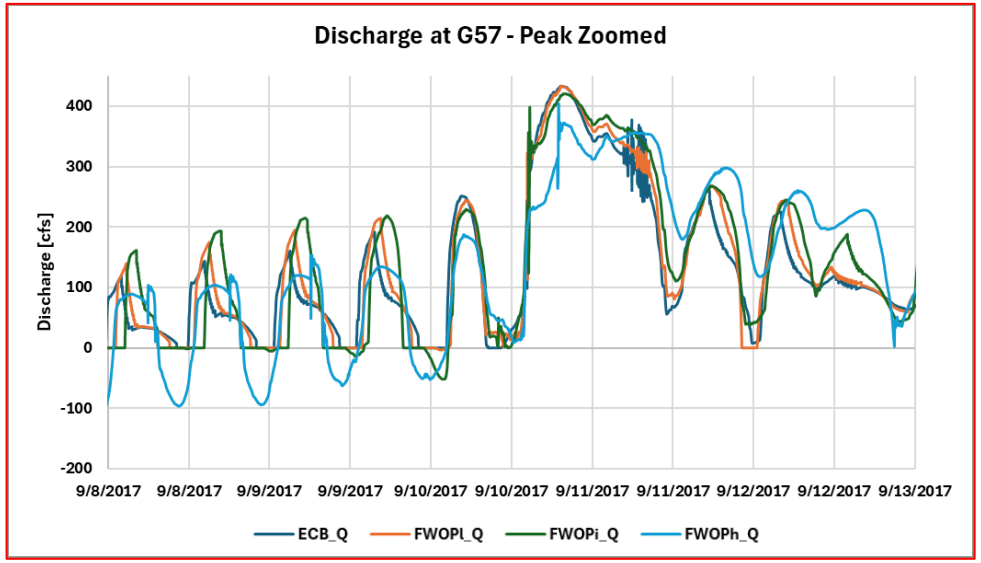


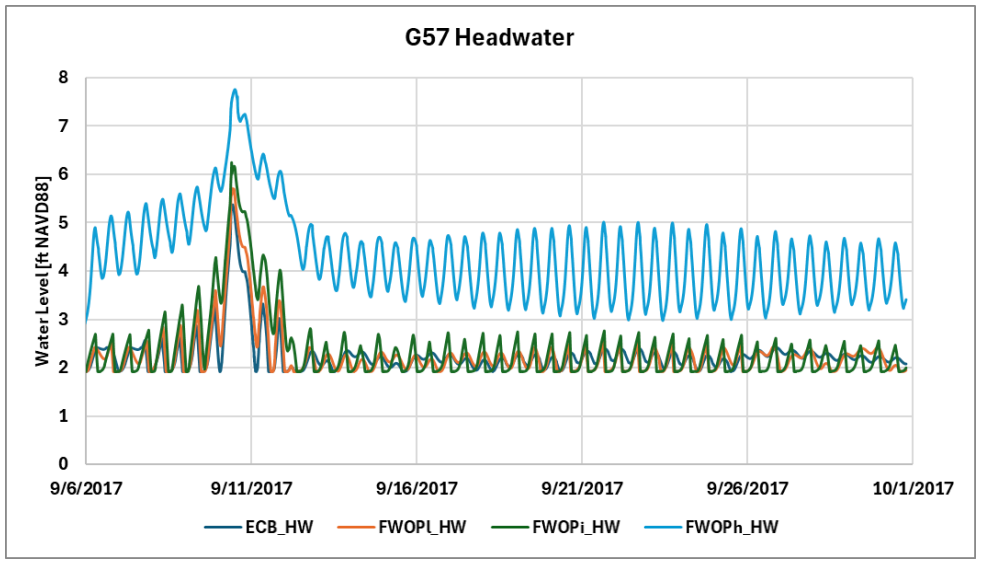


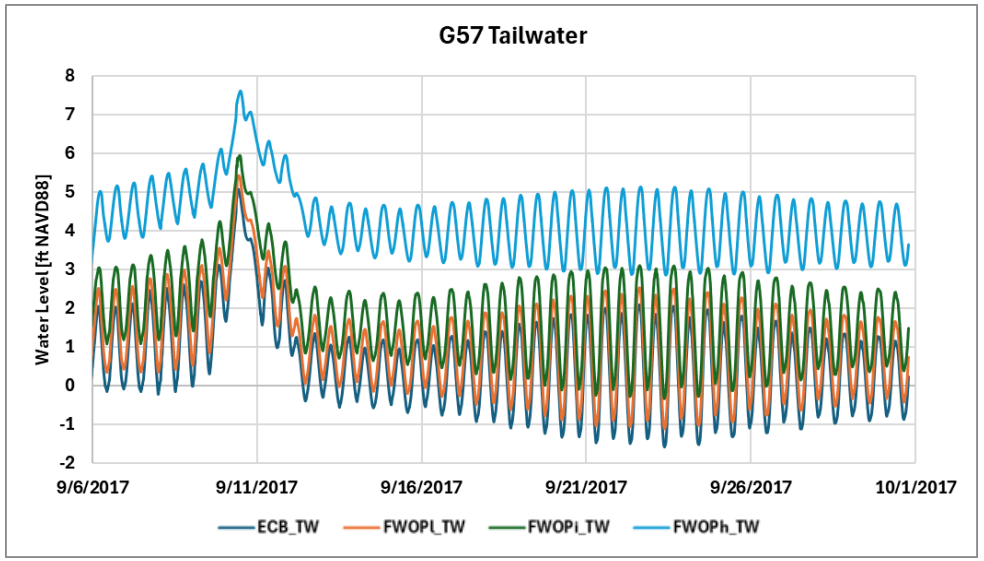


STRUCTURE PERFORMANCE, G57 – 20S/25R

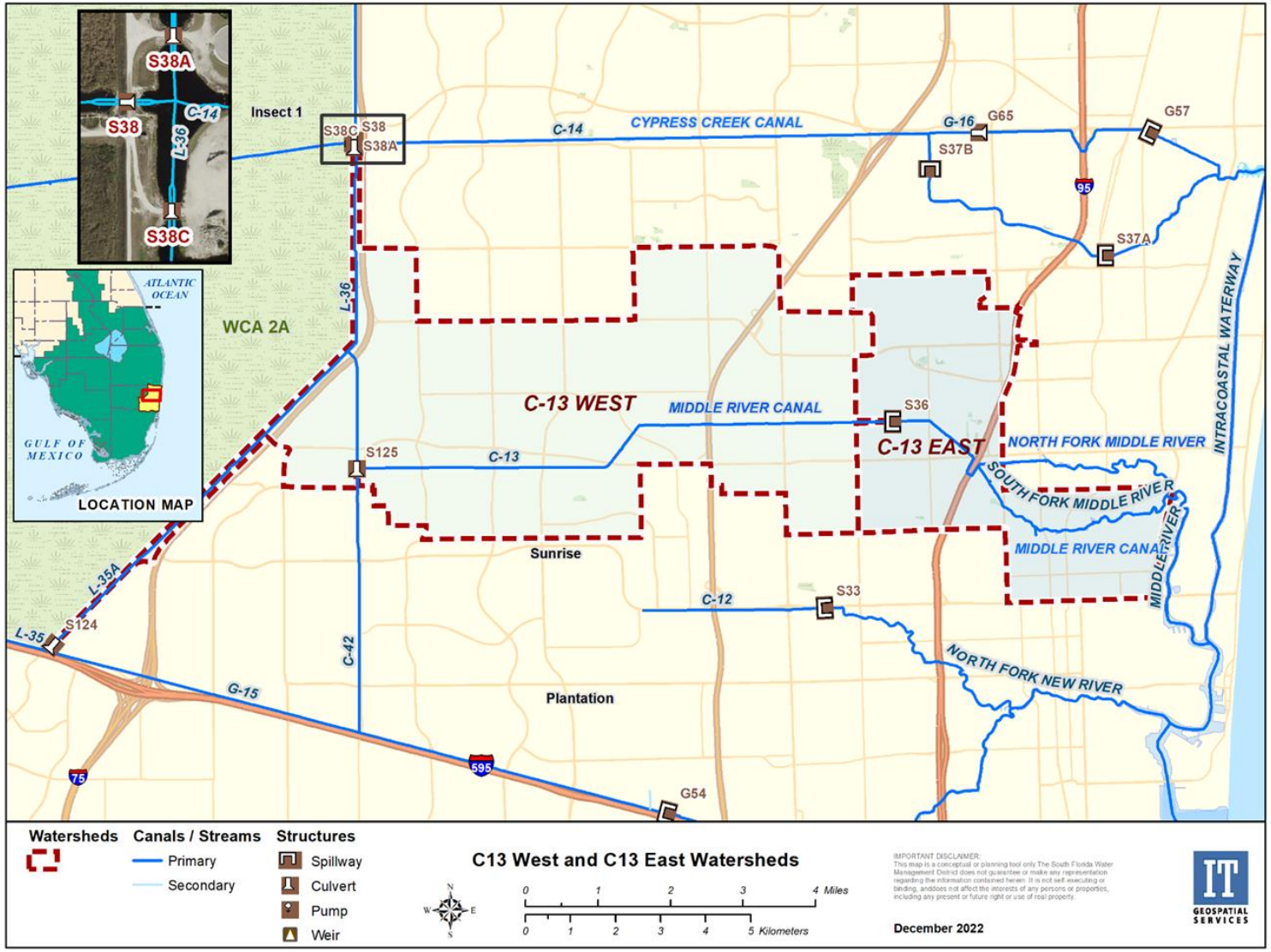








C-13/ S36


S38A
S38
S38C
C-14
L-36
Insect 1
S38C
S38
S38A
C-14
CYPRESS CREEK CANAL
G-16
G65
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S37B
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ATLANTIC OCEAN
GULF OF MEXICO
LOCATION MAP
WCA 2A
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INTRACOASTAL WATERWAY
C-13 WEST
MIDDLE RIVER CANAL
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C-13 EAST
NORTH FORK MIDDLE RIVER
S125
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G-15
Plantation
75
595
G54
Watersheds
Canals / Streams
Primary
Secondary
Structures
Spillway
Culvert
Pump
Weir
C13 West and C13 East Watersheds
0 1 2 3 4 Miles
0 1 2 3 4 5 Kilometers
IMPORTANT DISCLAIMER:
December 2022
GEOSPATIAL SERVICES
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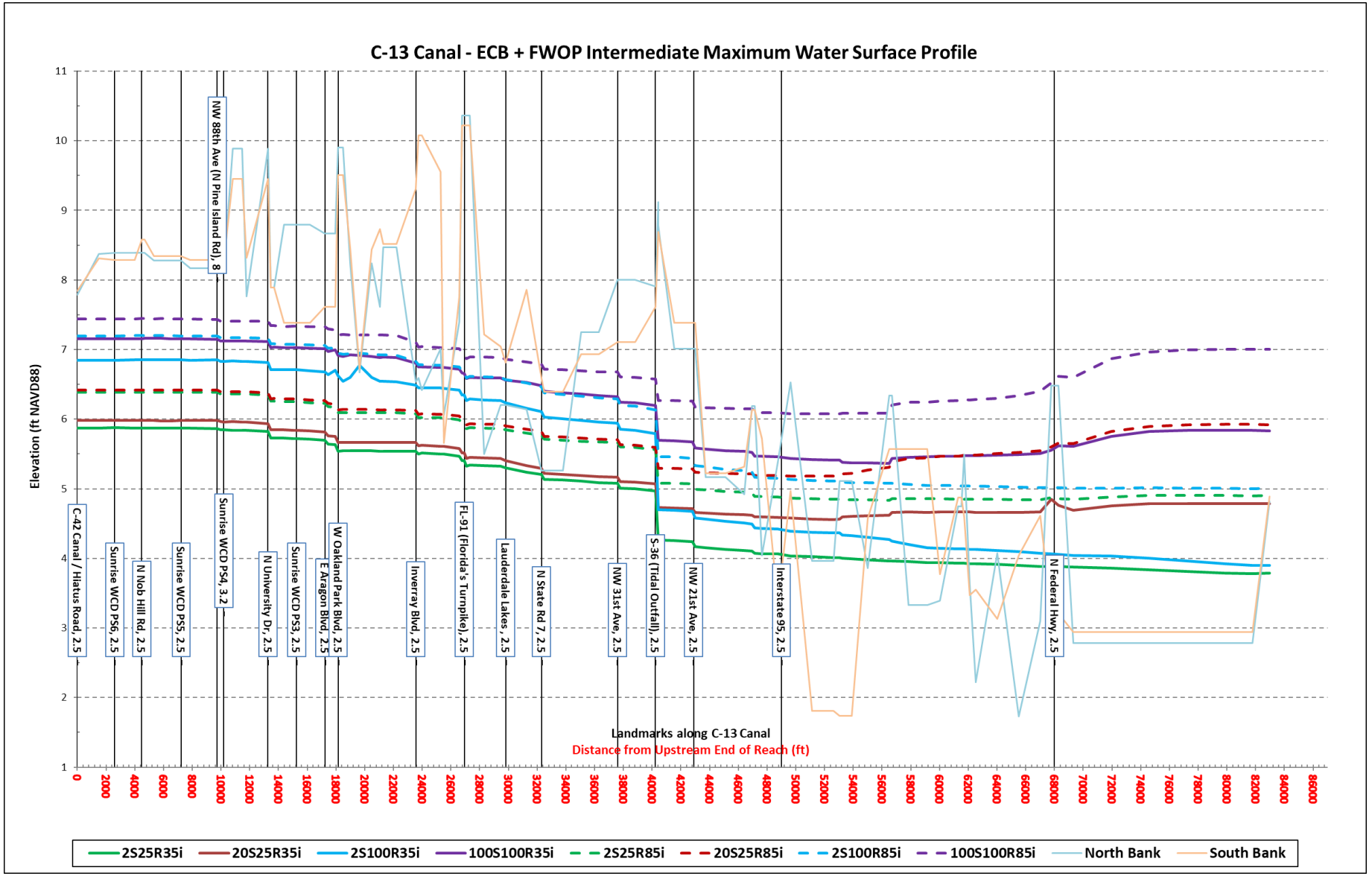
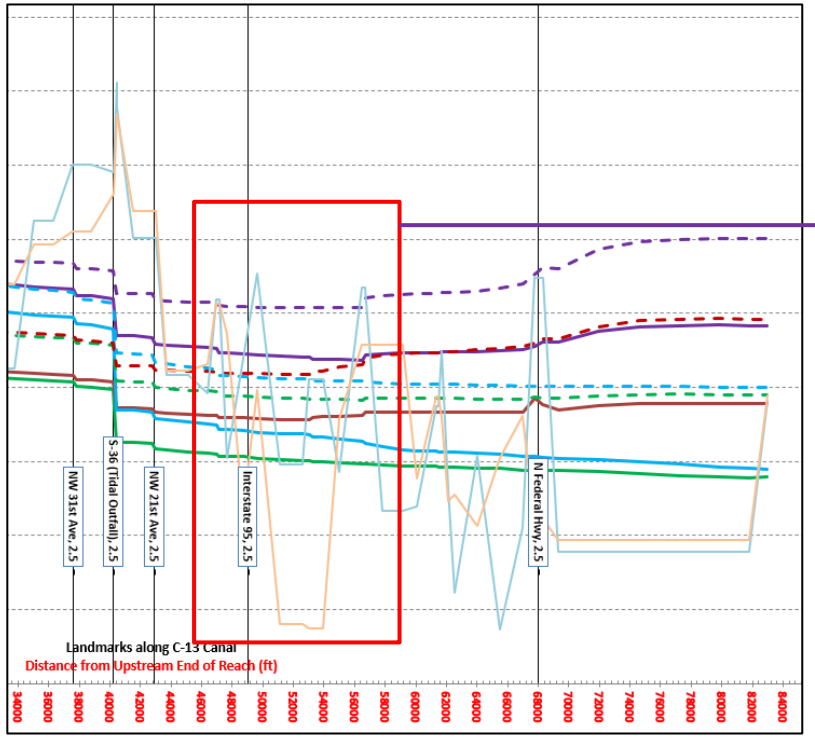
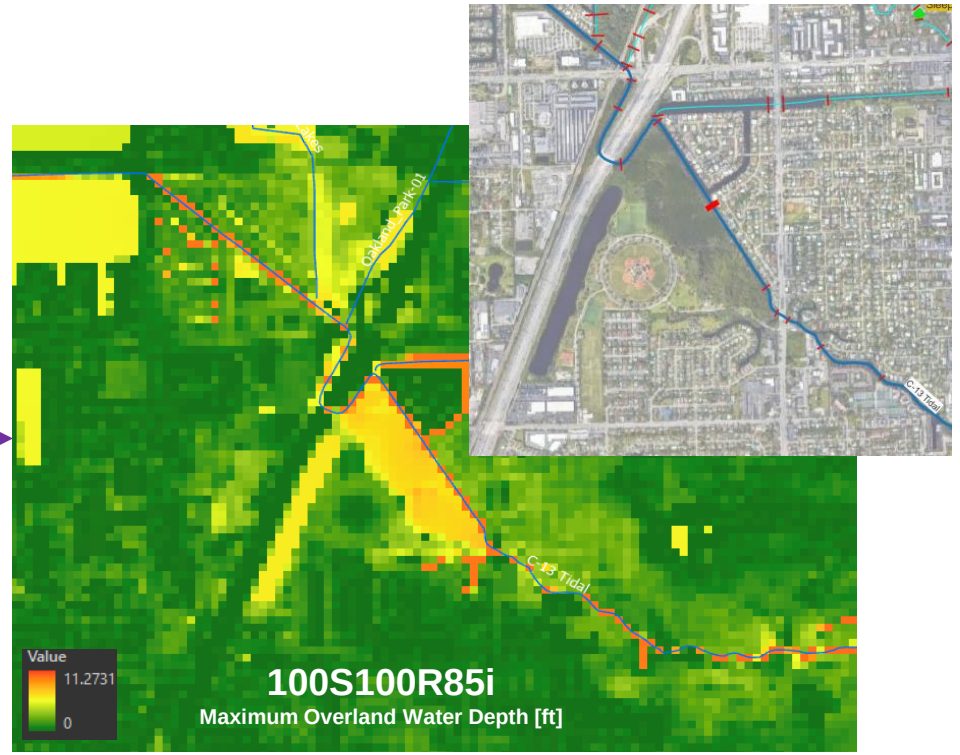
MAXIMUM STAGE PROFILE PLOT – C-13

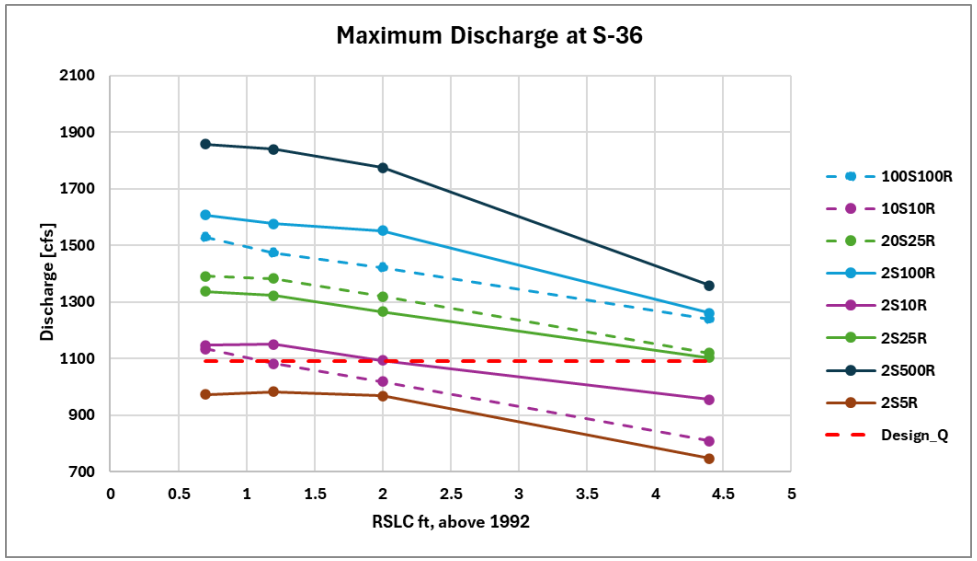


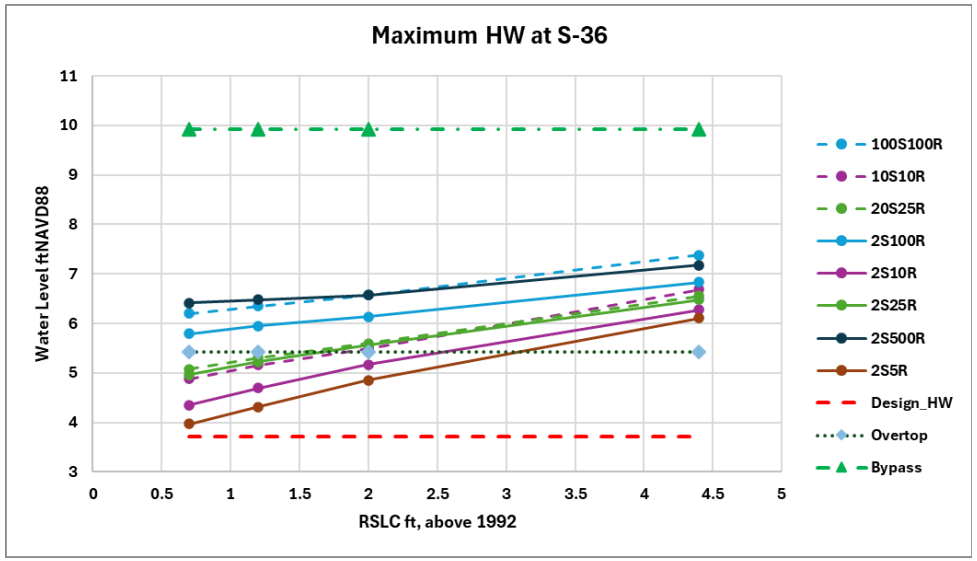
MAXIMUM STAGE PROFILE PLOT – C-13

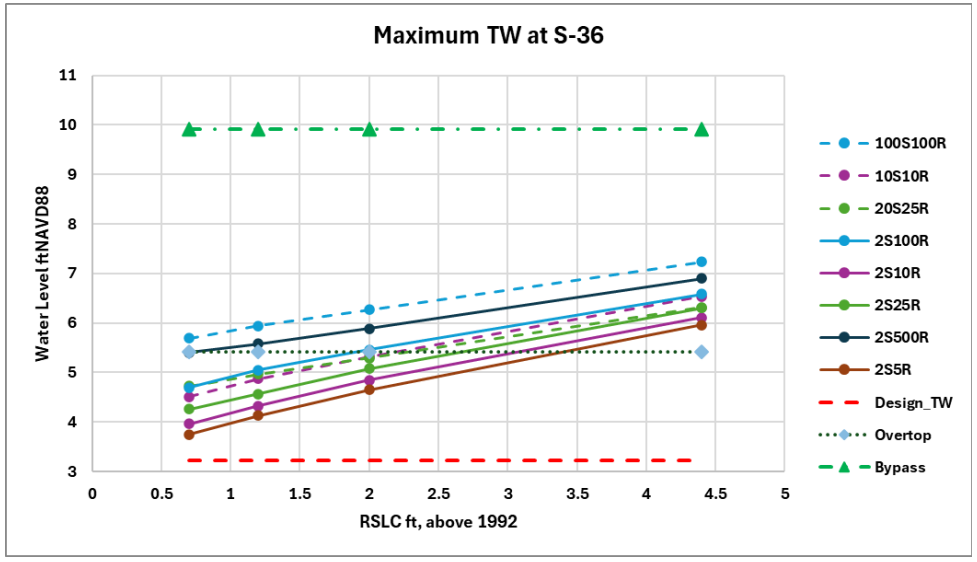




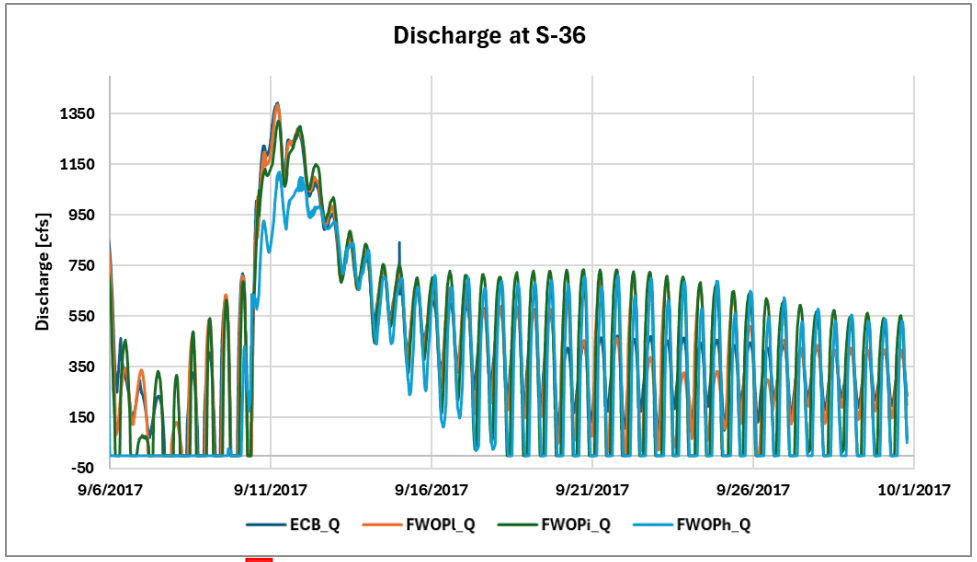
STRUCTURE PERFORMANCE, S36

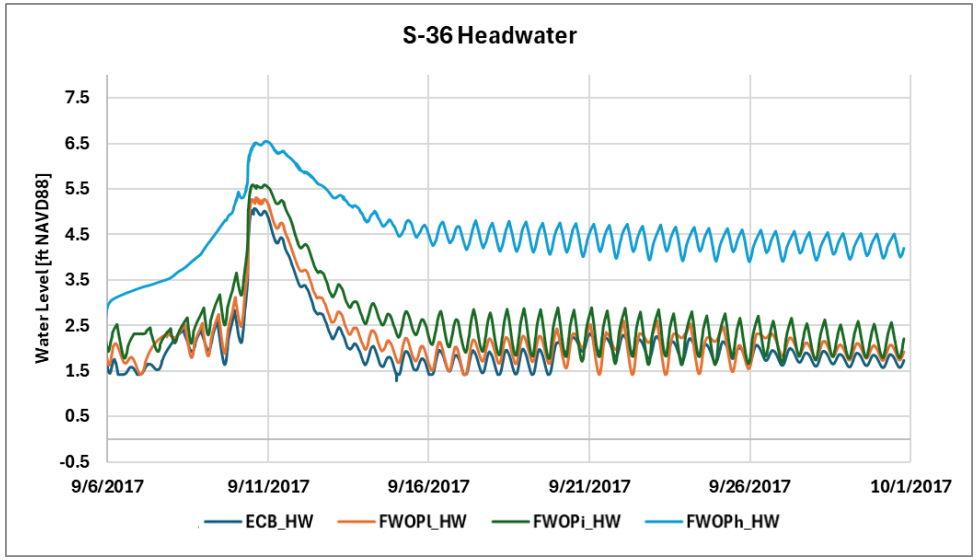


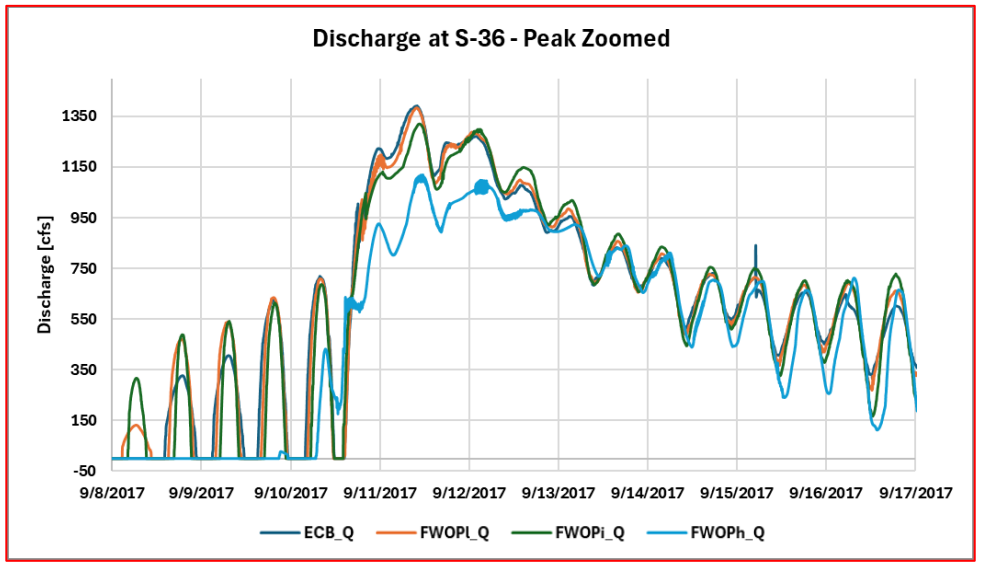


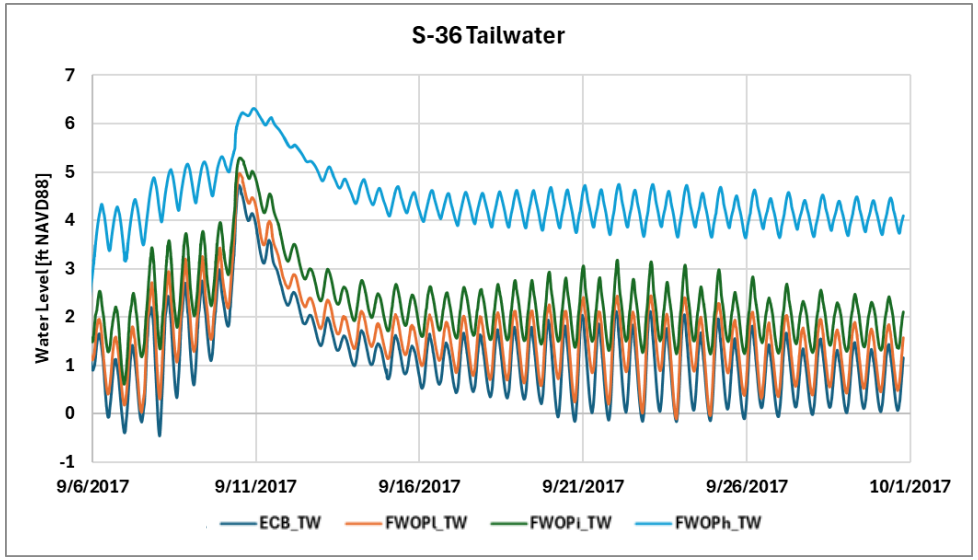


STRUCTURE PERFORMANCE, S36 – 20S25R

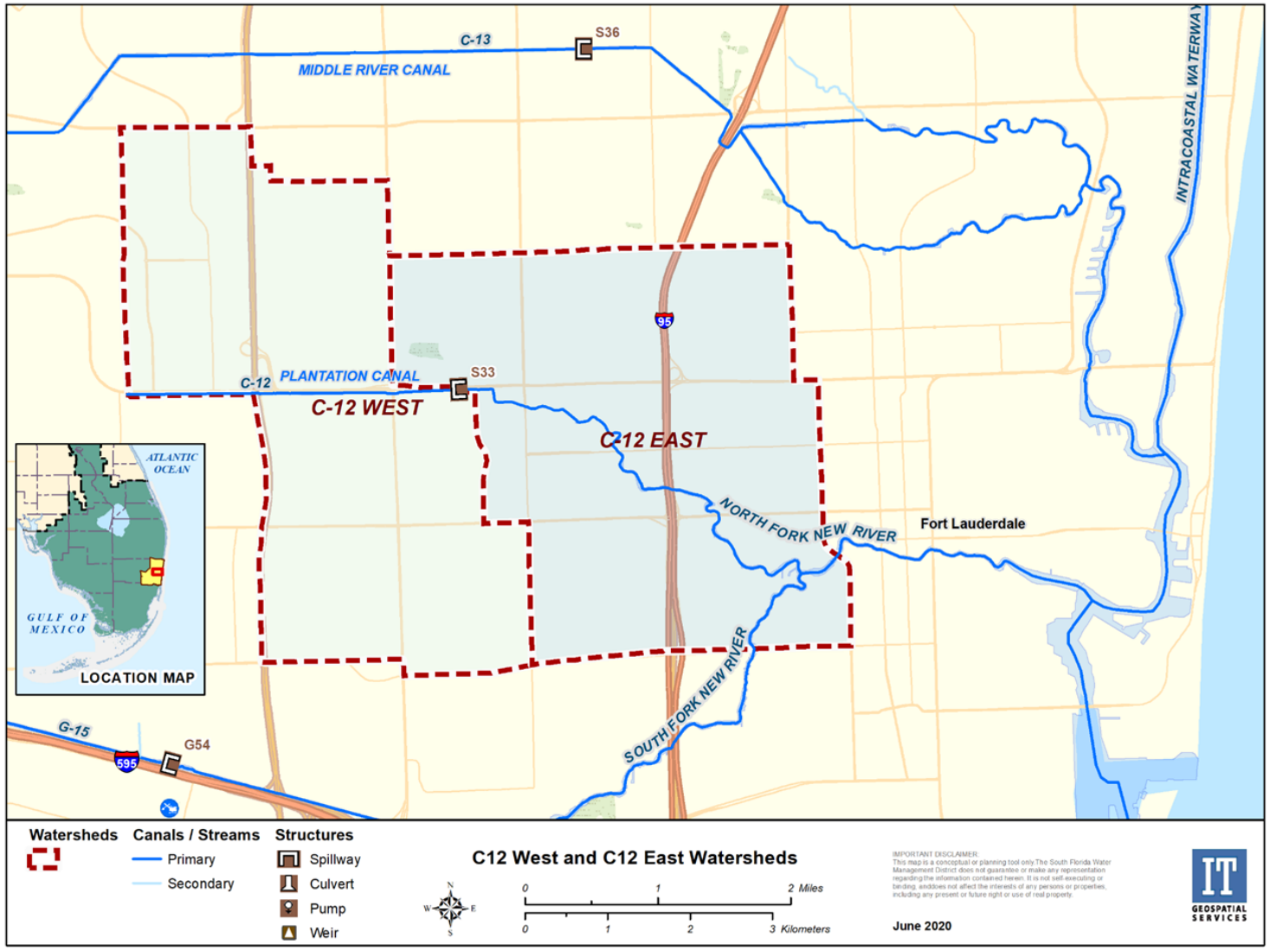




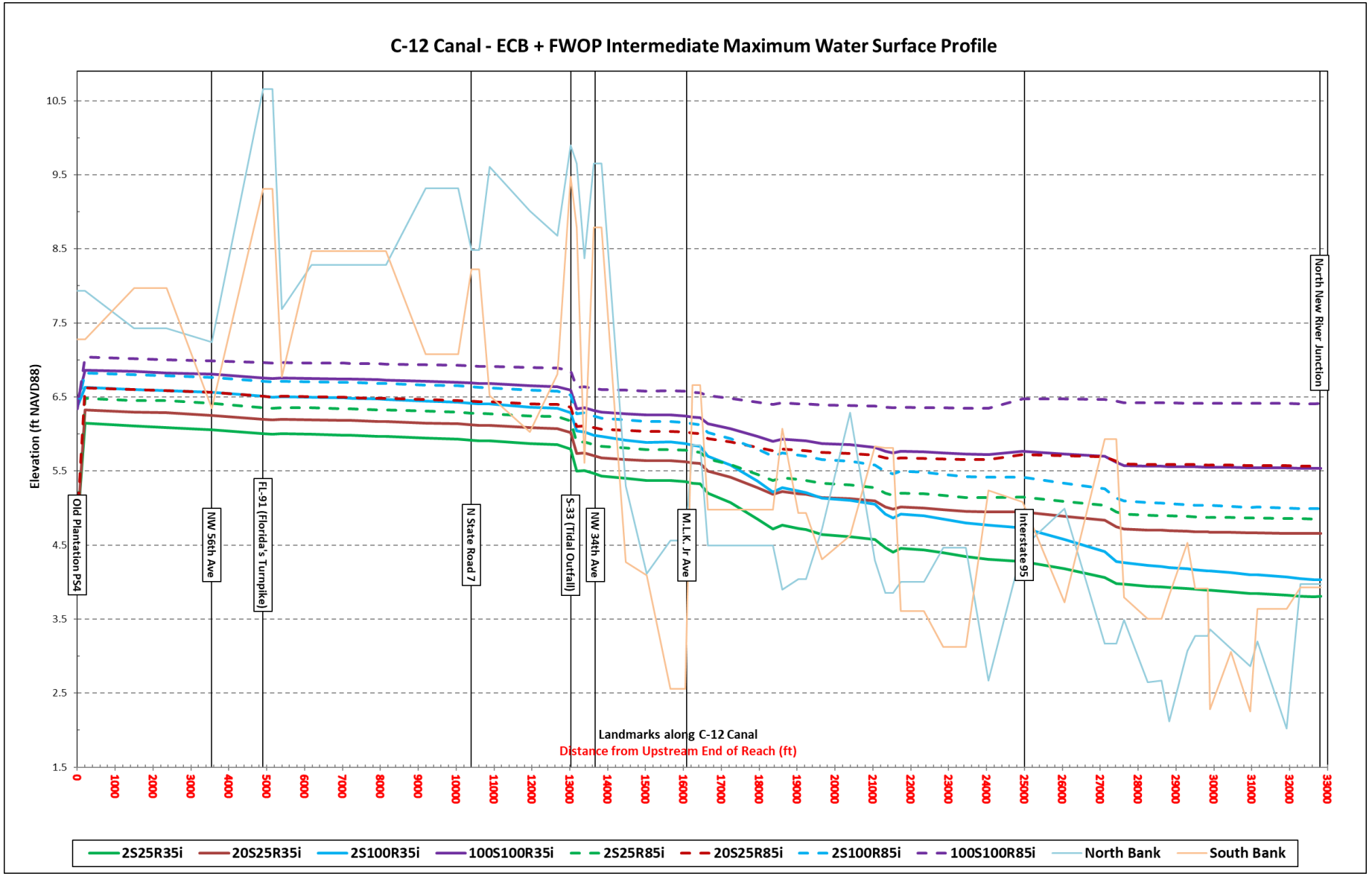




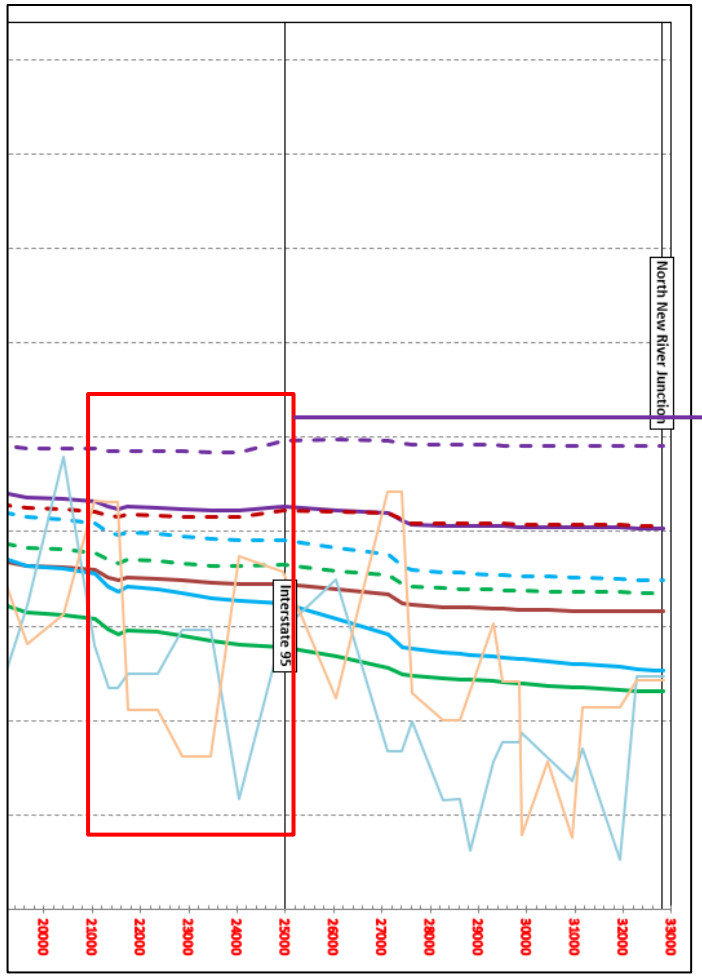
C-12, NORTH FORK NEW RIVER/ S33

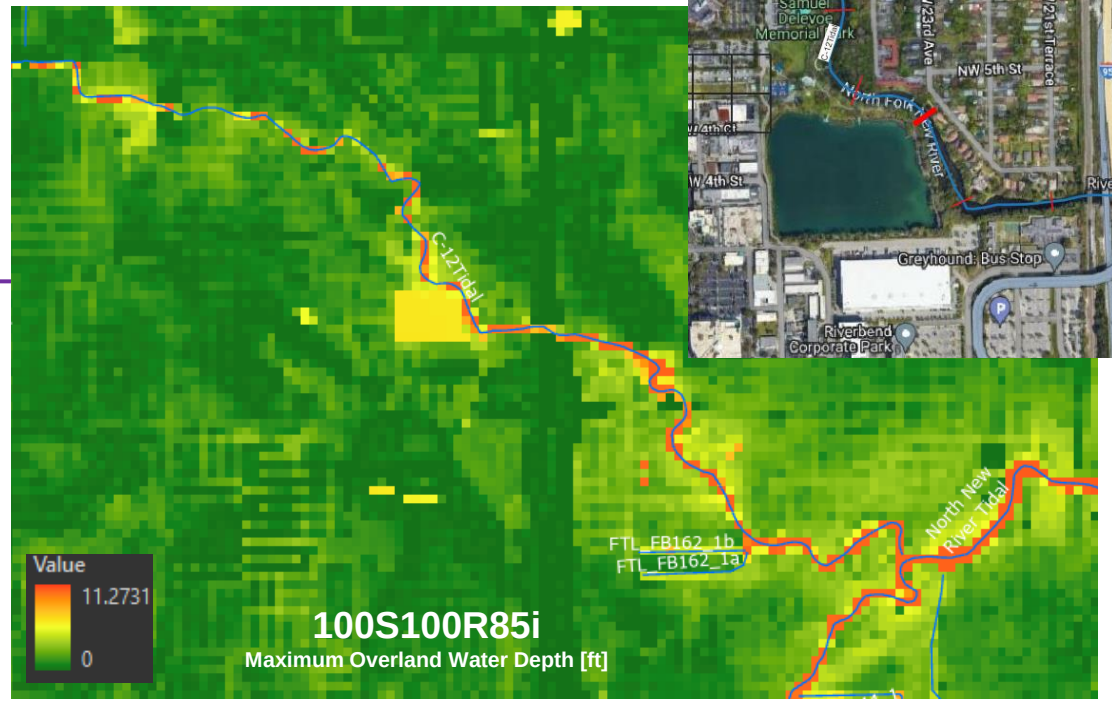


MAXIMUM STAGE PROFILE PLOT – C-12 / NFNR

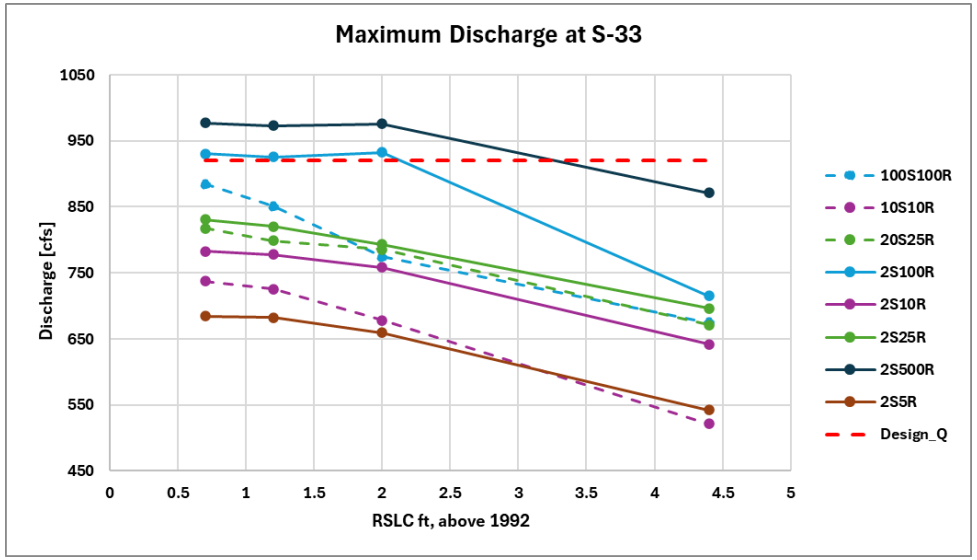


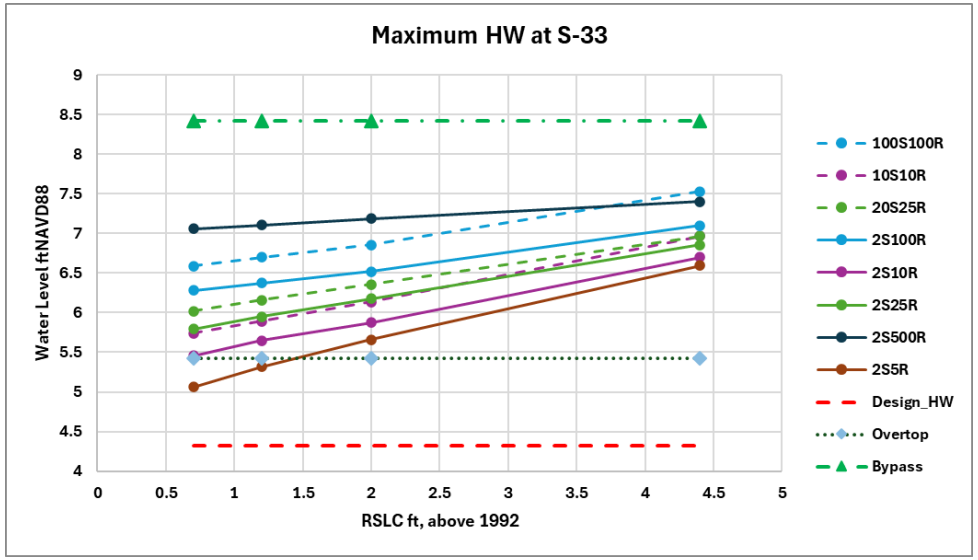
MAXIMUM STAGE PROFILE PLOT – C-12 / NFNR

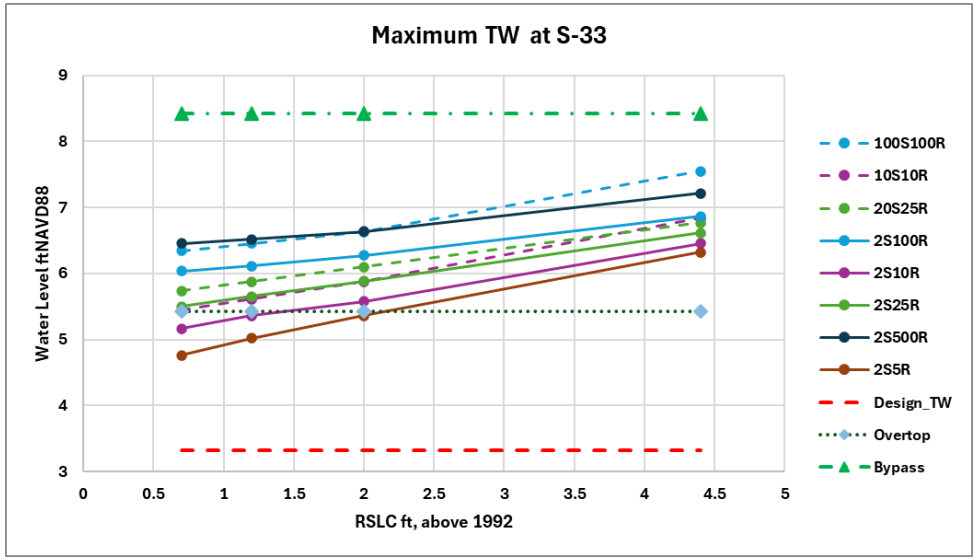




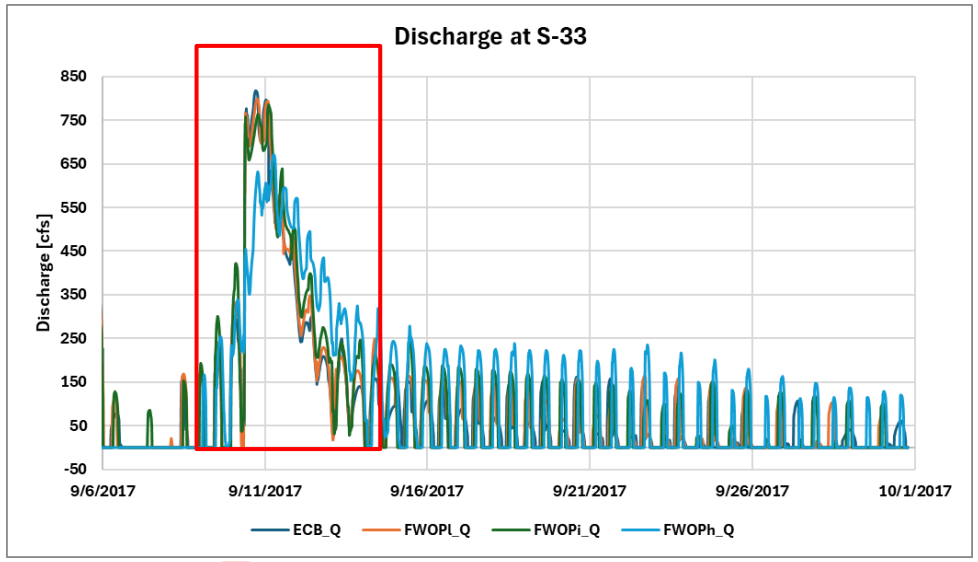
STRUCTURE PERFORMANCE, S33

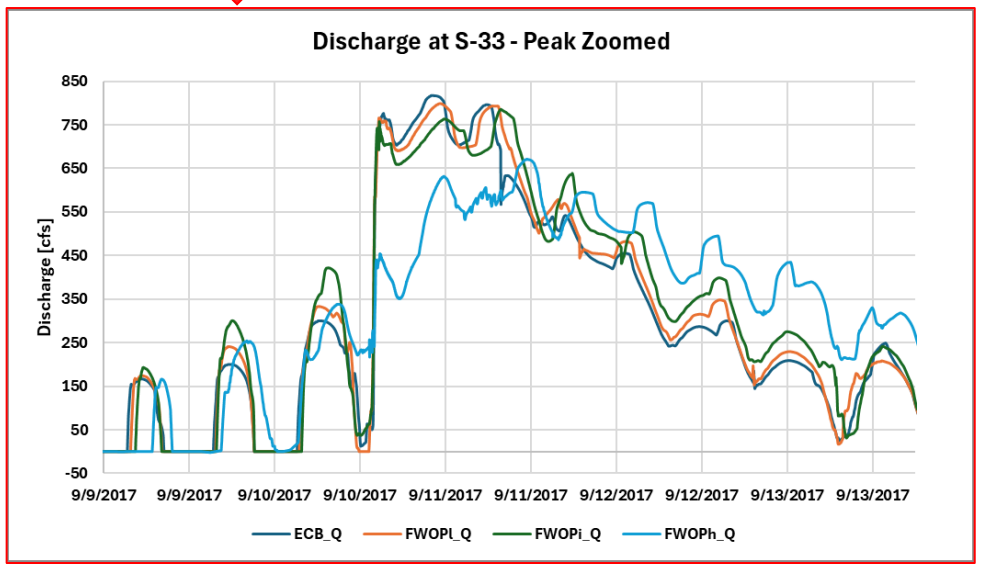


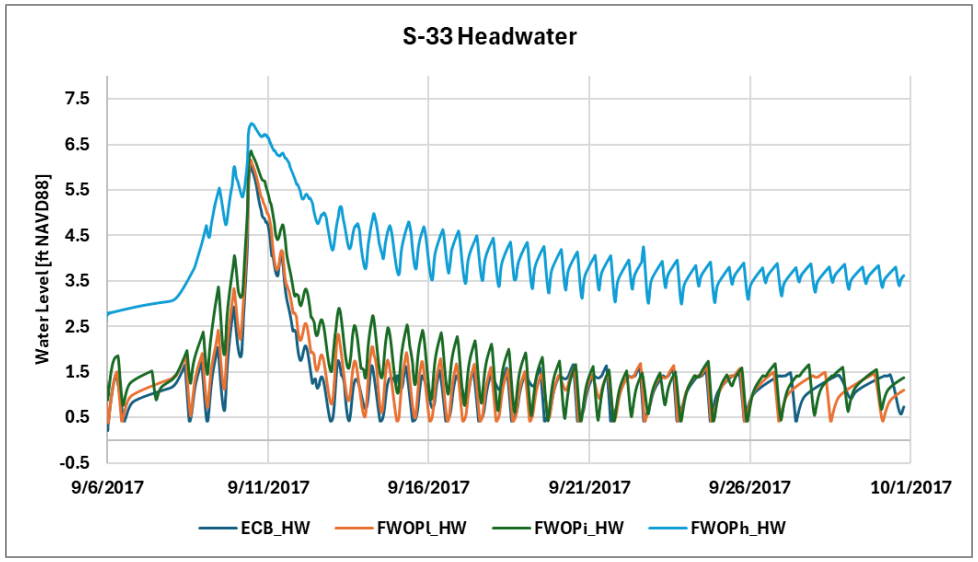


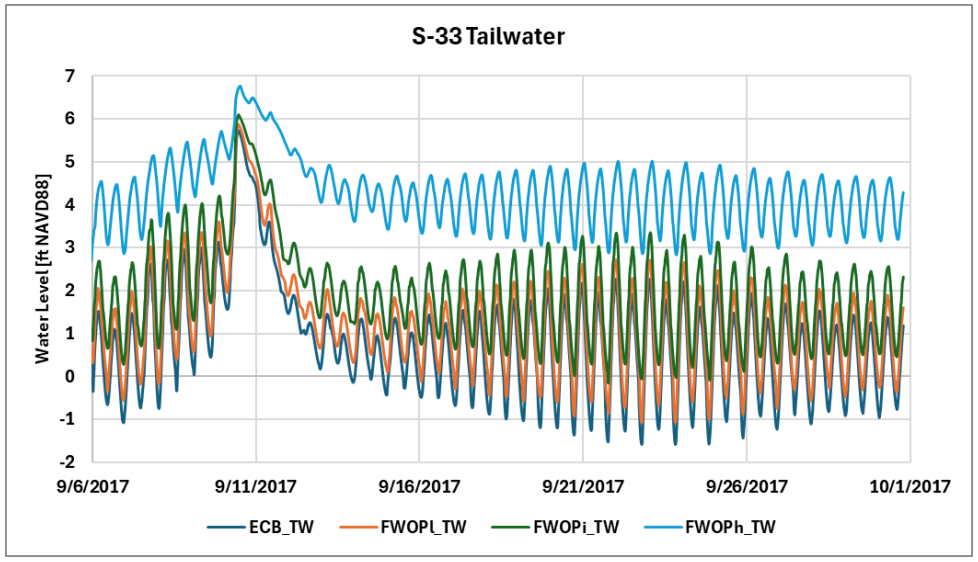


STRUCTURE PERFORMANCE, S33 – 20S25R

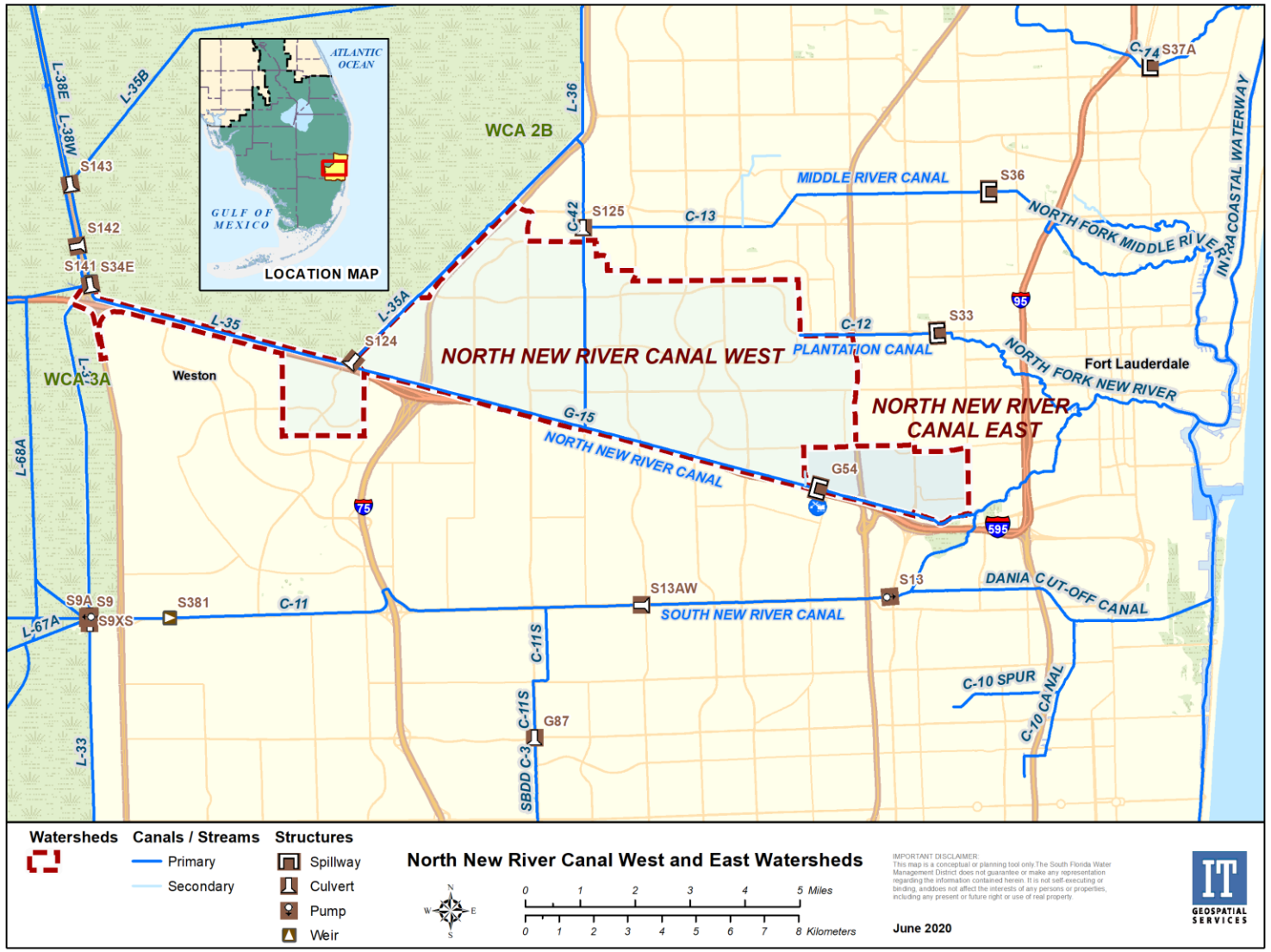




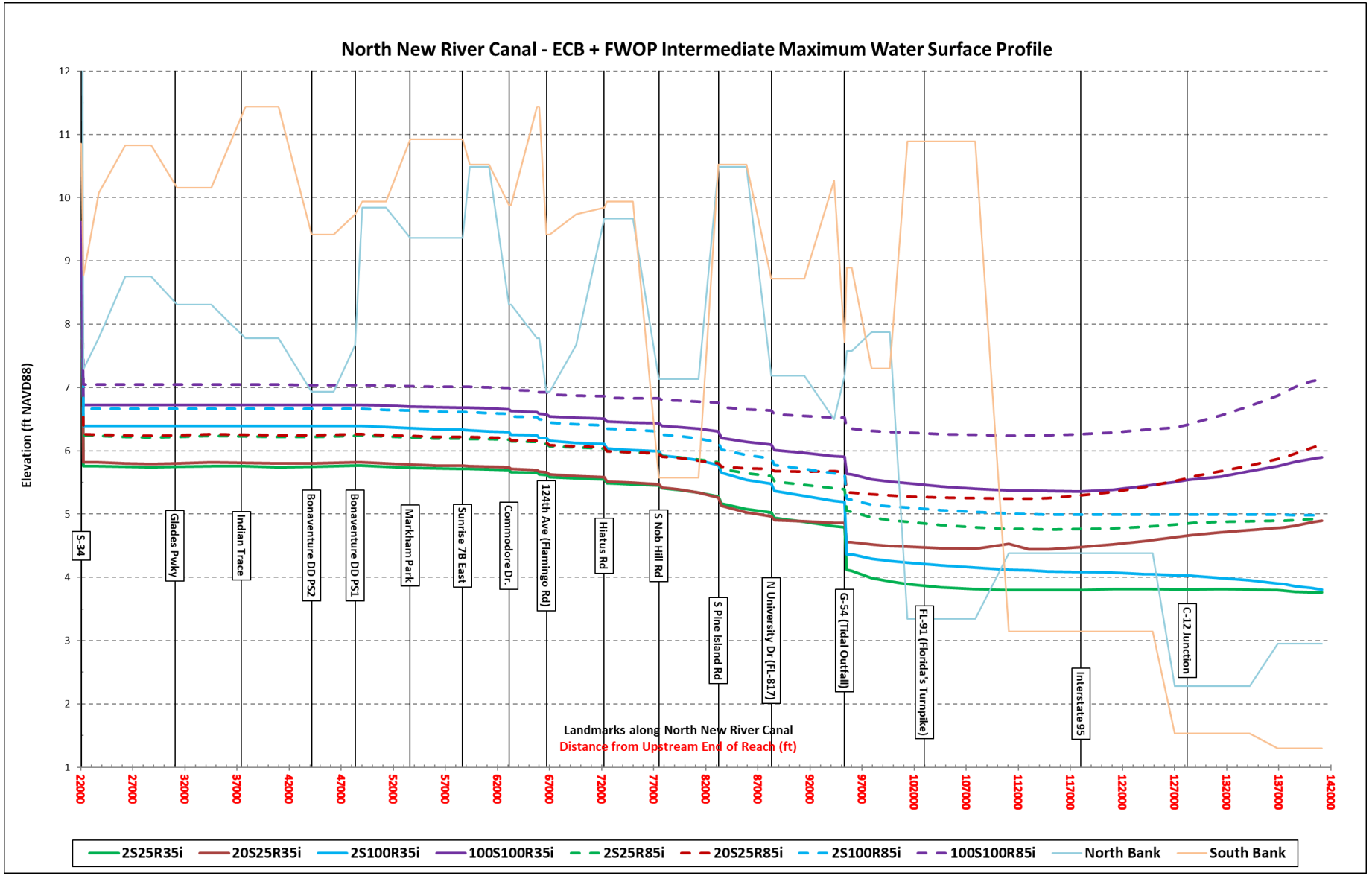




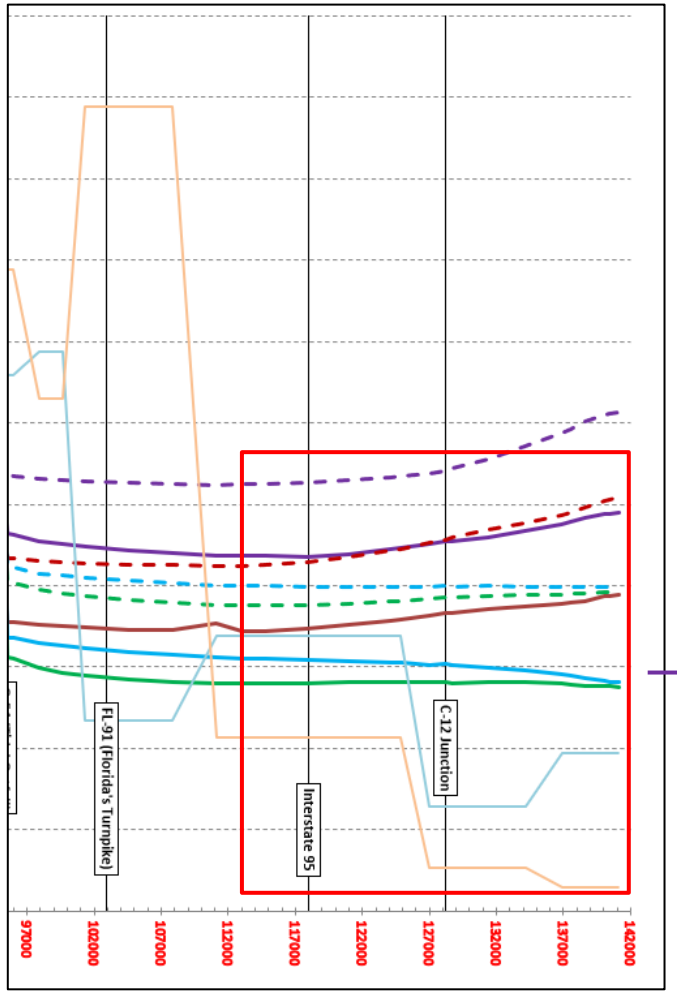
NORTH NEW RIVER CANAL /G54

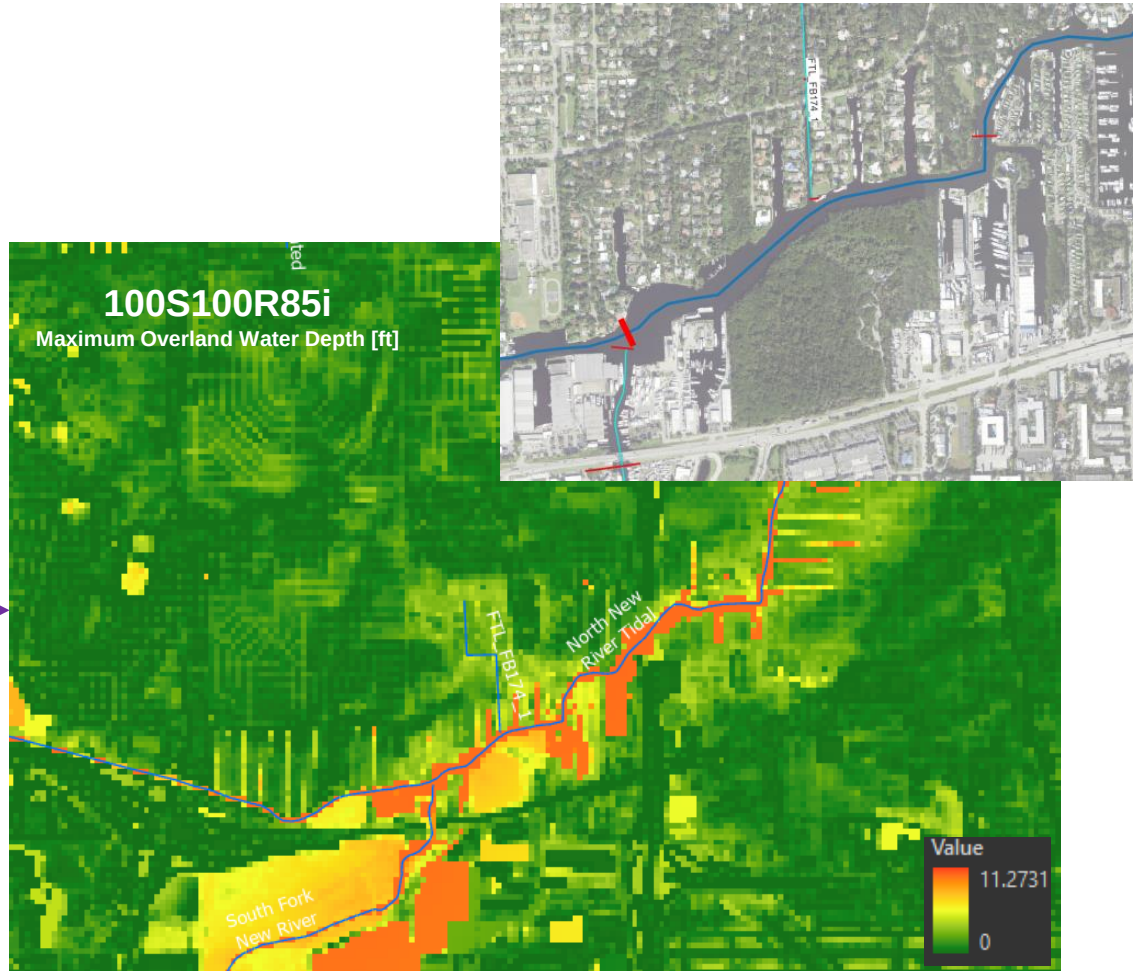


MAXIMUM STAGE PROFILE PLOT – NORTH NEW RIVER CANAL WEST

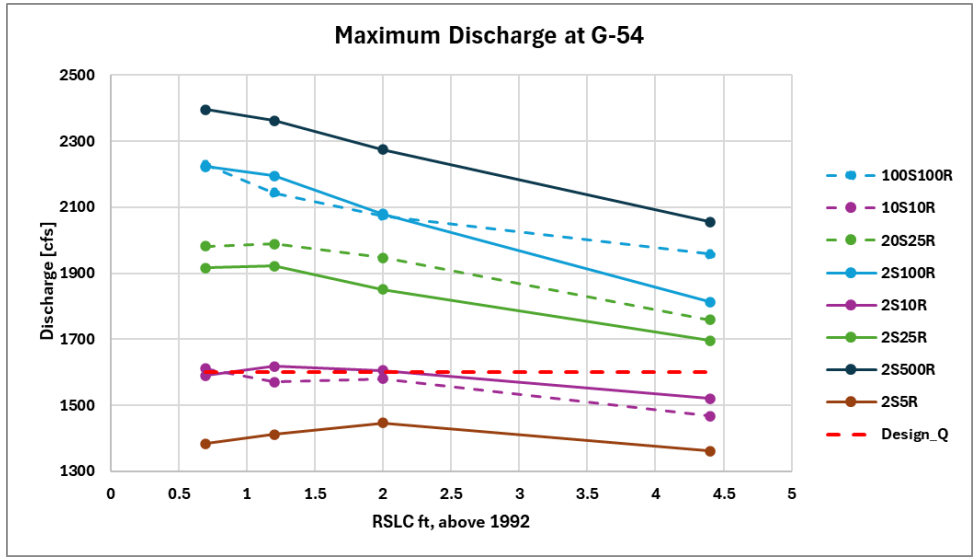


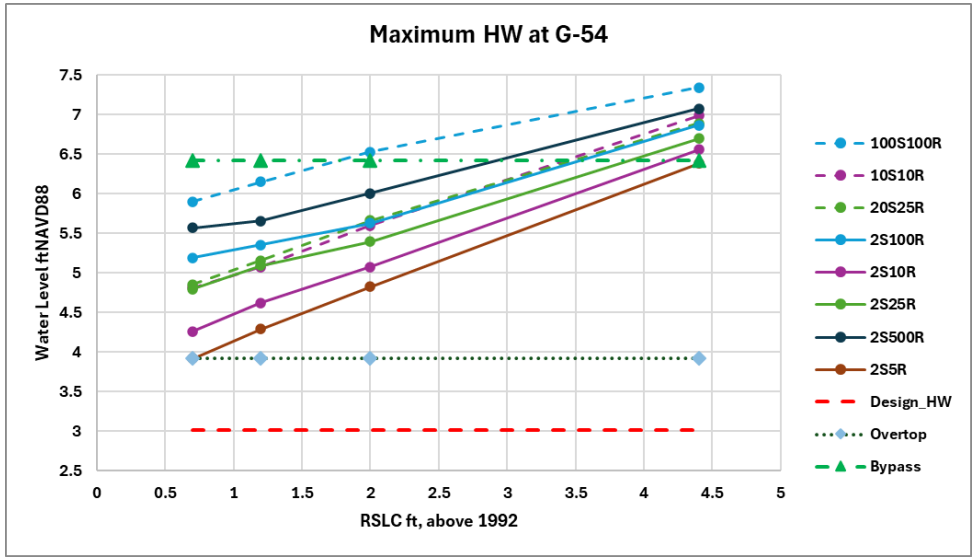
MAXIMUM STAGE PROFILE PLOT – NORTH NEW RIVER CANAL WEST

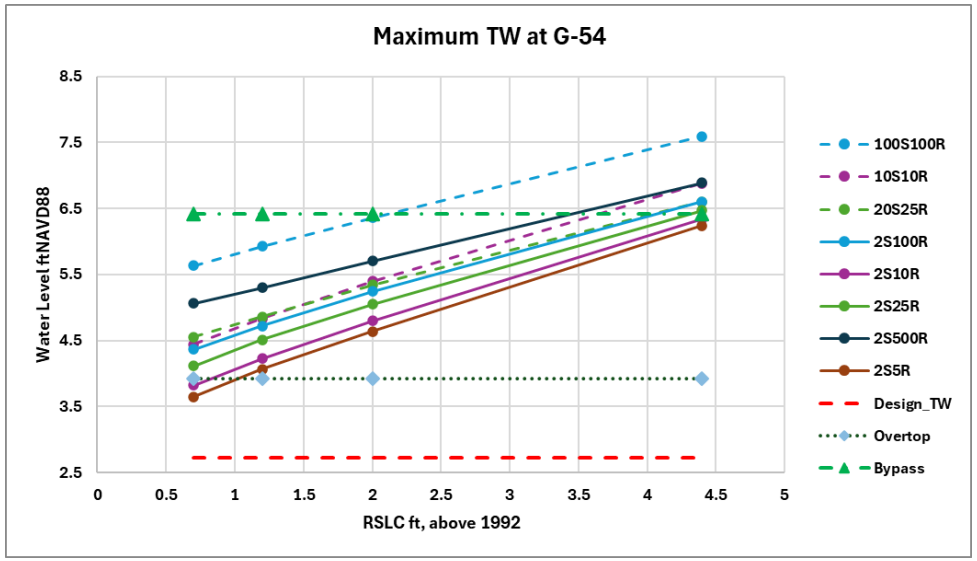




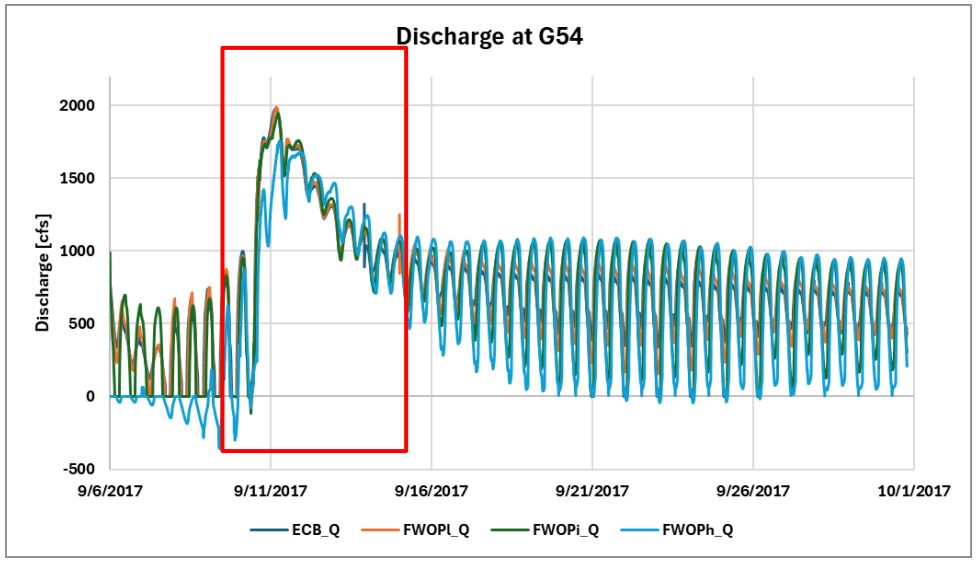
STRUCTURE PERFORMANCE, G54

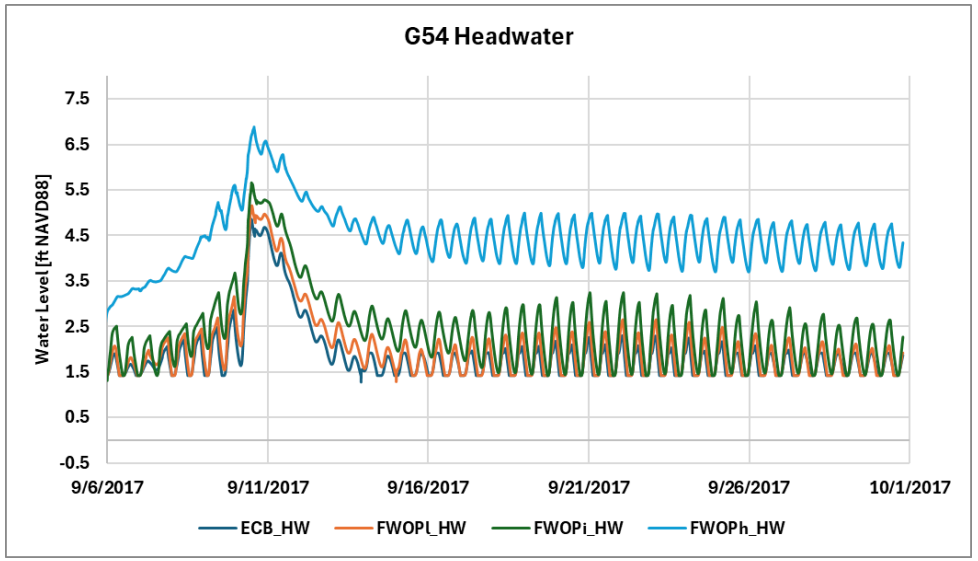


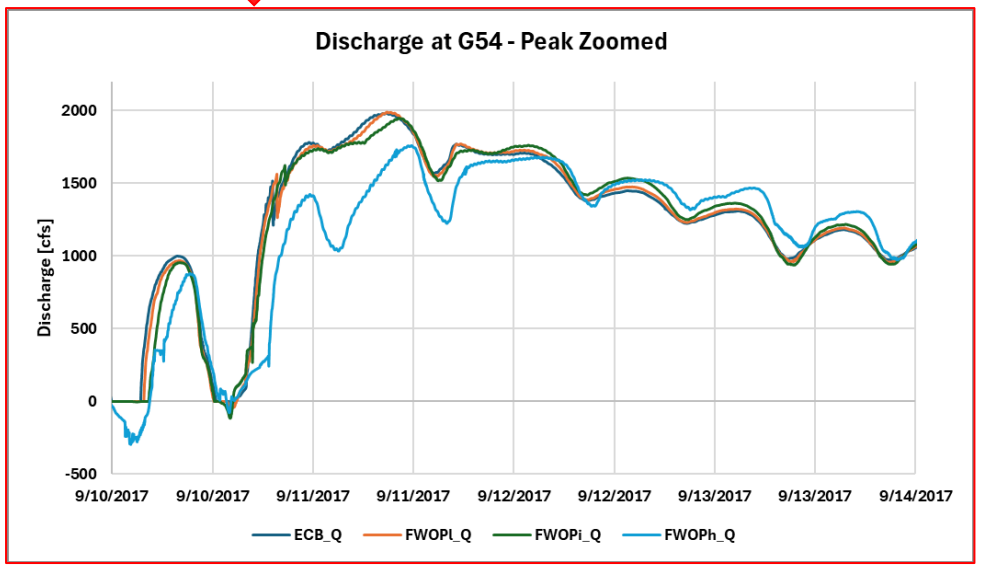


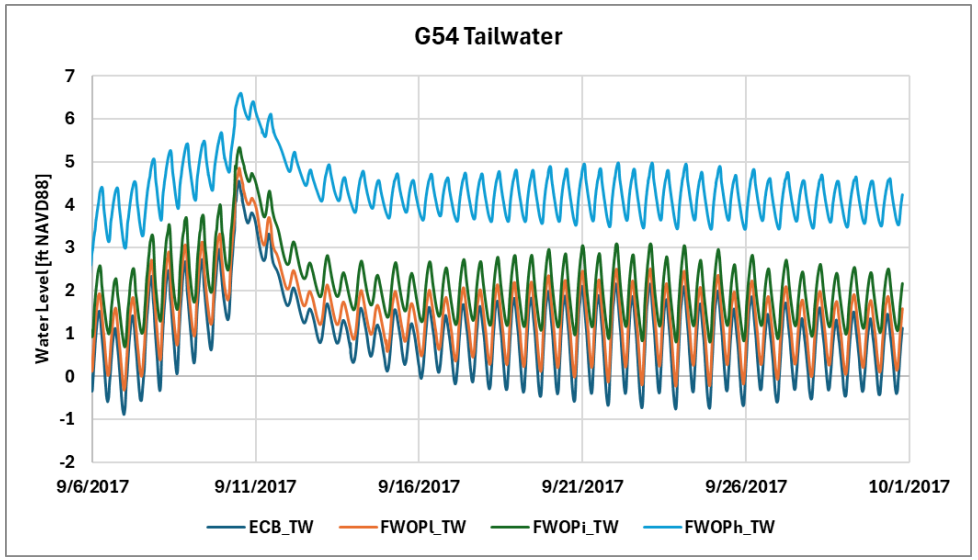


STRUCTURE PERFORMANCE, G54 – 20S25R









REACH A - Q&A

- Please **use the Q&A function** to submit questions OR **use the 'raise hand' function** at the bottom of your screen and we call on you to unmute.

- You are welcome to **submit follow up questions and additional comments** after the webinar via email to CSFFRSComments@usace.army.mil.

- Please take a moment to complete the **H&H Model Output Survey** at the provided link: https://forms.office.com/g/gkvZBCnCP3

6. BREAK

Workshop will resume at 1:00 PM

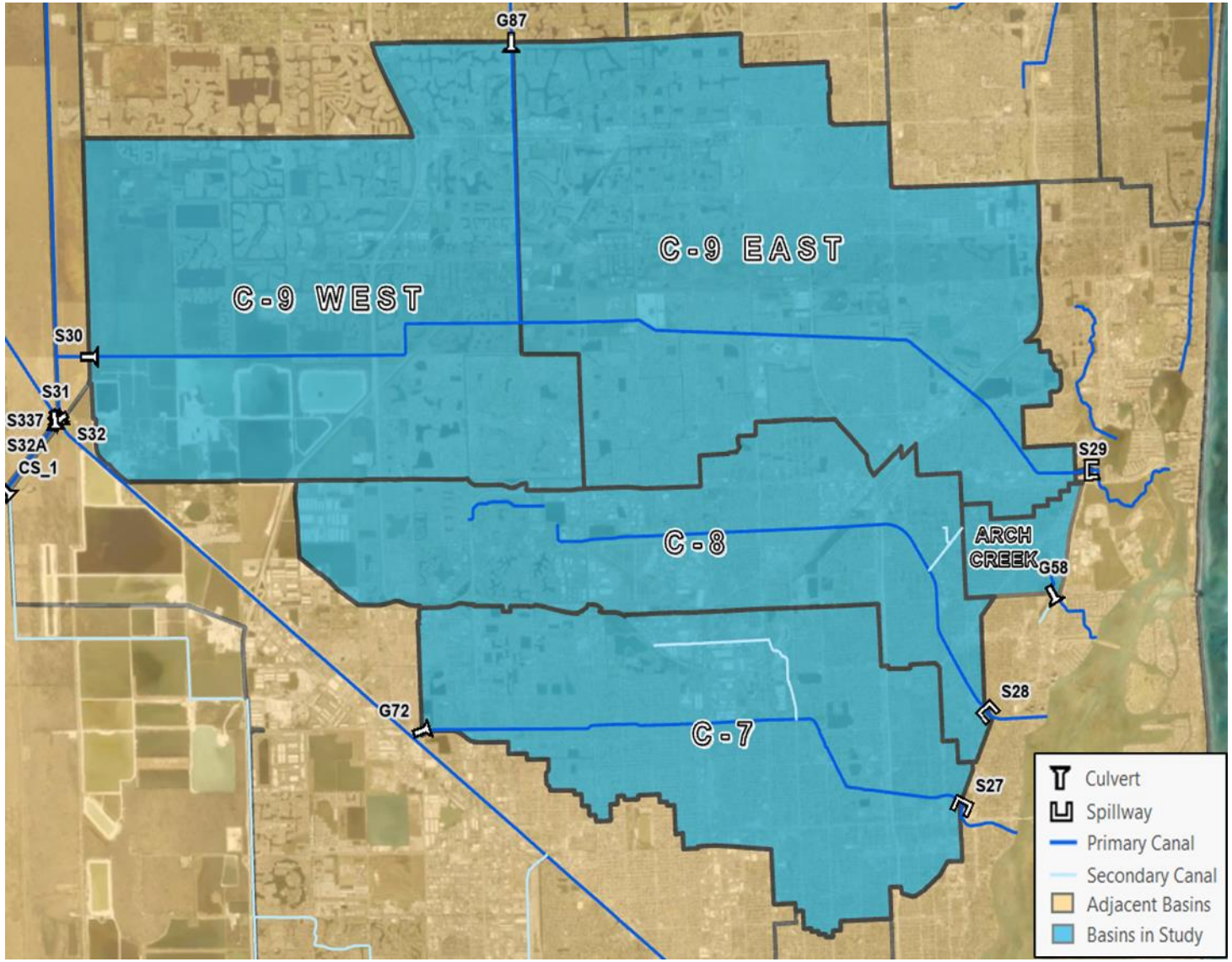
7. REACH B

Presenter: Amanda Bredesen, P.E., H&H Model Subteam Lead, USACE
Carol Ballard, P.E. CFM, H&H Model Subteam Lead, SFWM
Modelers: Joseph Wilder, P.E., Lead Modeler, Taylor Engineering
Francisco Pena, PhD., Resiliency Project Manager/Modeler

PLANNING REACH OVERVIEW

- Reach B consists of the C-7 or Little River Basin, C-8, and C-9 watersheds and additional watersheds downstream of the coastal structures including the western portion of the North Biscayne Bay watershed which encompasses the Arch Creek sub watershed area.

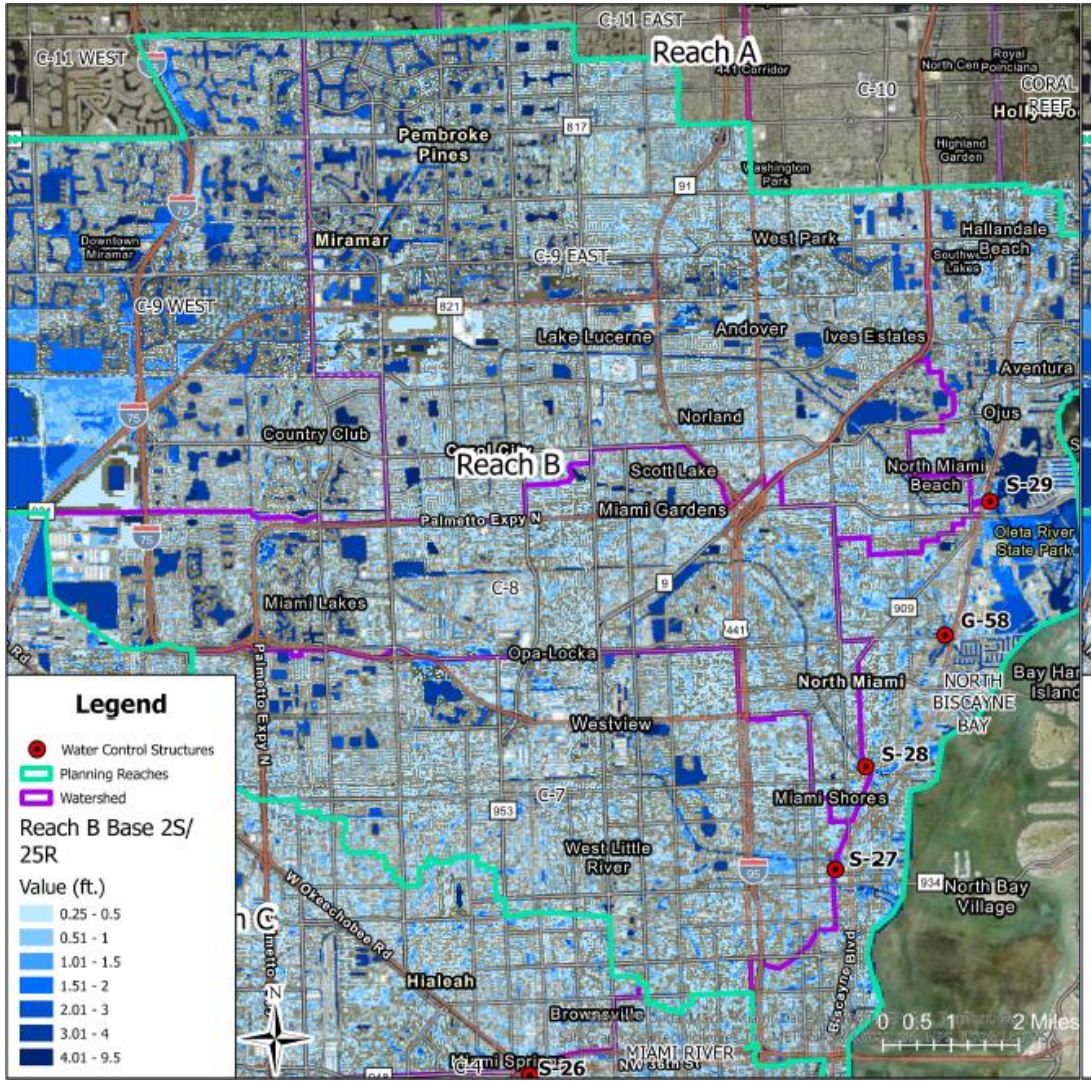
- Section 216 Focus: C-9/S-29, Arch Creek/G-58, C-8/S-28 and C-7/S-27

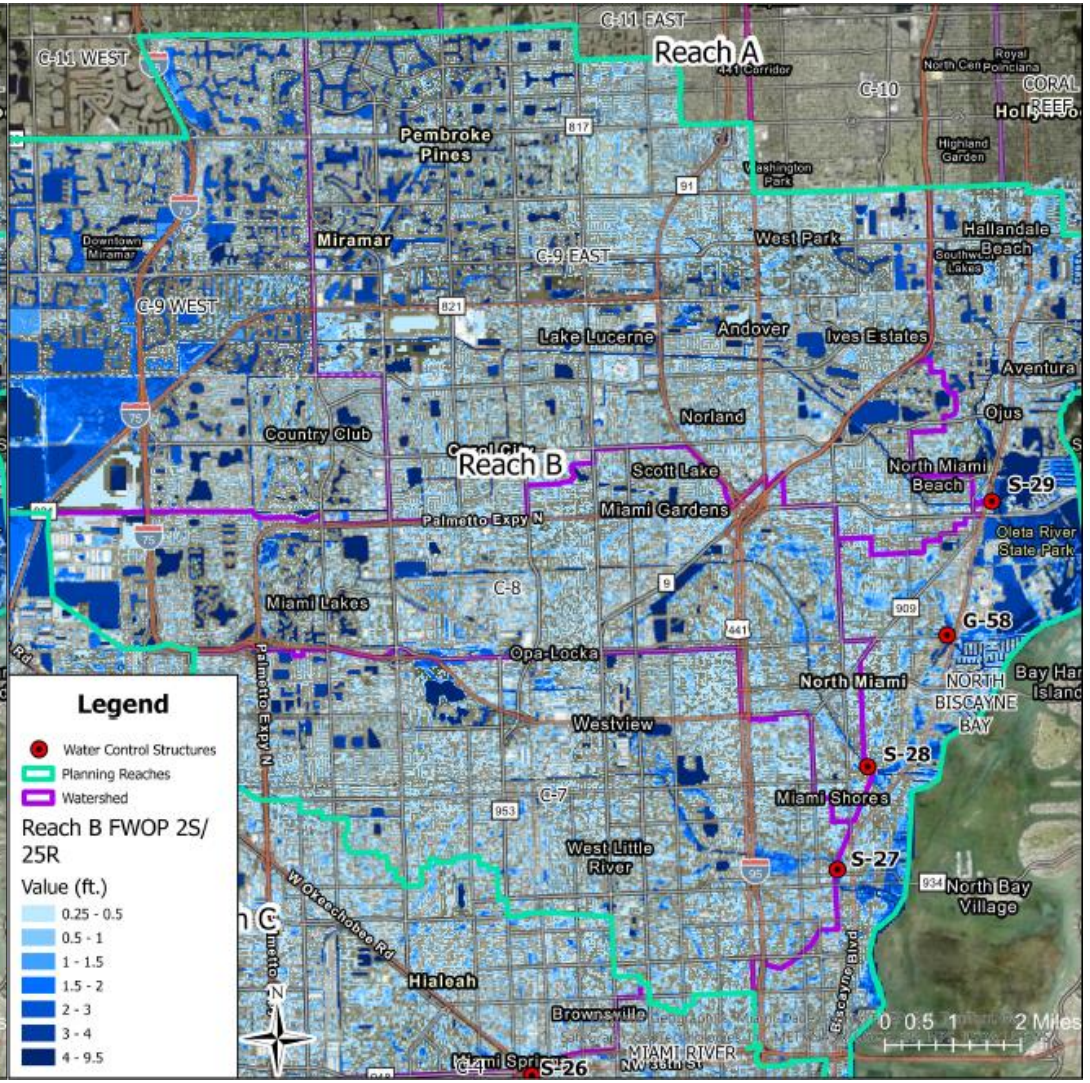


Primary canals and structures in Reach B

MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 2-YEAR COASTAL

Base Year

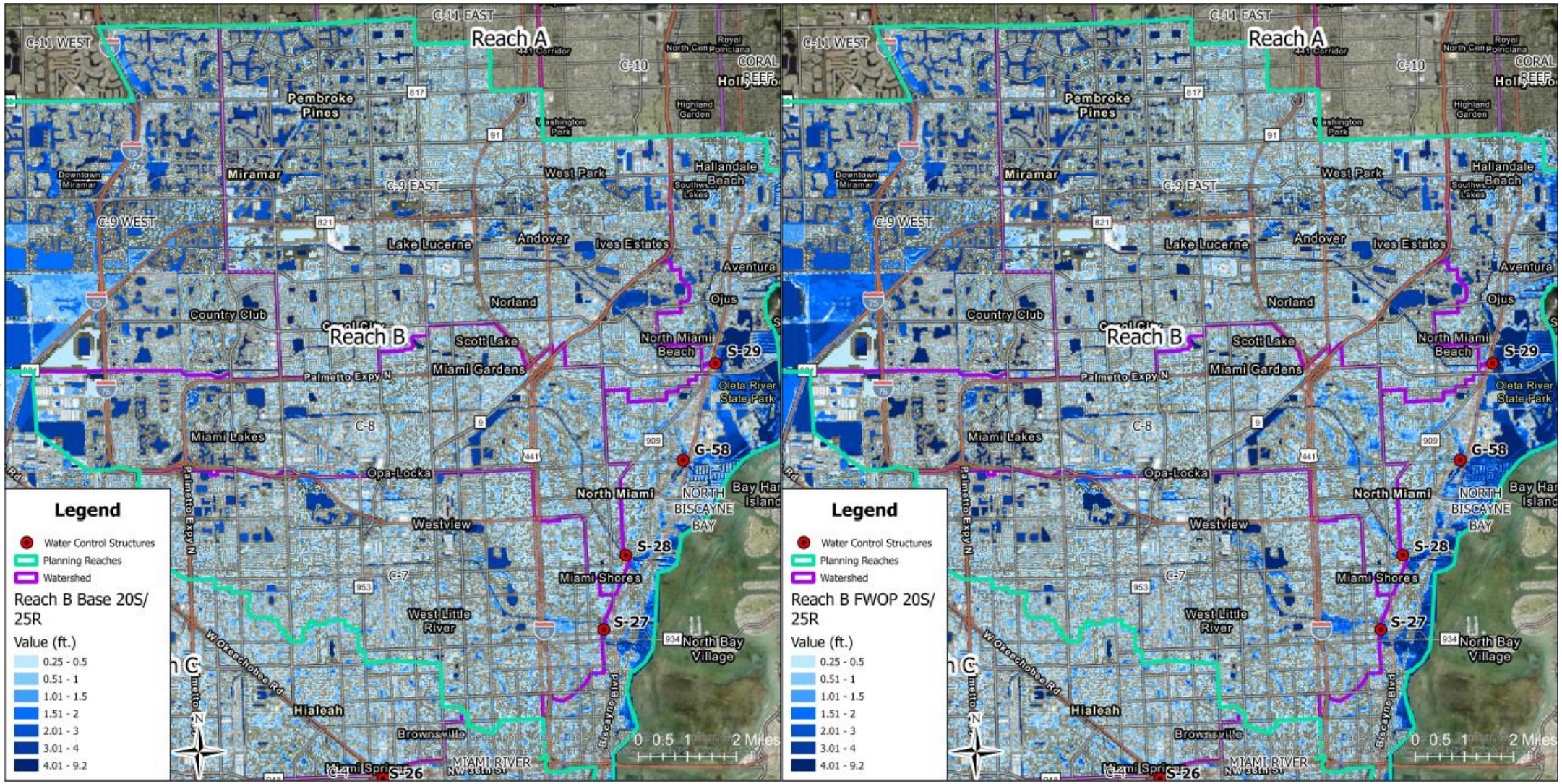




FWOP Int SLR

MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 20-YEAR COASTAL

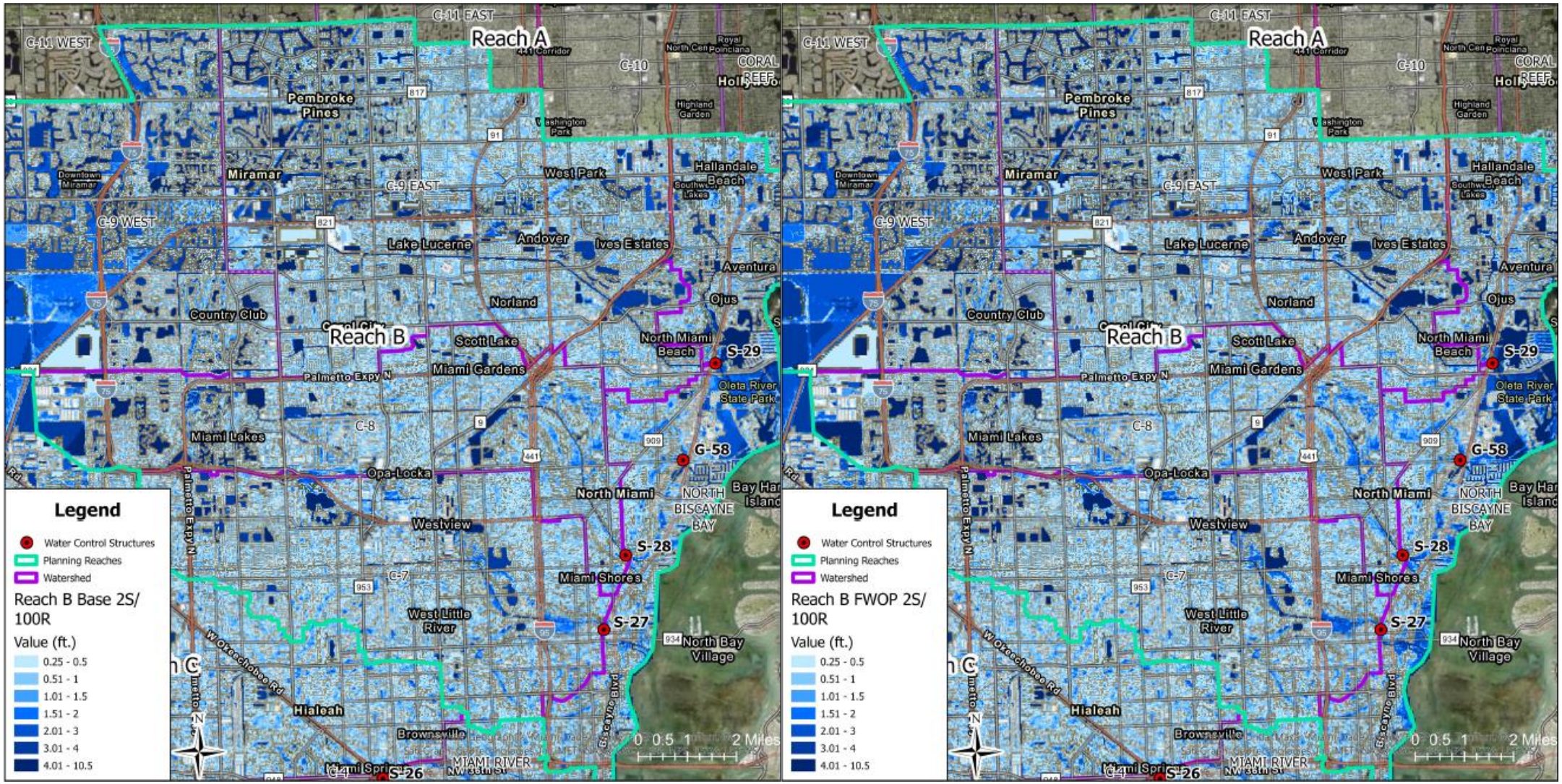
Base Year



FWOP Int SLR

MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 2-YEAR COASTAL

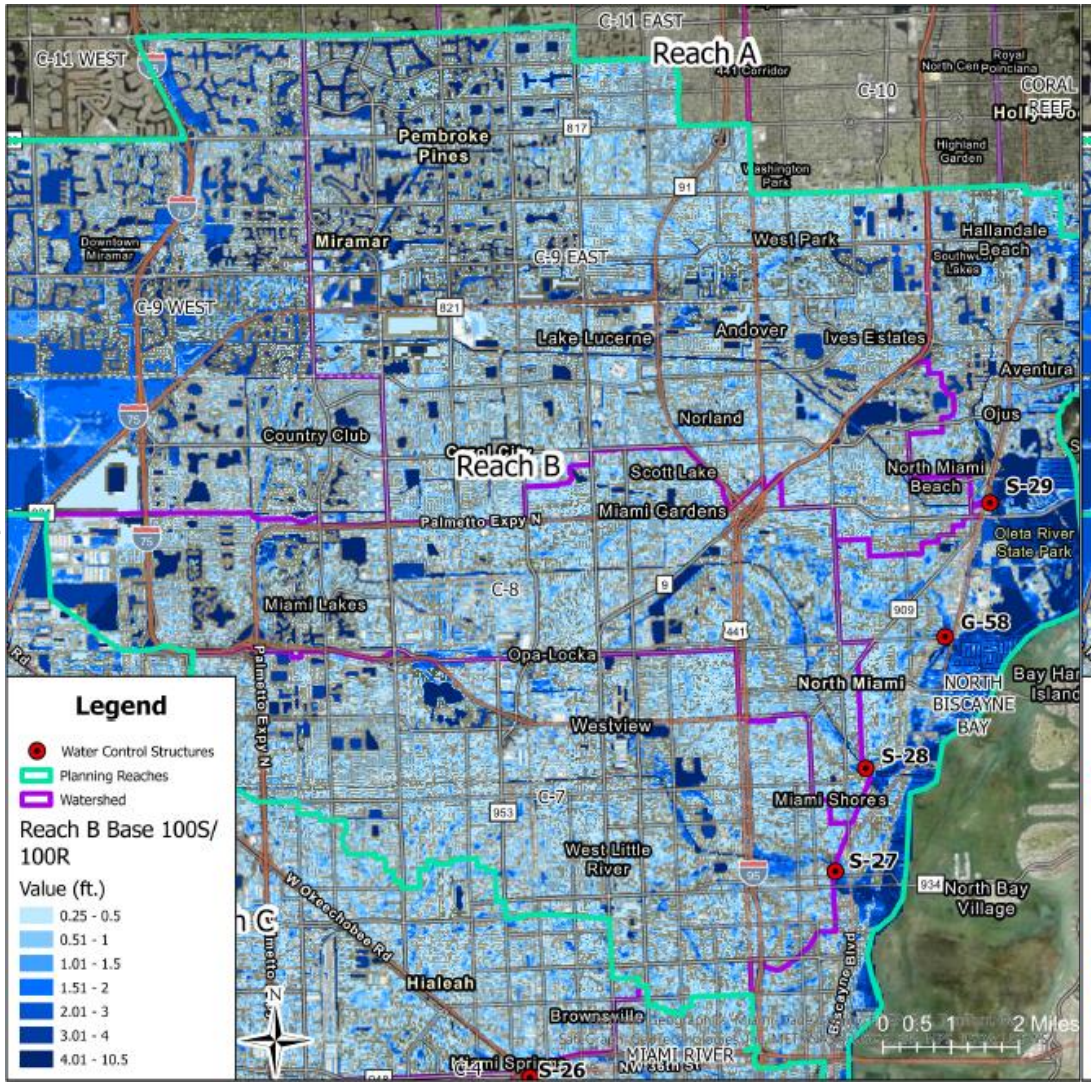
Base Year

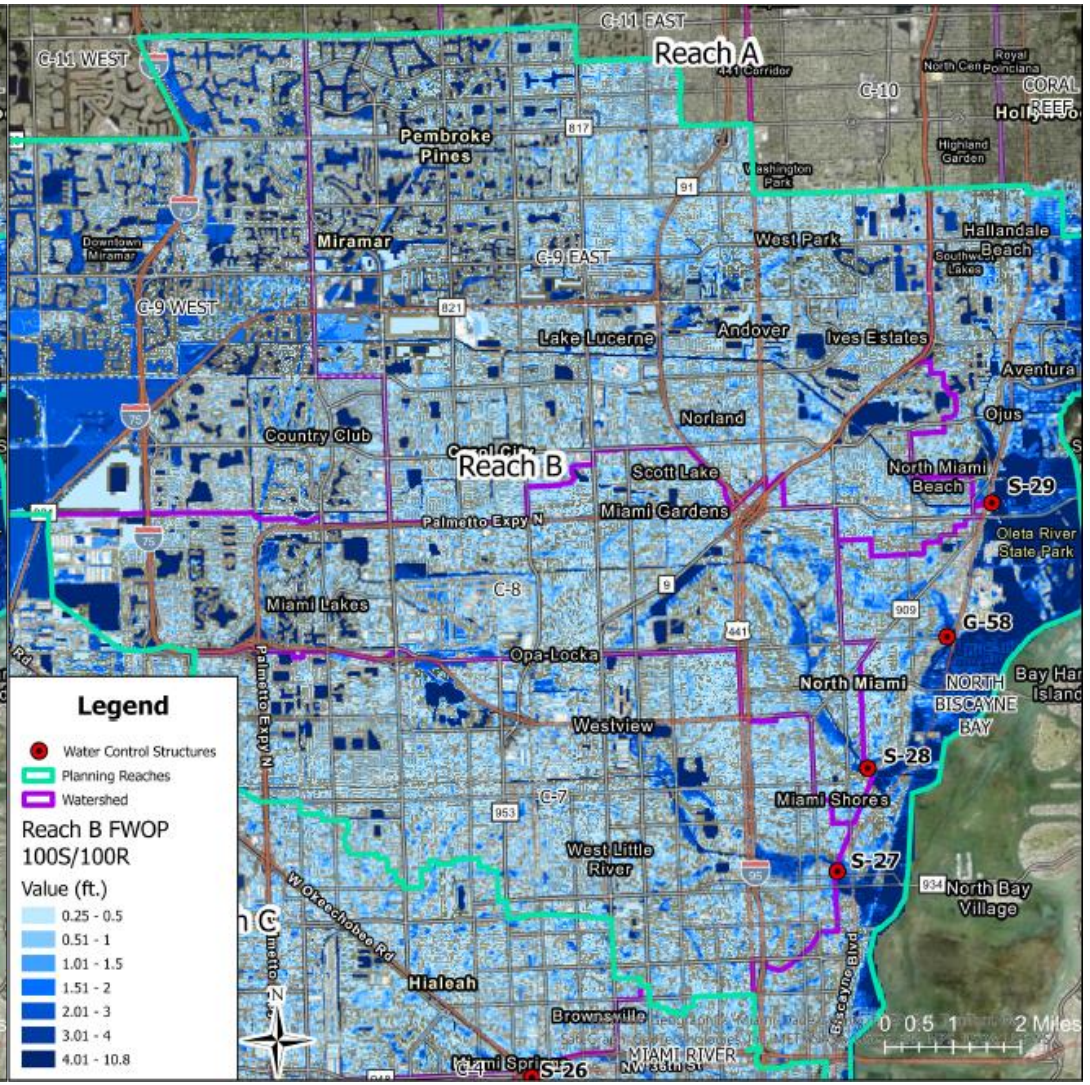


FWOP Int SLR

MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 100-YEAR COASTAL

Base Year





FWOP Int SLR

REACH B

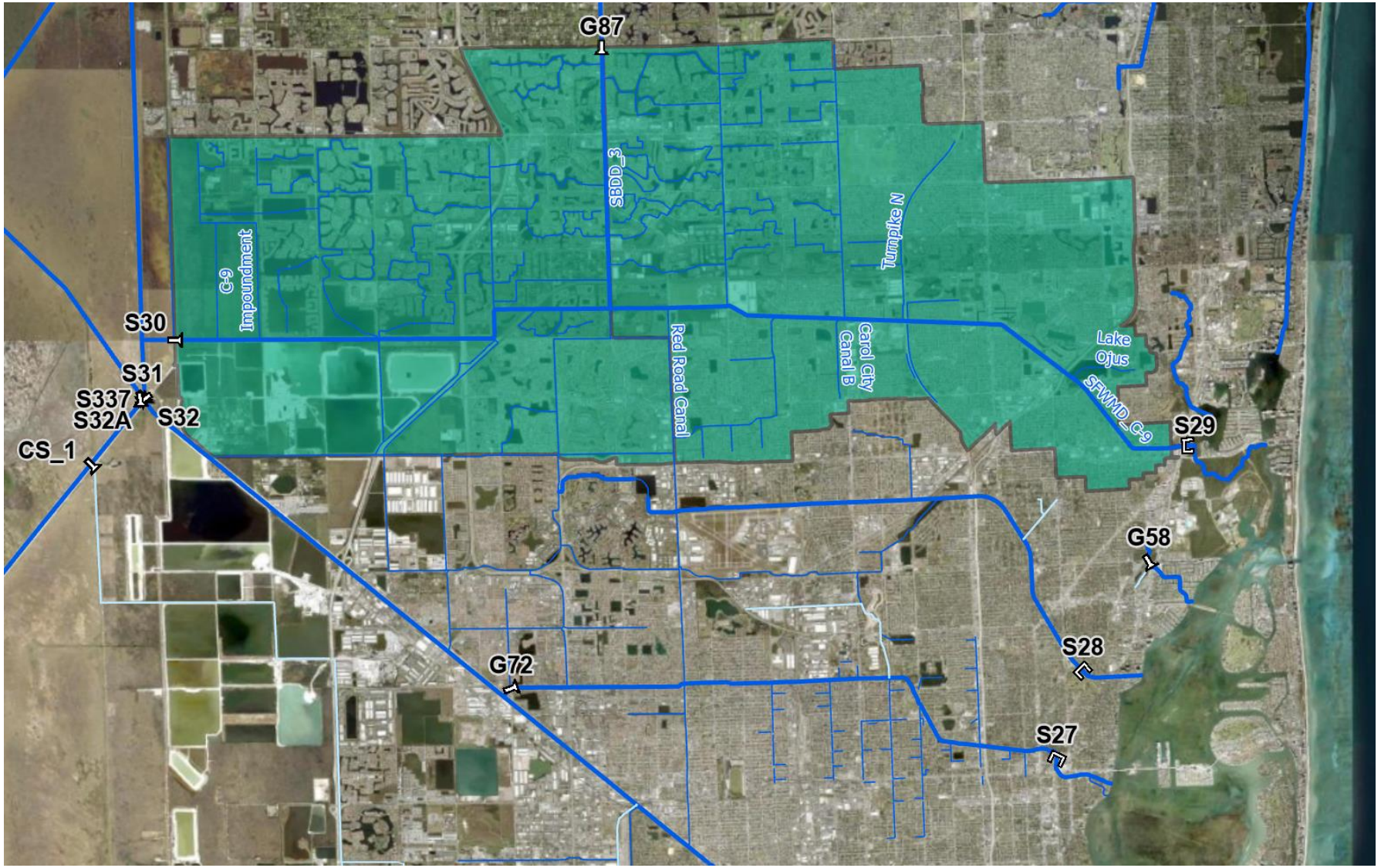
S-29, S-28, S-27 Coastal Structure Enhancements are included in ECB 2035 and FWOP 2085

- Forward Pump: a 500cfs forward pump is added that will convey flood waters to tide when downstream water elevations are too high to allow gravity flow. Current funding accommodates the completion and operation of the forward pump station with 500 cfs capacity.

- Water control structure gates were elevated +3 ft

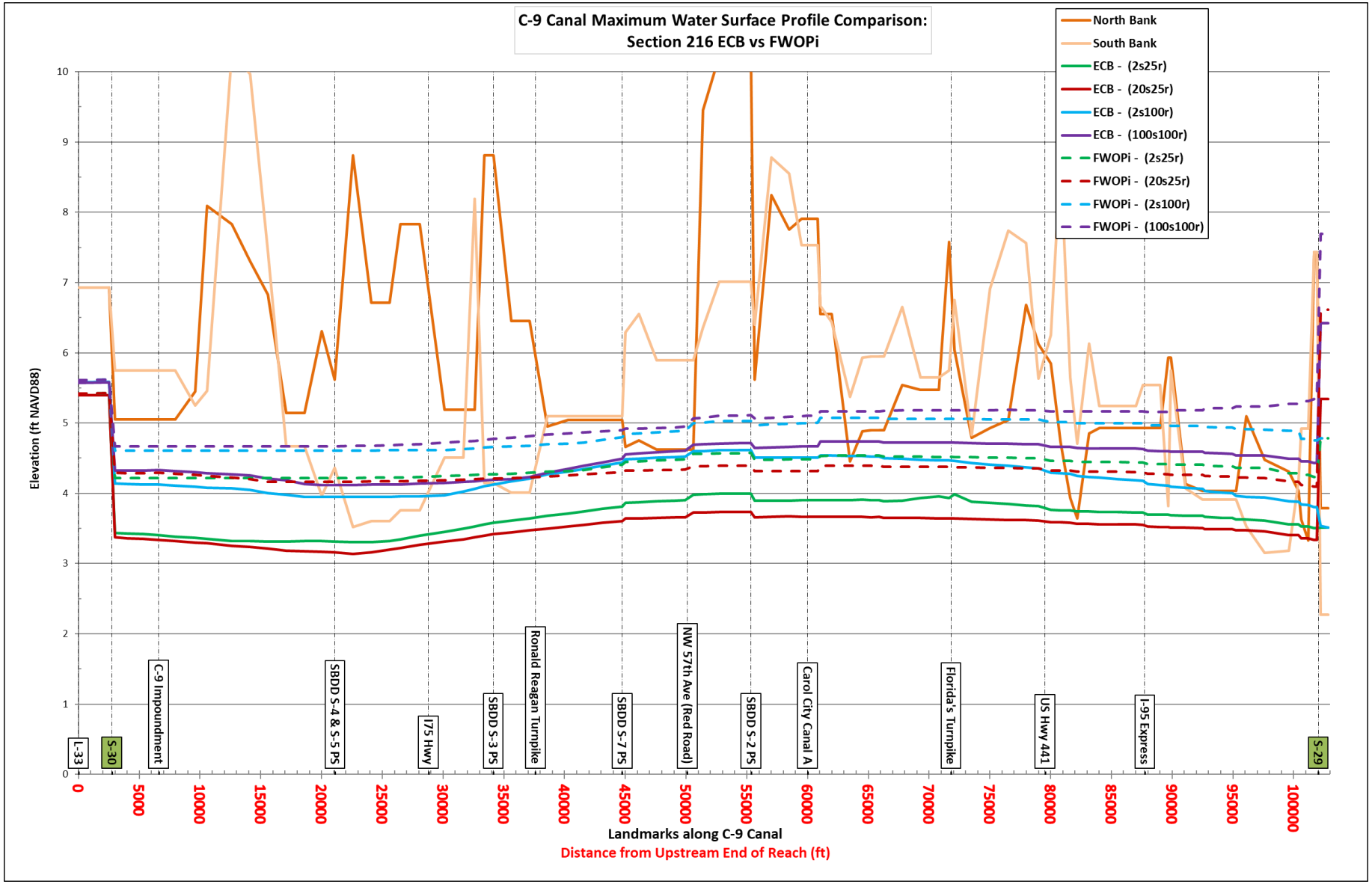
- Tie Back Flood Barrier: a tie back flood barrier/salinity barrier was modeled to provide flood and storm surge protection and supporting the required function of the spillway gates and pump. The tie back levee was represented equal to the raised gate elevation.

C-9 CANAL/ S29

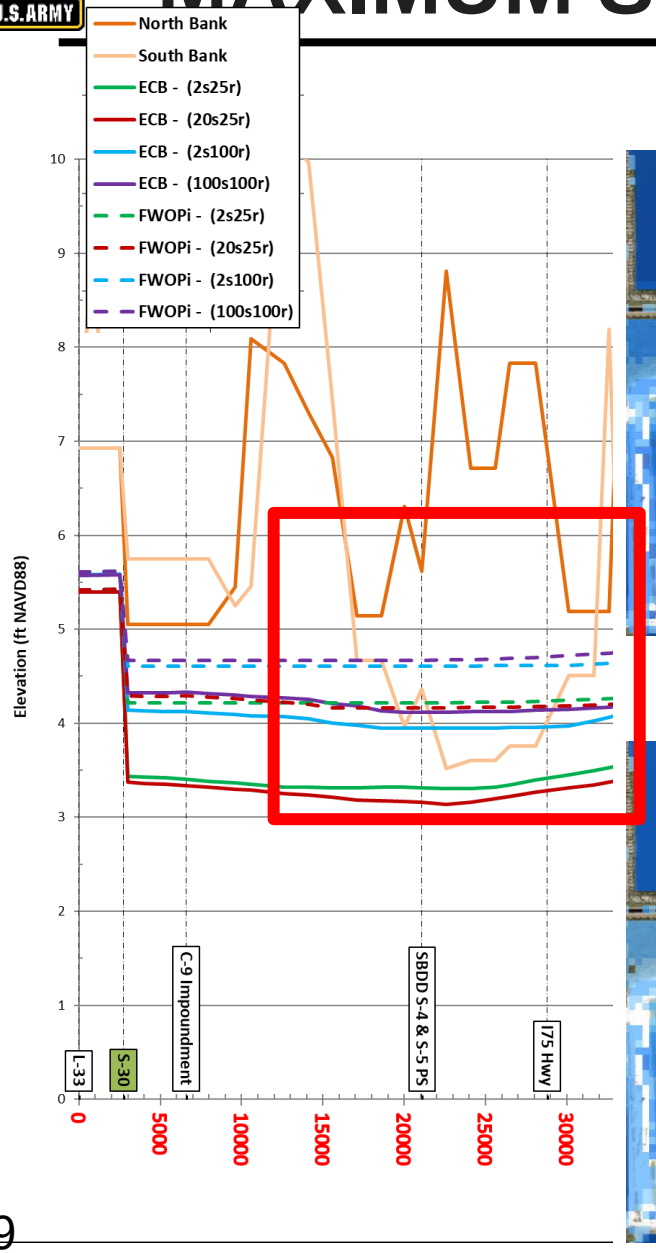


Canal network for the C-9 Basin

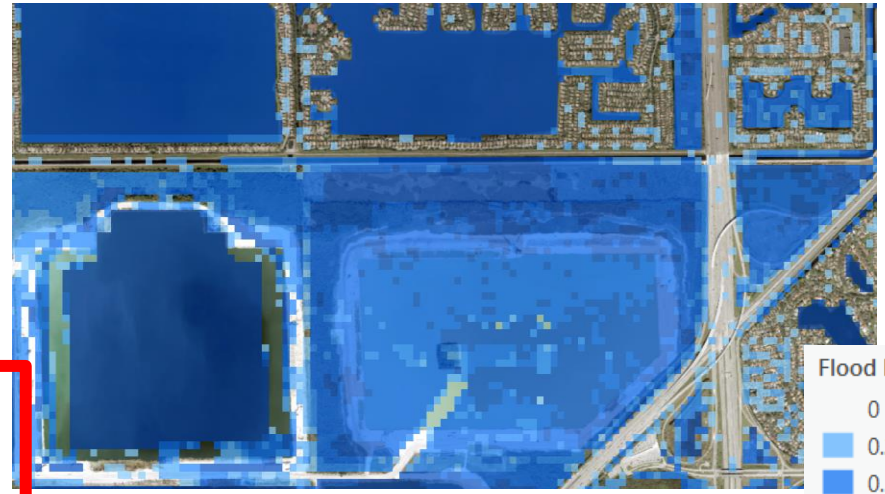
MAXIMUM STAGE PROFILE – C-9 ECB VS FWOPi



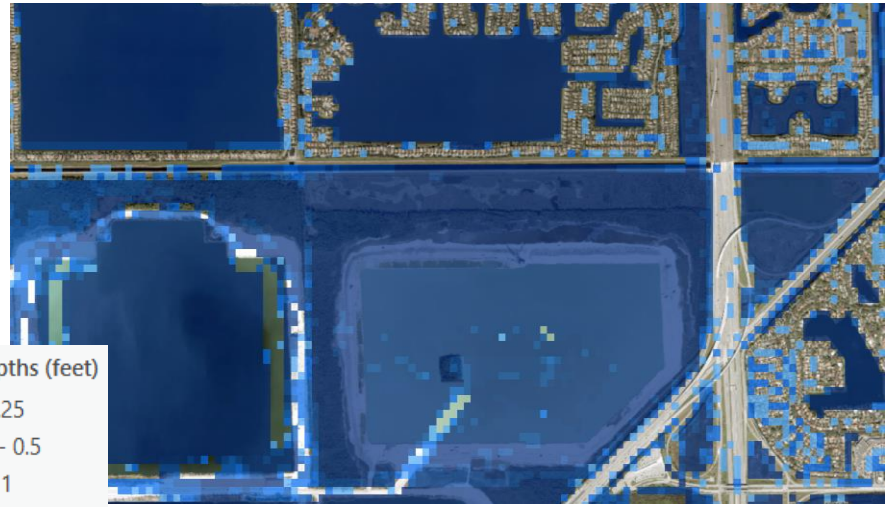
MAXIMUM STAGE PROFILE – C-9 ECB VS FWOPi

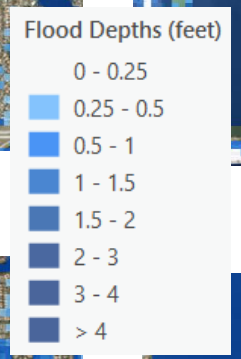


20S – 25R FWOPi

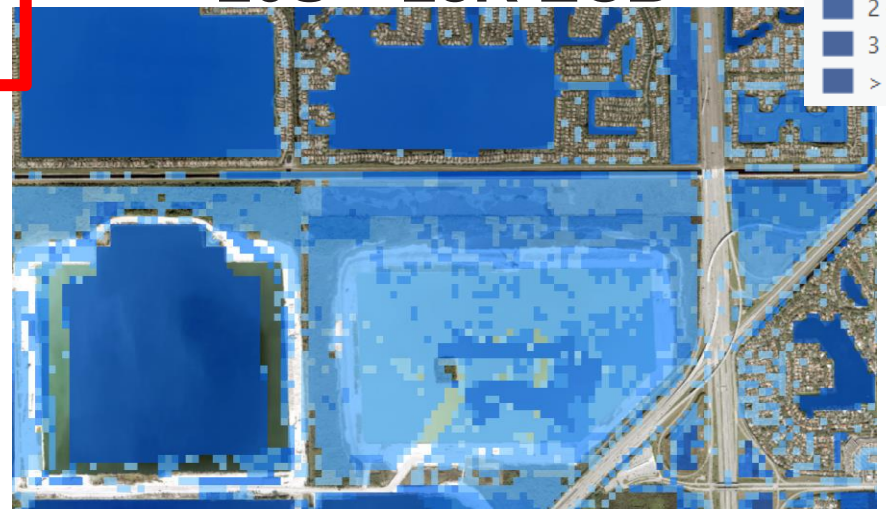


100S – 100R FWOPi

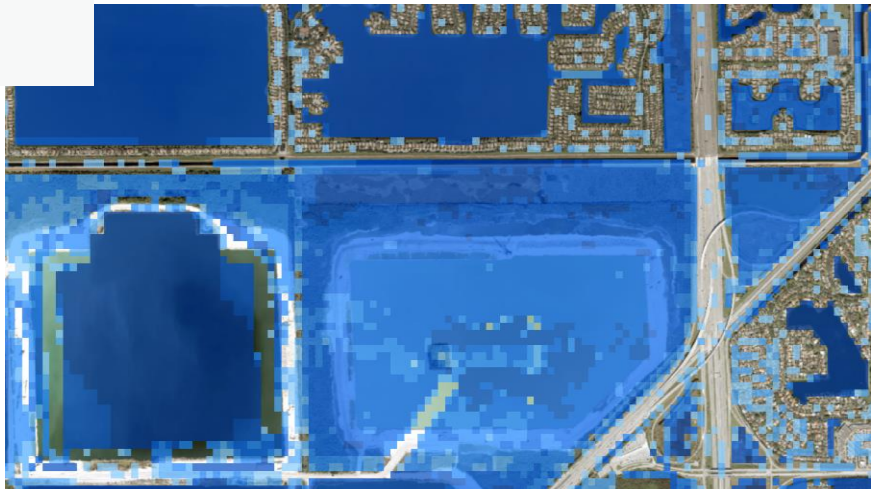




20S – 25R ECB



100S – 100R ECB



STRUCTURE PERFORMANCE, S29

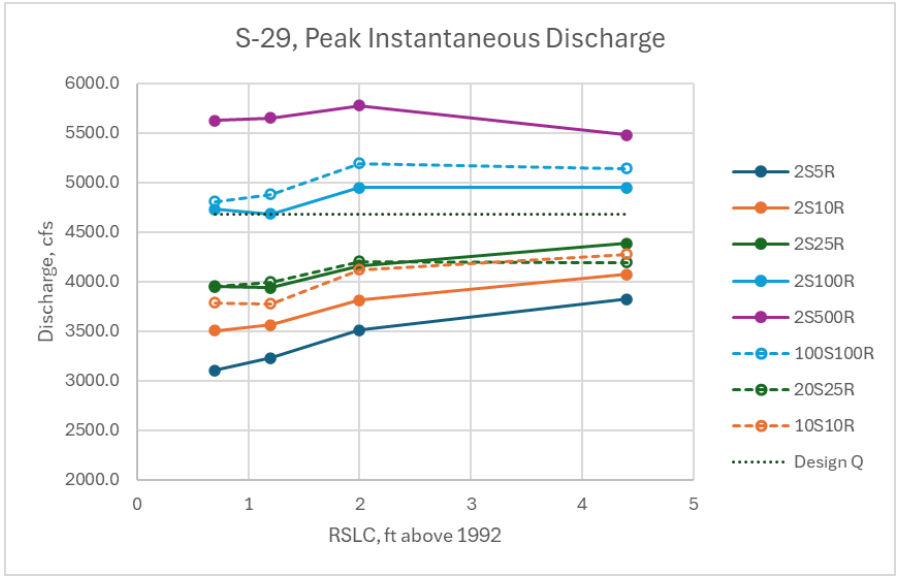
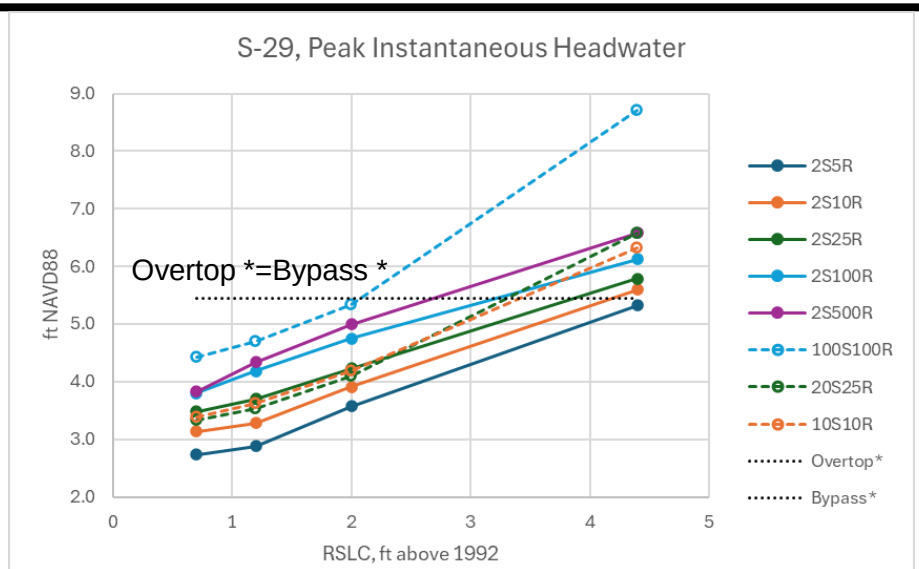
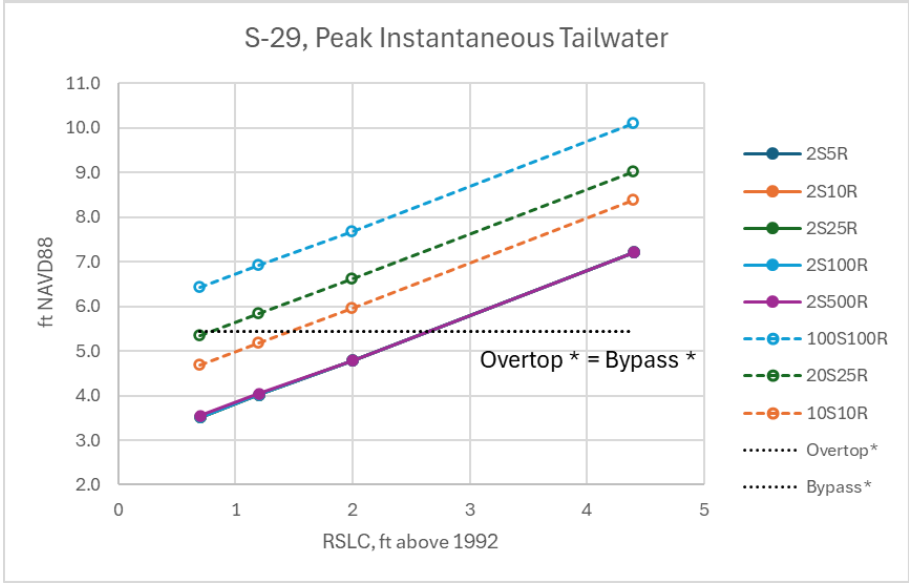


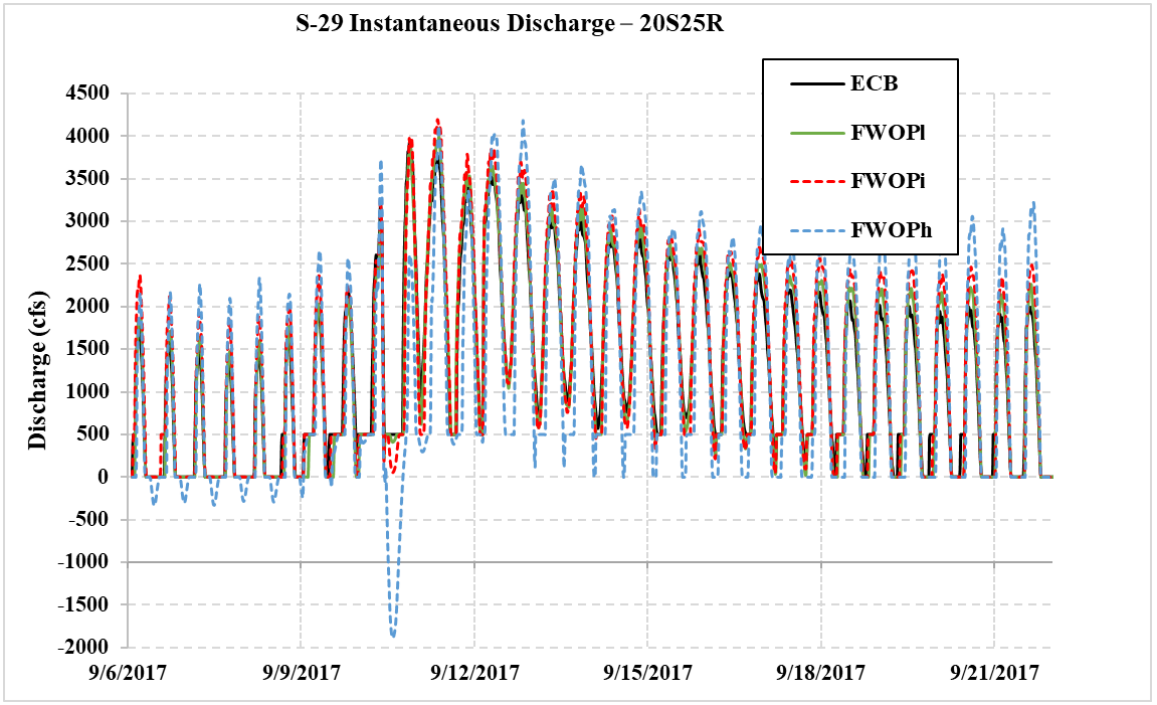
Figure 2: Aerial view of S-29 - Downstream view

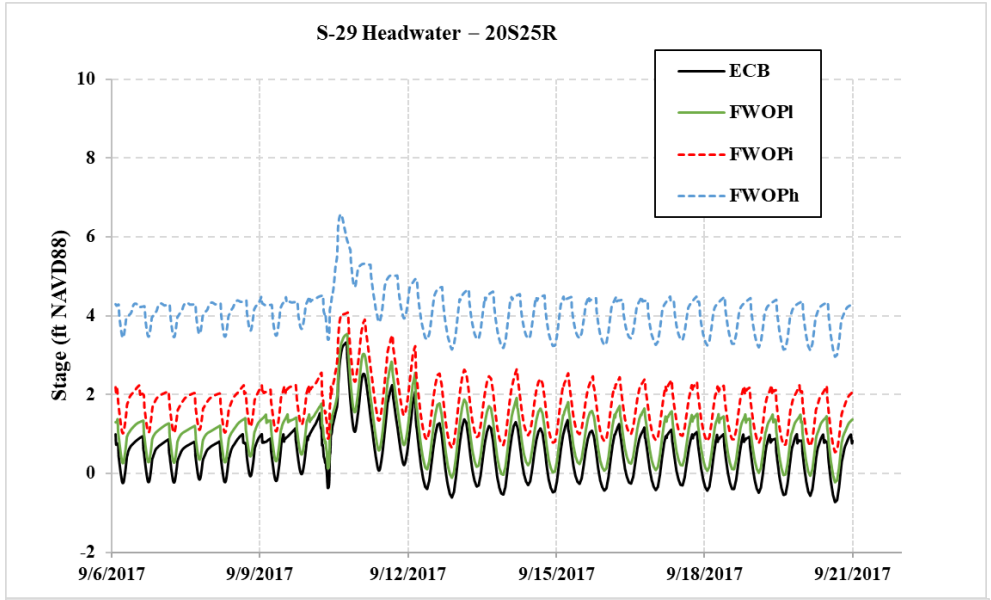
* Gates and tieback flood barrier adds 3' to bypass and overtop elevation, which is reflected here

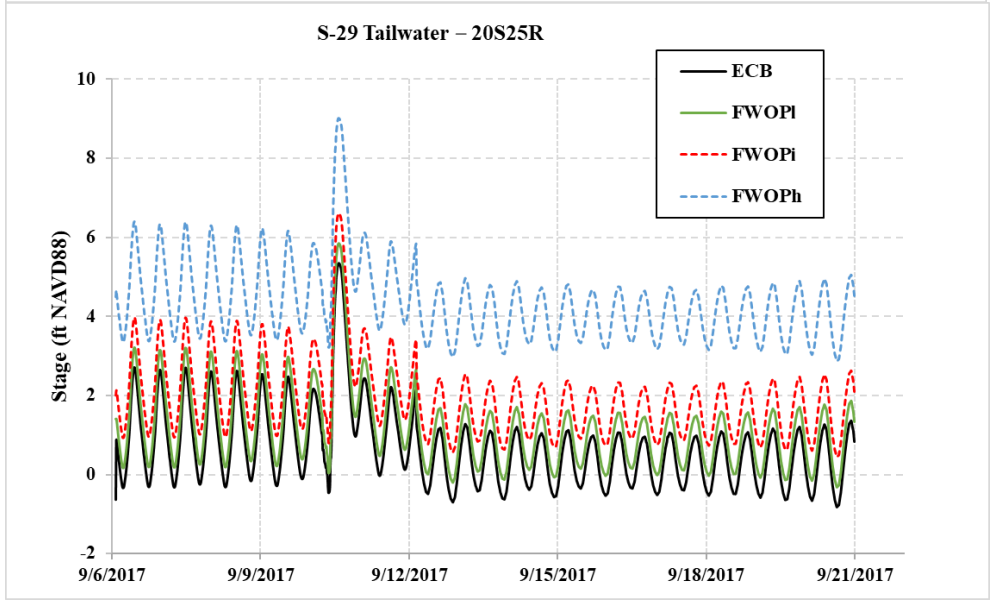




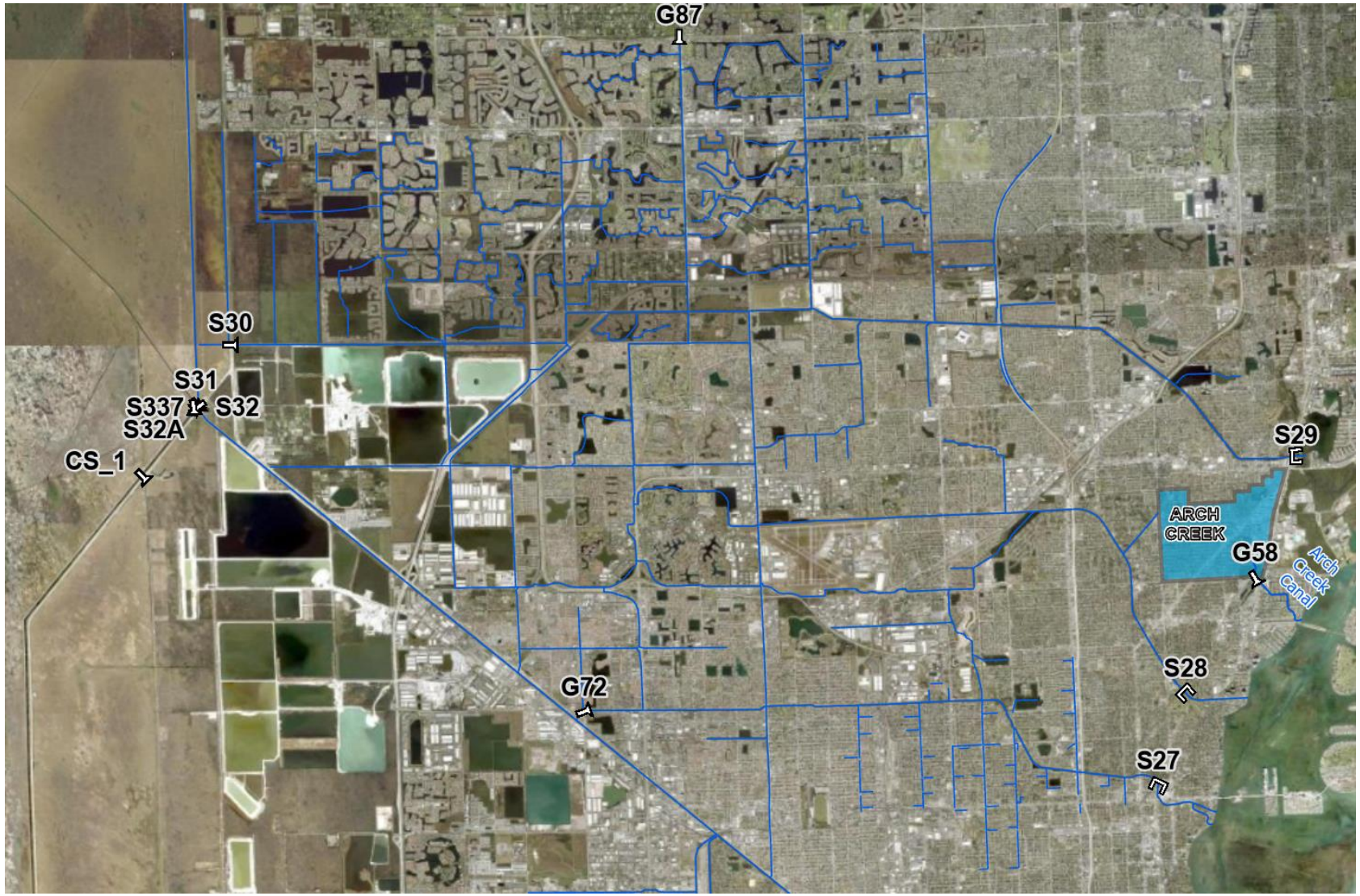
STRUCTURE PERFORMANCE, S29





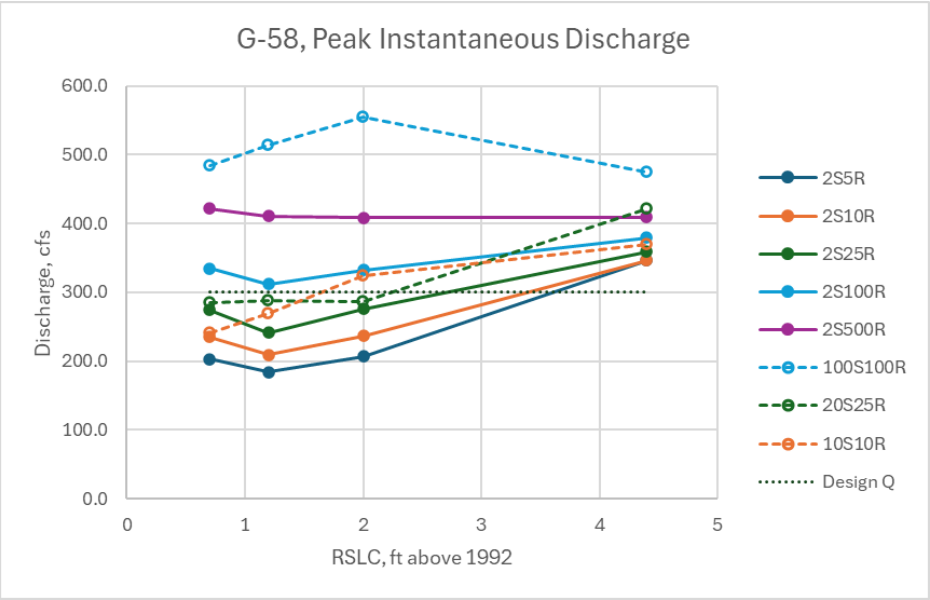


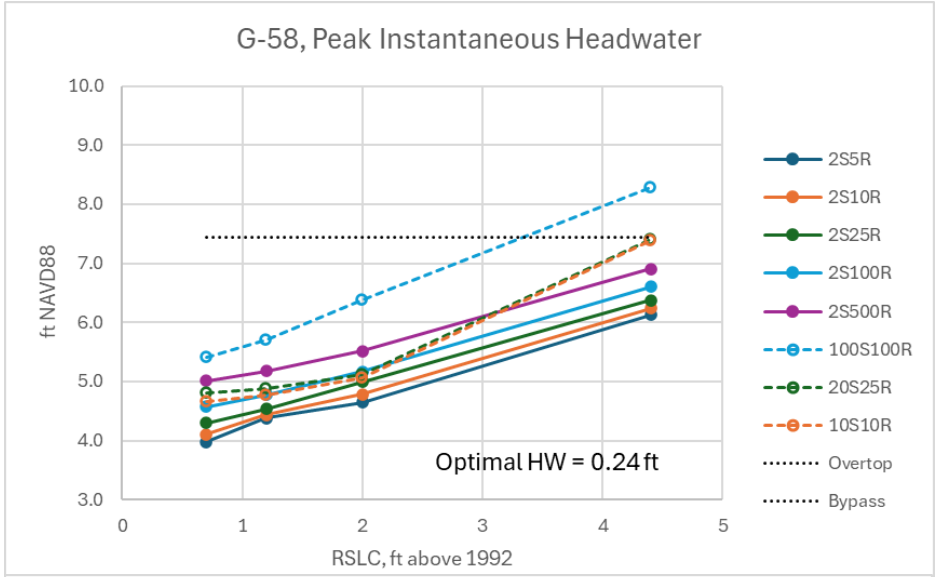
ARCH CREEK BASIN/ G58

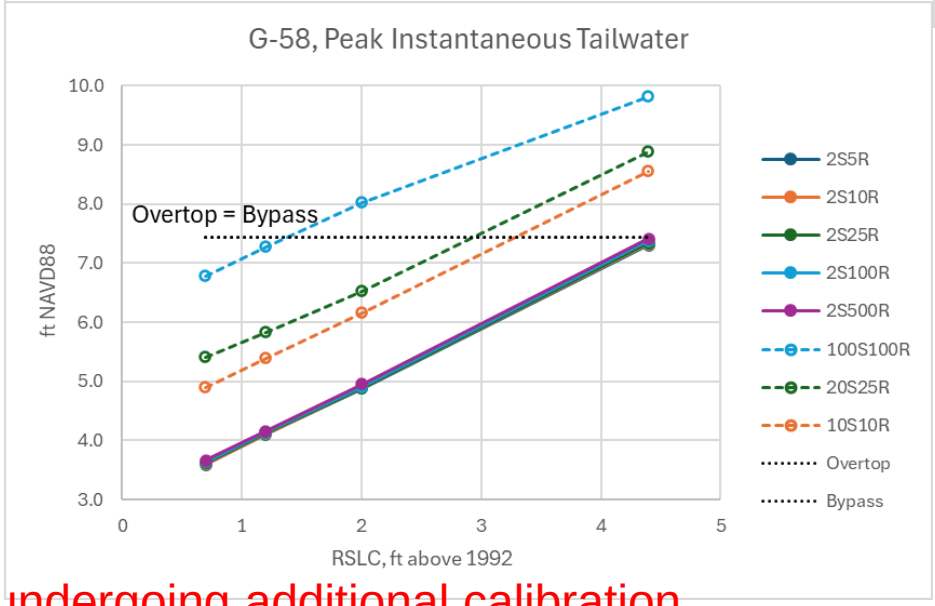


Canal network for the Arch Creek Basin

STRUCTURE PERFORMANCE, G58

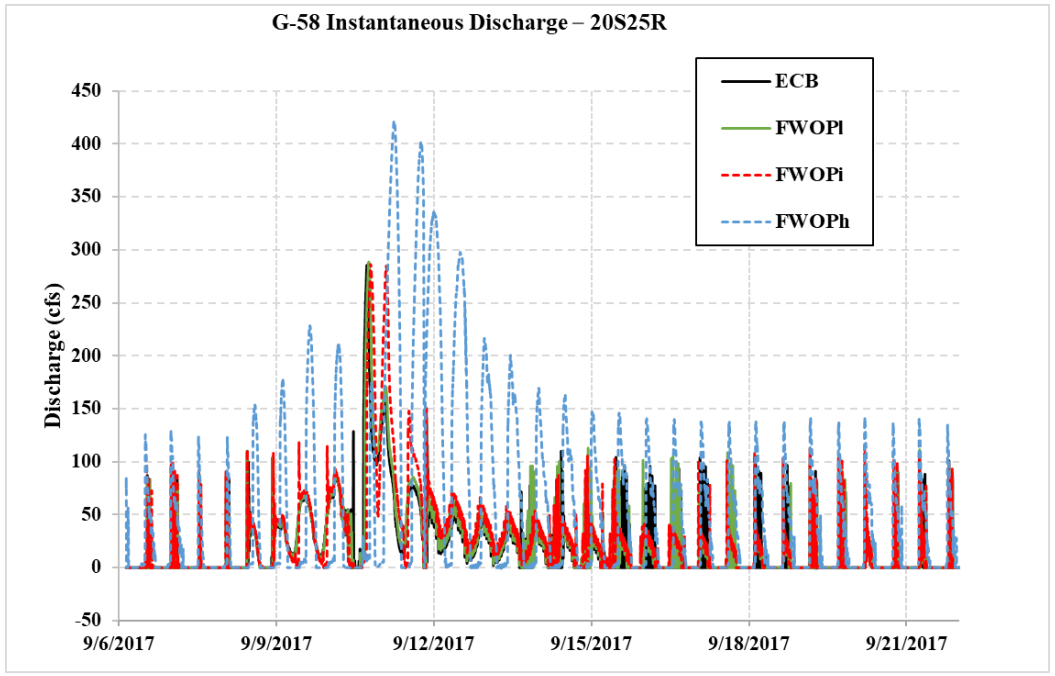


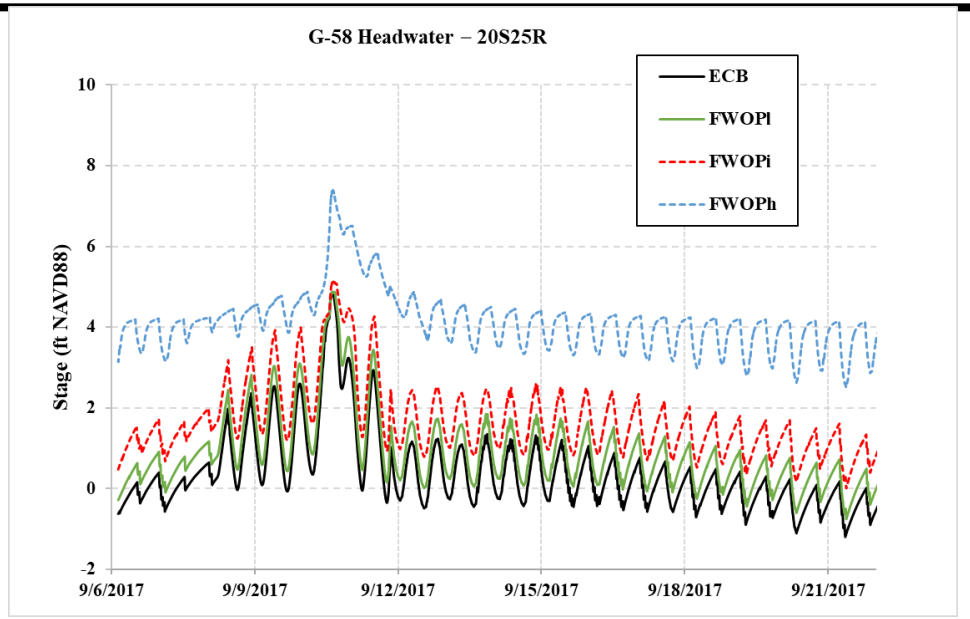


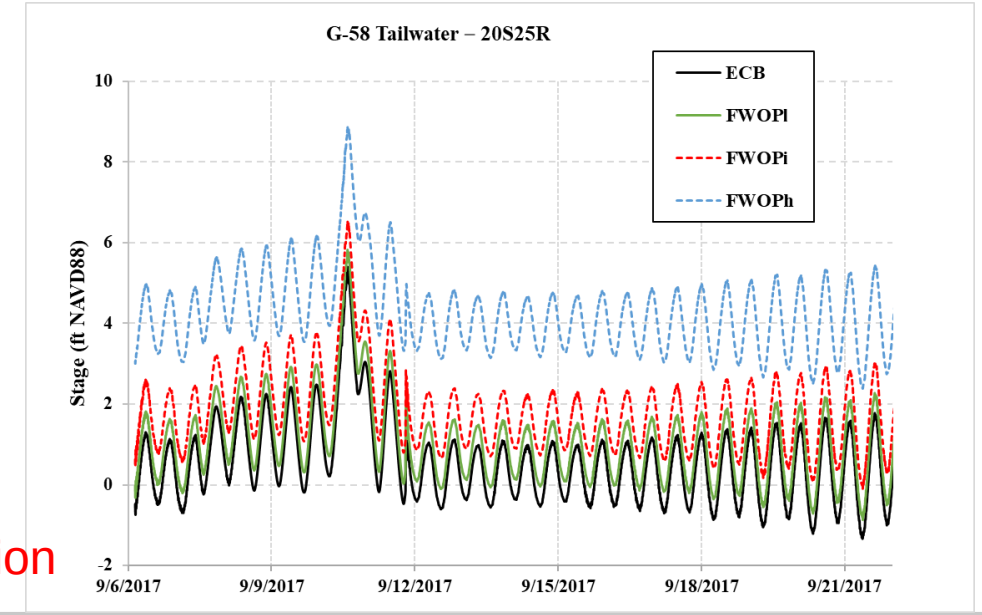


PRELIMINARY – undergoing additional calibration

STRUCTURE PERFORMANCE, G58

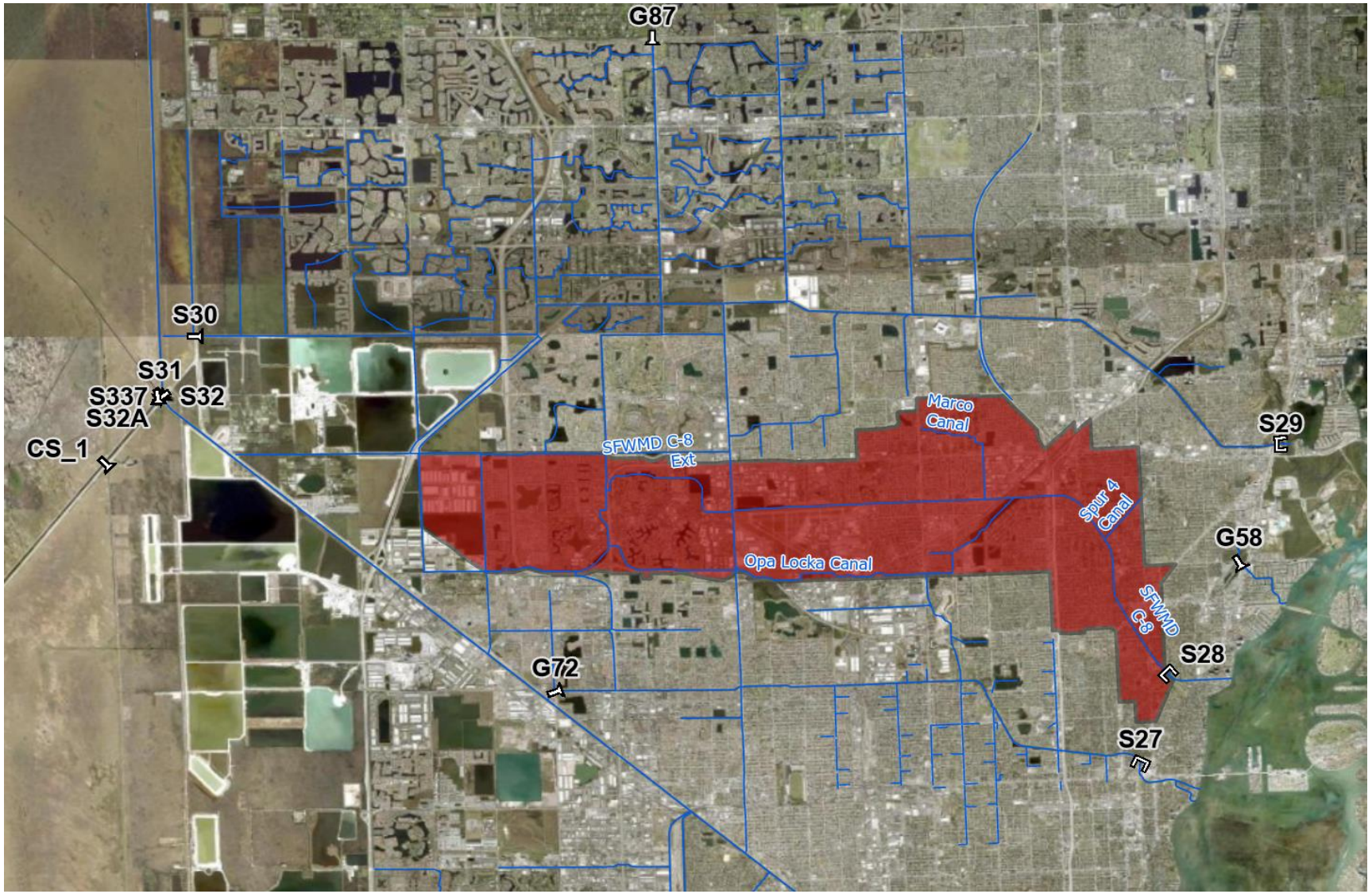






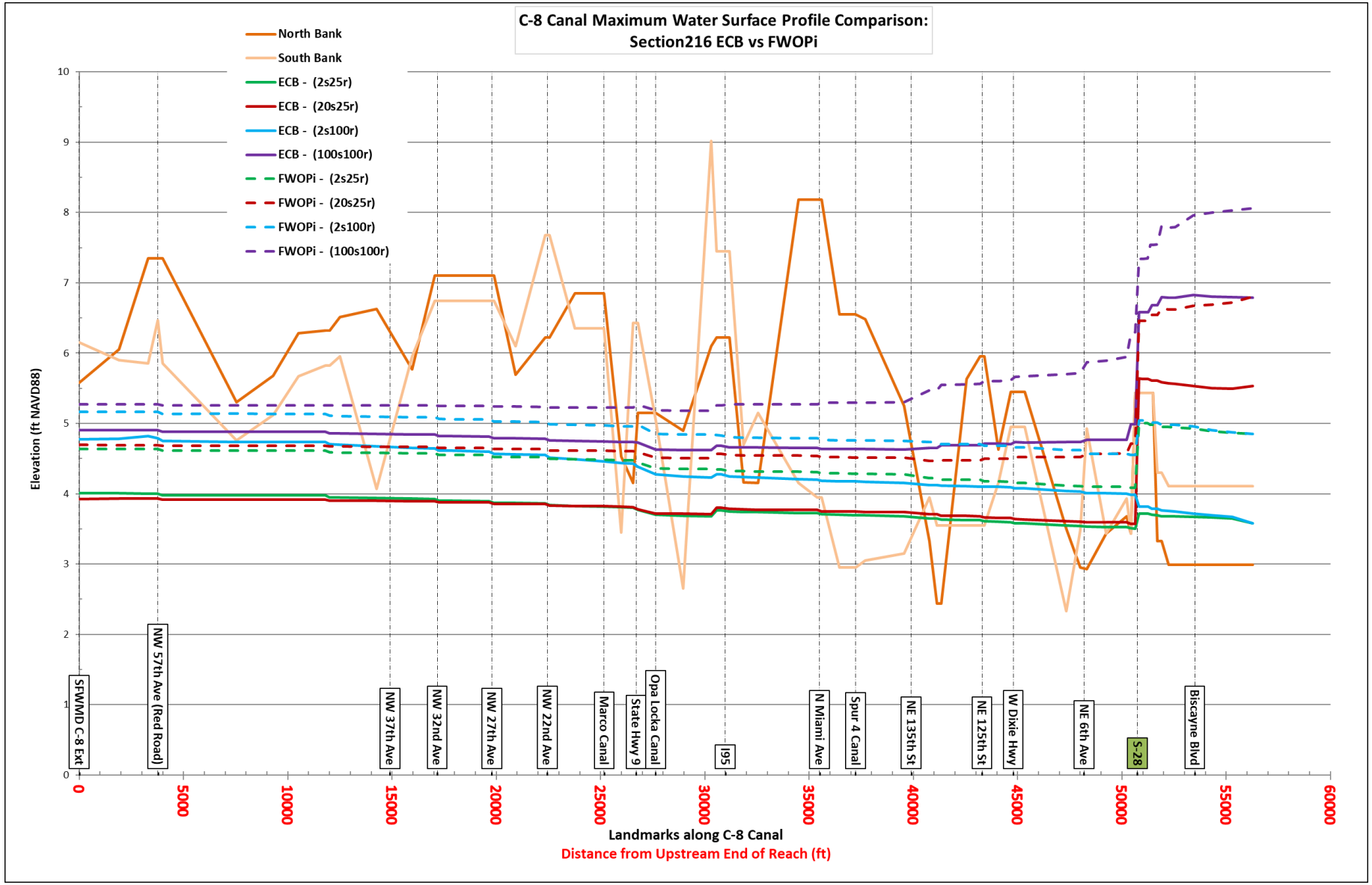
PRELIMINARY – undergoing additional calibration

C-8 CANAL/ S28

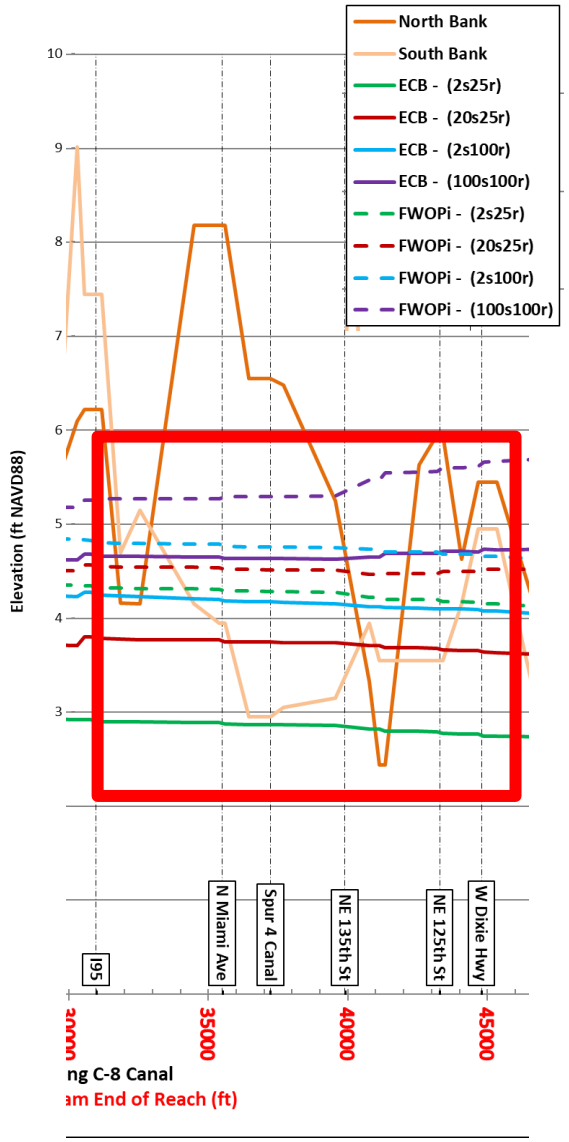


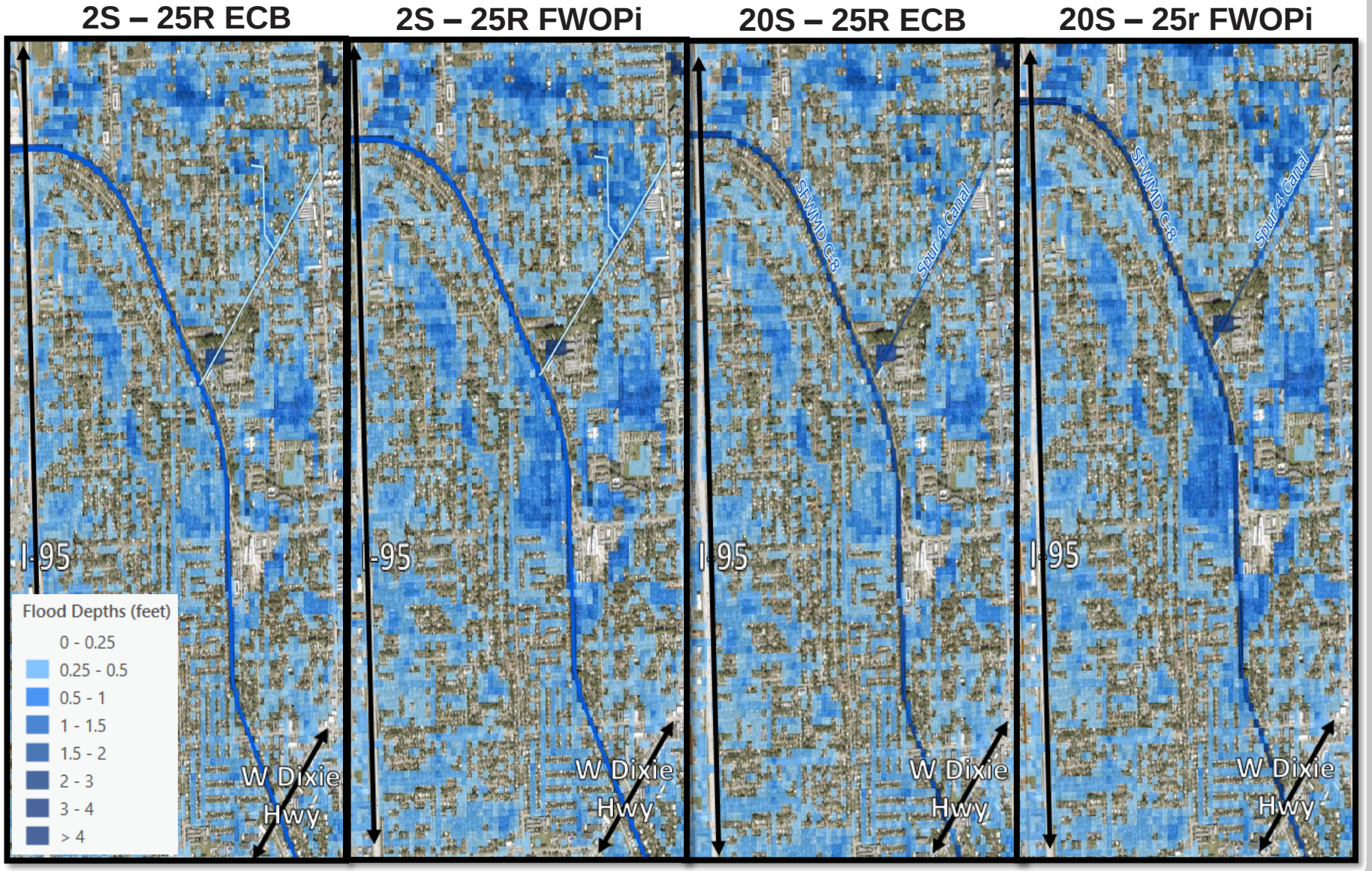
Canal network for the C-8 Basin

MAXIMUM STAGE PROFILE – C-8 ECB VS FWOP



MAXIMUM STAGE PROFILE – C-8 ECB VS FWOPi





STRUCTURE PERFORMANCE, S28

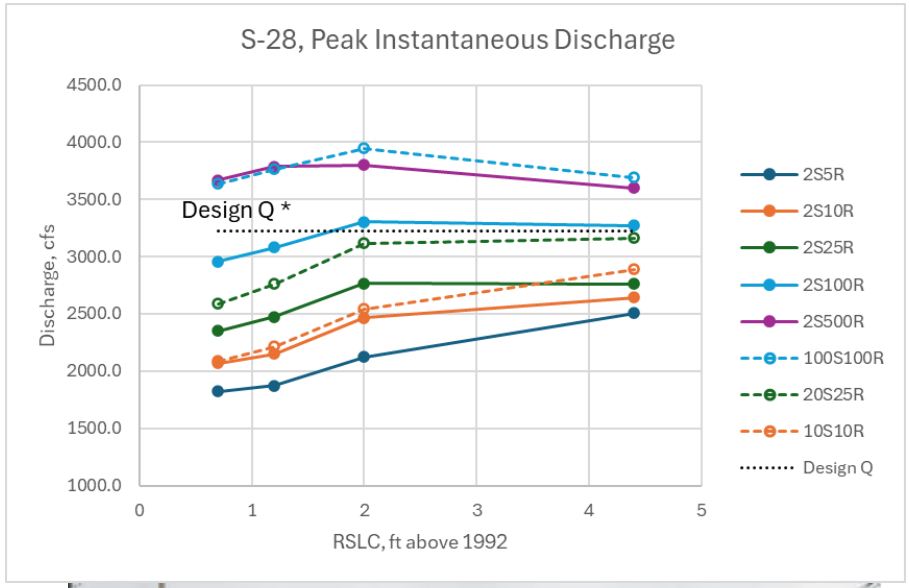
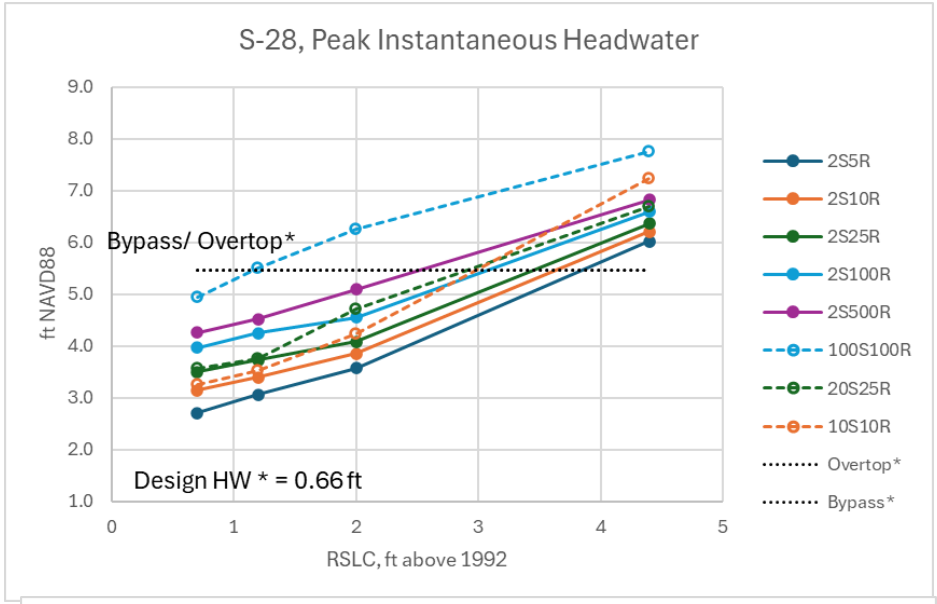
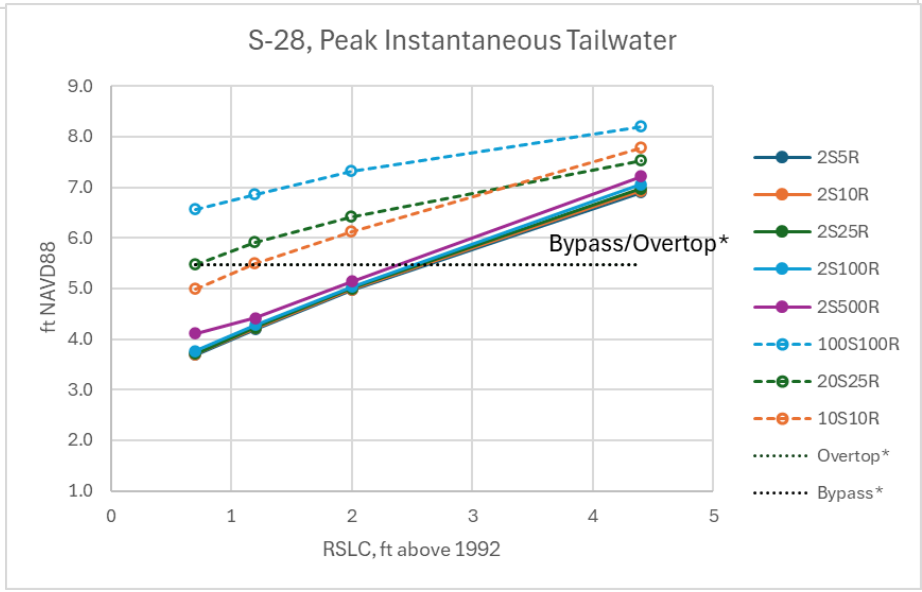


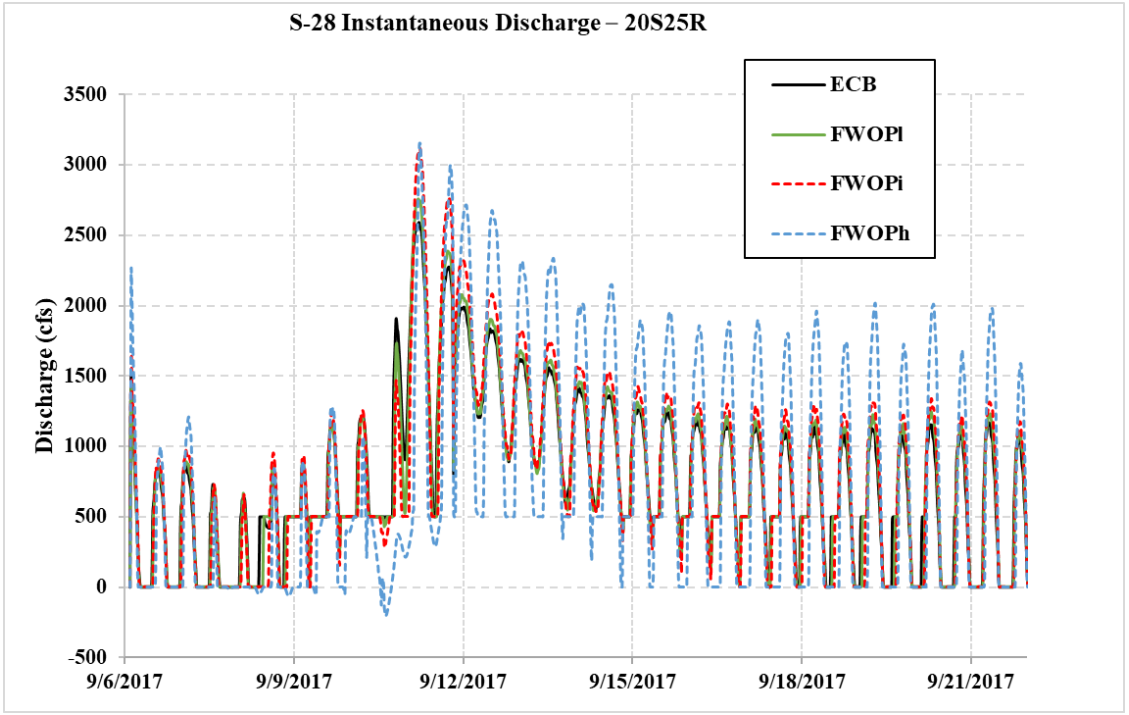
Figure 2: Upstream of the S-28

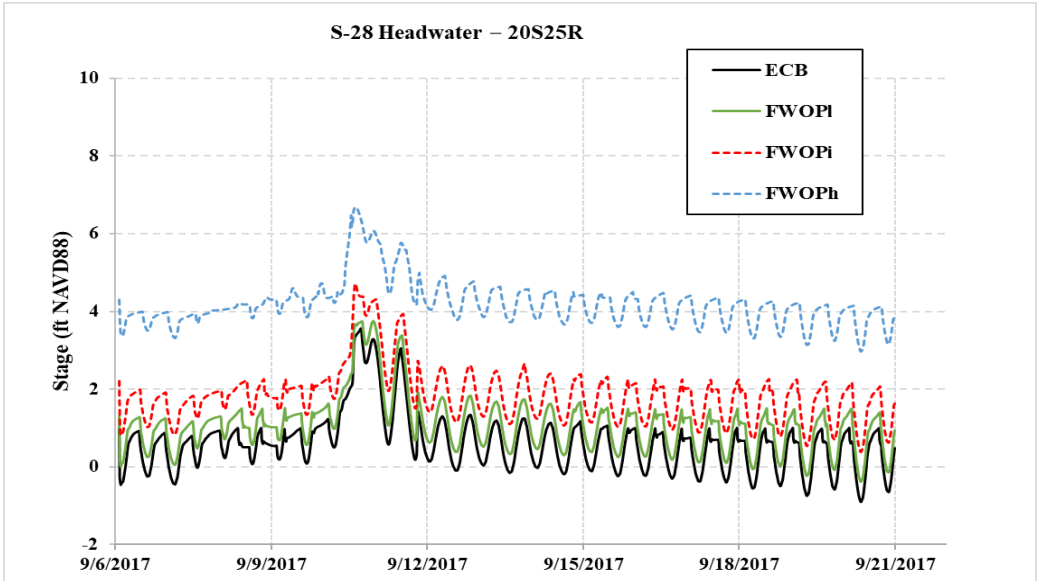
* Gates and tieback flood barrier adds 3' to bypass and overtop which is reflected here

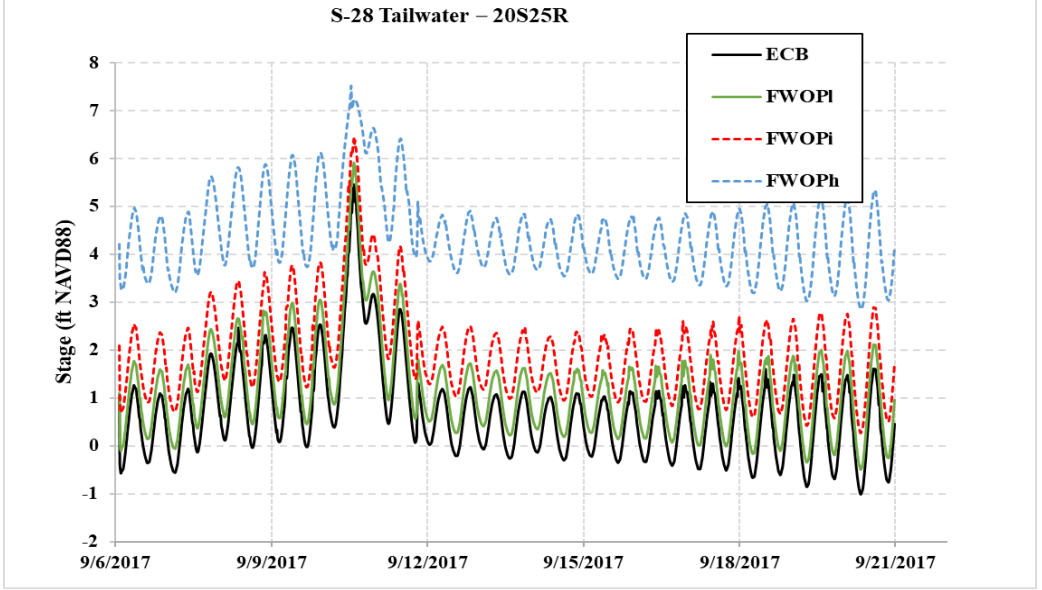




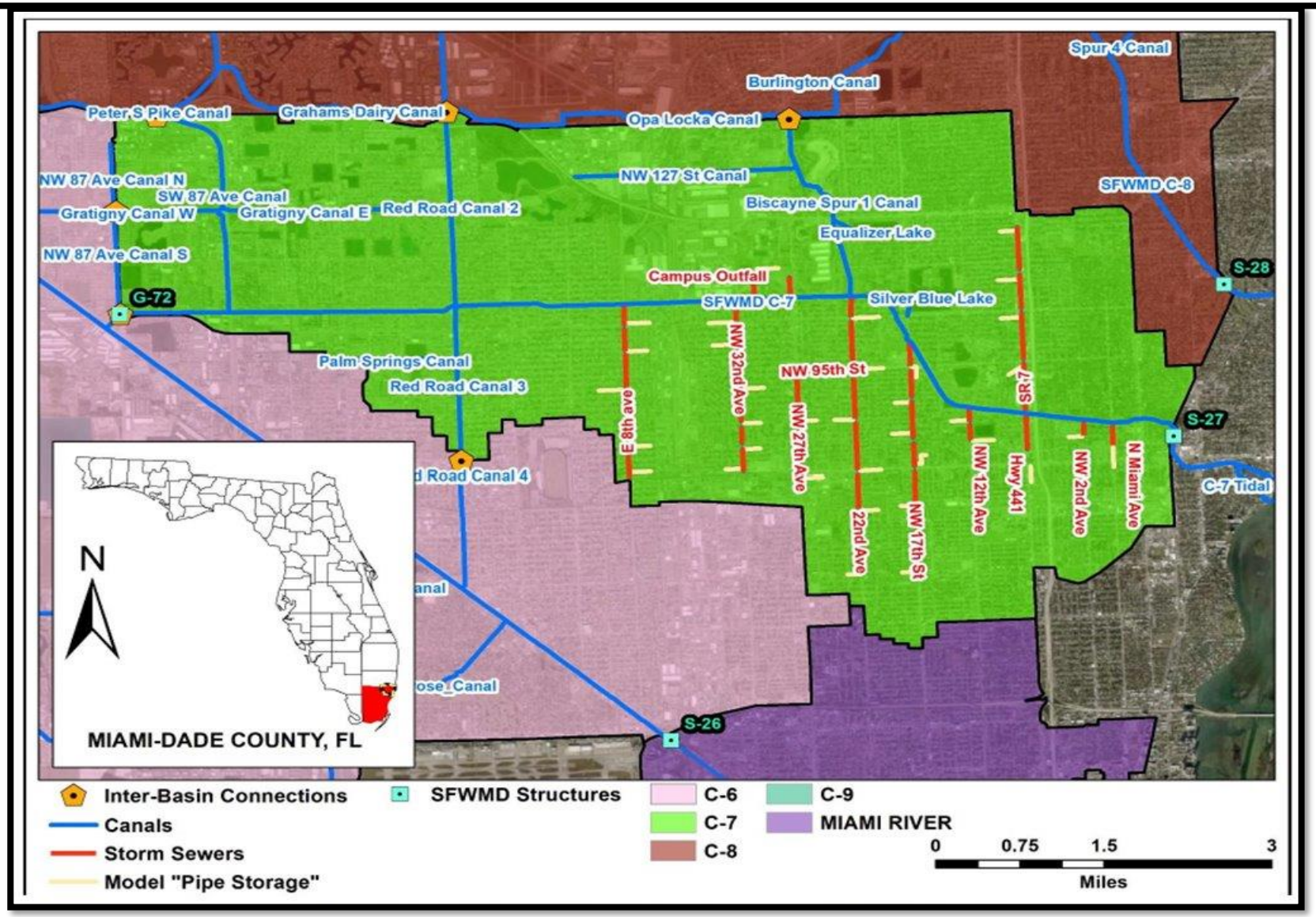
STRUCTURE PERFORMANCE, S28





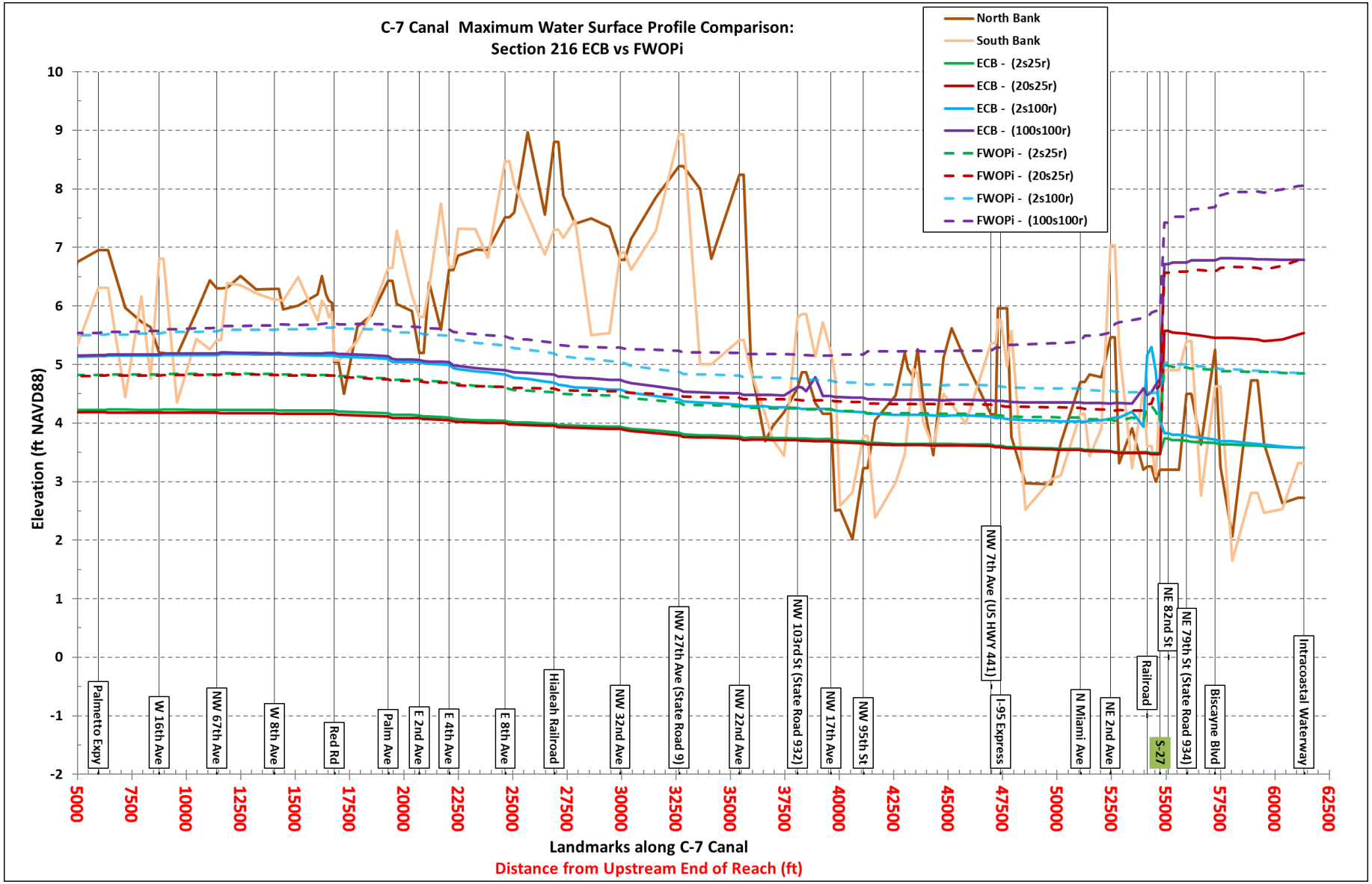


C-7 CANAL/ S27

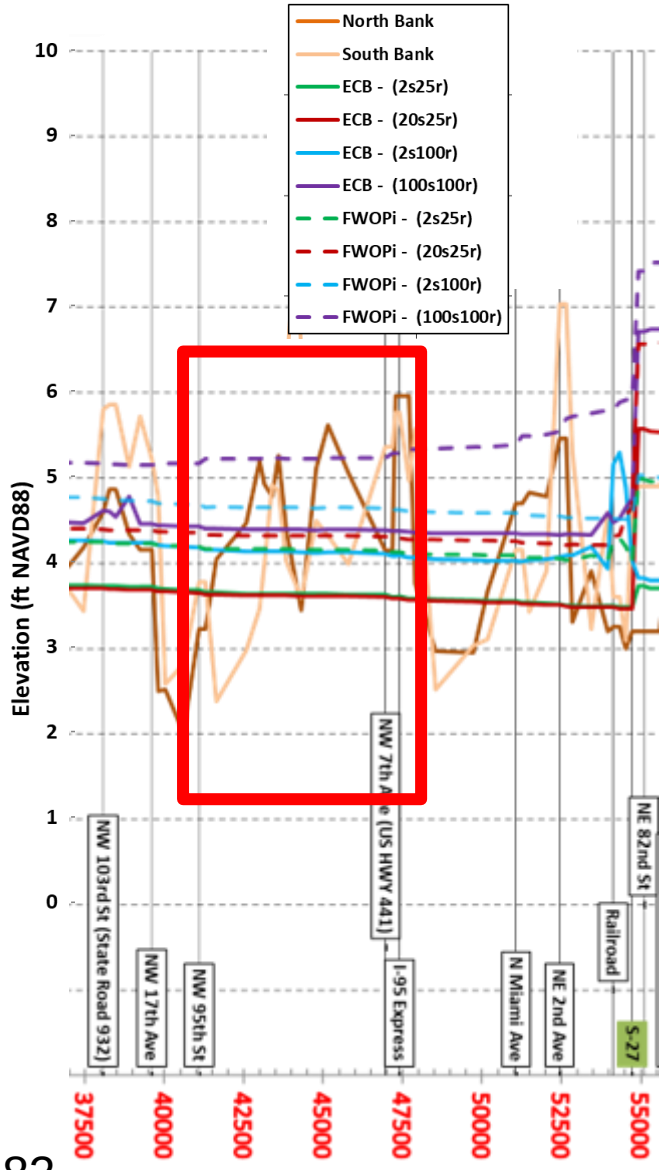


1D Canal and Pipe Network represented in MIKE HYDRO for the C-7 Basin

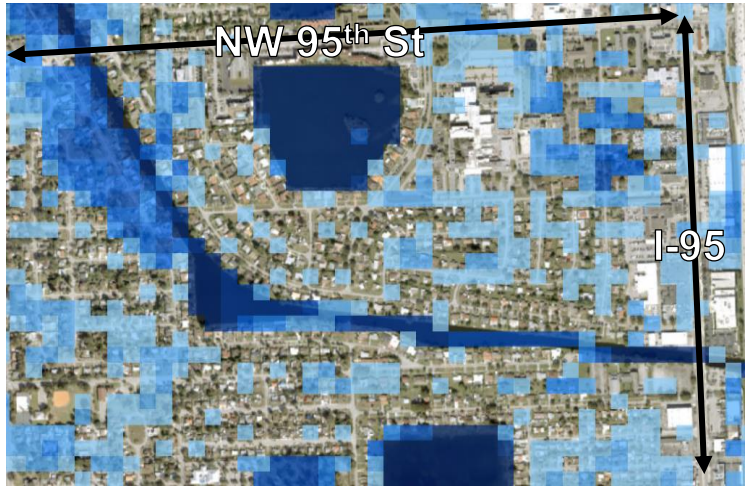
MAXIMUM STAGE PROFILE – C-7 ECB VS FWOP



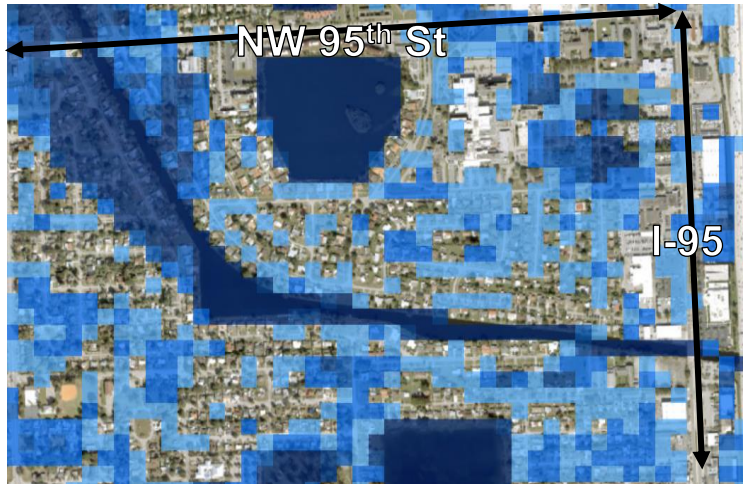
MAXIMUM STAGE PROFILE – C-7 ECB VS FWOPi



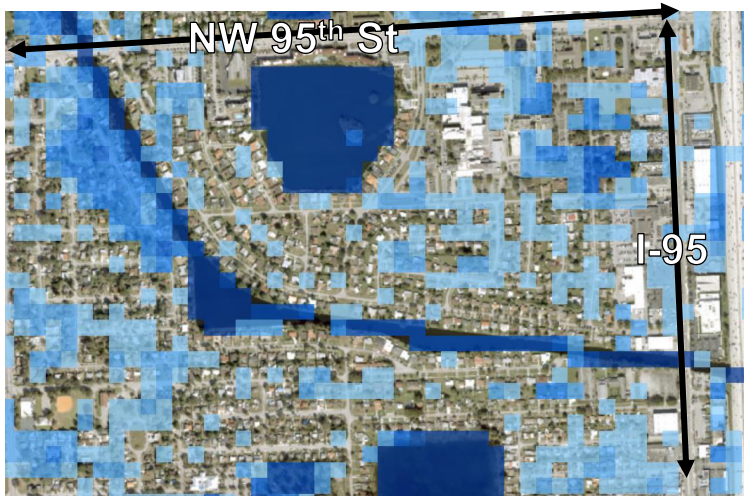
20S – 25R FWOPi



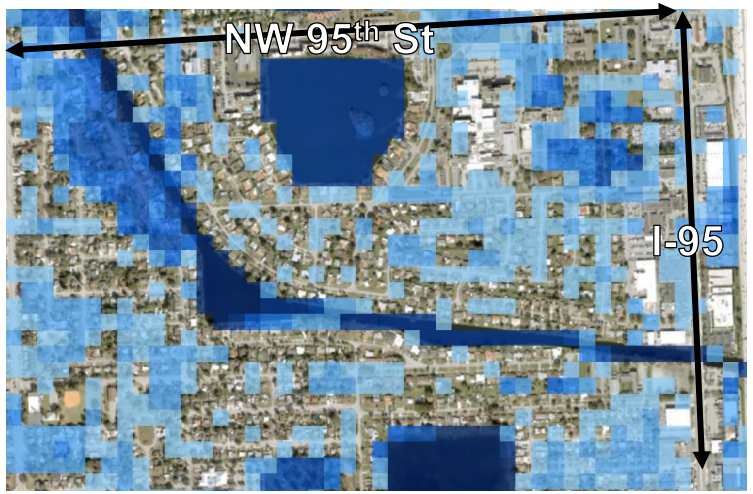
100S – 100R FWOPi

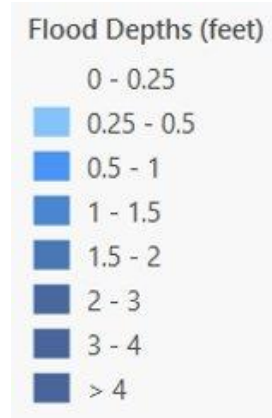


20S – 25R ECB



100S – 100R ECB





STRUCTURE PERFORMANCE, S27

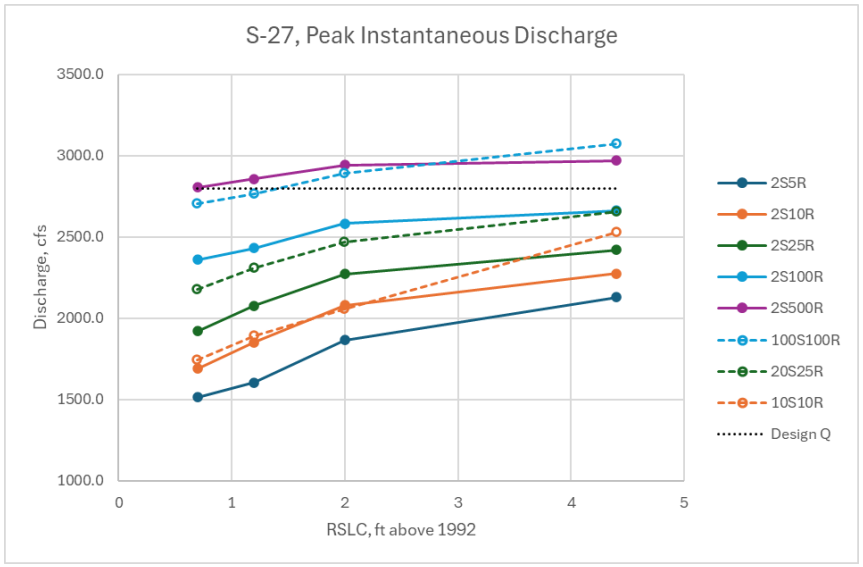
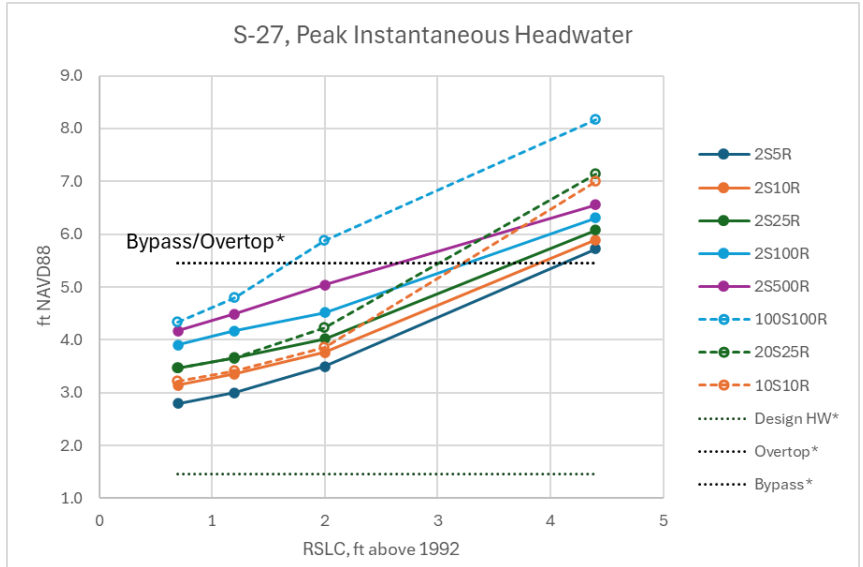
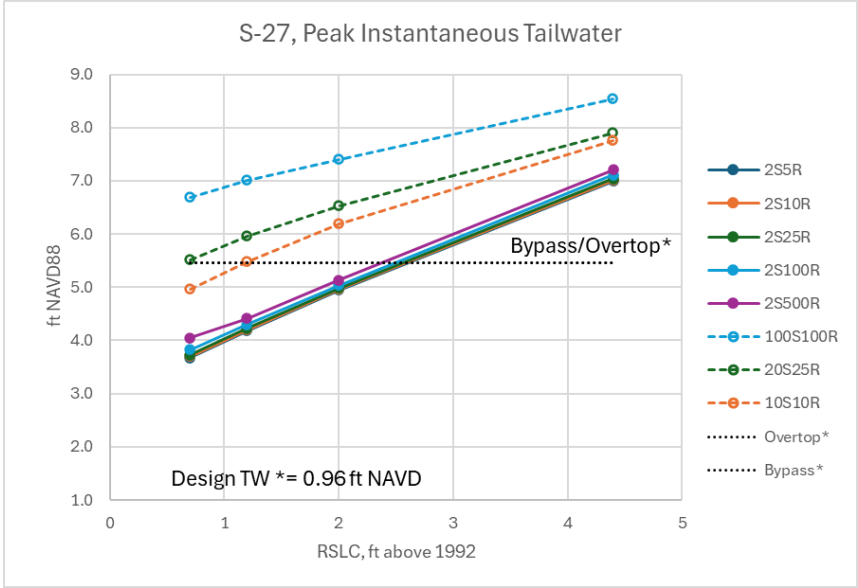


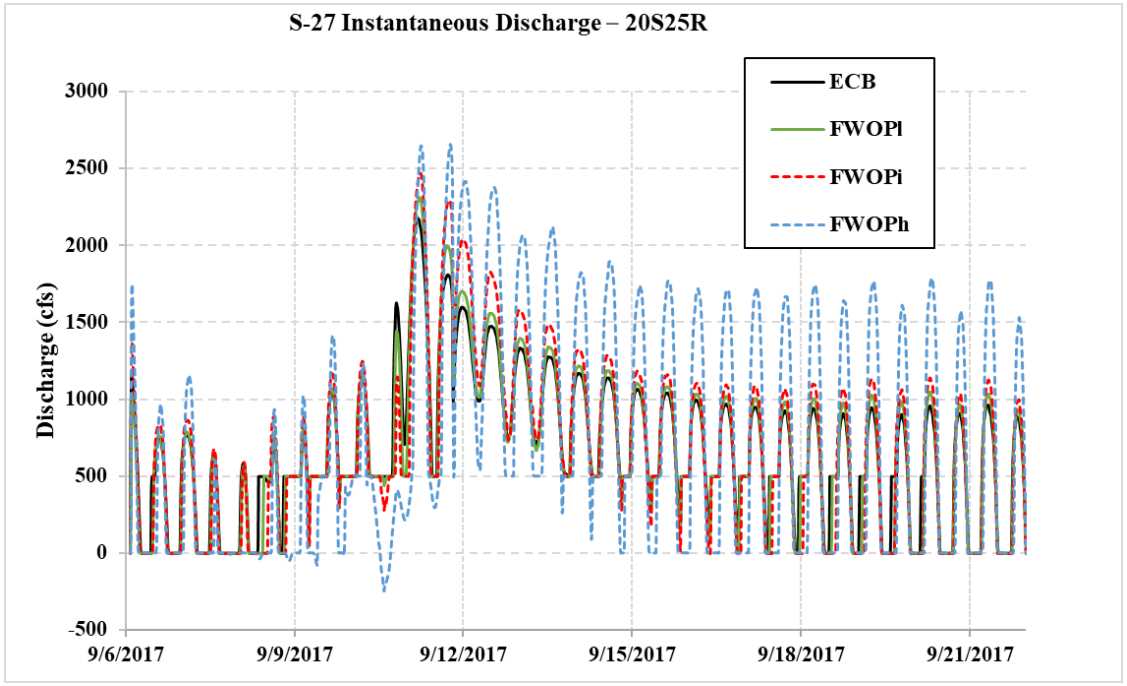
Figure 2: Aerial view of S-27 (looking upstream)

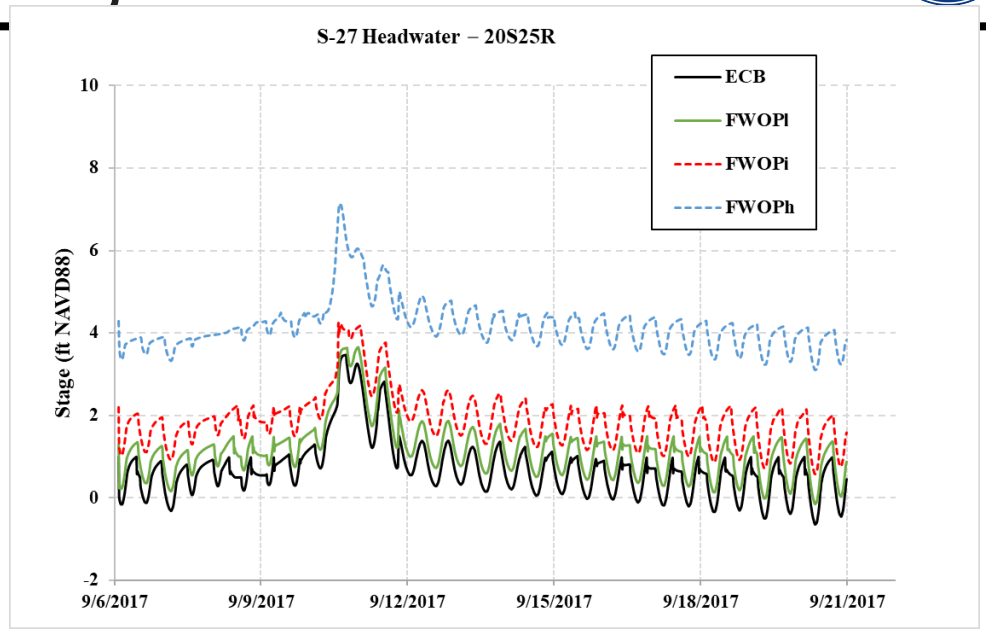


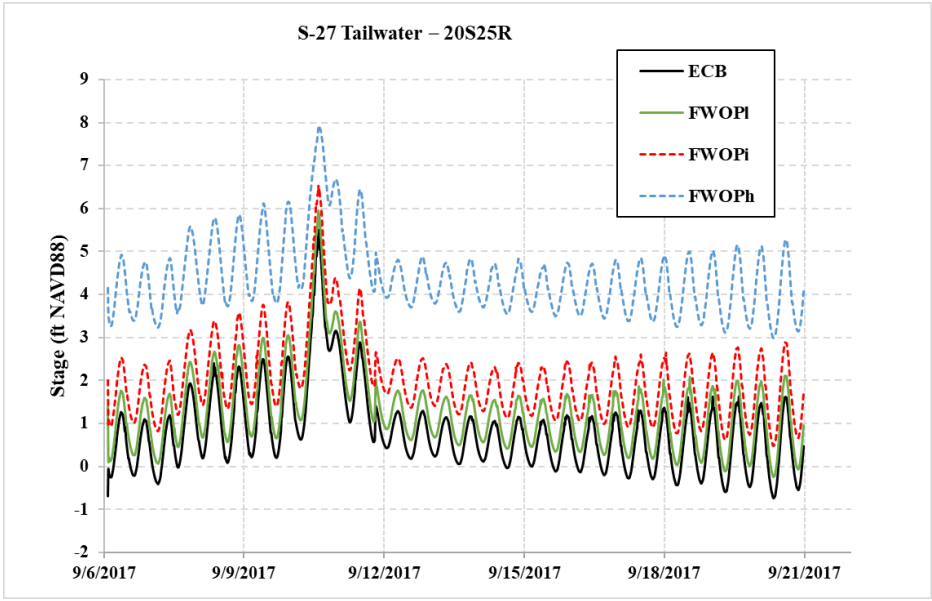


* Gates and tieback flood barrier adds 3’ to bypass and overtop which is shown here

STRUCTURE PERFORMANCE, S27







REACH B - Q&A

- Please **use the Q&A function** to submit questions OR **use the 'raise hand' function** at the bottom of your screen and we call on you to unmute.

- You are welcome to **submit follow up questions and additional comments** after the webinar via email to CSFFRSComments@usace.army.mil.

- Please take a moment to complete the **H&H Model Output Survey** at the provided link: https://forms.office.com/g/gkvZBCnCP3

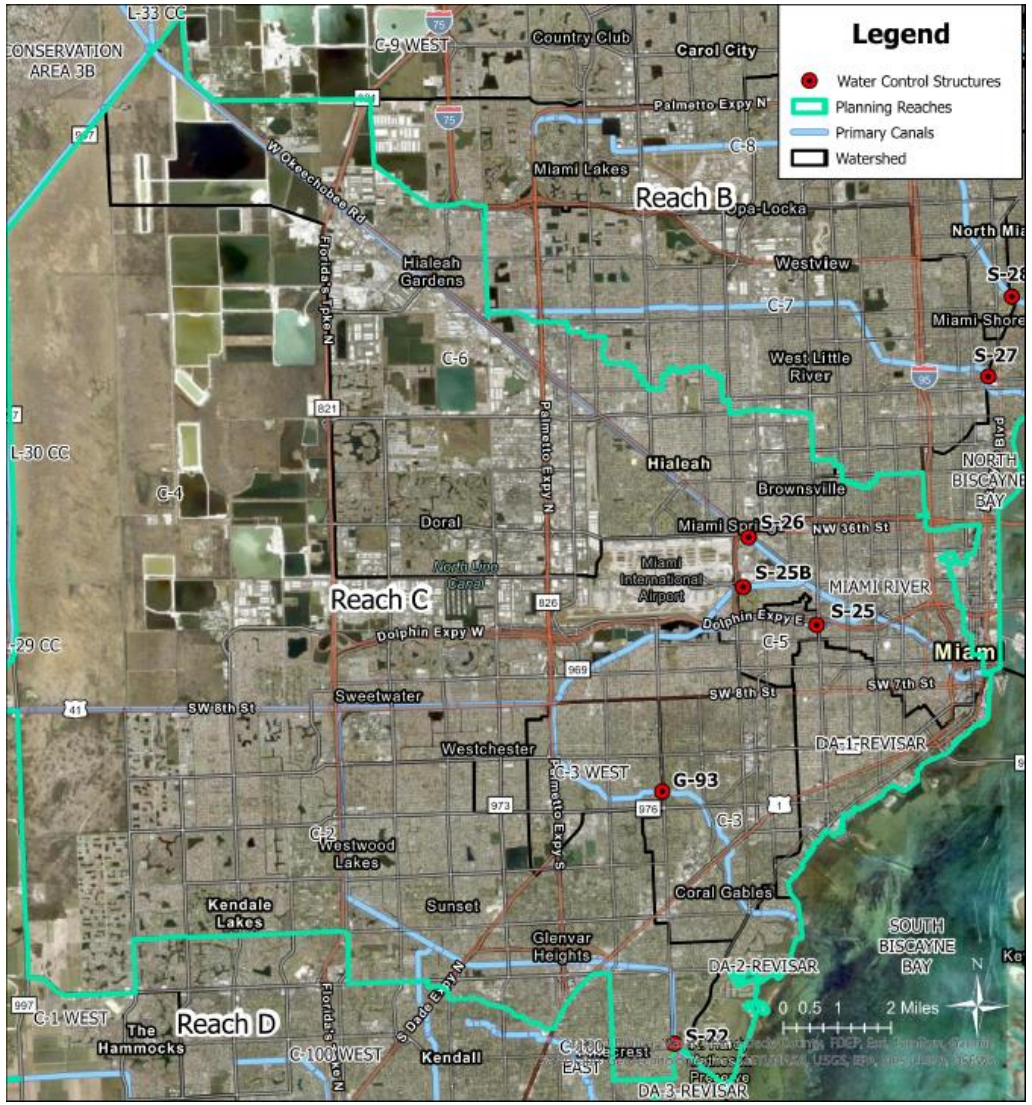
8. REACH C

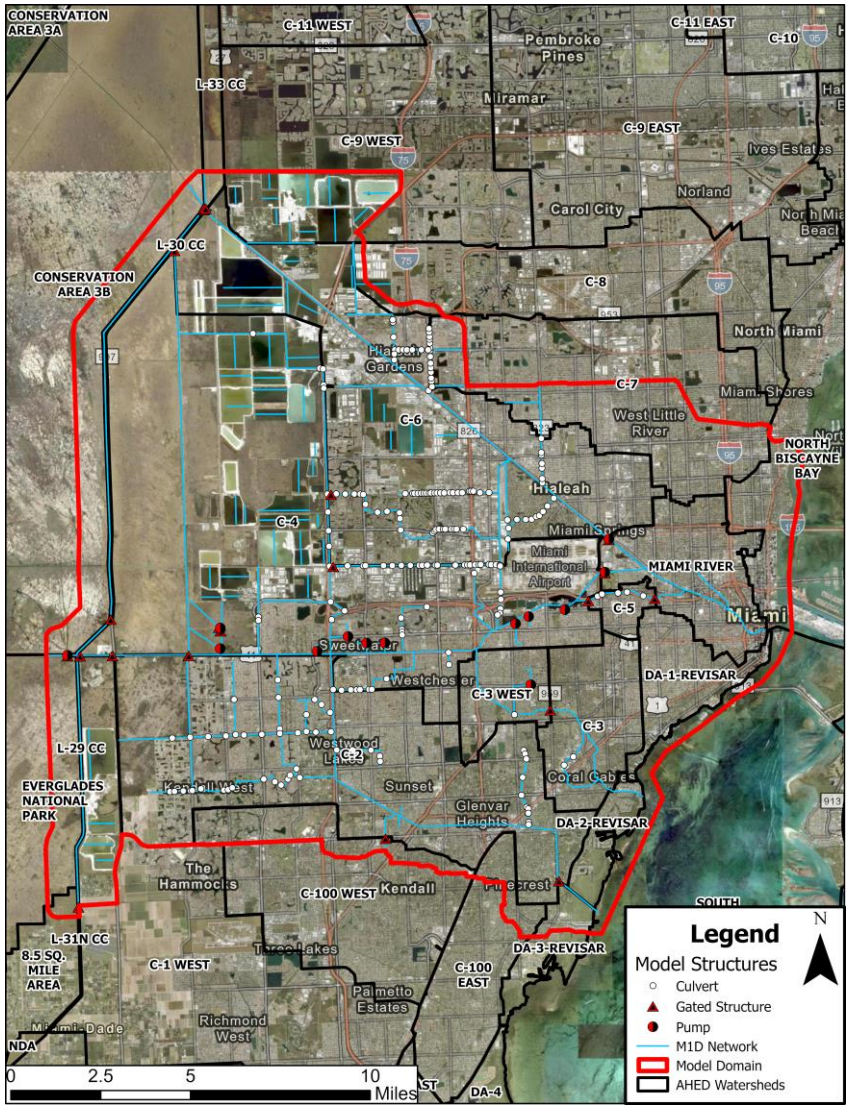
Presenter: Amanda Bredesen, P.E., H&H Model Subteam Lead, USACE
Carol Ballard, P.E. CFM, H&H Model Subteam Lead, SFWMD
Modelers: Laura Vogel, PhD., P.E., Lead Modeler, Chen Moore Associates
Justin Tagle, P.E., Modeler, Chen Moore Associates
Ruben Arteaga, PhD., P.E., Technical Lead, SFWMD

PLANNING REACH OVERVIEW

- This Reach includes five managed watersheds in the Miami River area which are the C-2, C-3W, C-5, C-6, and C-4 watersheds and also includes watersheds downstream of the coastal structures

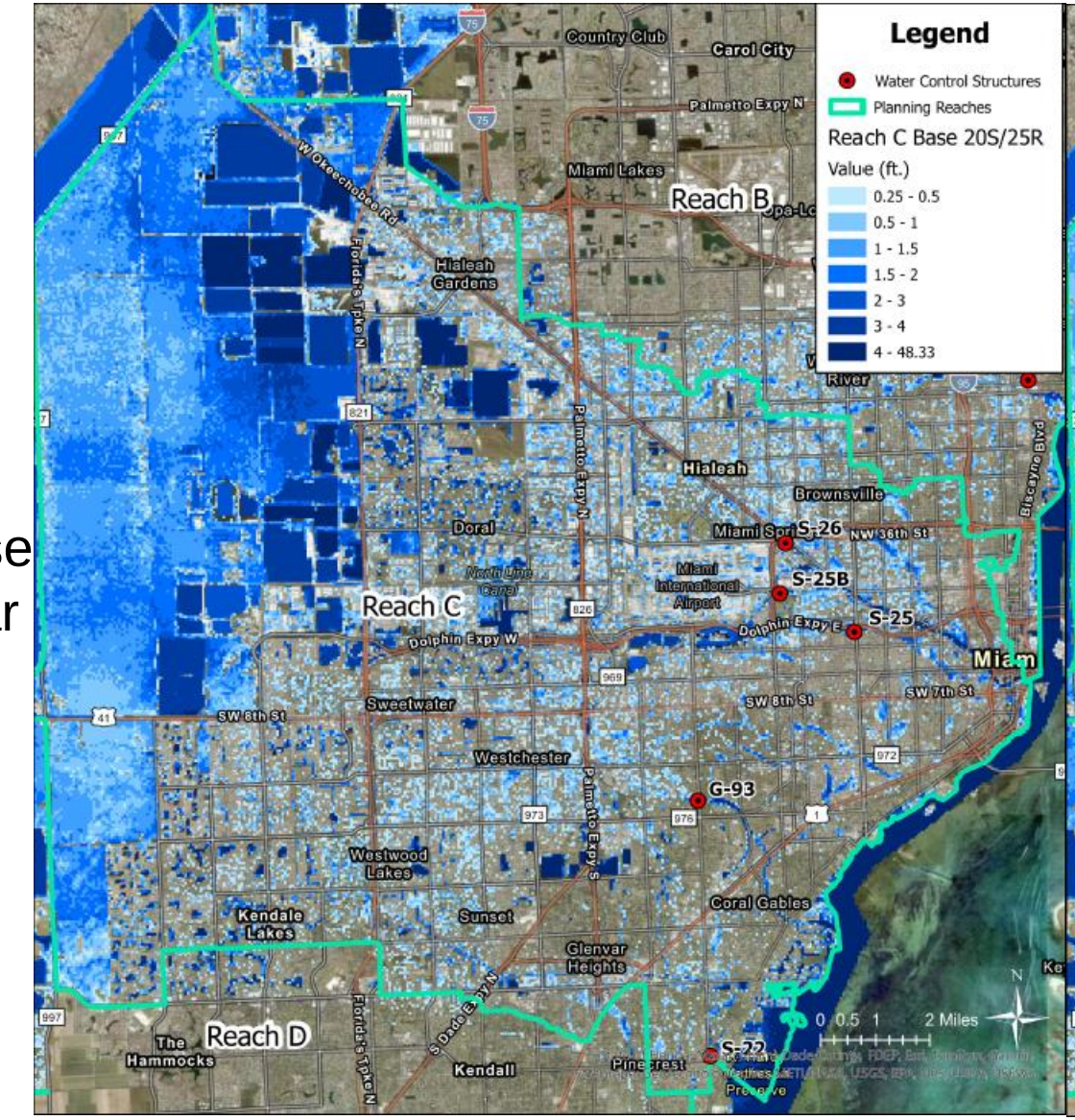
- Section 216 Focus: C-6/S-26, C-4/S-25B, C-3/G-93, C-5/S-25 and C-2 (Snapper Creek)/S-22



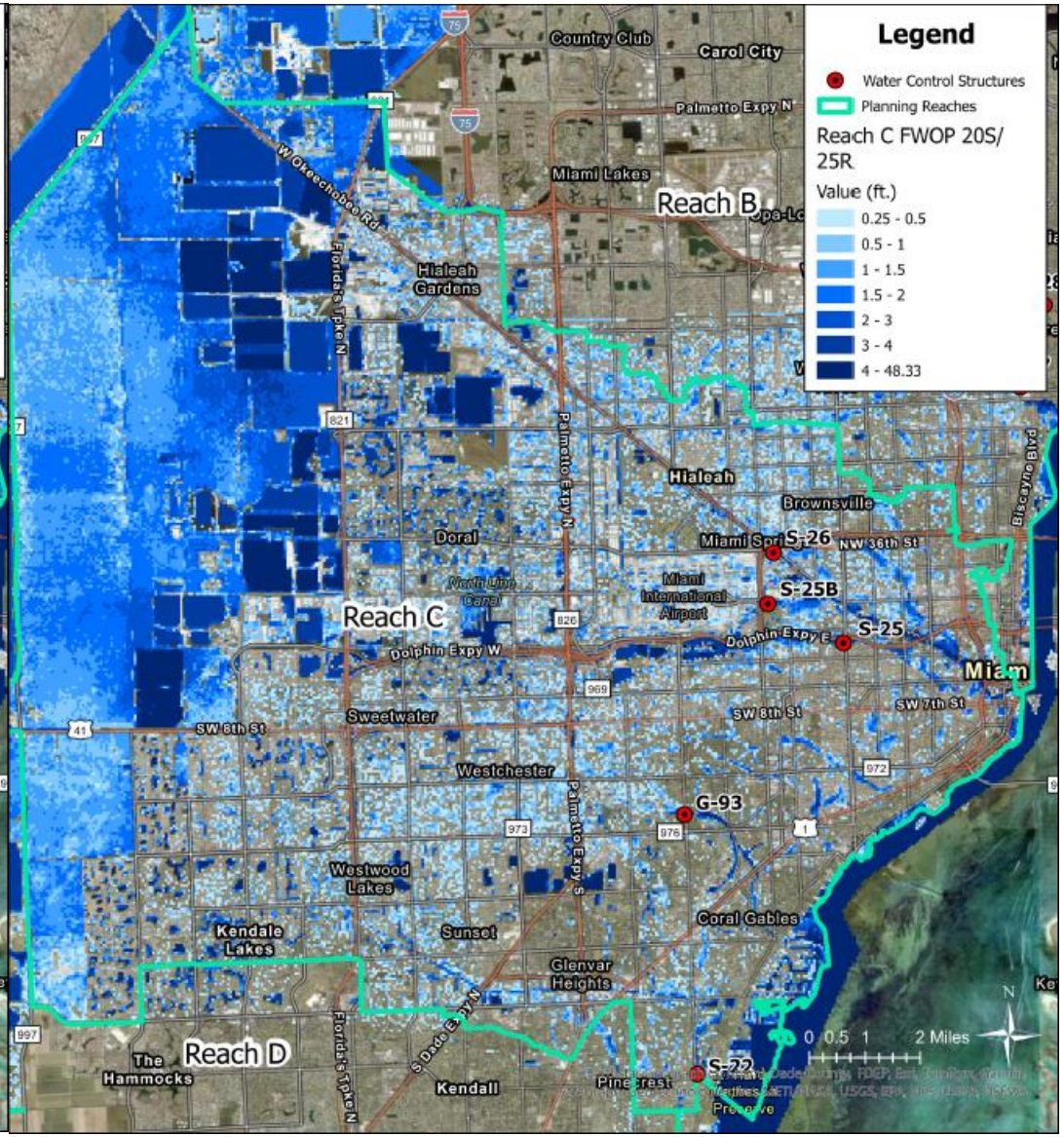


MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 20-YEAR COASTAL

Base Year

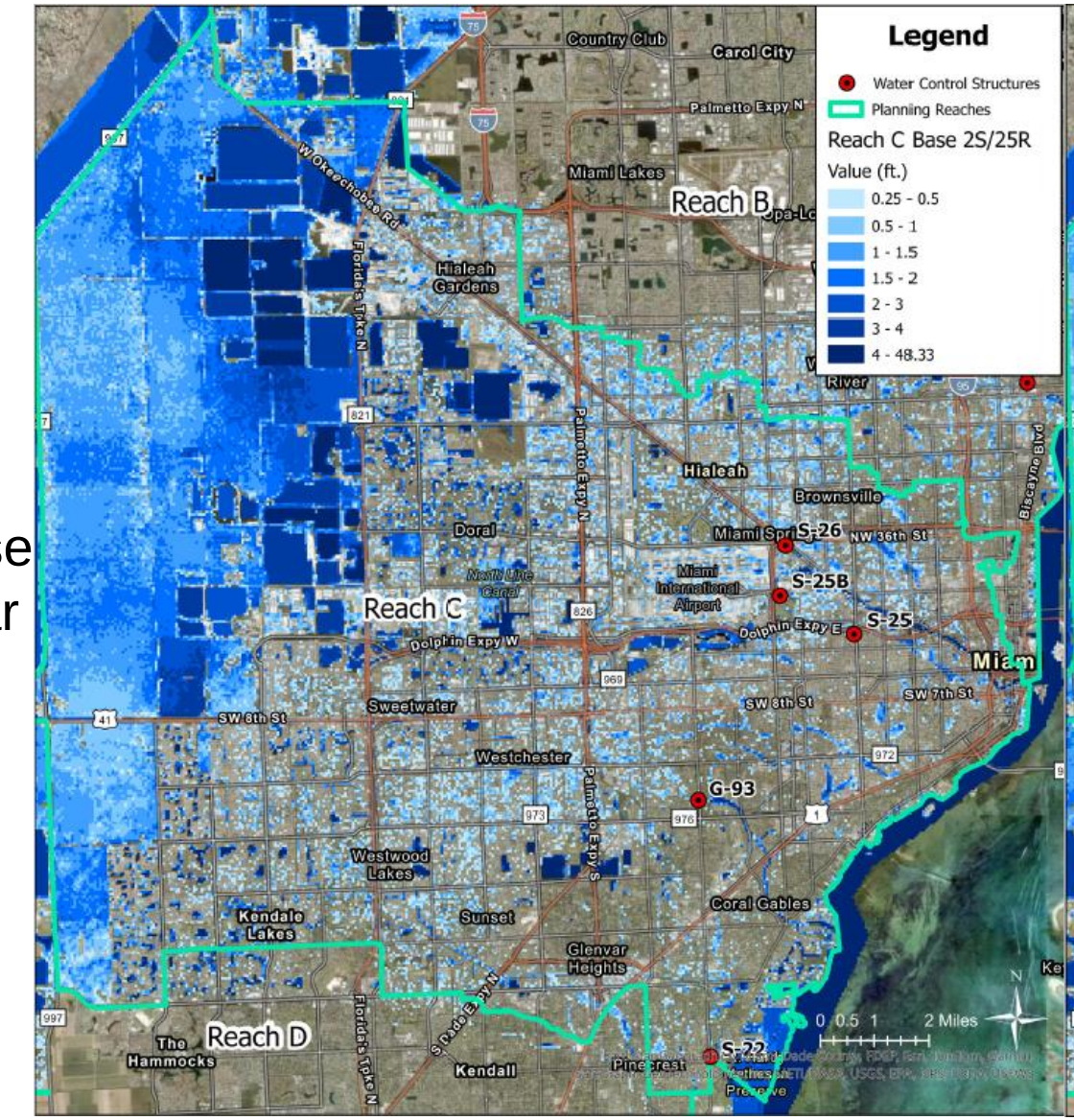


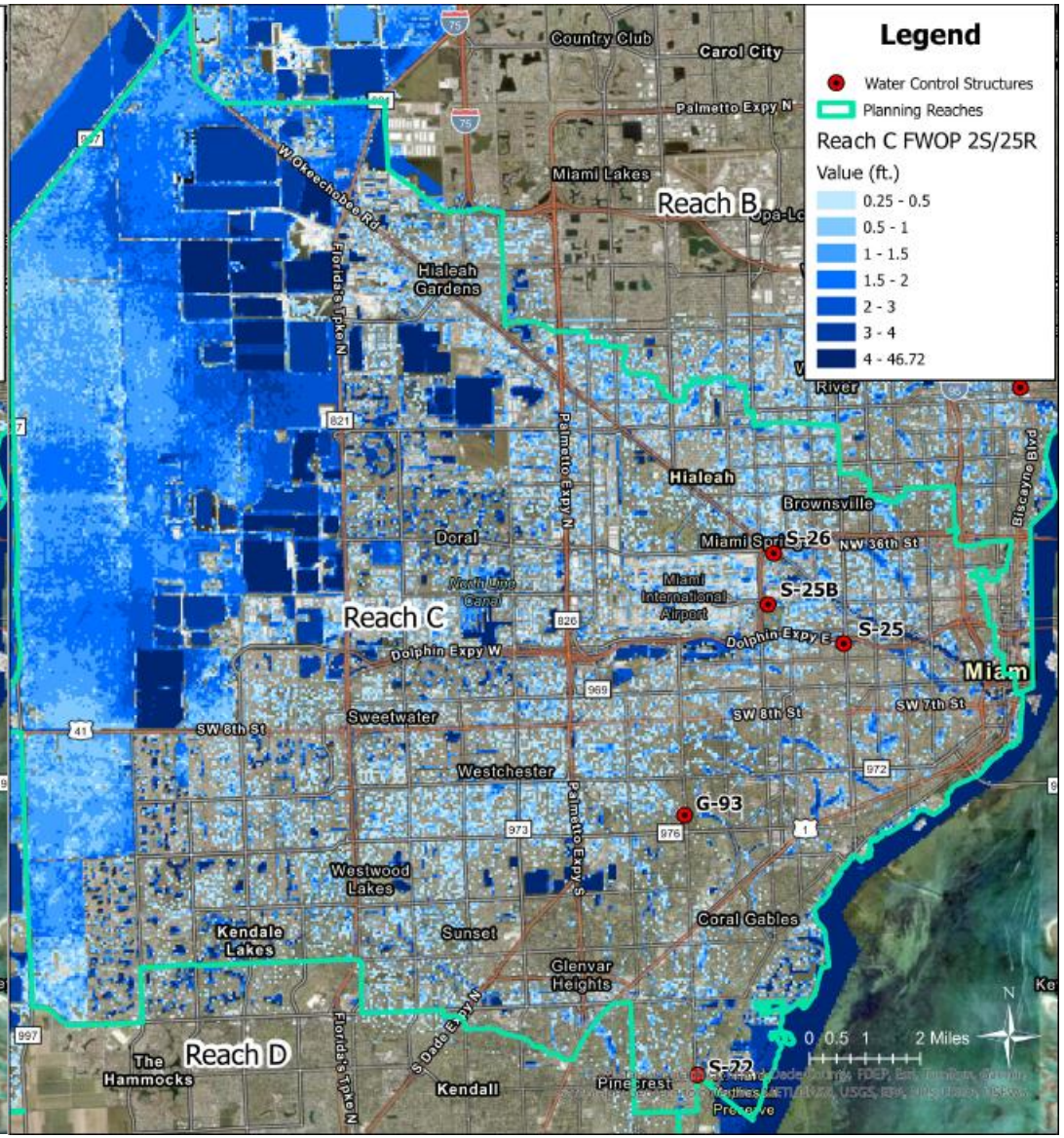
FWOP Int SLR



MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 2-YEAR COASTAL

Base Year

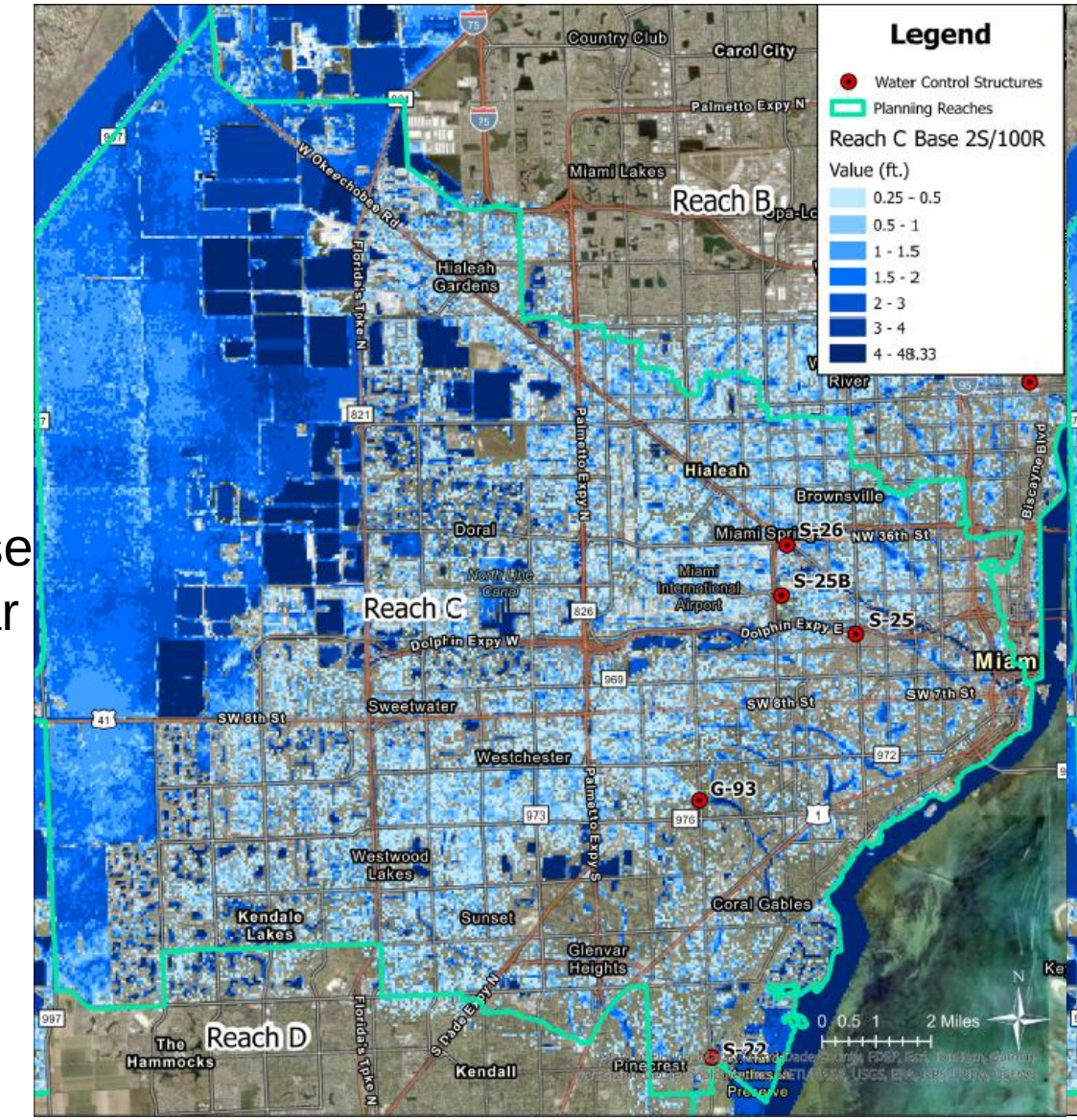




FWOP Int SLR

MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 2-YEAR COASTAL

Base Year



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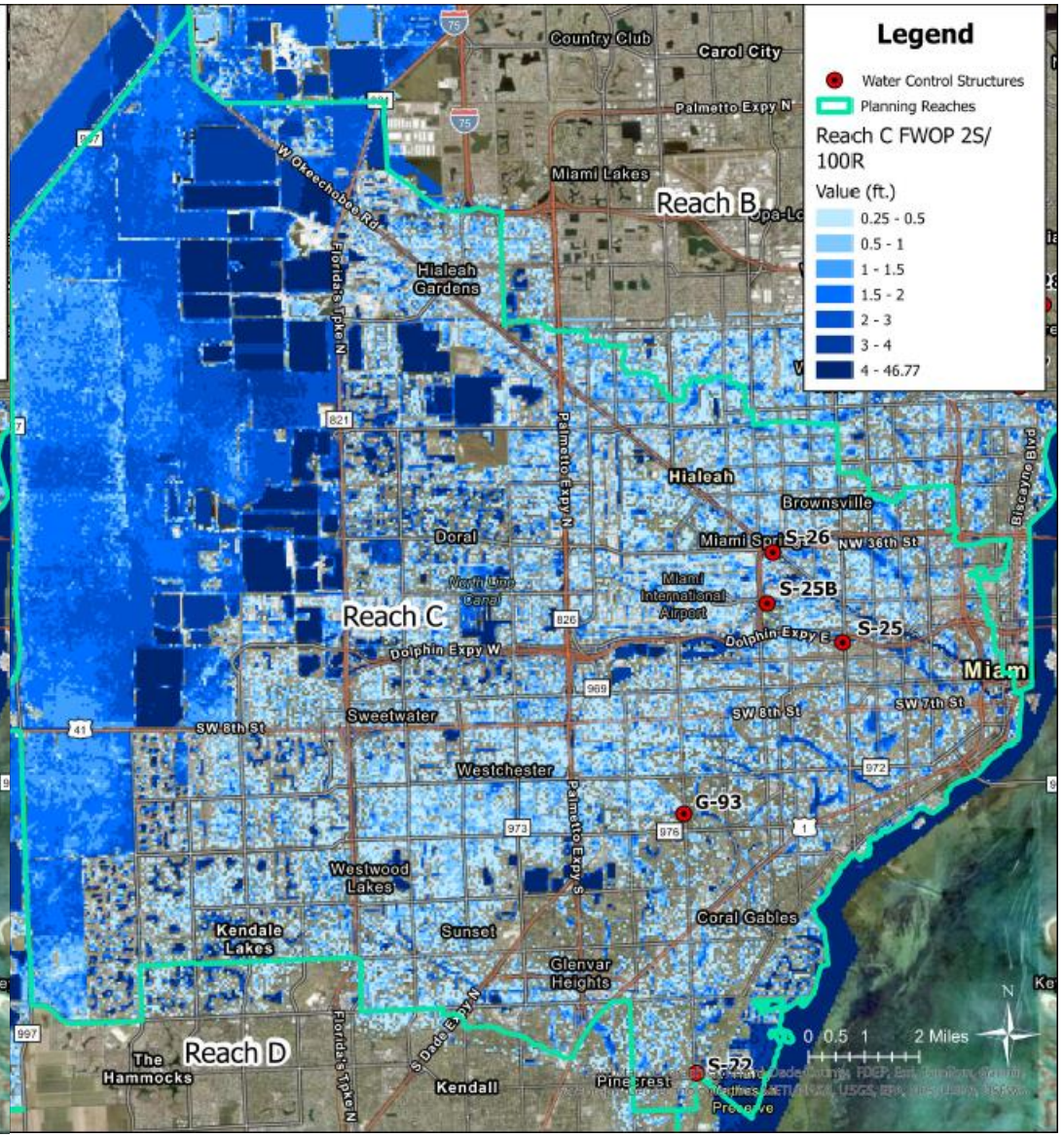
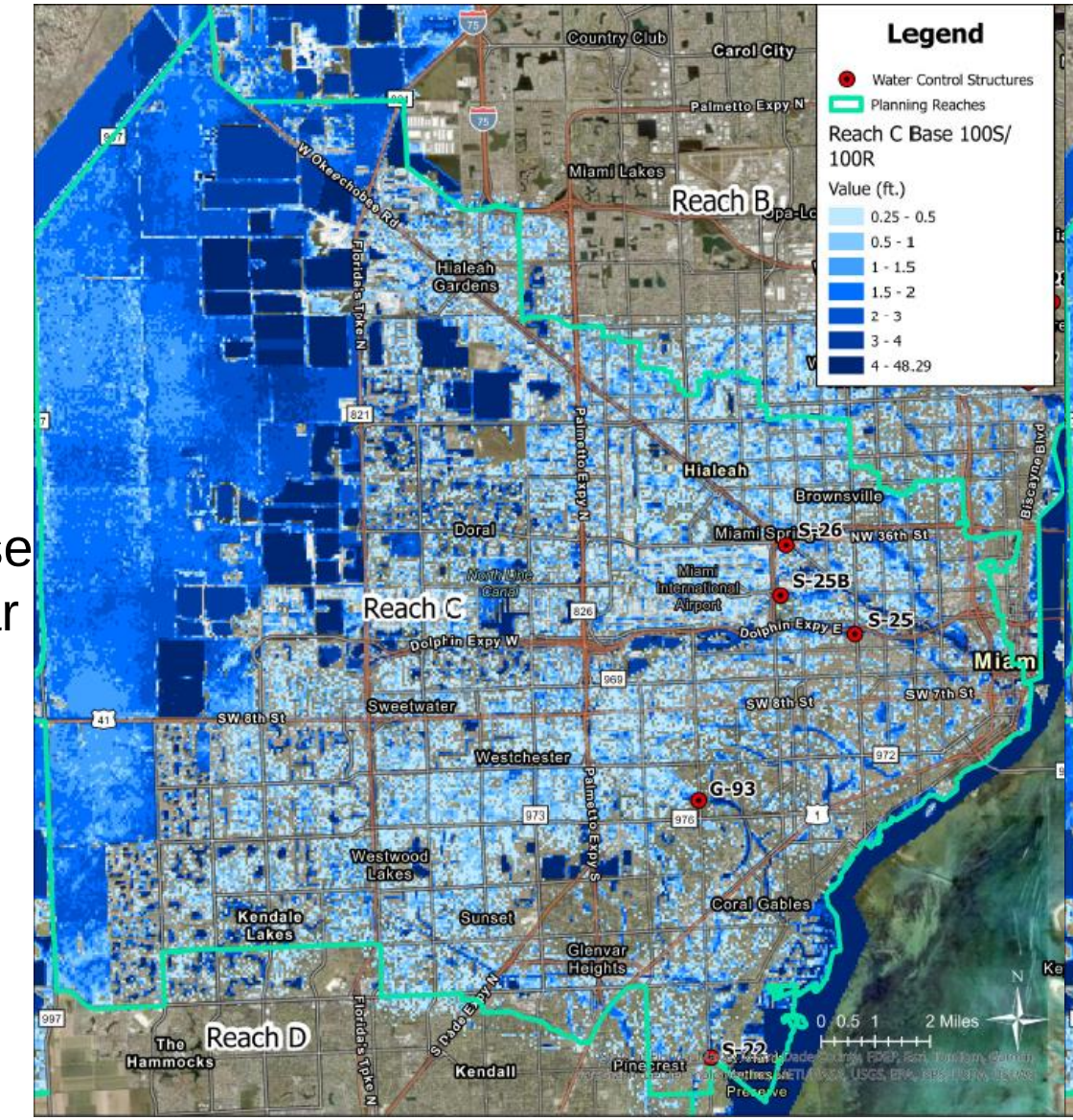


MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 100-YEAR COASTAL

Base Year



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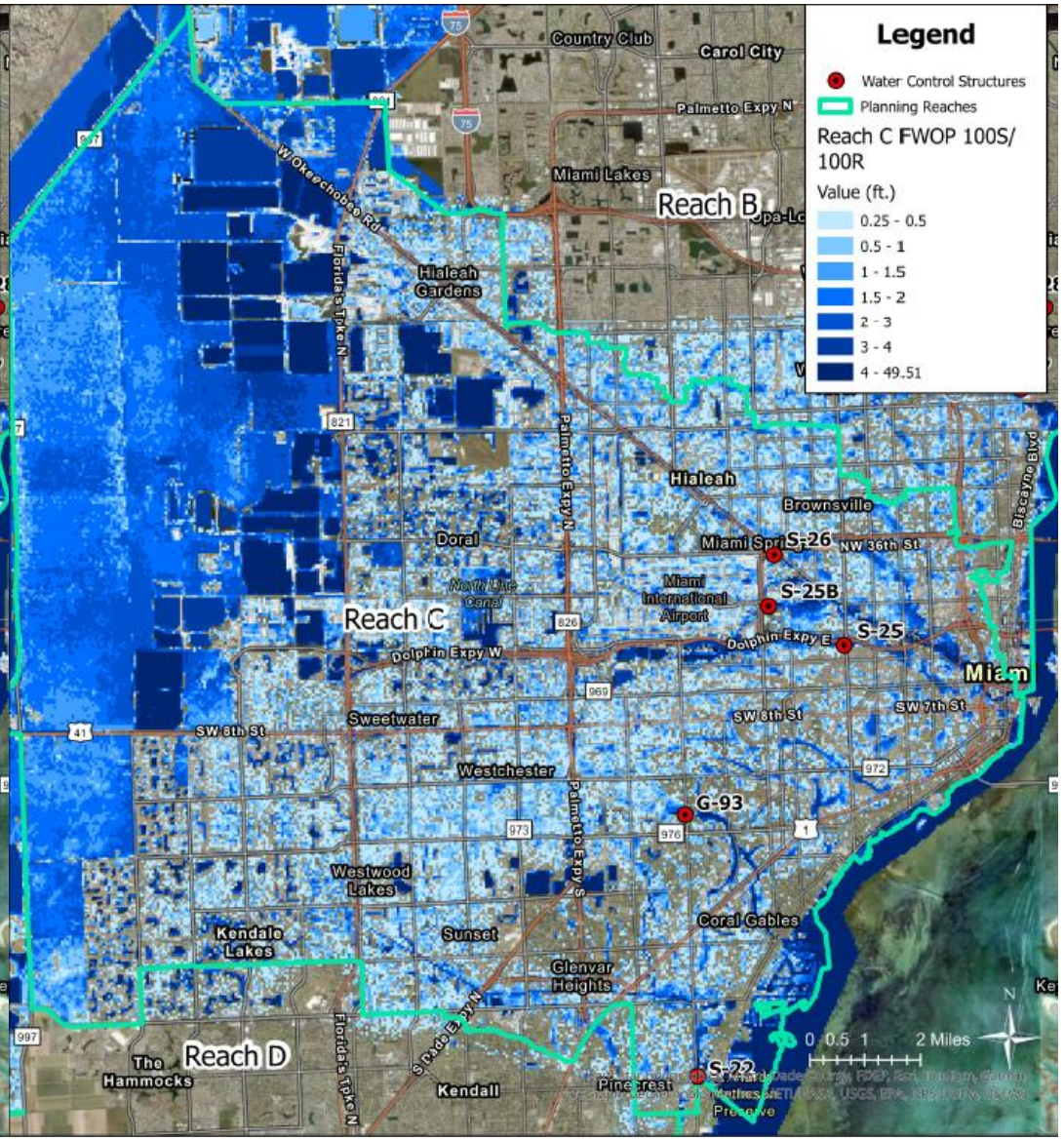
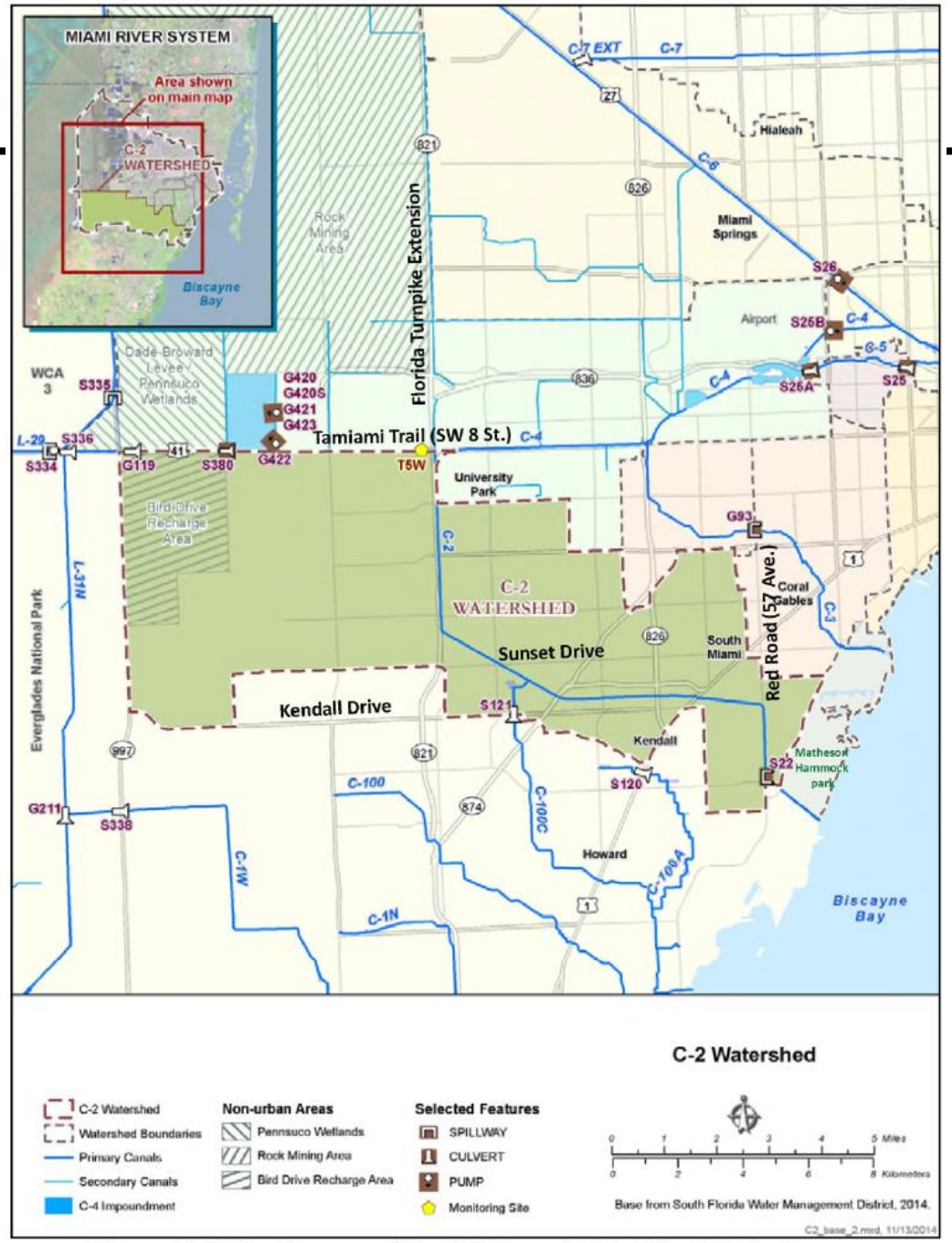
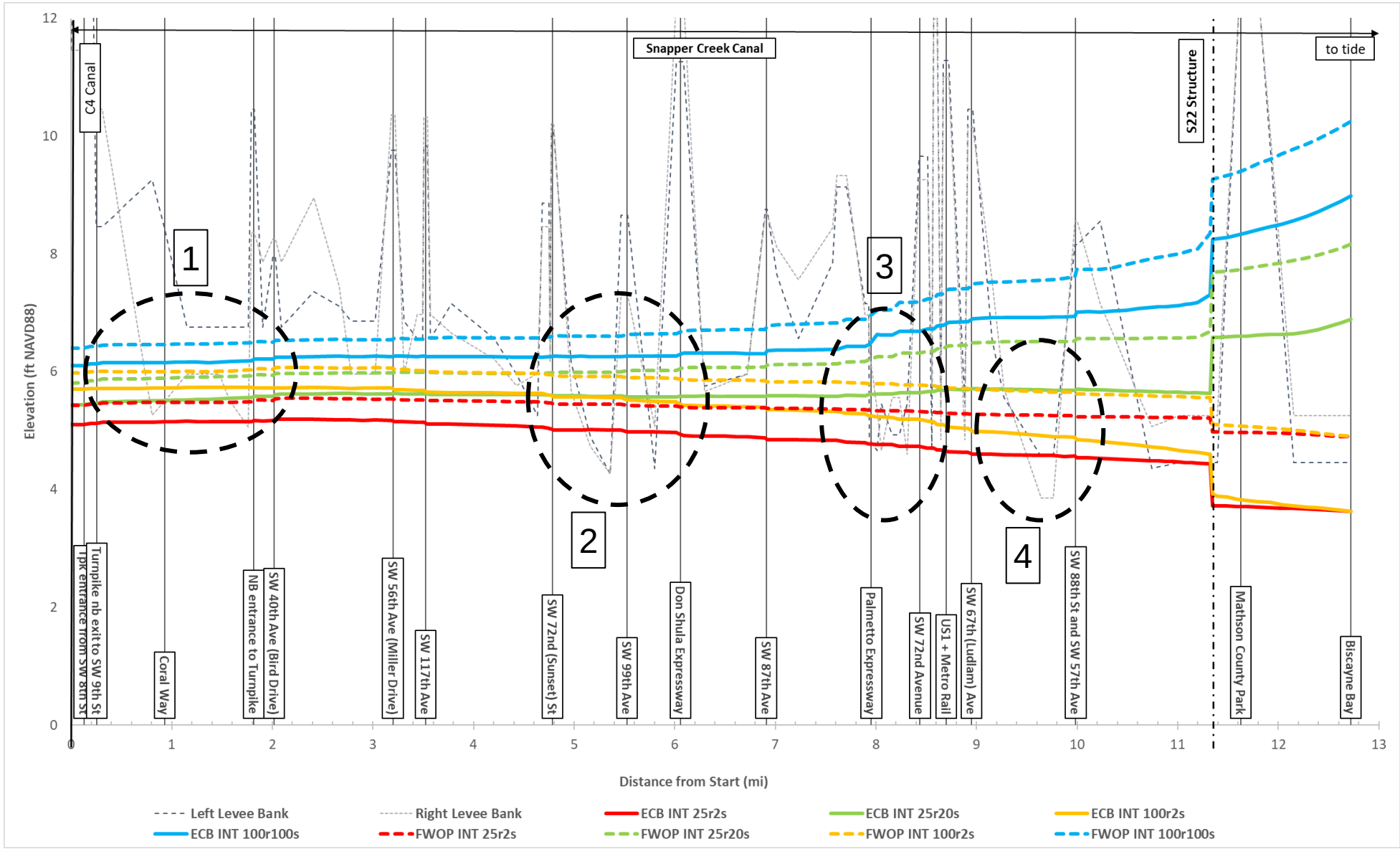


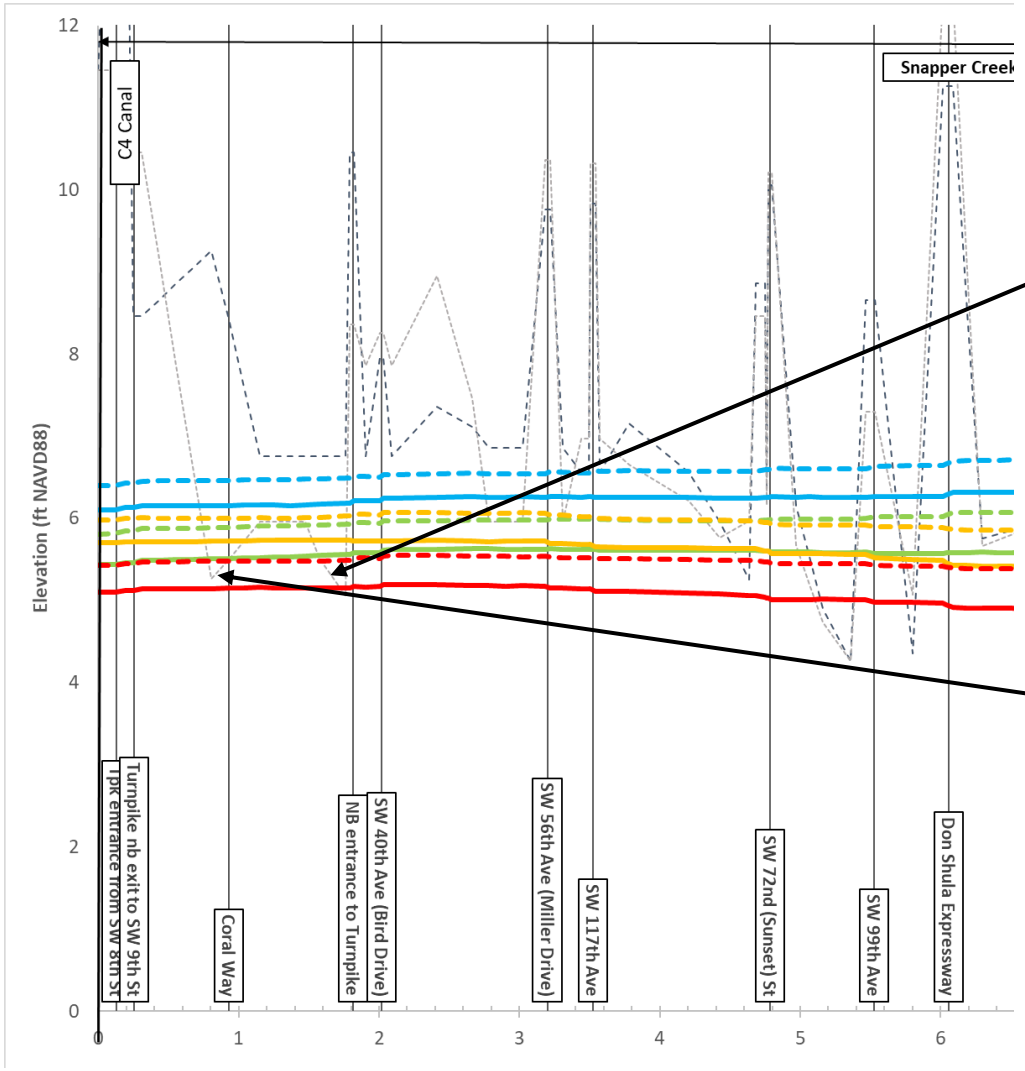
C-2, SNAPPER CREEK / S22



MAXIMUM STAGE PROFILE PLOT – C-2/SNAPPER CREEK CANAL



MAXIMUM STAGE PROFILE PLOT – SNAPPER CREEK CANAL



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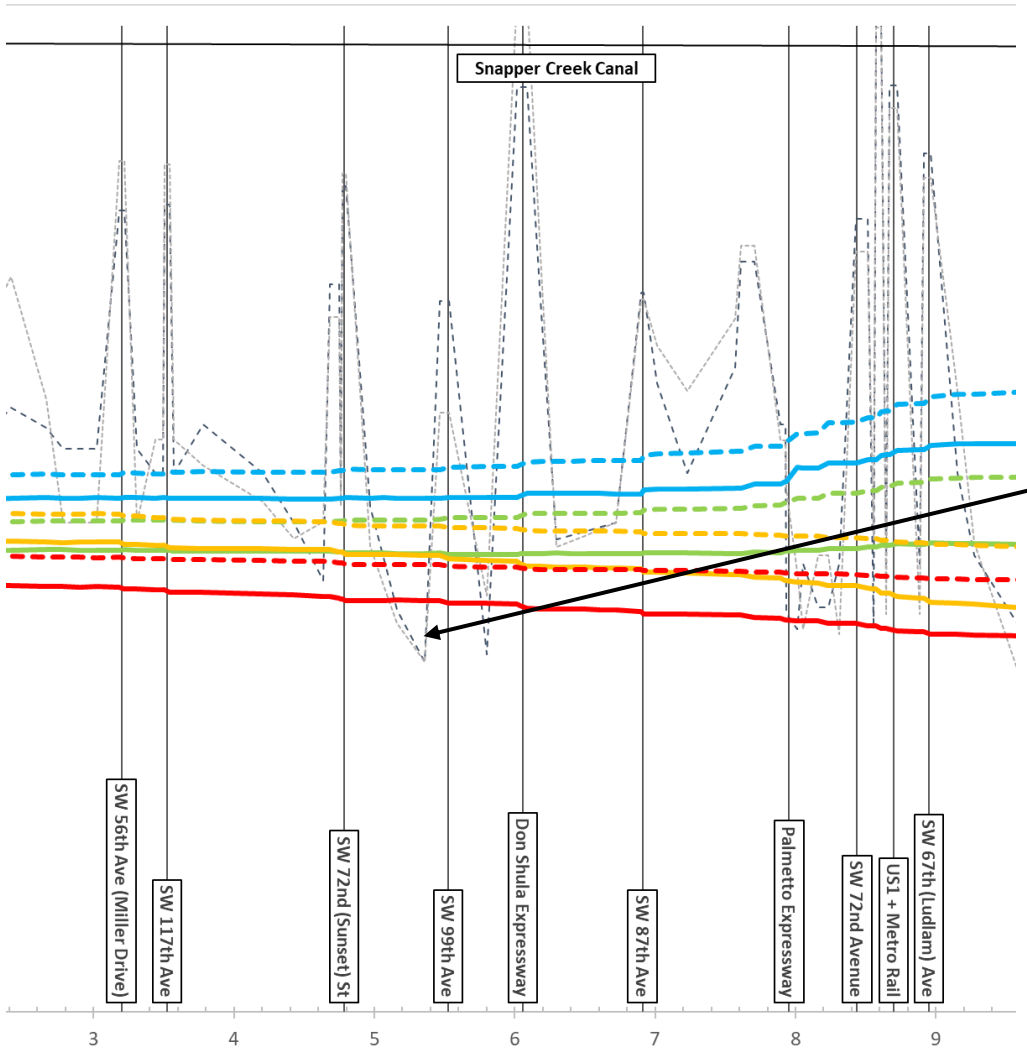
MAXIMUM STAGE PROFILE PLOT – SNAPPER CREEK CANAL



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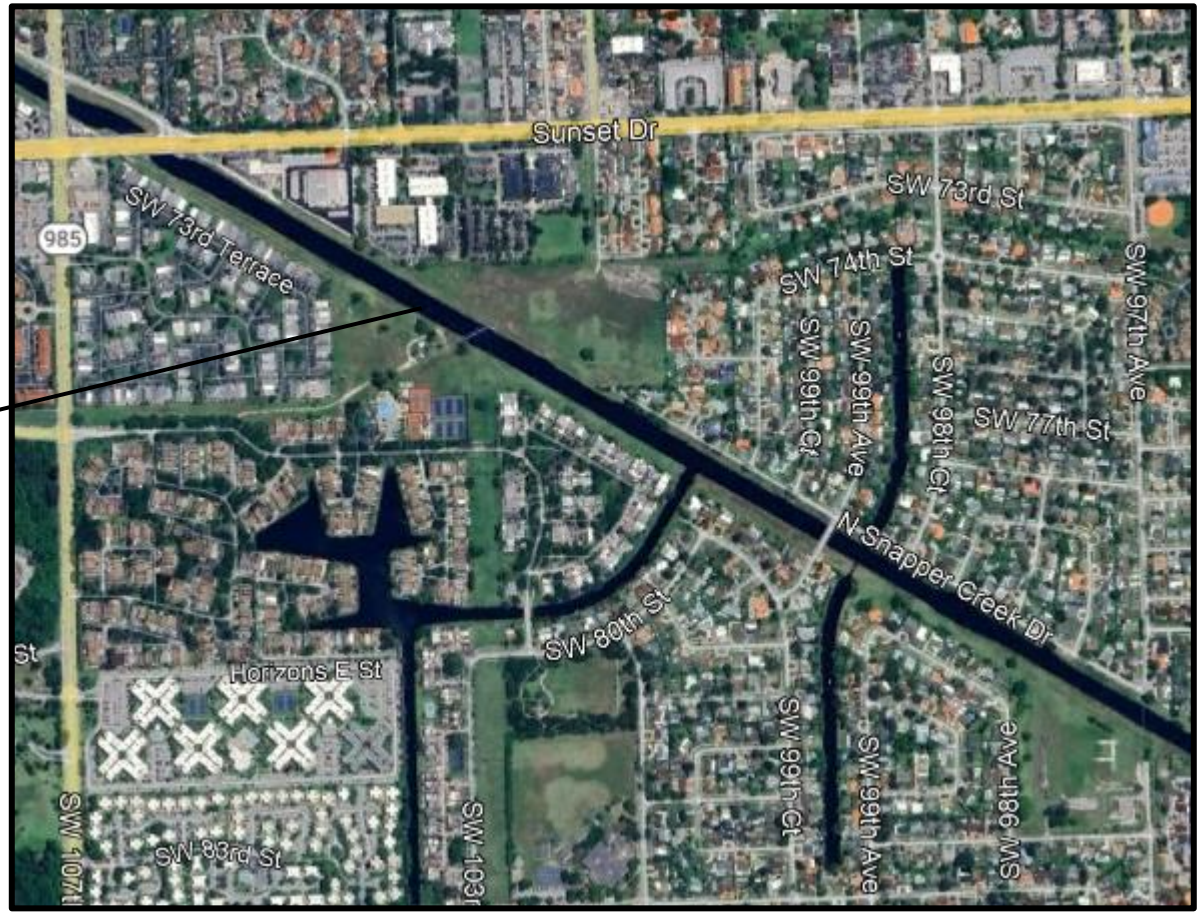
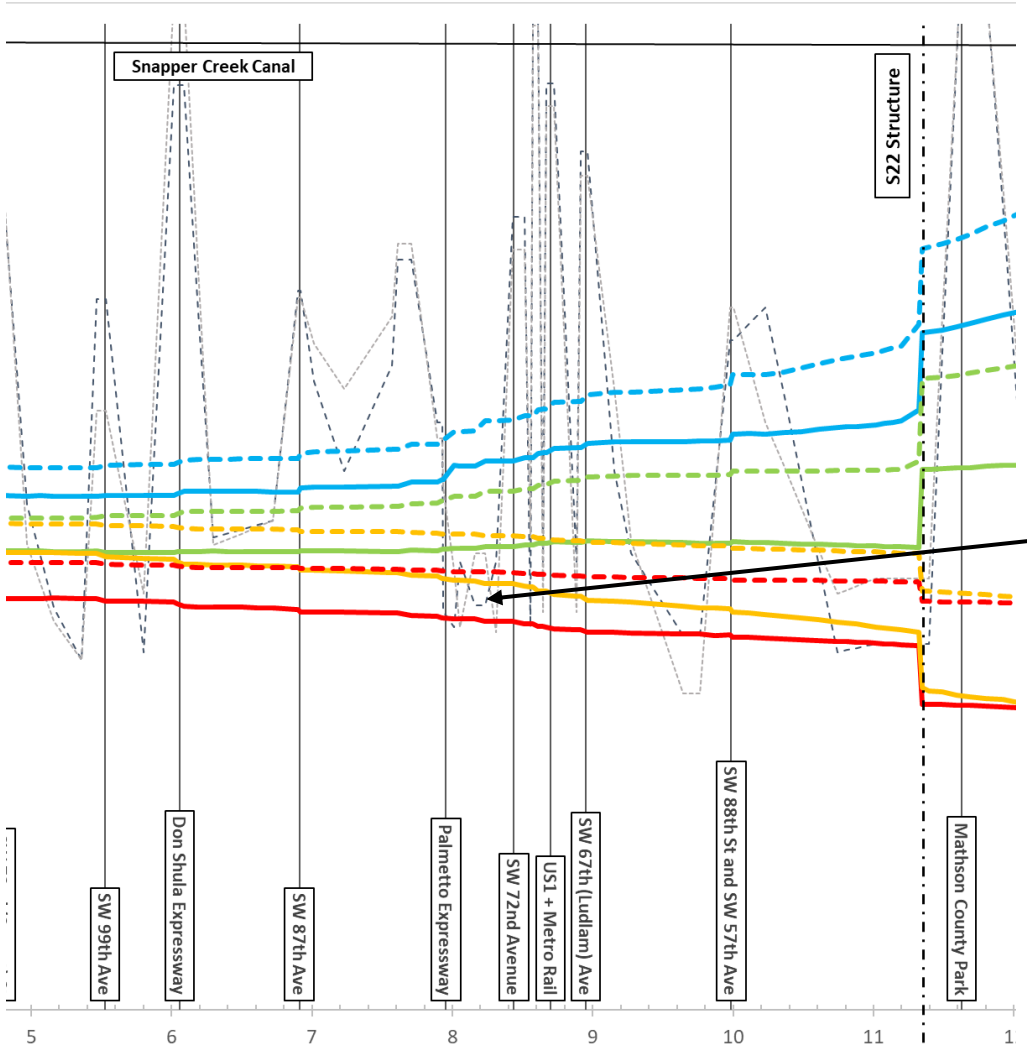


MAXIMUM STAGE PROFILE PLOT – SNAPPER CREEK CANAL



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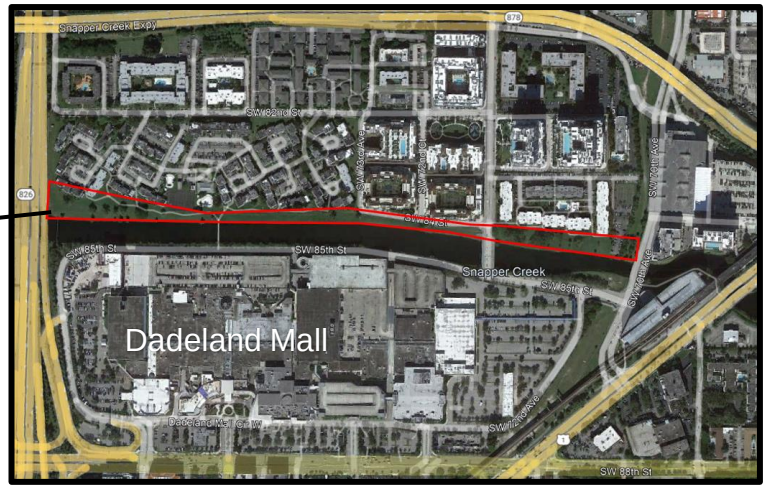
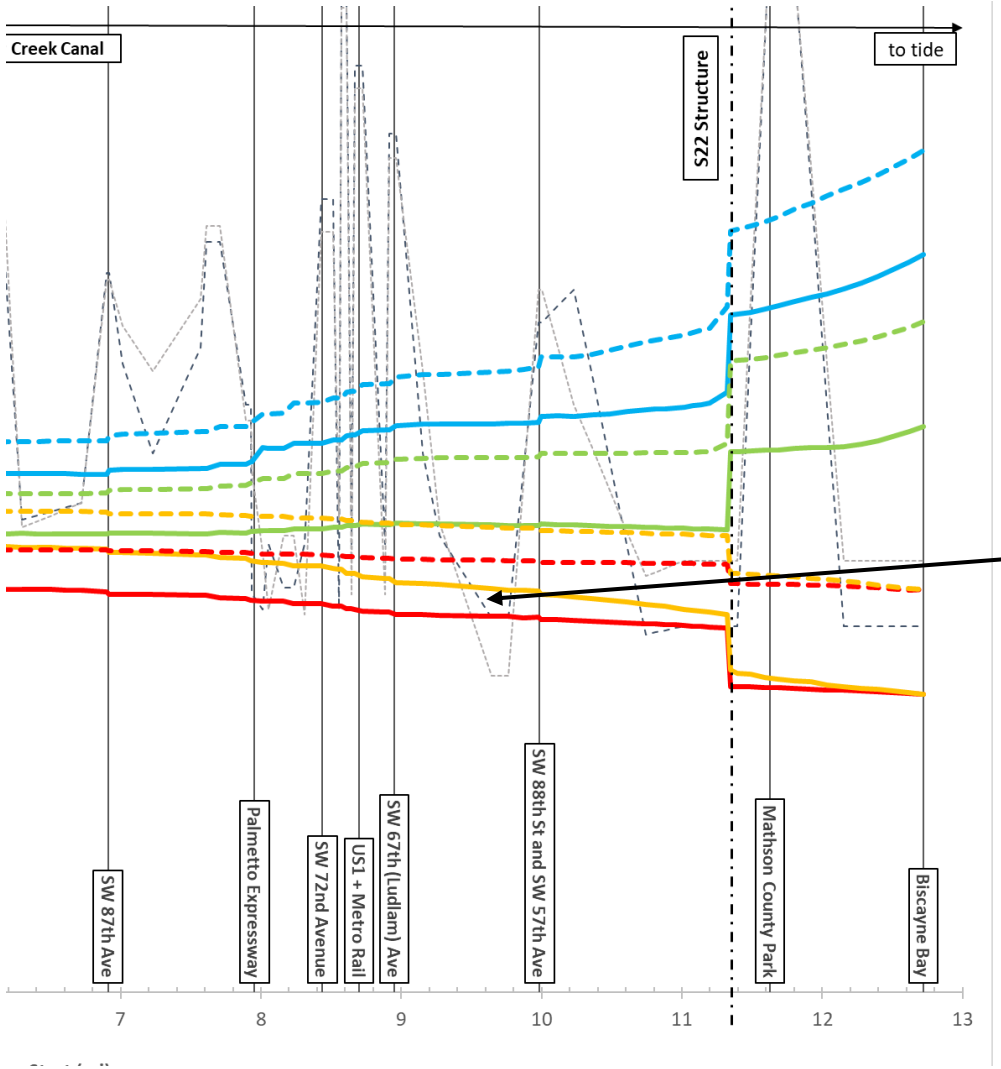


MAXIMUM STAGE PROFILE PLOT – SNAPPER CREEK CANAL



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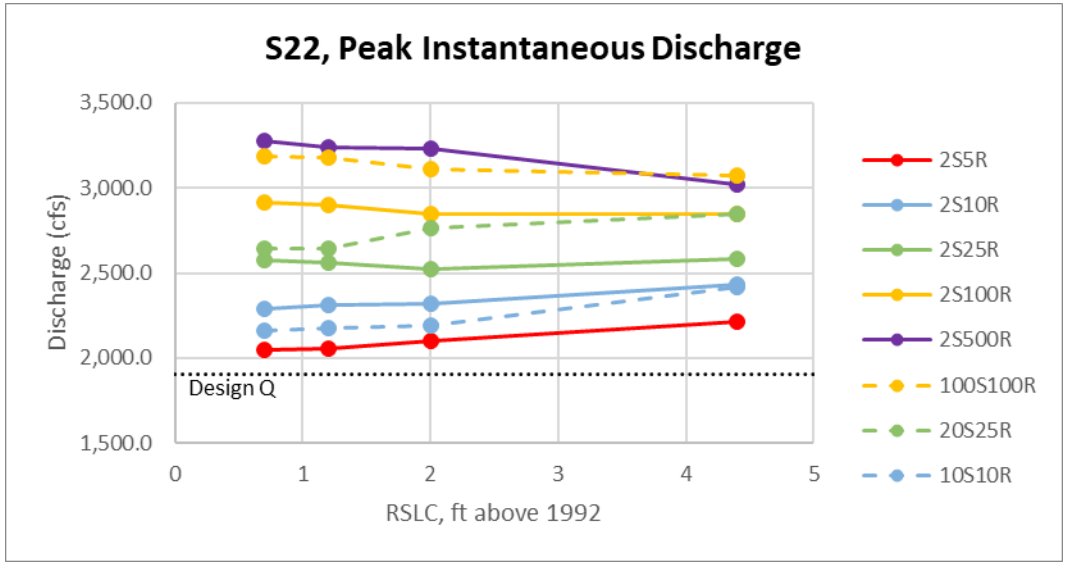
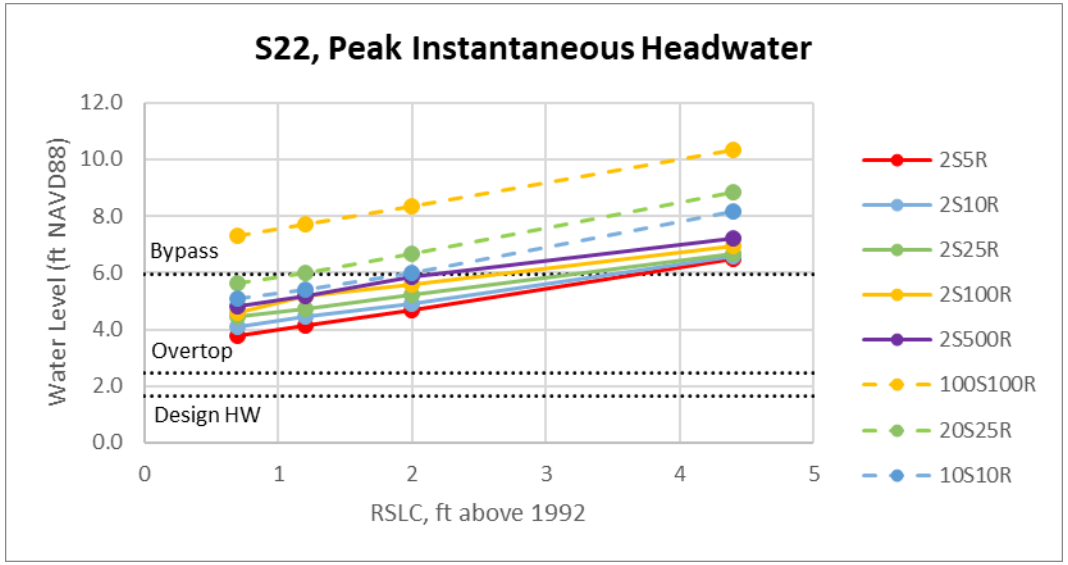
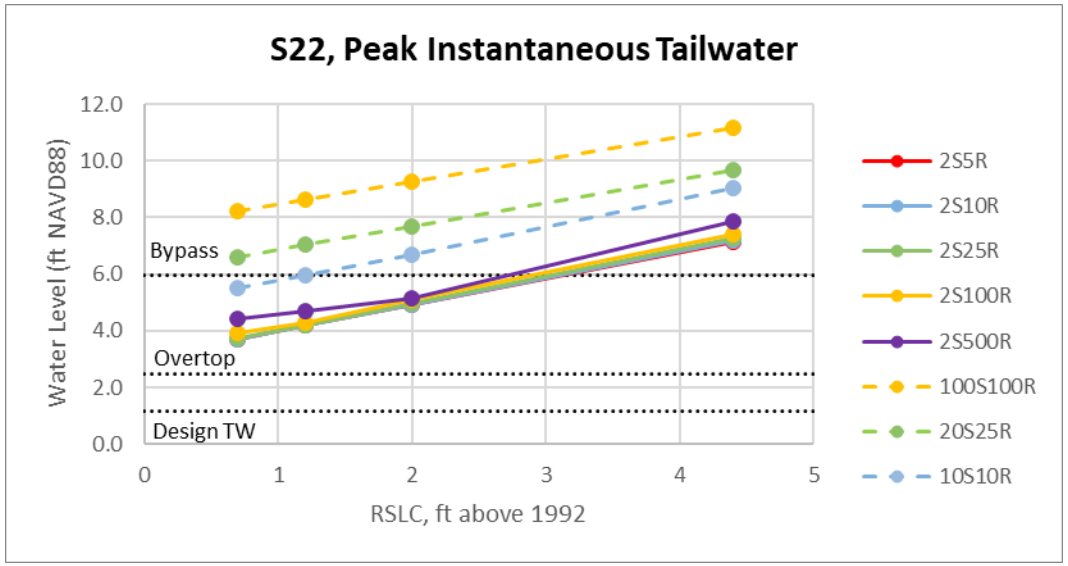
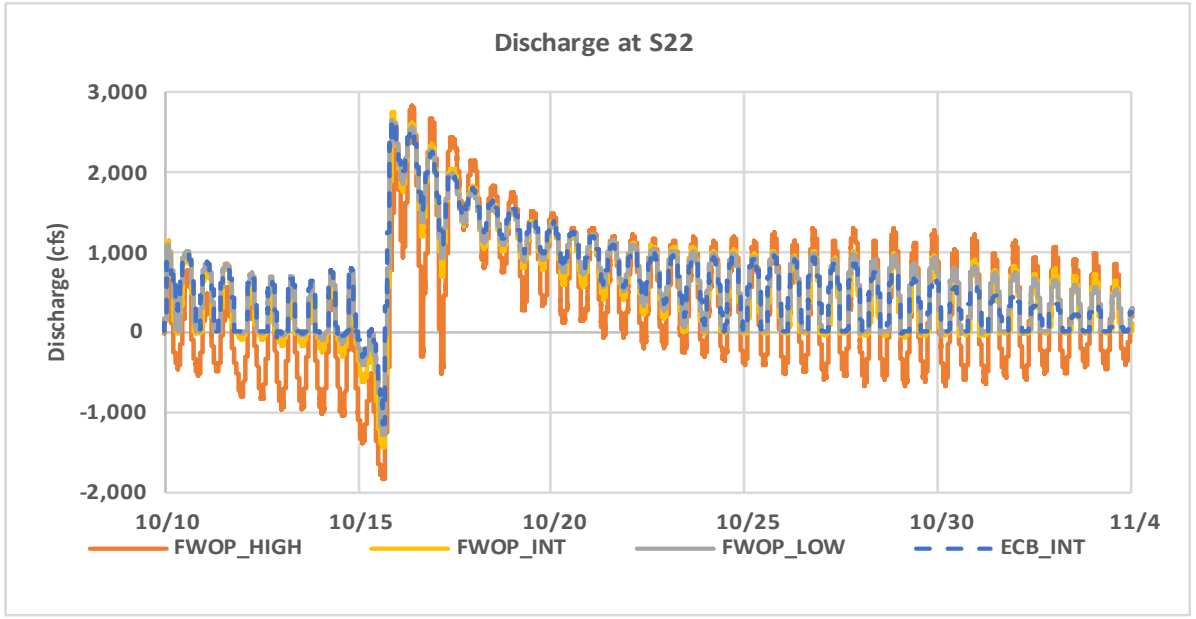
STRUCTURE PERFORMANCE, S22

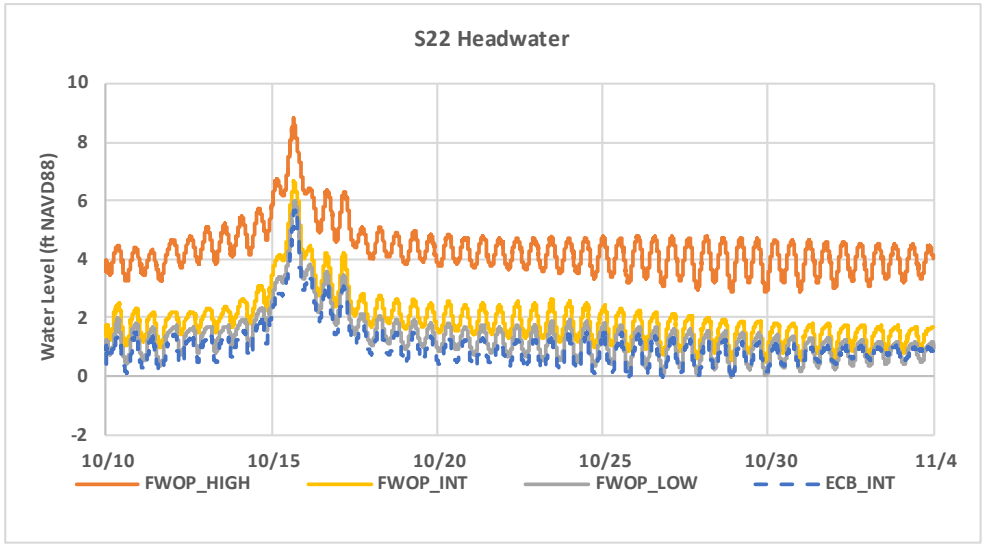


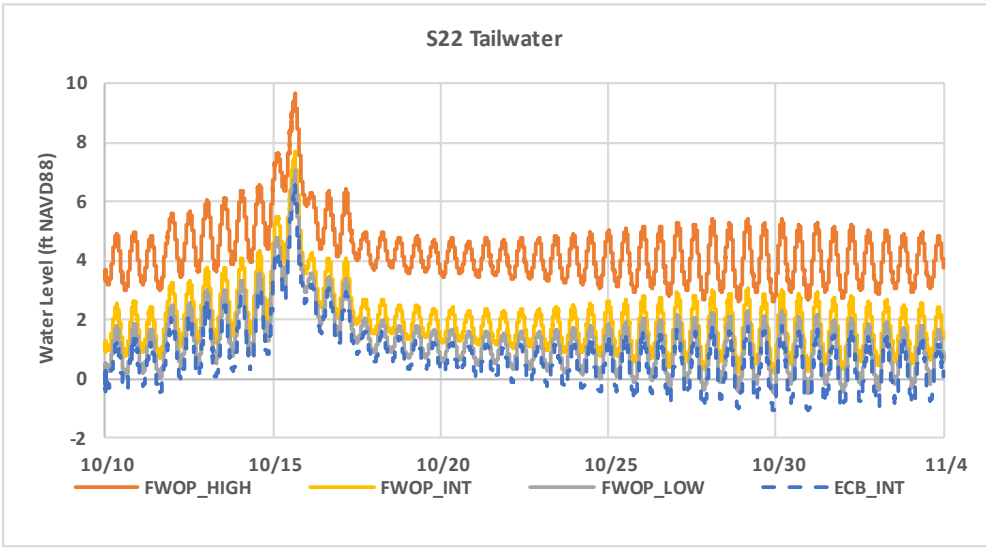




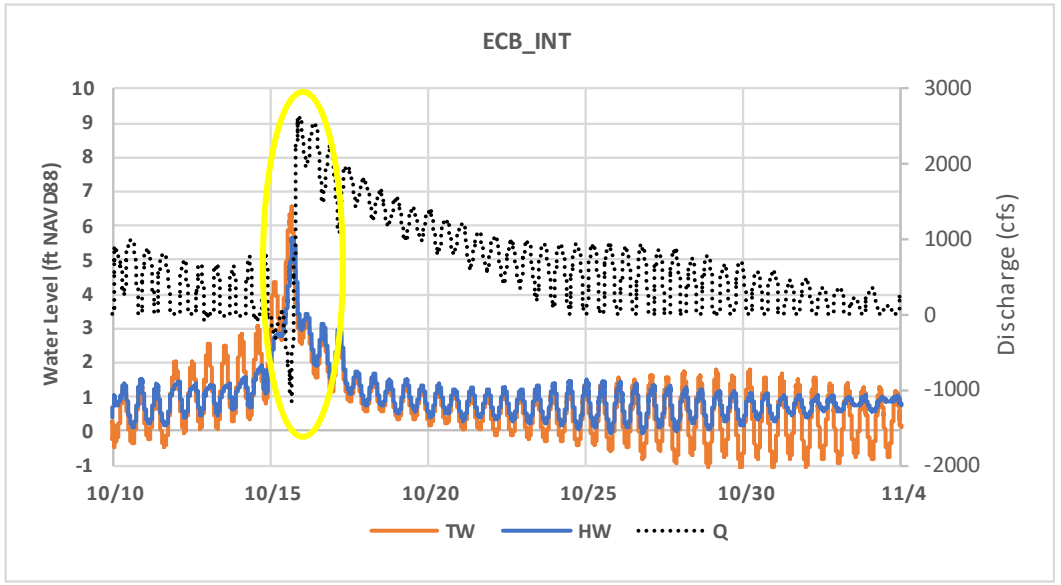
STRUCTURE PERFORMANCE, S22 – 20S25R

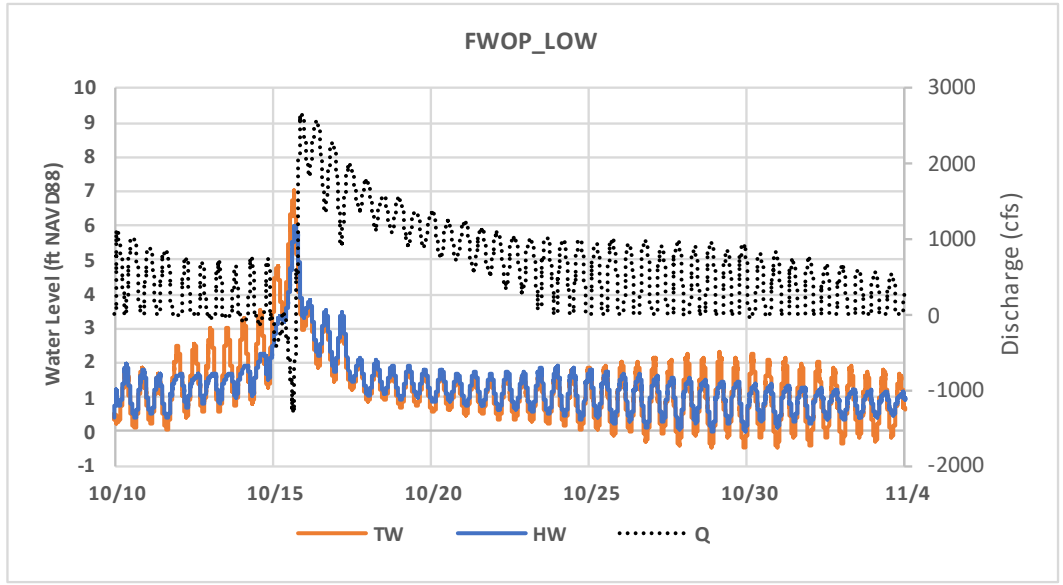


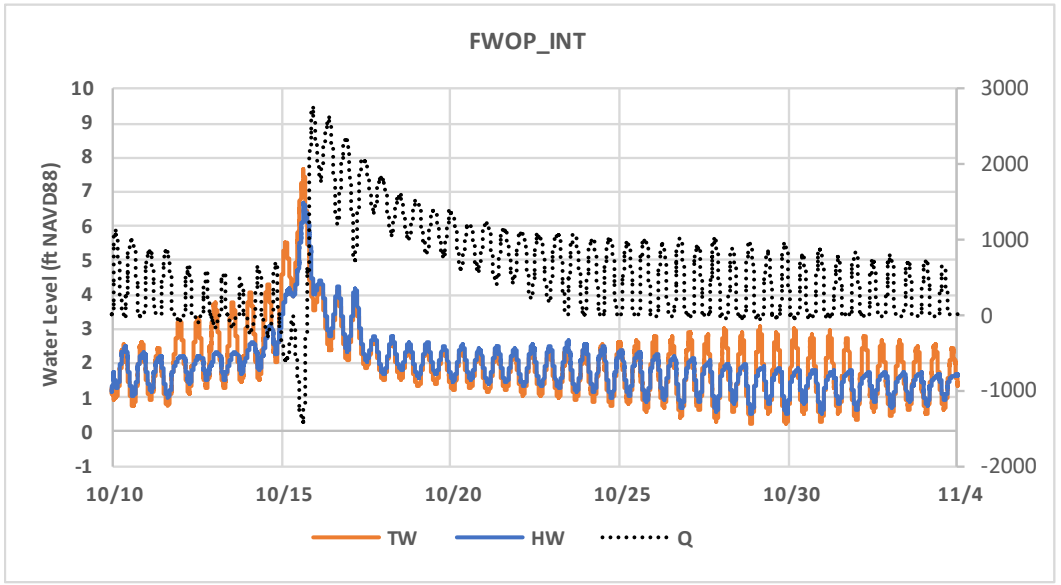


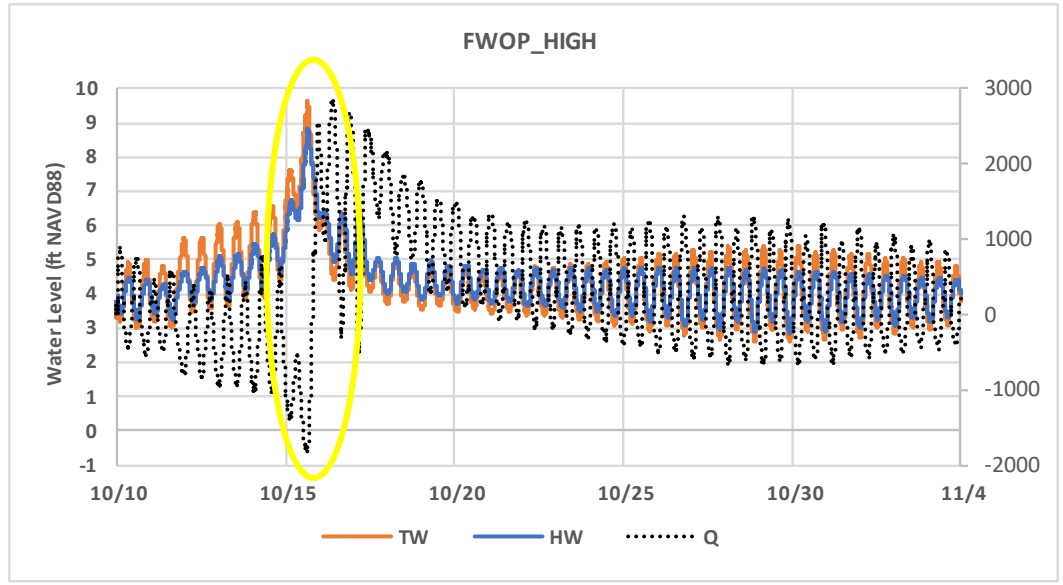


STRUCTURE PERFORMANCE, S22 – 20S25R



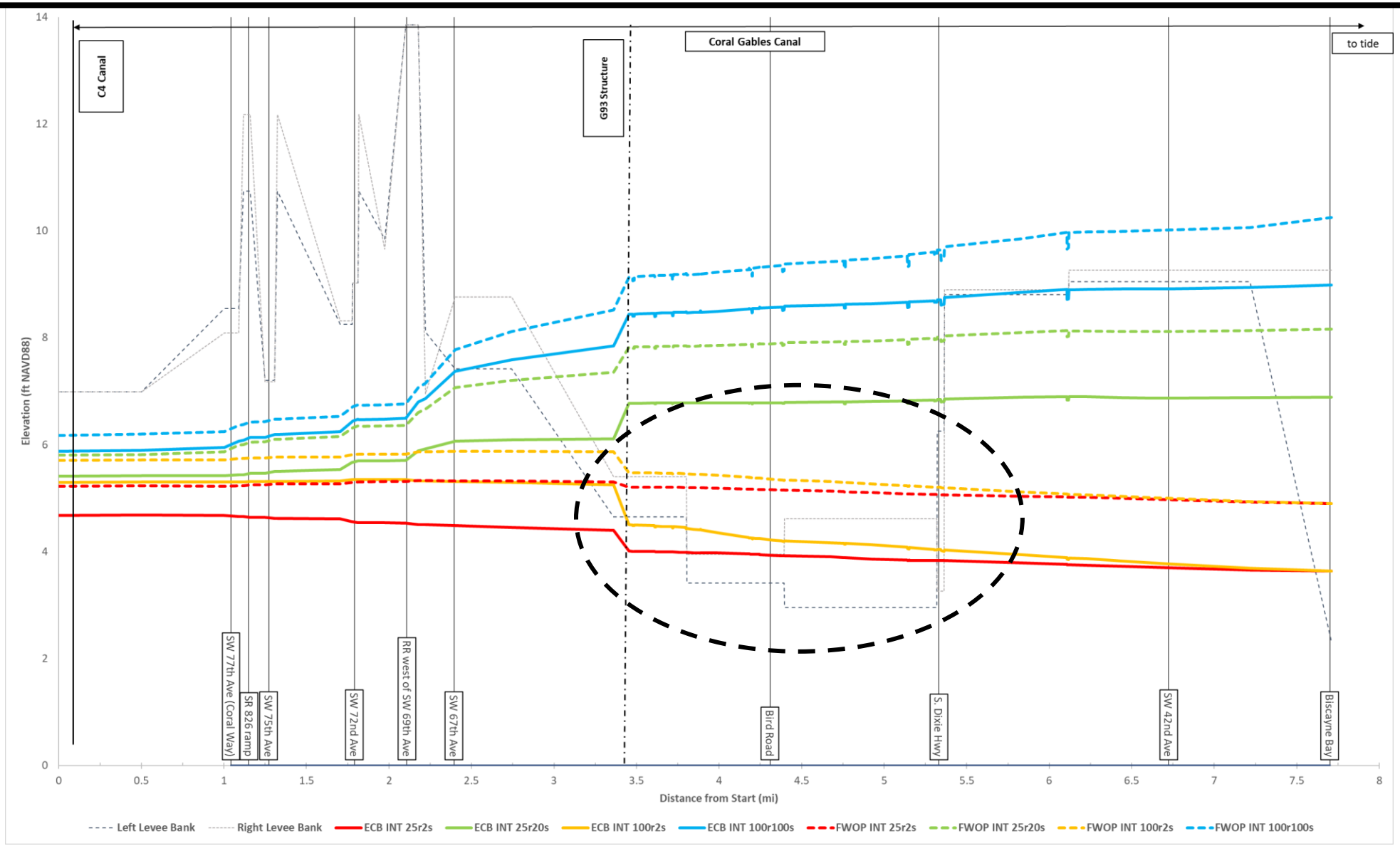




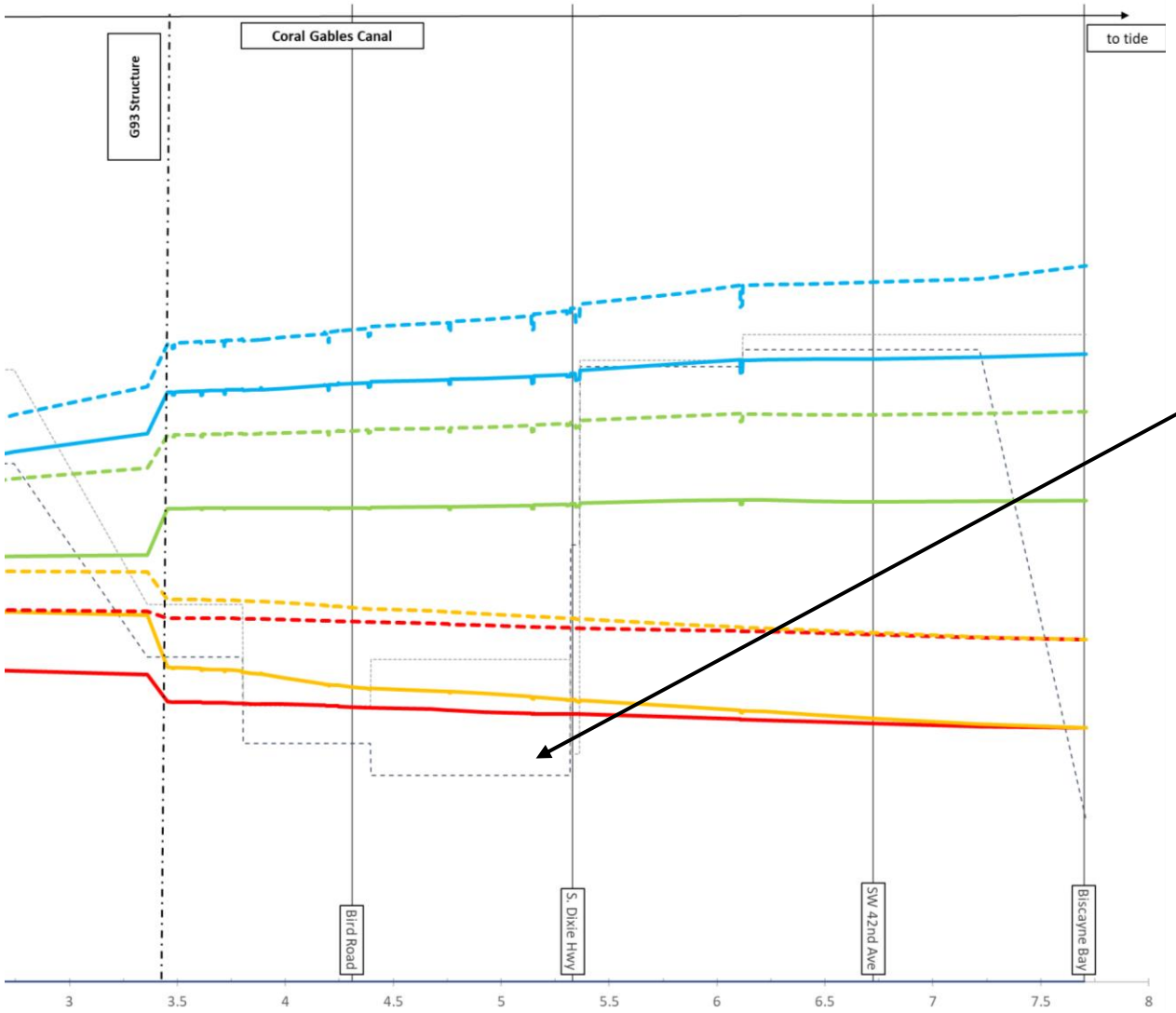


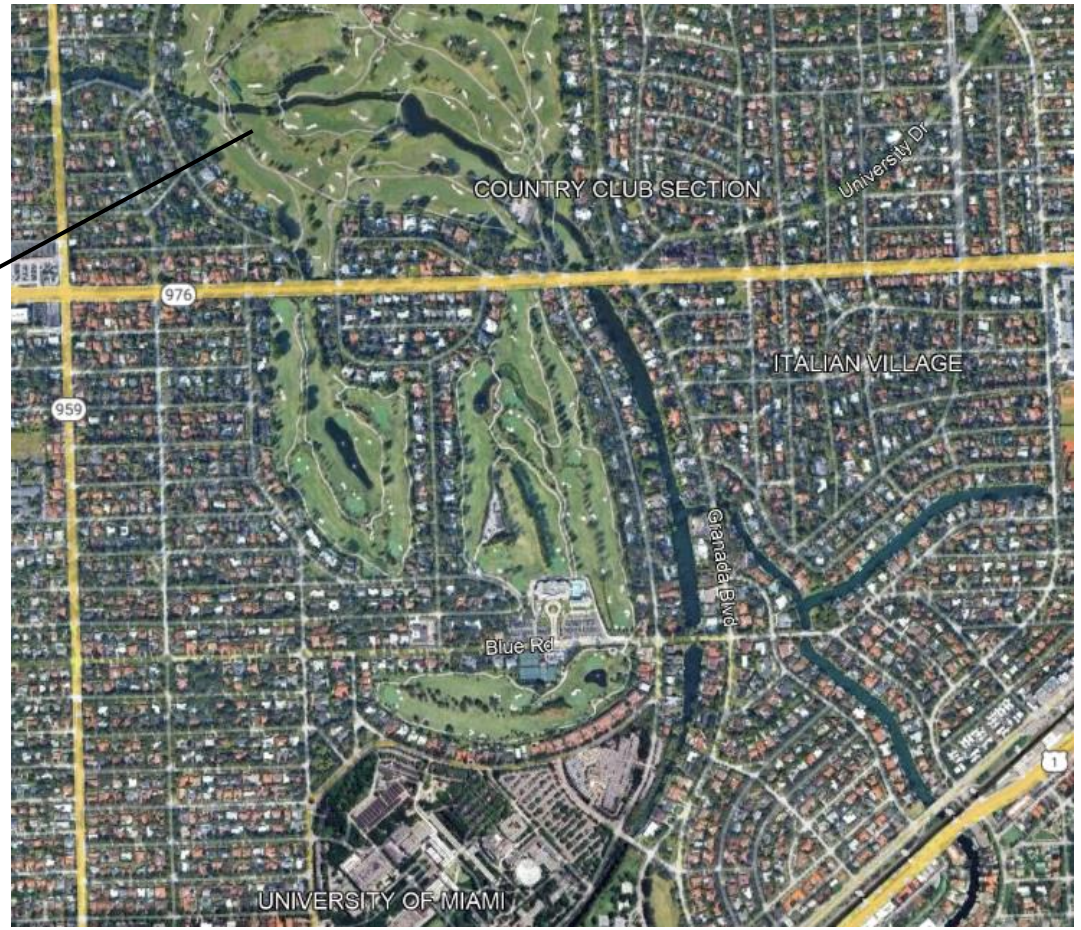
C-3/CORAL GABLES CANAL

MAXIMUM STAGE PROFILE PLOT – C-3/CORAL GABLES CANAL

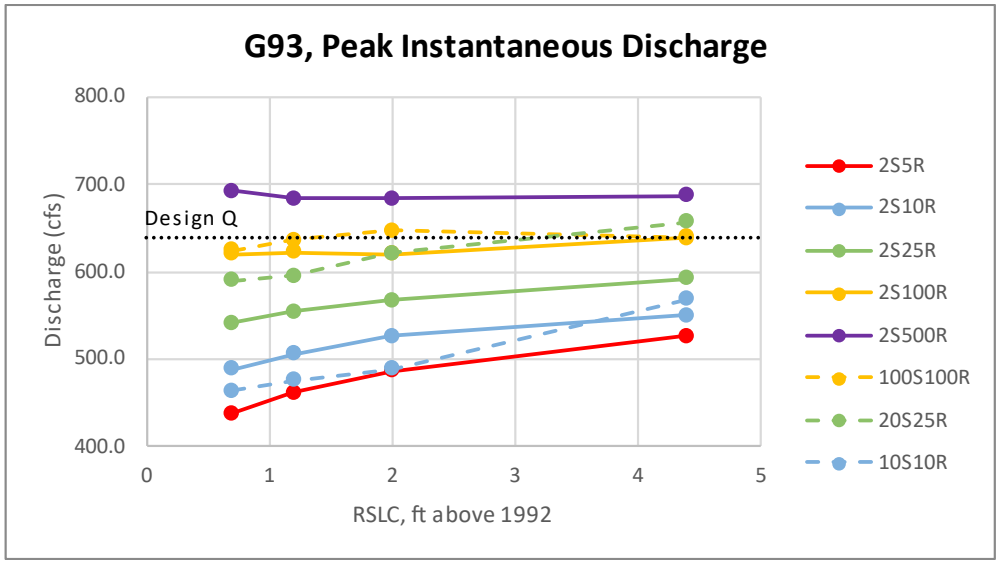


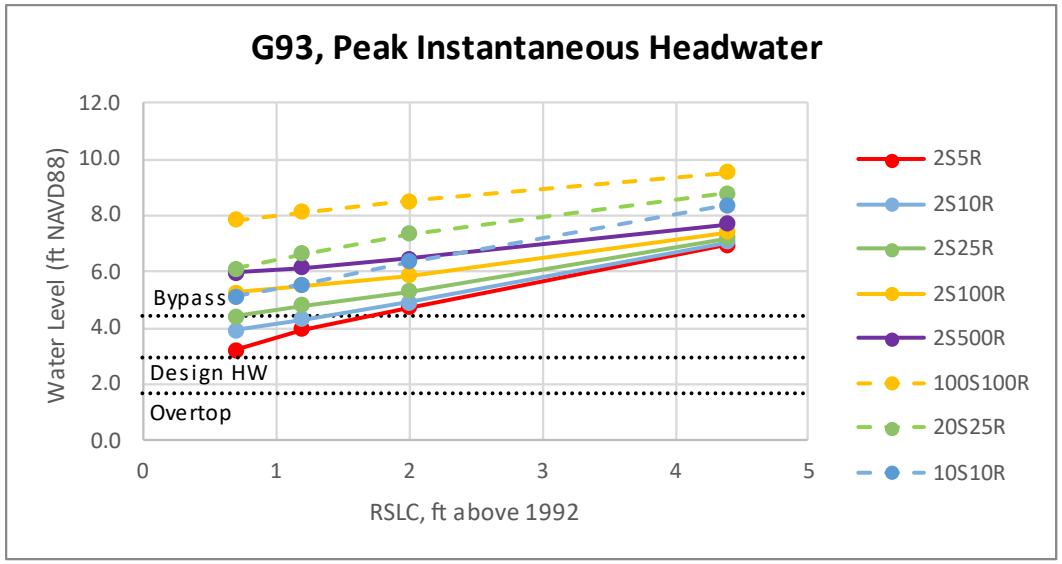
MAXIMUM STAGE PROFILE PLOT – C-3/CORAL GABLES CANAL

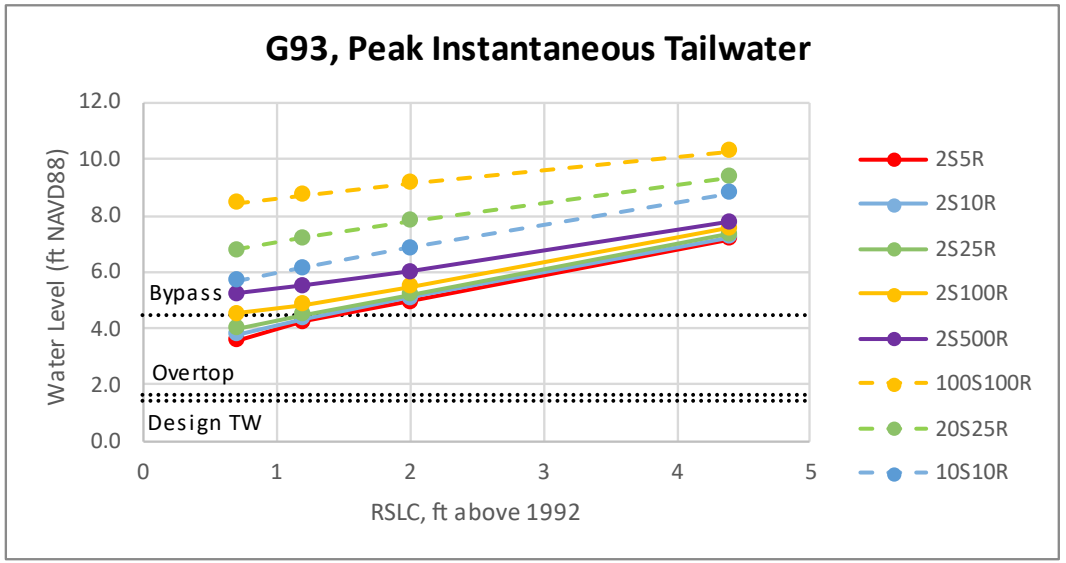




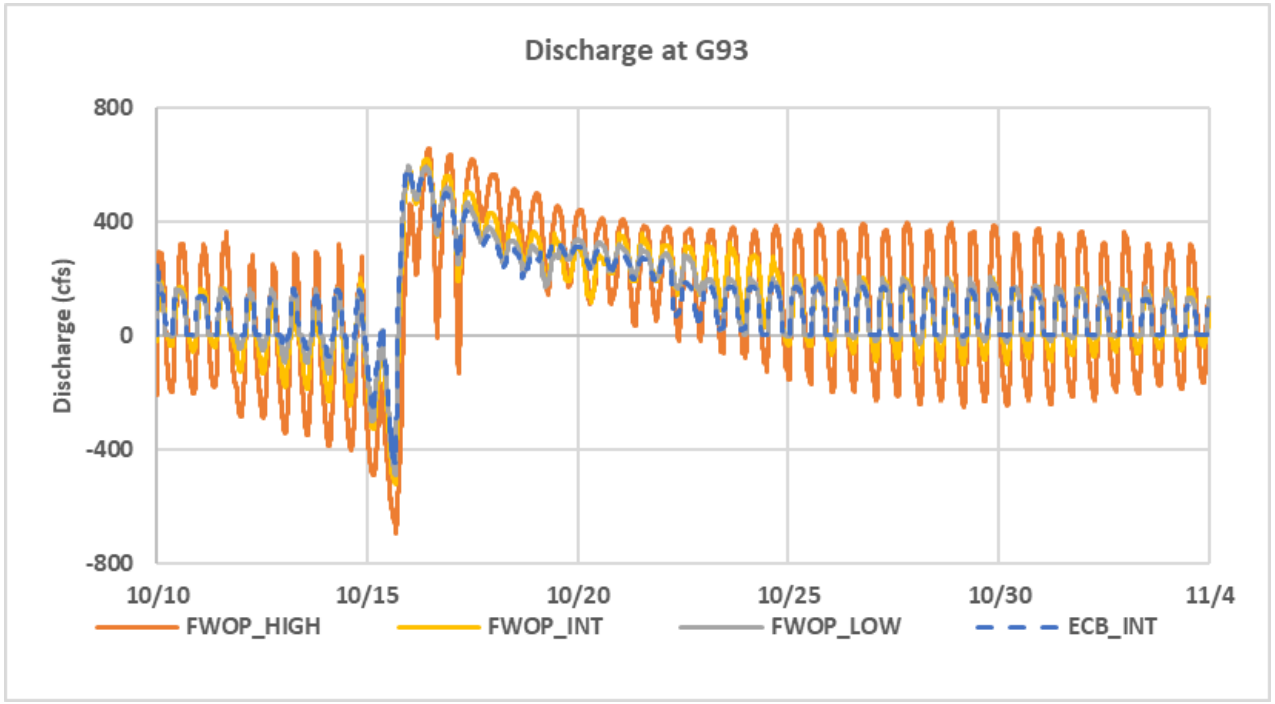
STRUCTURE PERFORMANCE, G93

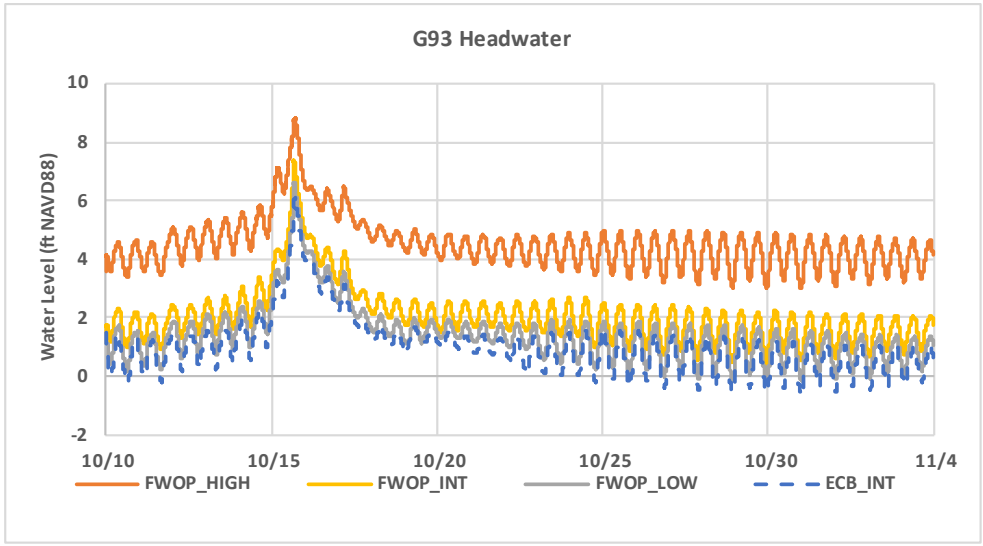


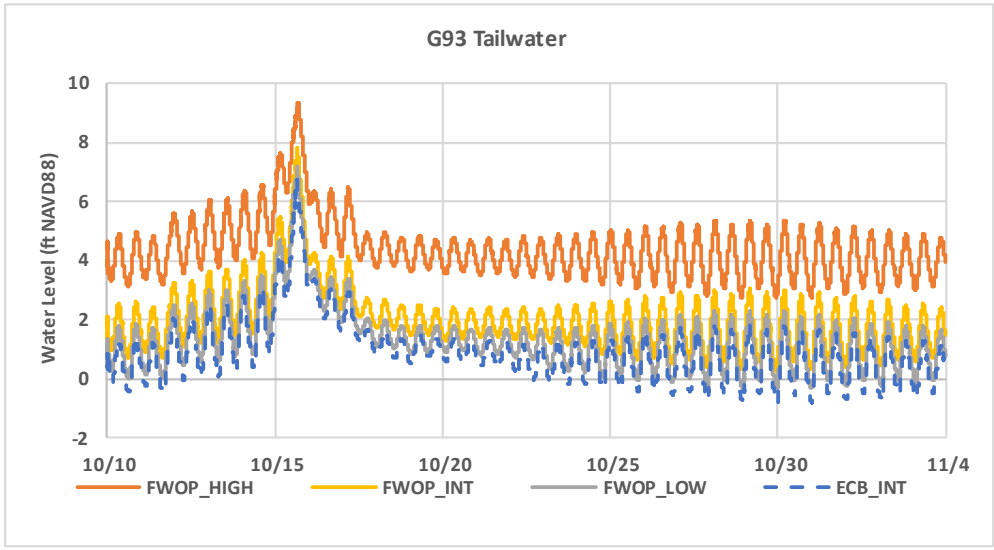




STRUCTURE PERFORMANCE, G93 – 20S25R







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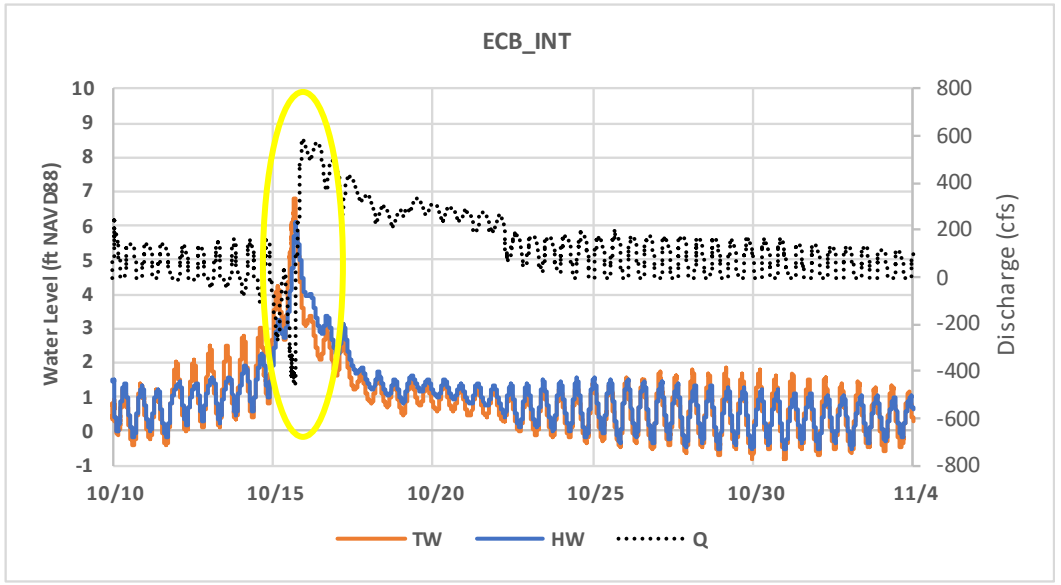
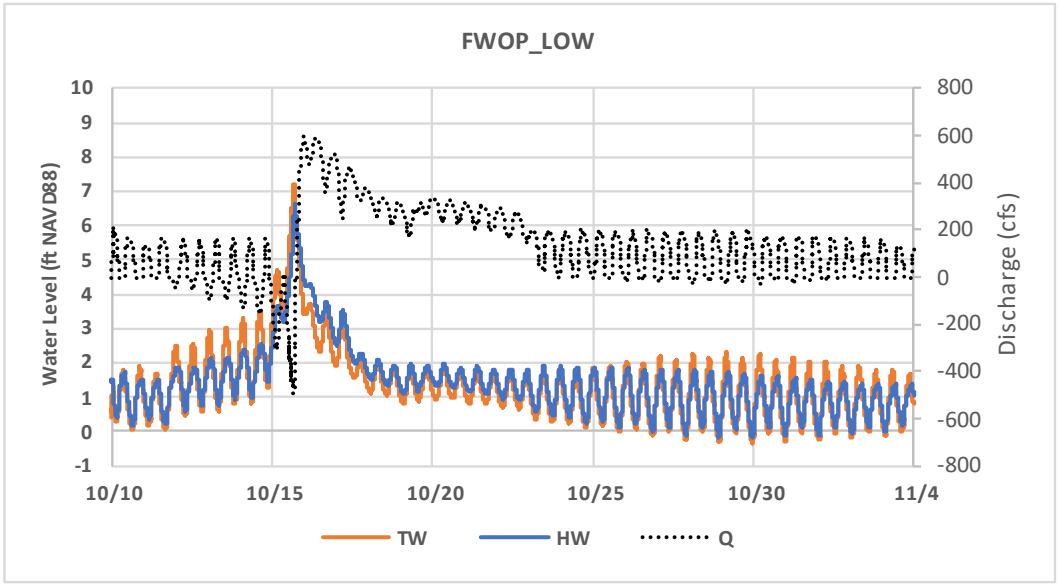
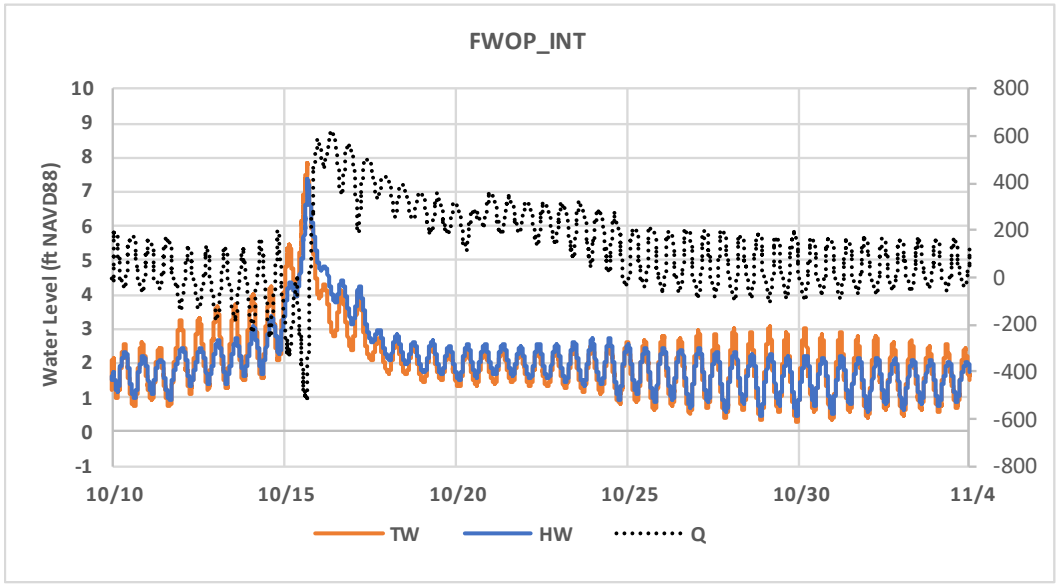
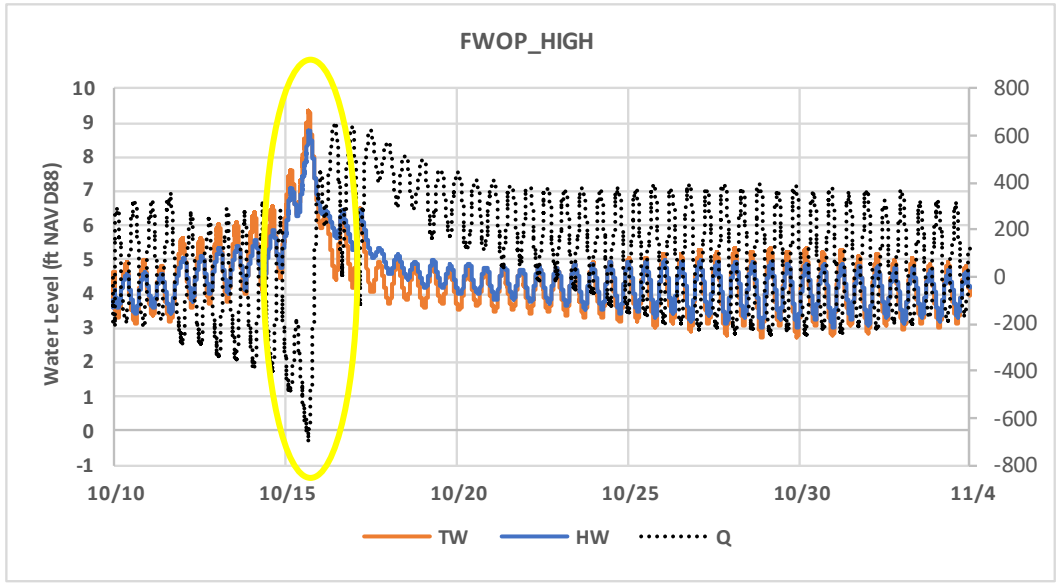
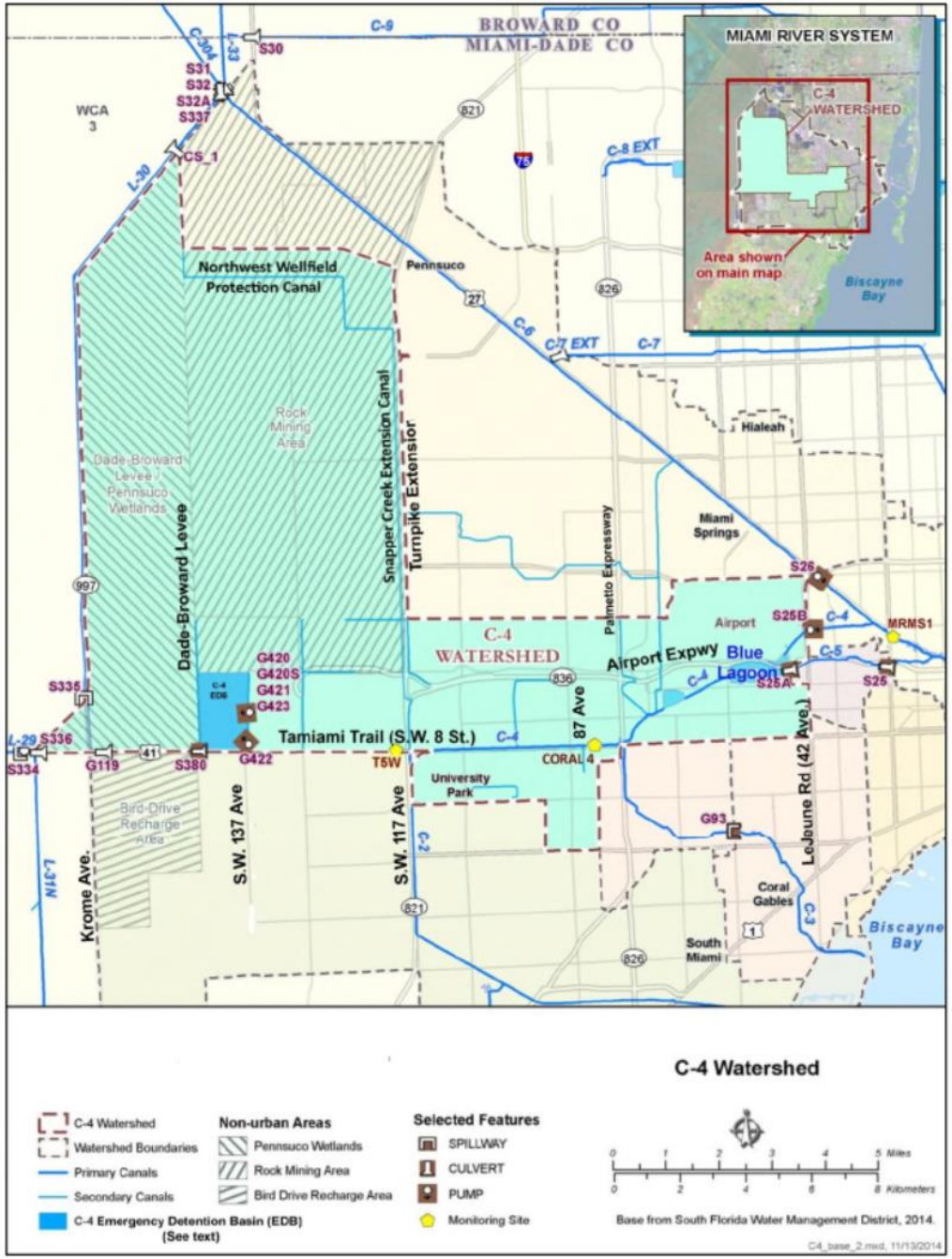




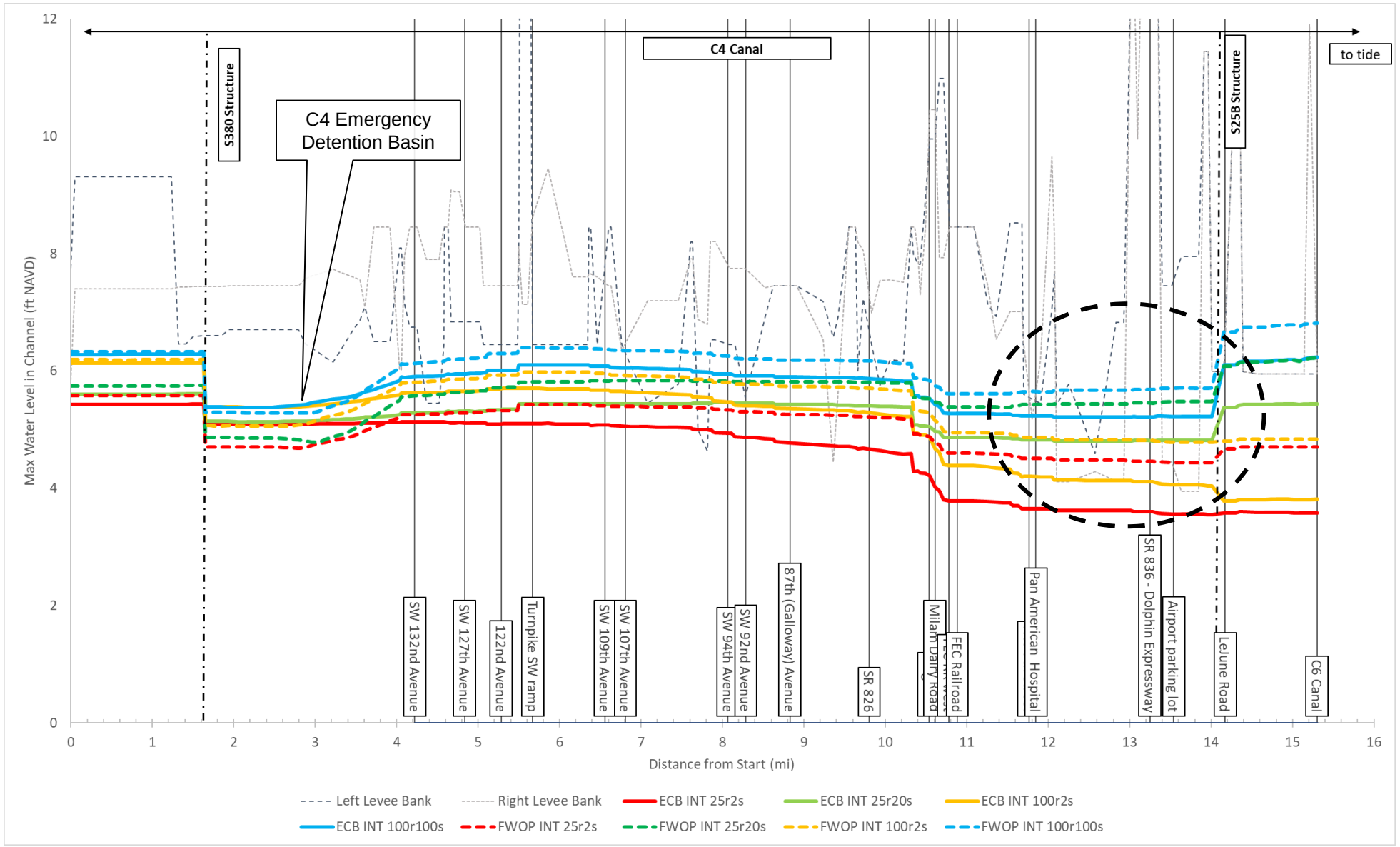




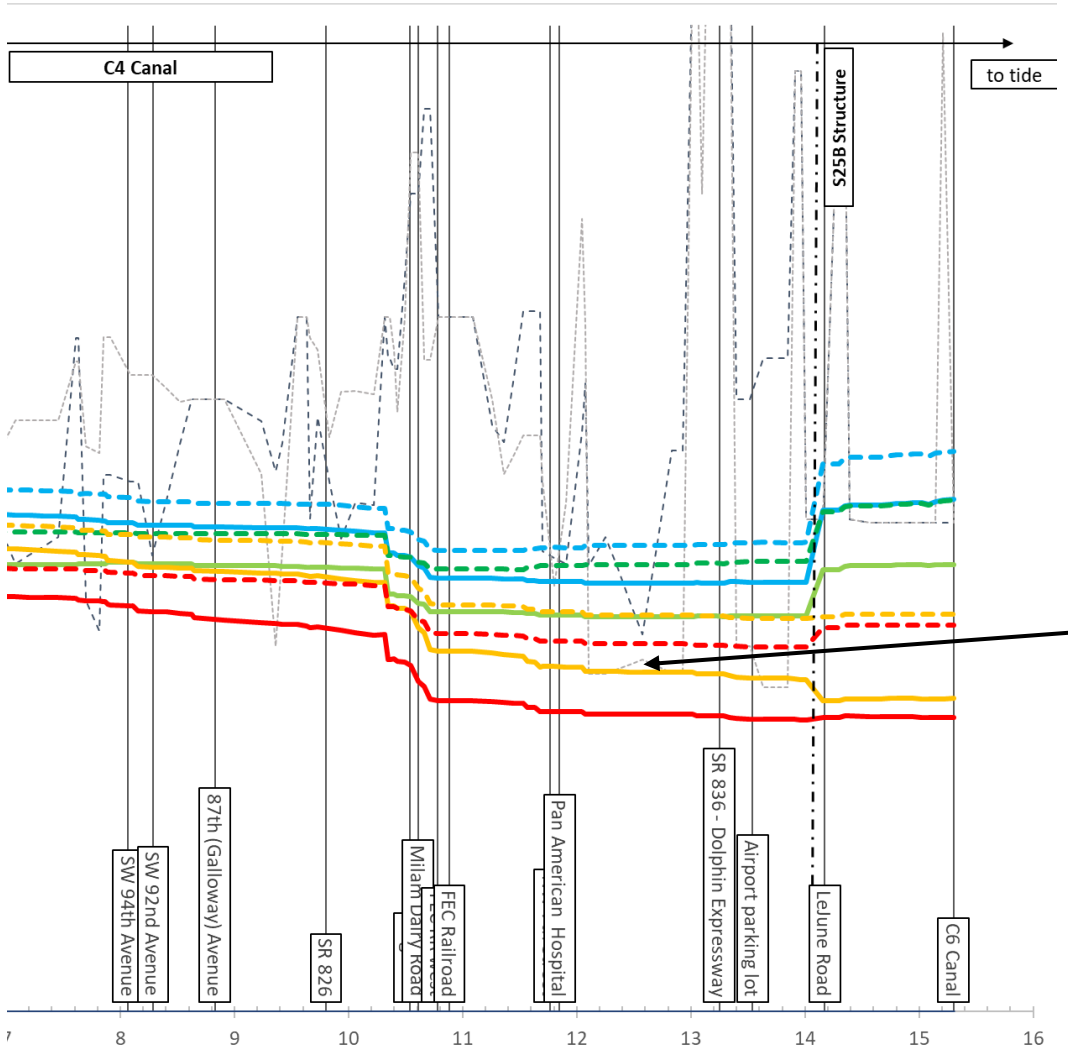
C4 CANAL/ S25B

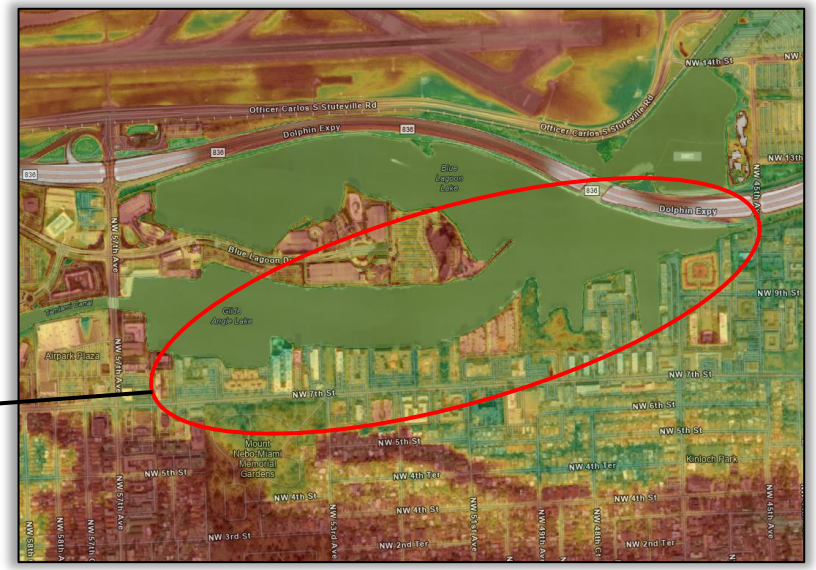


MAXIMUM STAGE PROFILE PLOT – C4 CANAL

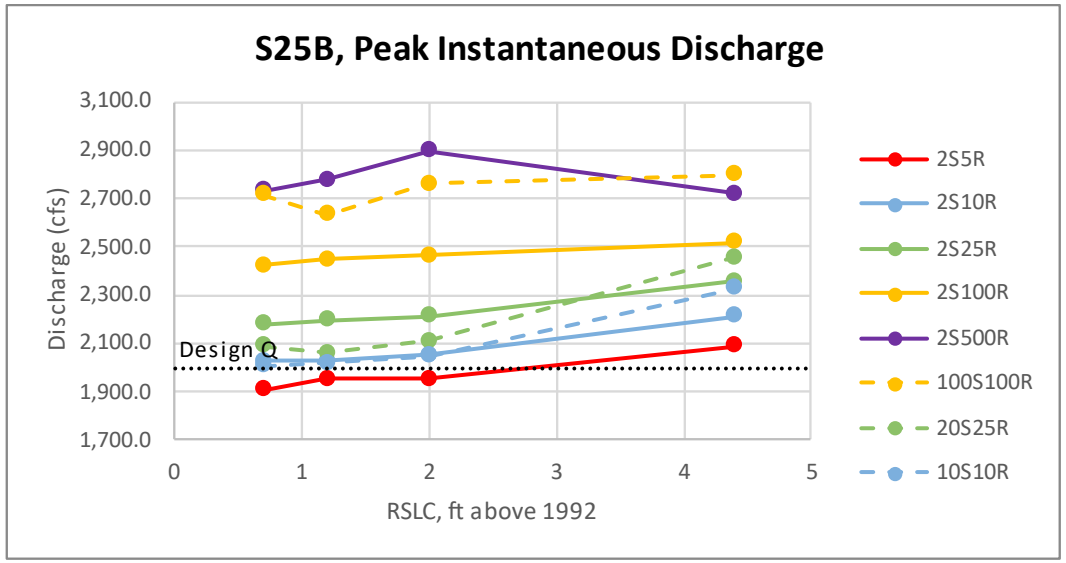


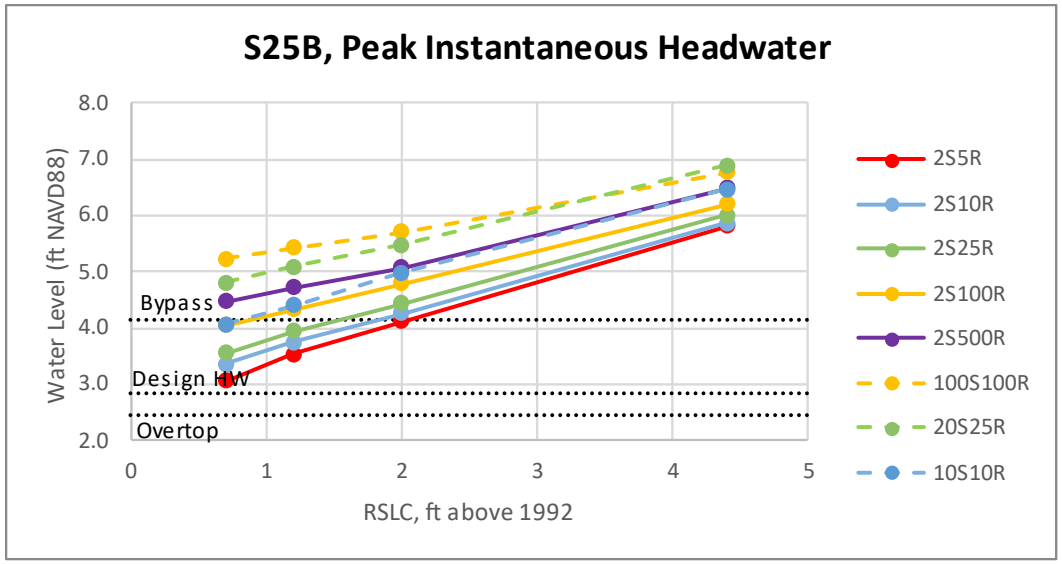
MAXIMUM STAGE PROFILE PLOT – C4 CANAL

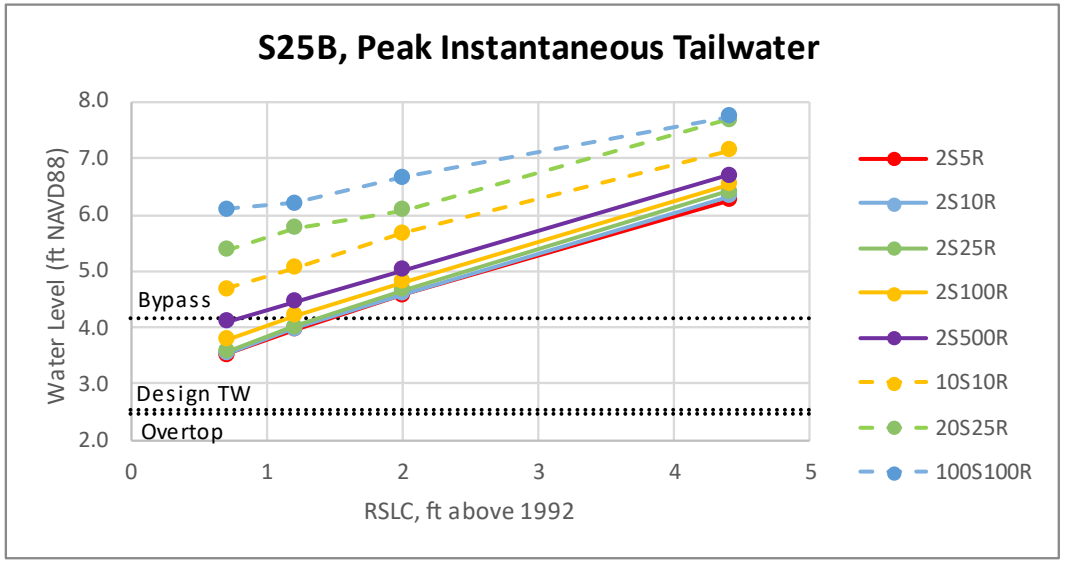




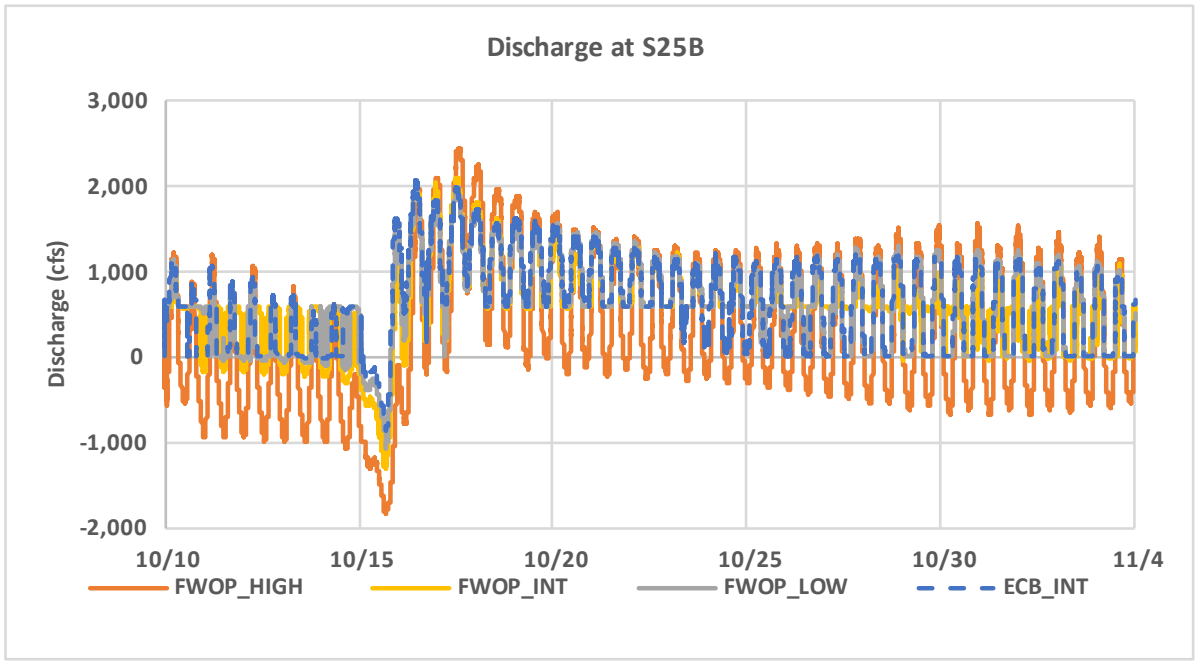
STRUCTURE PERFORMANCE, S25B

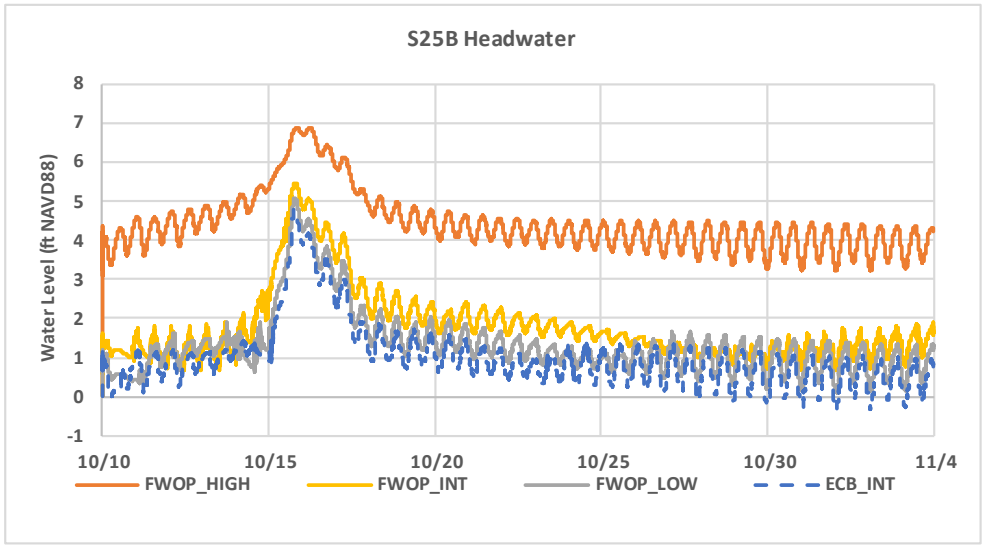


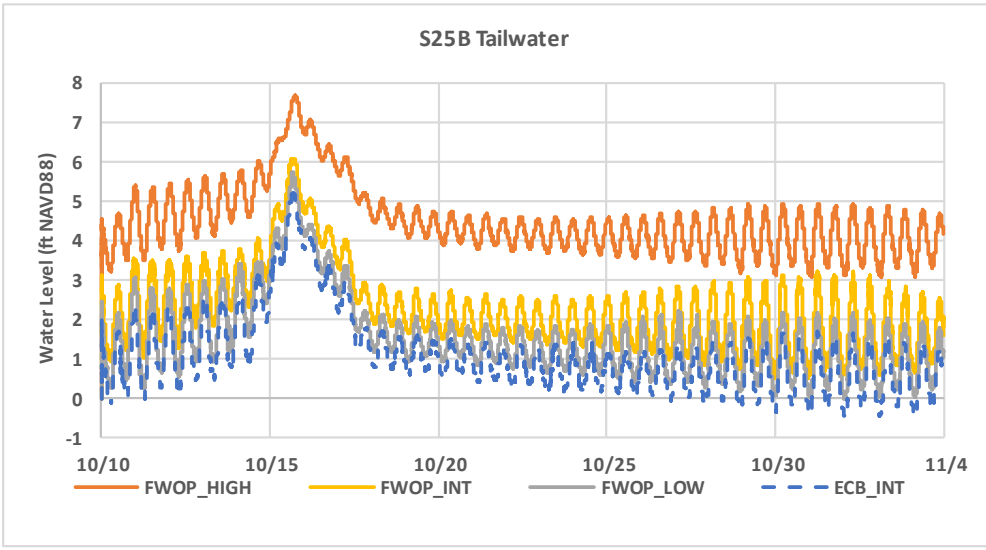




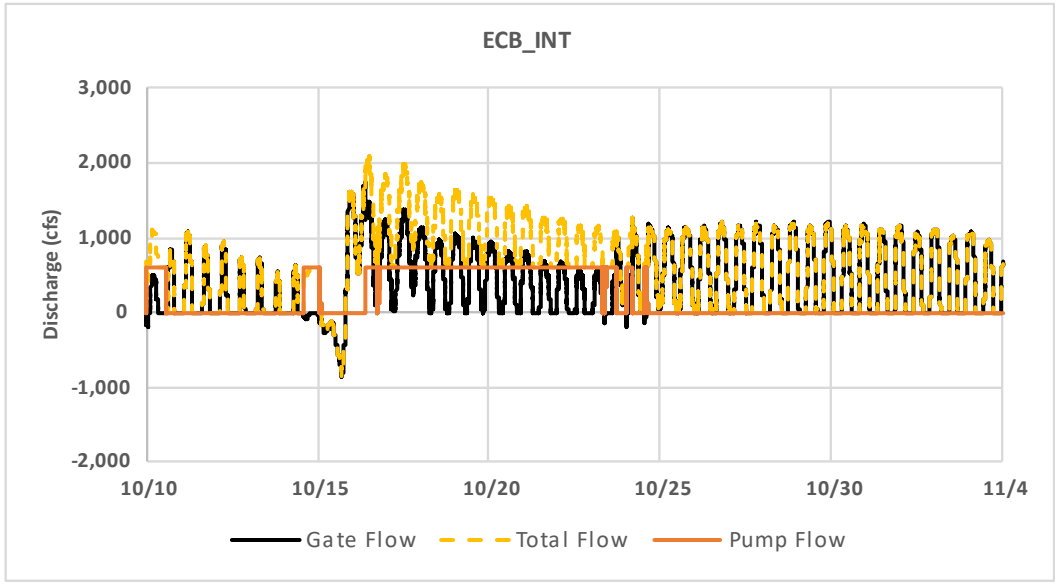
STRUCTURE PERFORMANCE, S25B – 20S25R

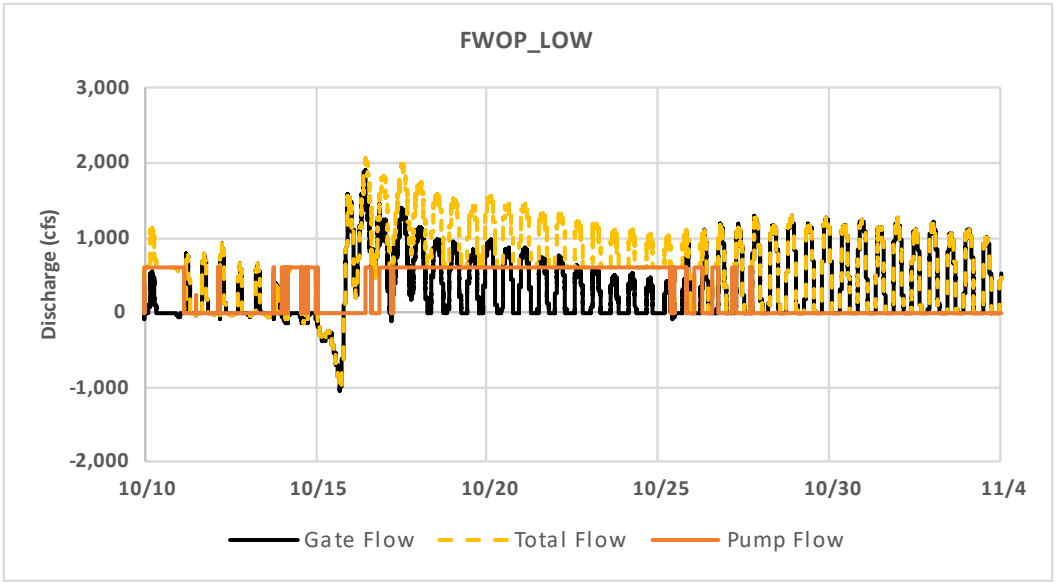


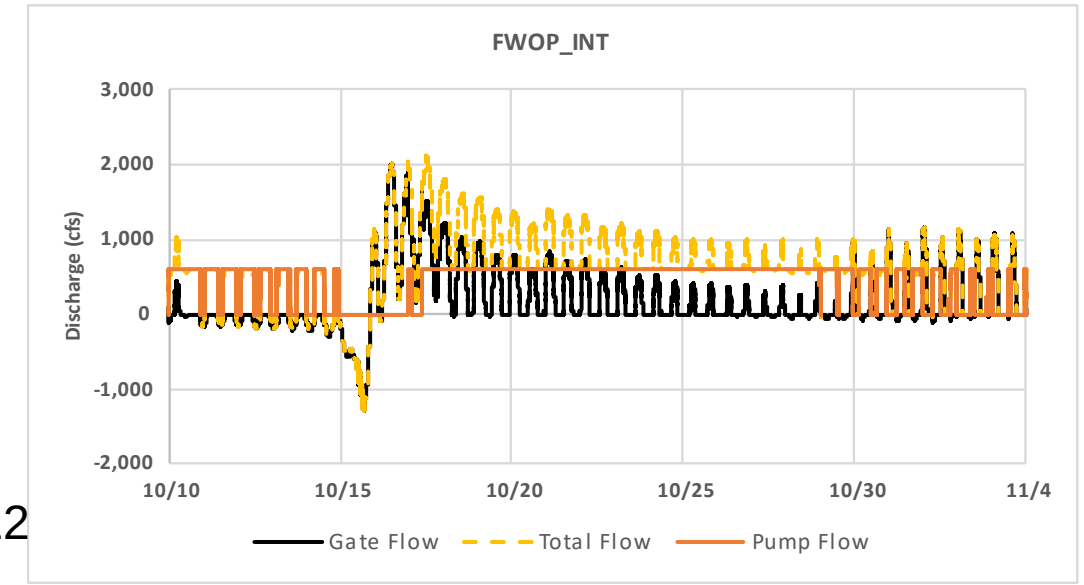


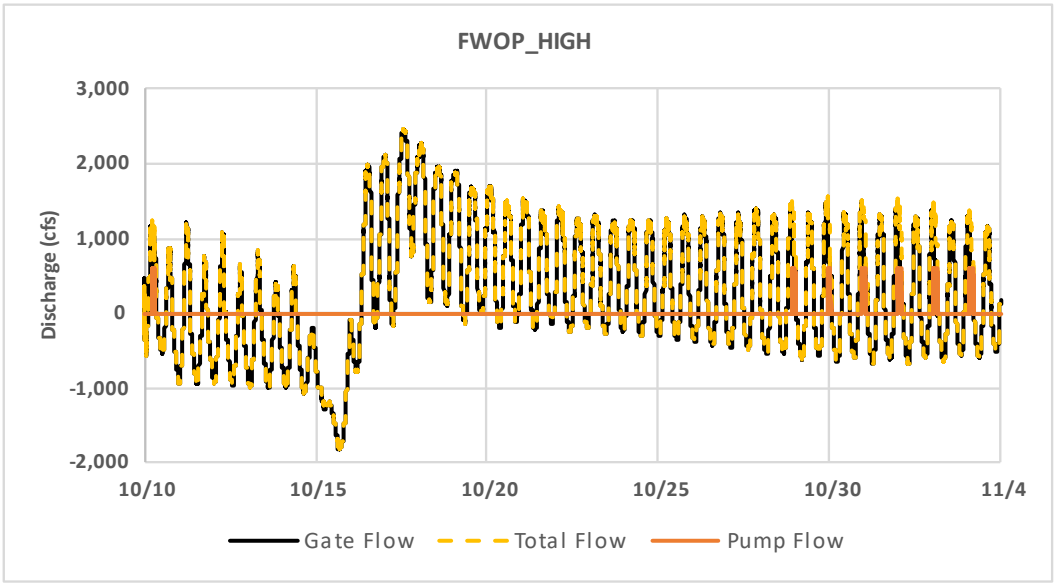


STRUCTURE PERFORMANCE, S25B – 20S25R



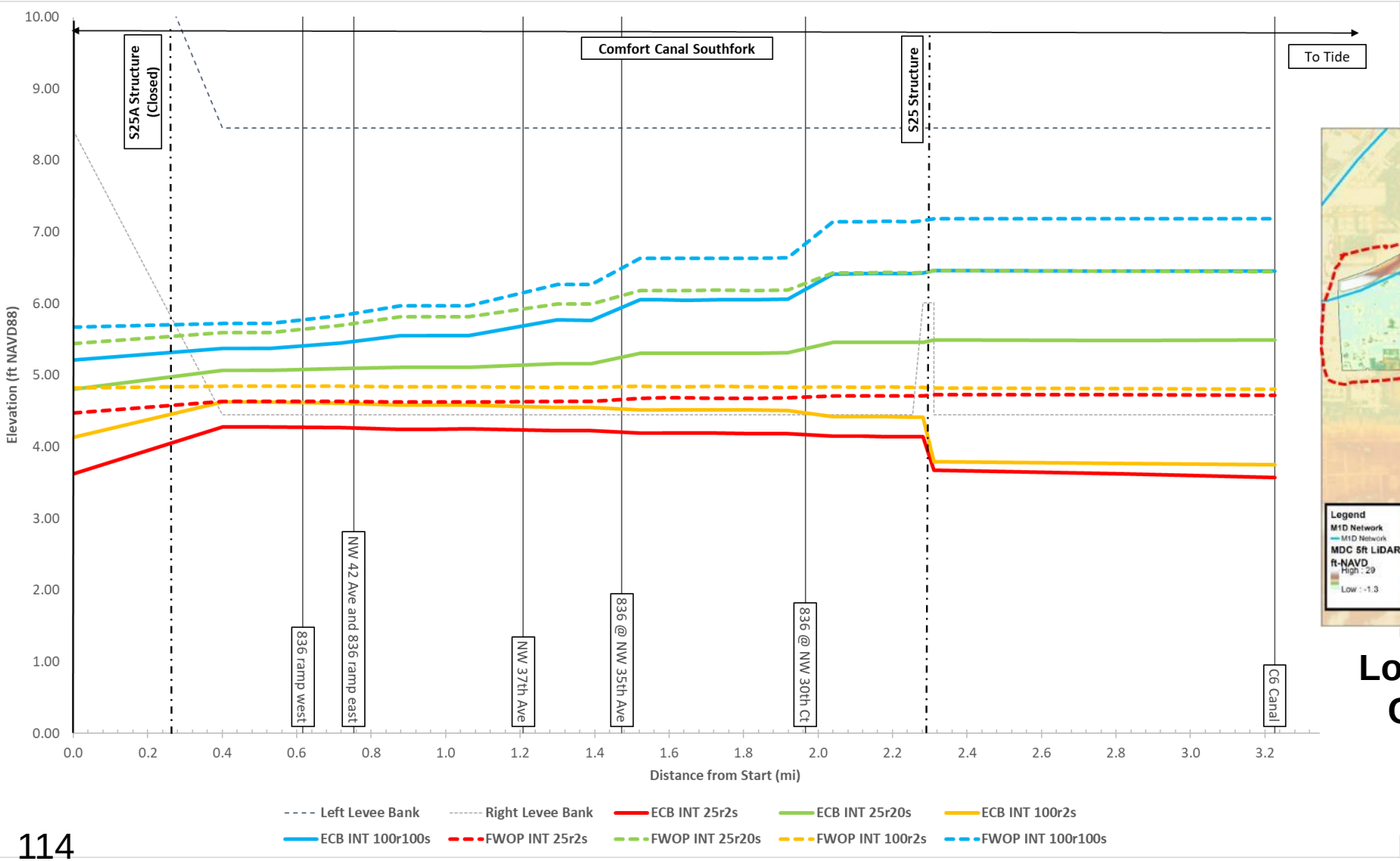


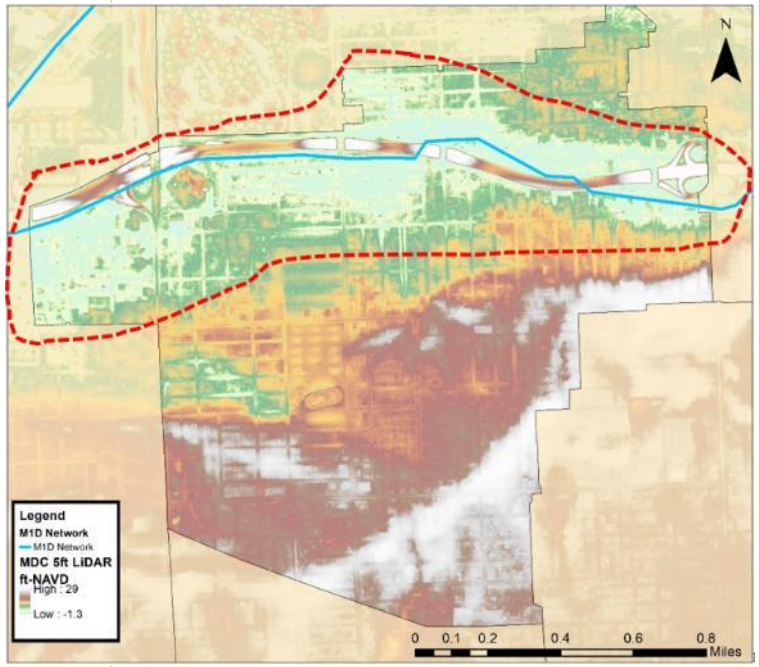




C-5, COMFORT CANAL/S25

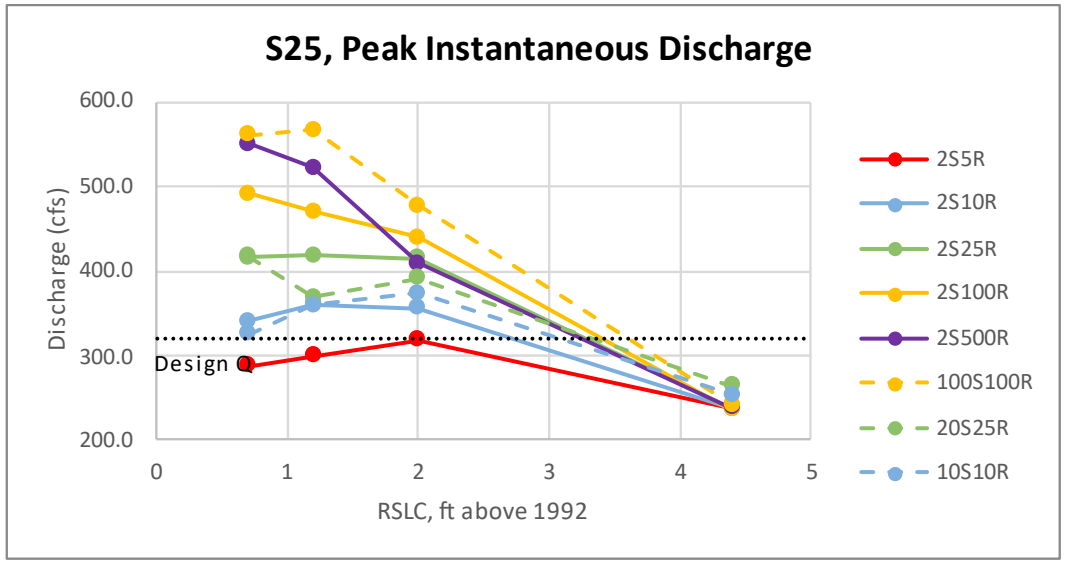
MAXIMUM STAGE PROFILE PLOT – C-5/COMFORT CANAL

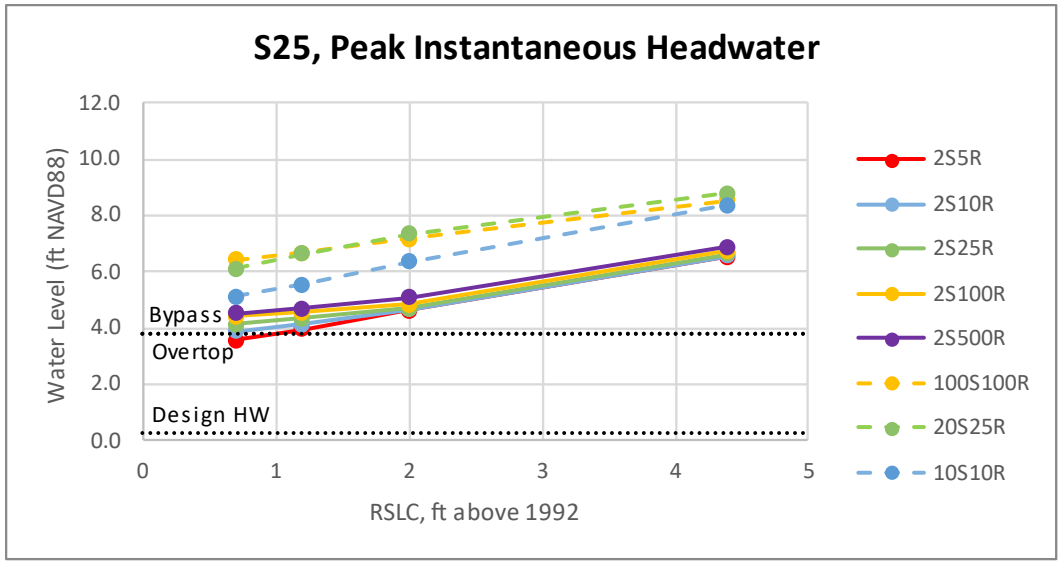


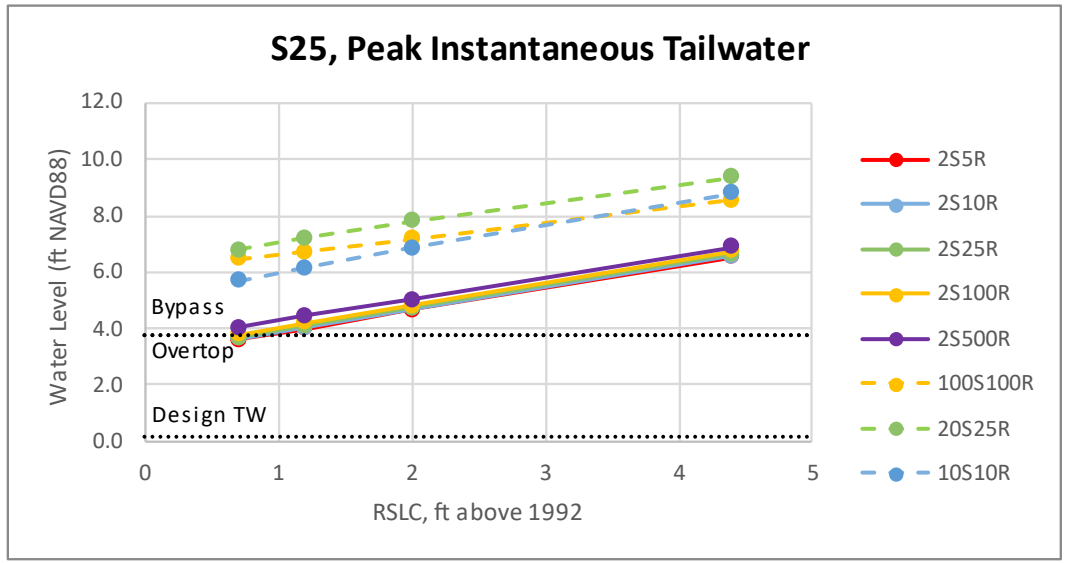


Low topography region near Comfort Canal Southfork

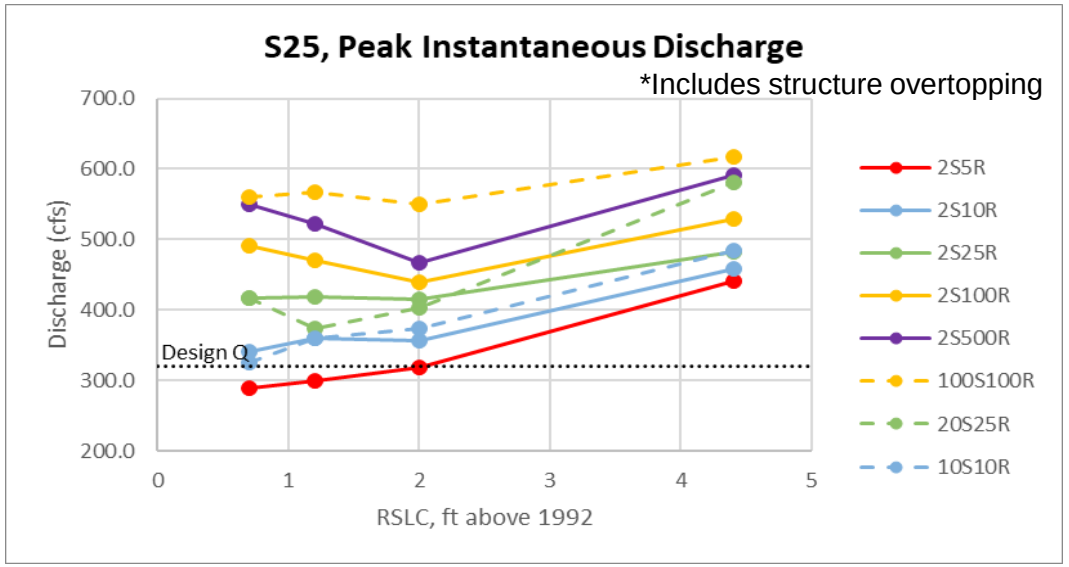
STRUCTURE PERFORMANCE, S25

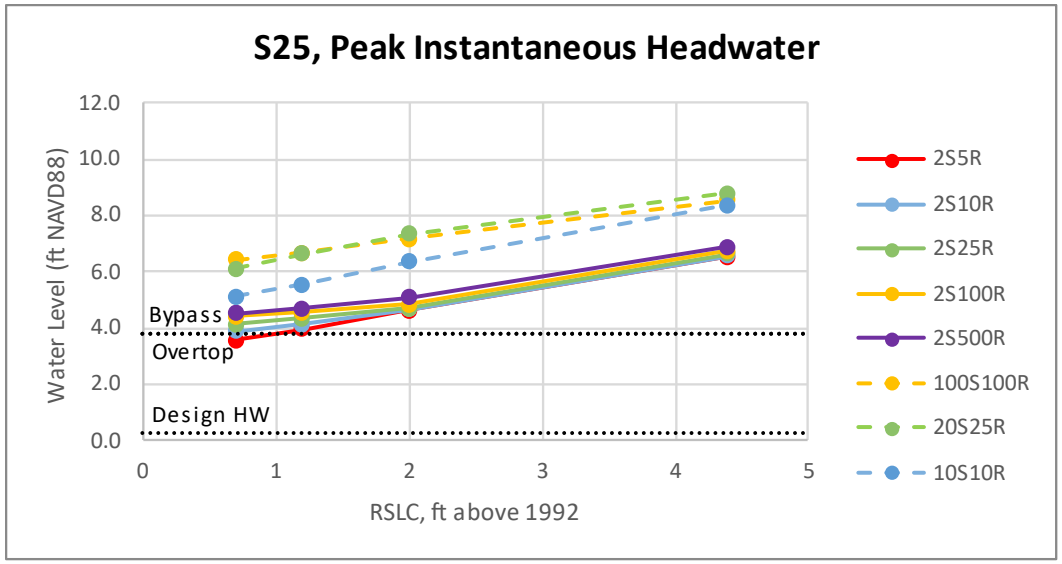




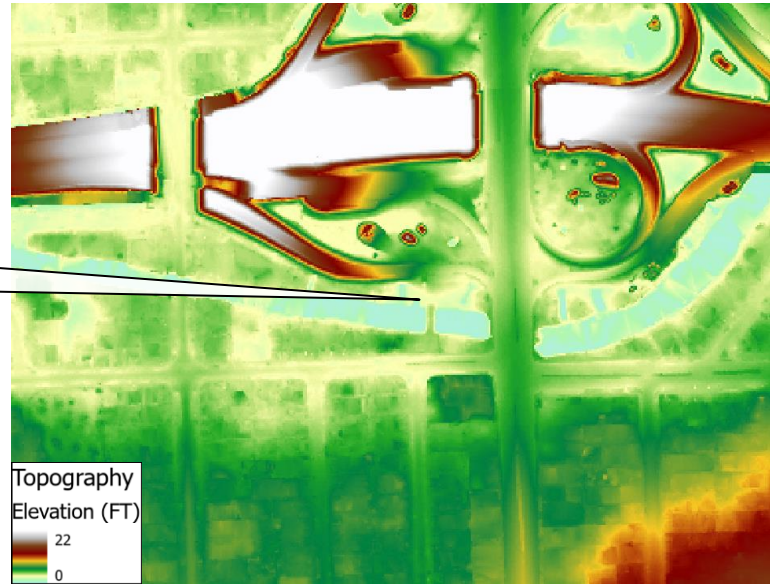


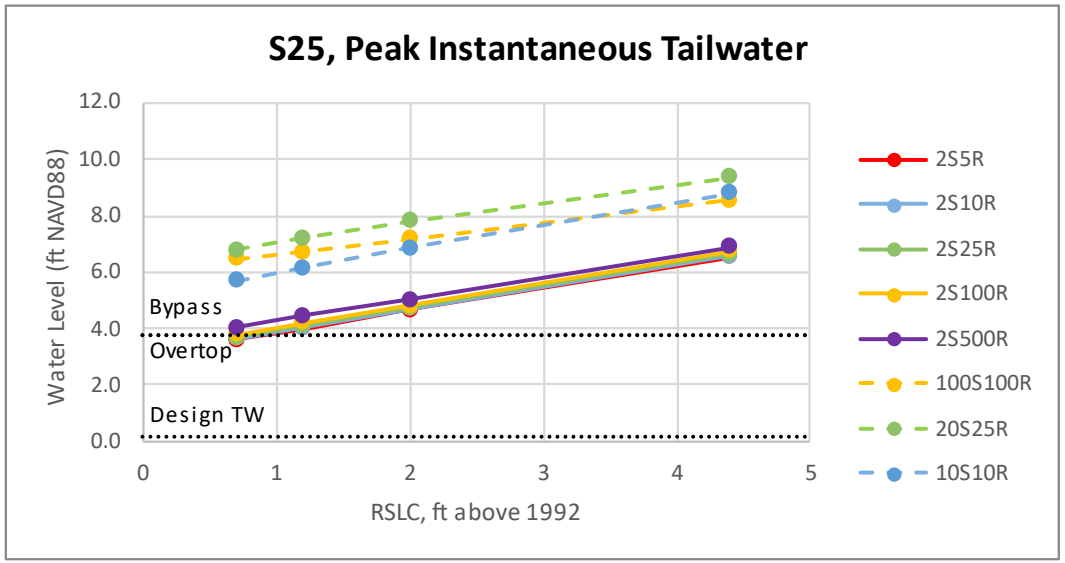
STRUCTURE PERFORMANCE, S25



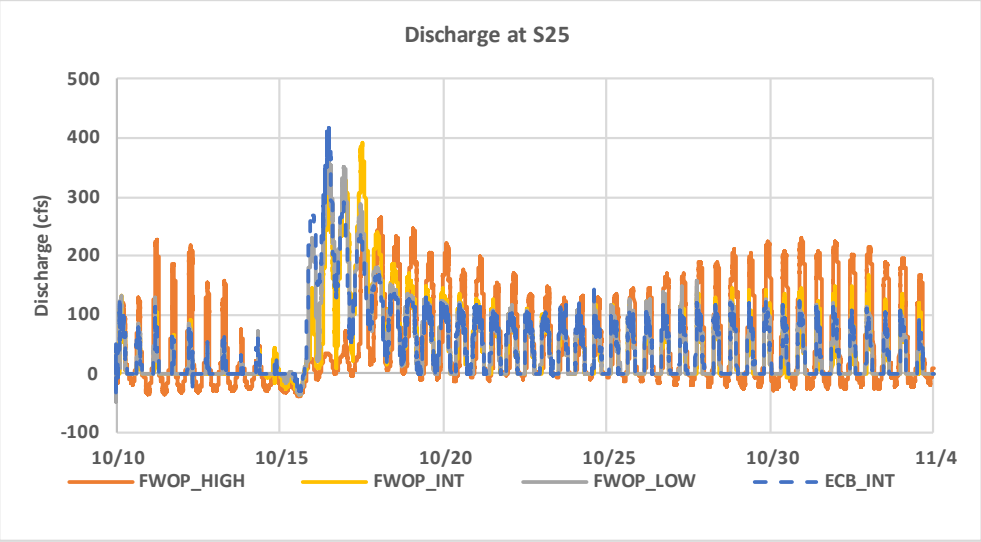


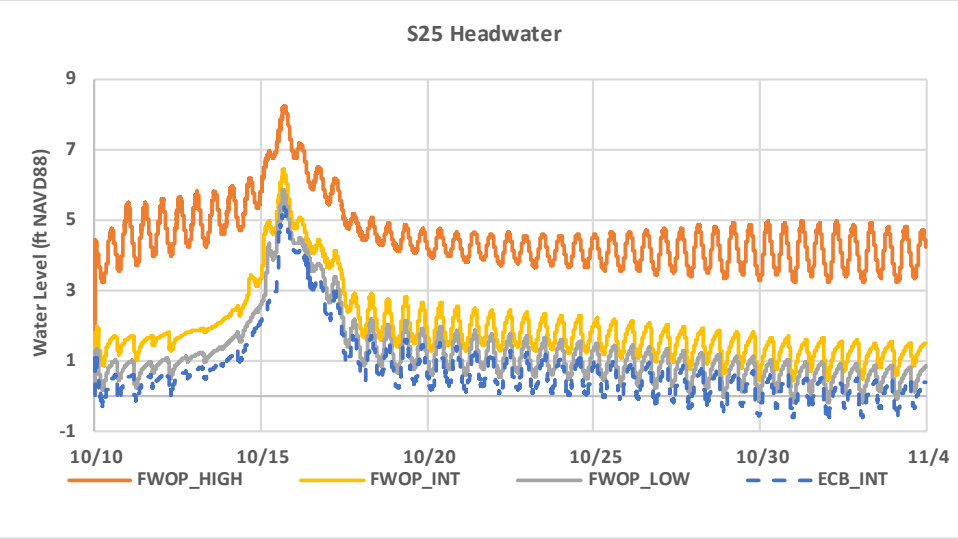
Low areas around S25

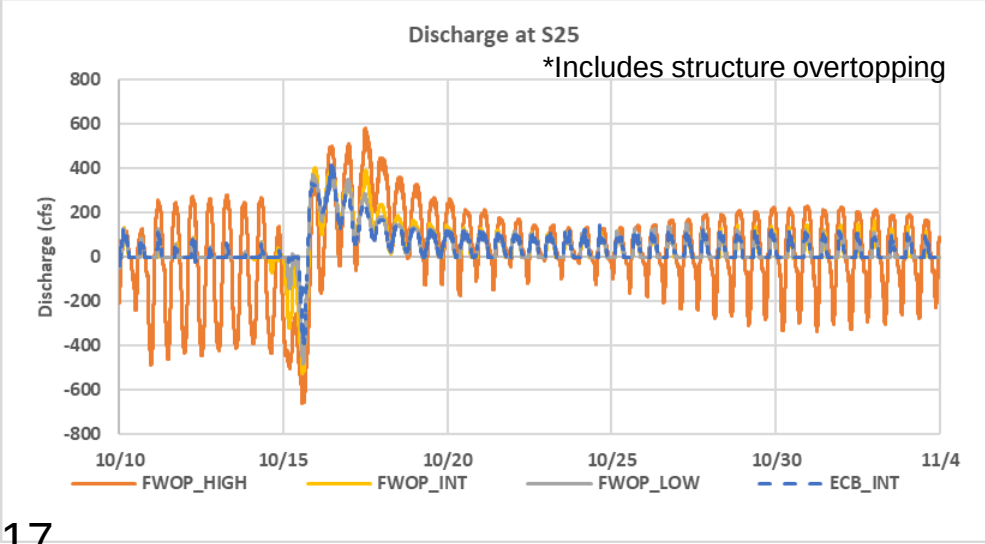


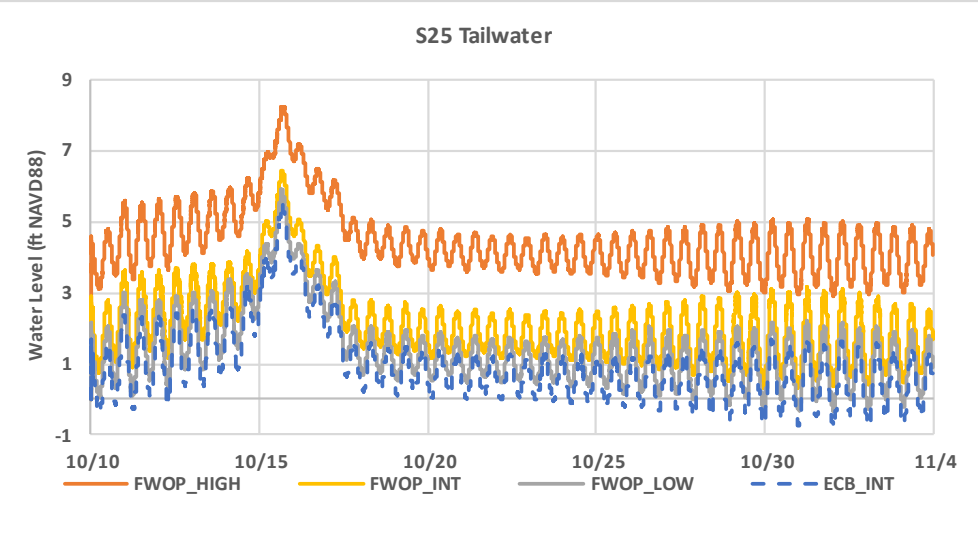


STRUCTURE PERFORMANCE, S25 – 20S25R

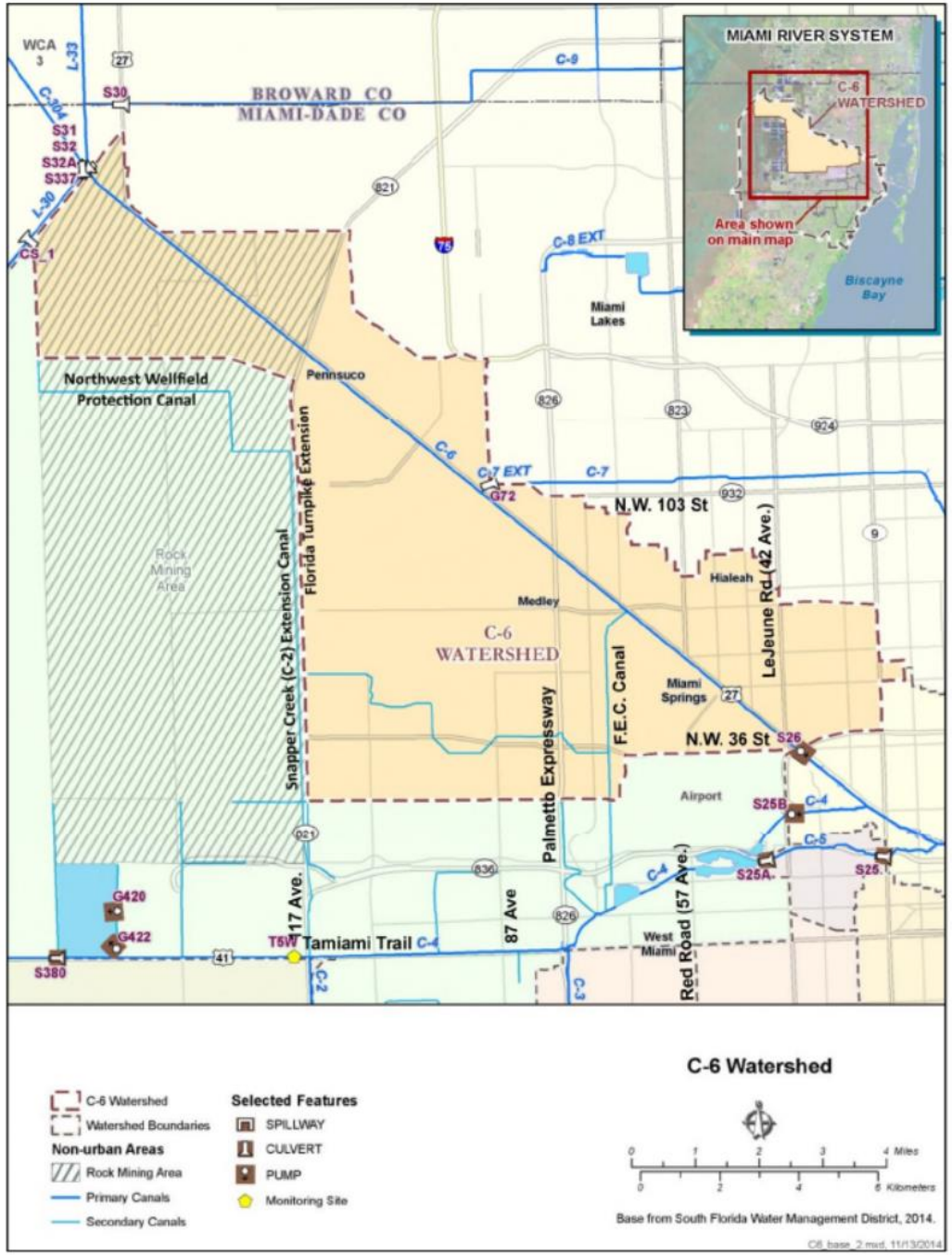




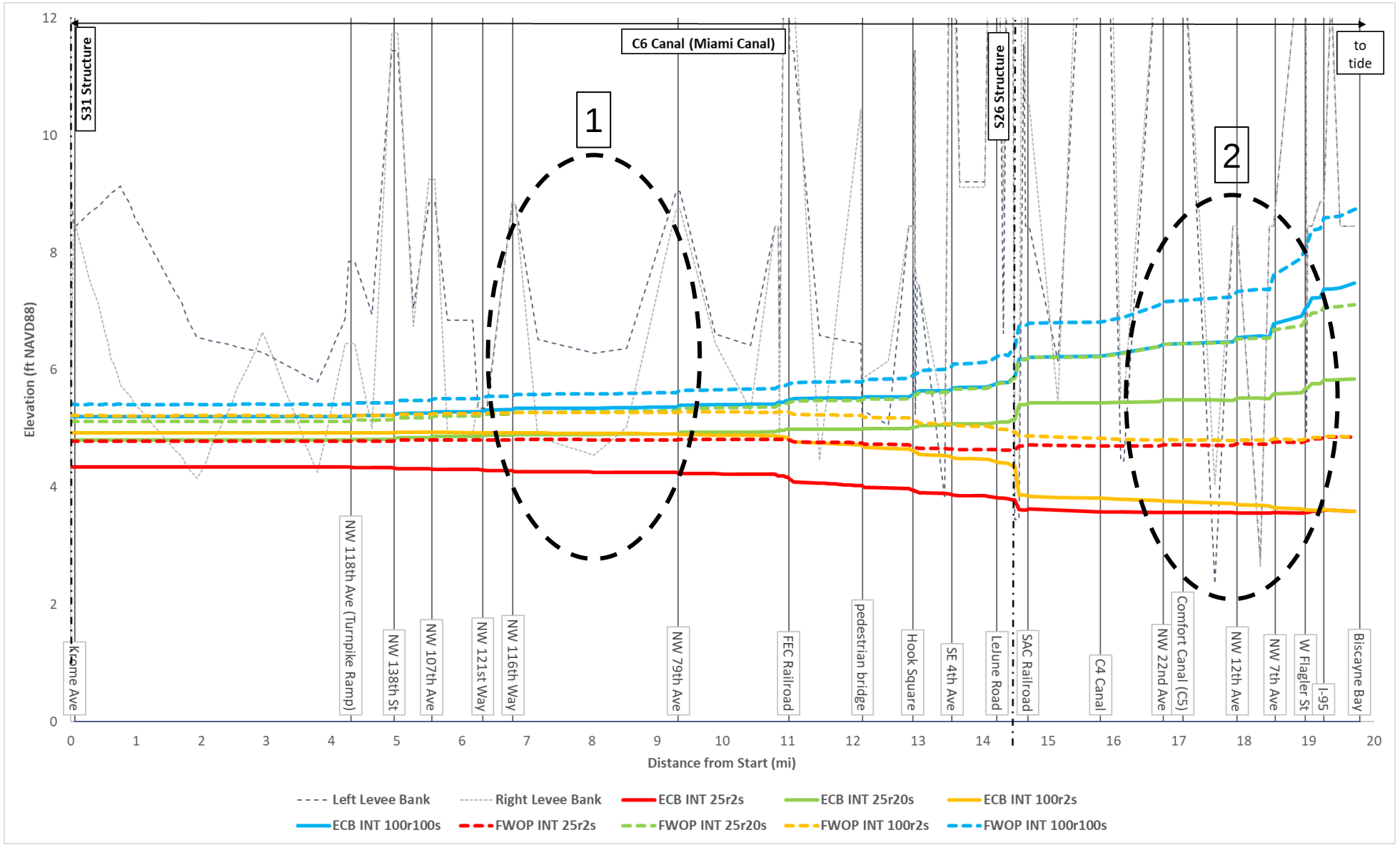




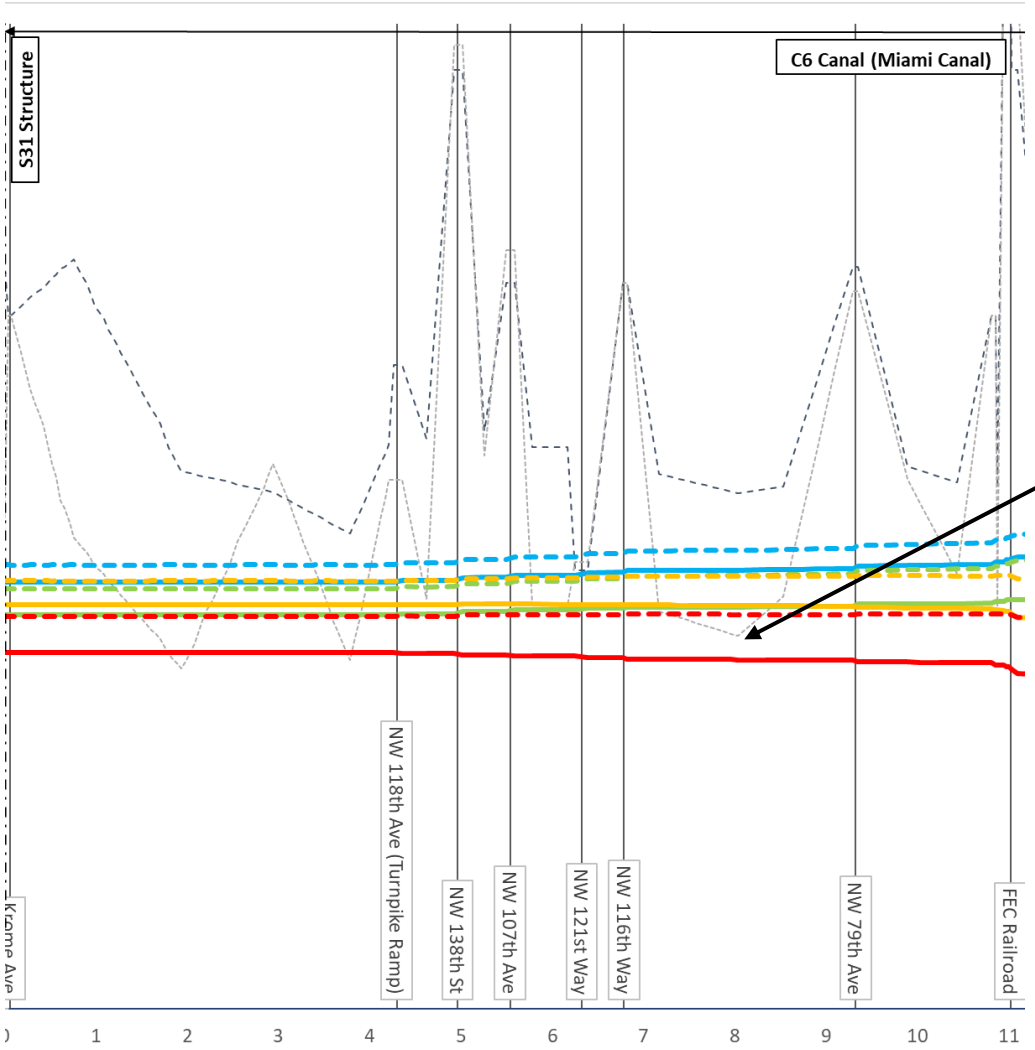
C6 CANAL


MIAMI RIVER SYSTEM
C-6 WATERSHED
Area shown on main map
Biscayne Bay
WCA 3
L-33
L-30
C-9
BROWARD CO
MIAMI-DADE CO
S30
S31
S32
S32A
S337
CS_1
821
75
C-8 EXT
Miami Lakes
Northwest Wellfield Protection Canal
Pennsuco
826
823
924
C-6
C-7 EXT
C-7
G72
N.W. 103 St
932
9
Rock Mining Area
Florida Turnpike Extension
Snapper Creek (C-2) Extension Canal
Medley
Hialeah
LeJeune Rd. (42 Ave.)
C-6 WATERSHED
F.E.C. Canal
Miami Springs
27
N.W. 36 St
S26
Palmetto Expressway
Airport
S25B
C-4
C-5
S25A
S25
836
921
G420
G422
S380
T5W
Tamiami Trail
41
C-2
C-3
87 Ave
117 Ave.
West Miami
Red Road (57 Ave.)
C-6 Watershed
Watershed Boundaries
Non-urban Areas
Rock Mining Area
Primary Canals
Secondary Canals
Selected Features
SPILLWAY
CULVERT
PUMP
Monitoring Site
C-6 Watershed
0 1 2 3 4 Miles
0 2 4 6 Kilometers
Base from South Florida Water Management District, 2014.
C6_base_2.mxd, 11/13/2014

MAXIMUM STAGE PROFILE PLOT – C6 CANAL

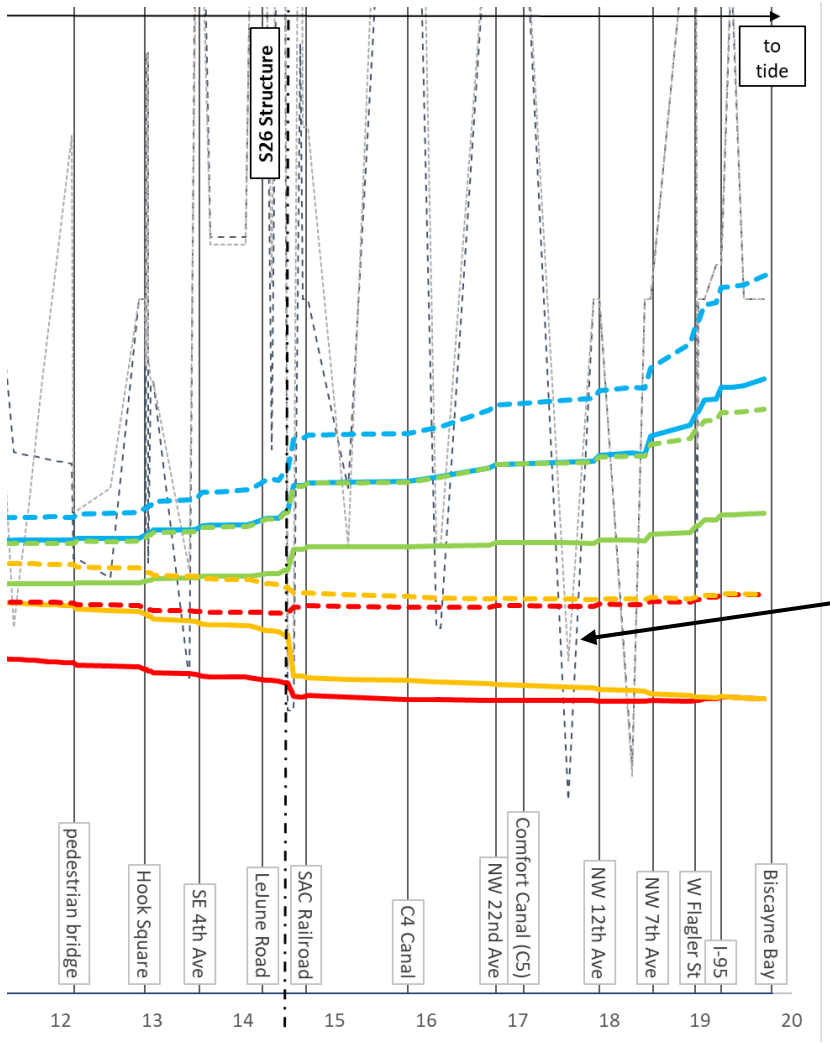


MAXIMUM STAGE PROFILE PLOT – C6 CANAL



1

MAXIMUM STAGE PROFILE PLOT – C6 CANAL



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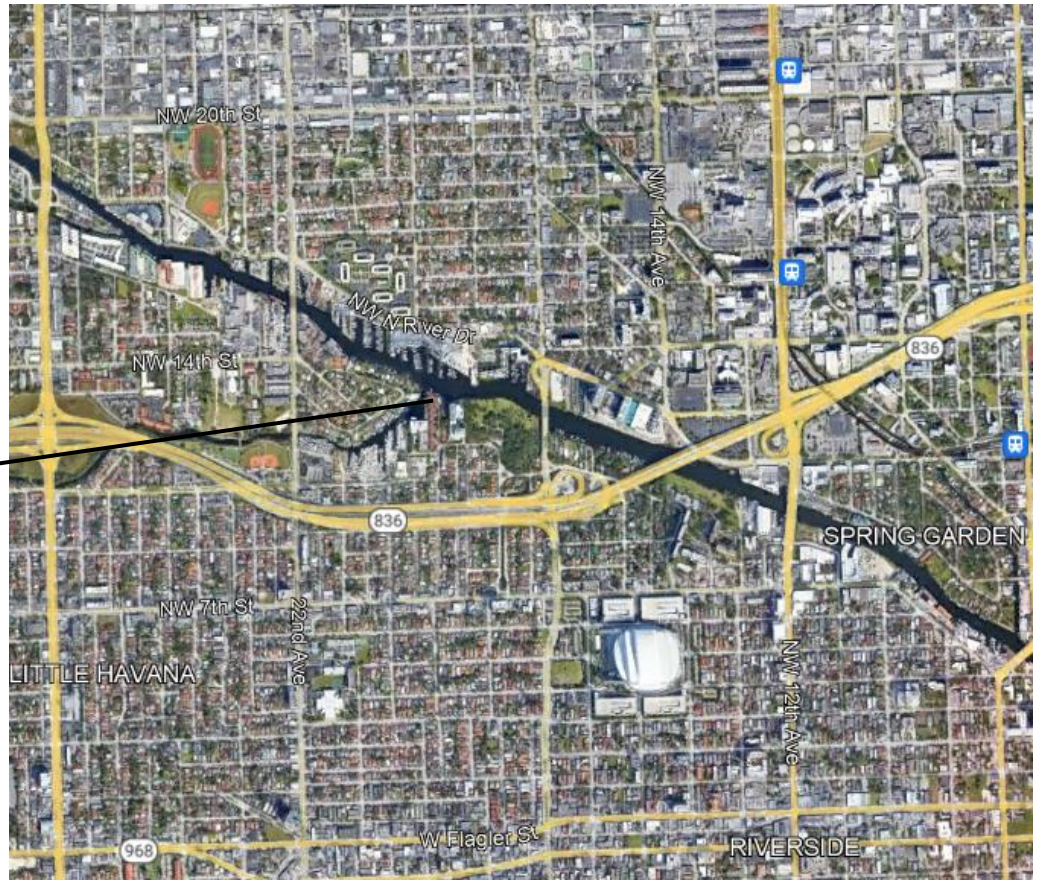
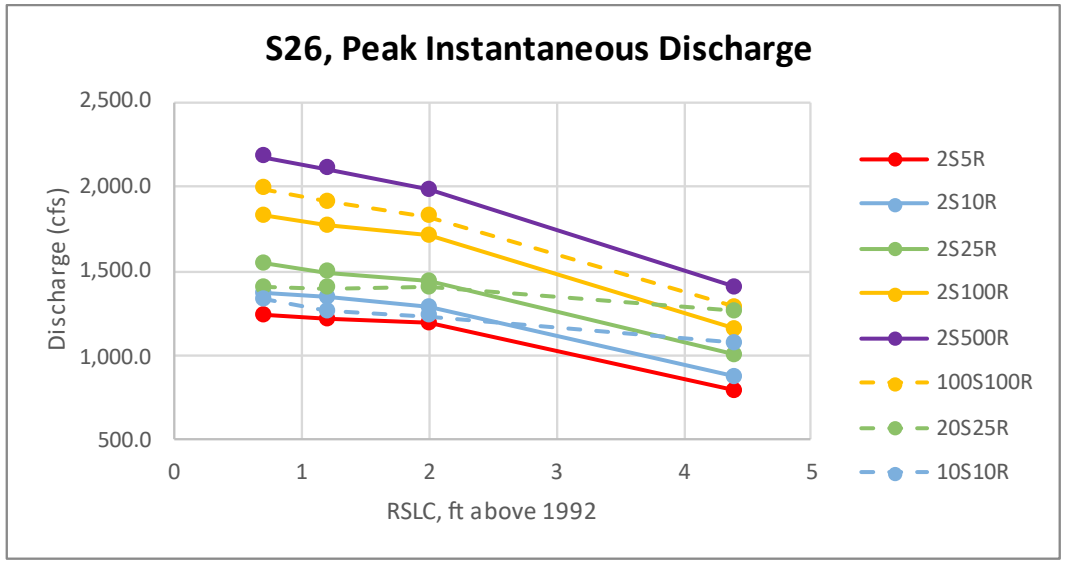
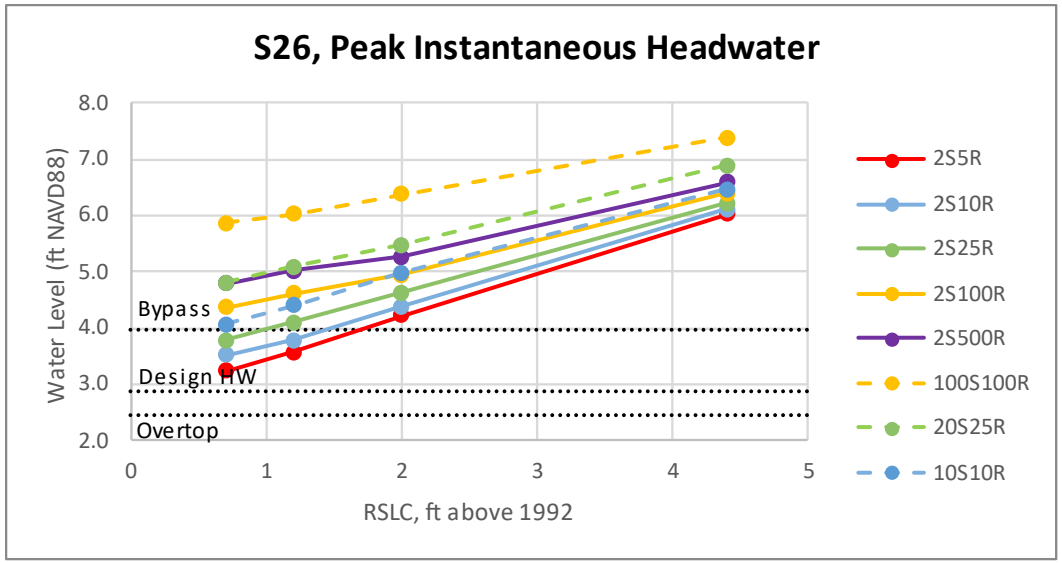
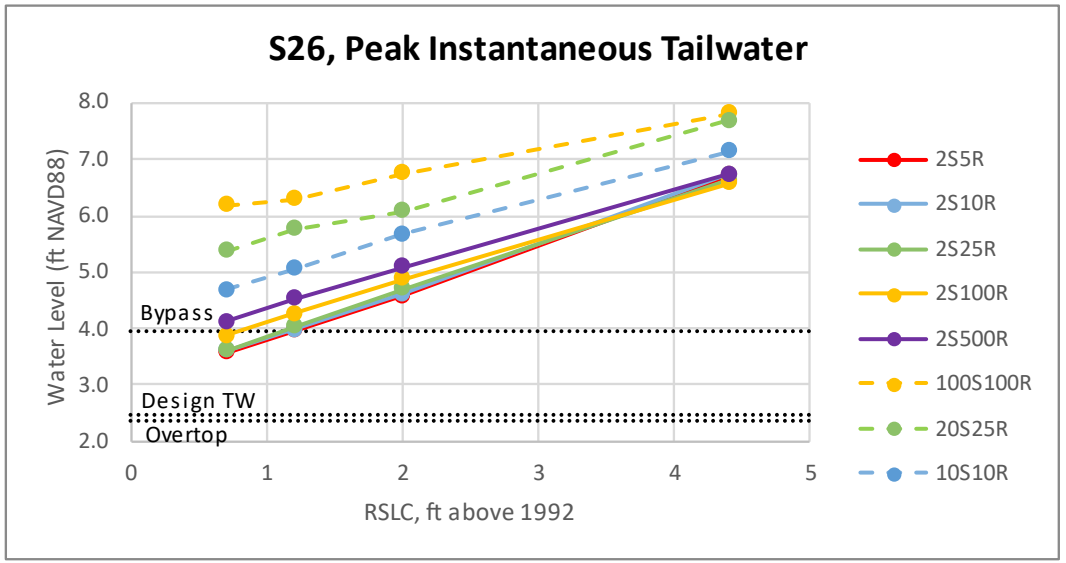


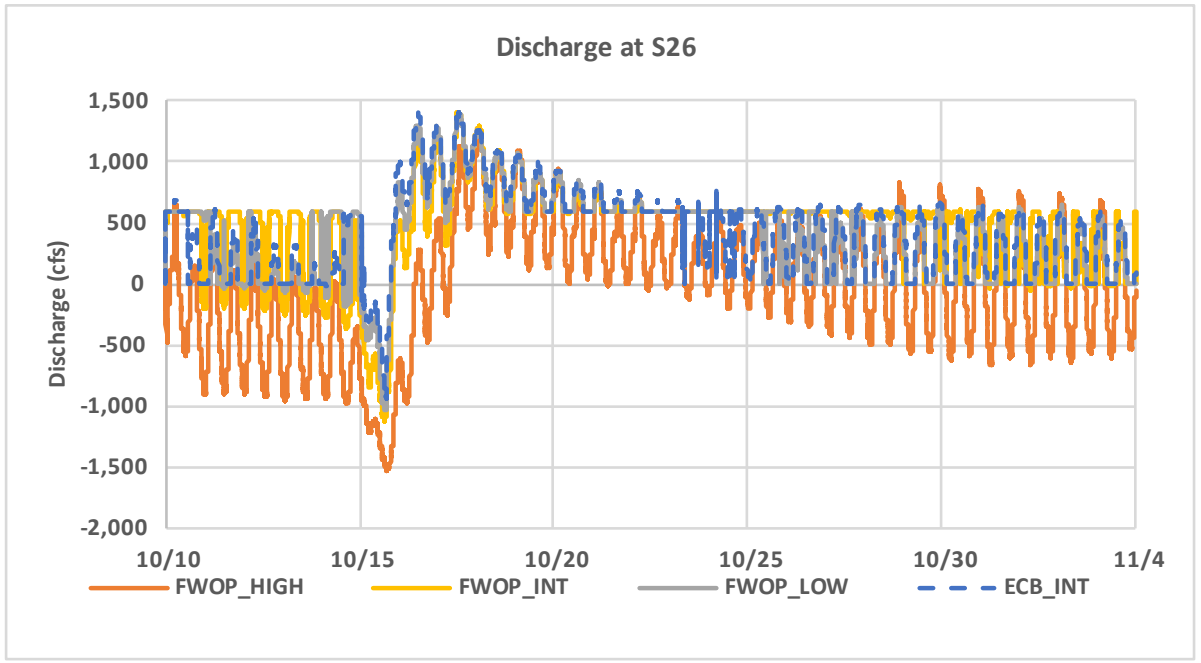
STRUCTURE PERFORMANCE, S26

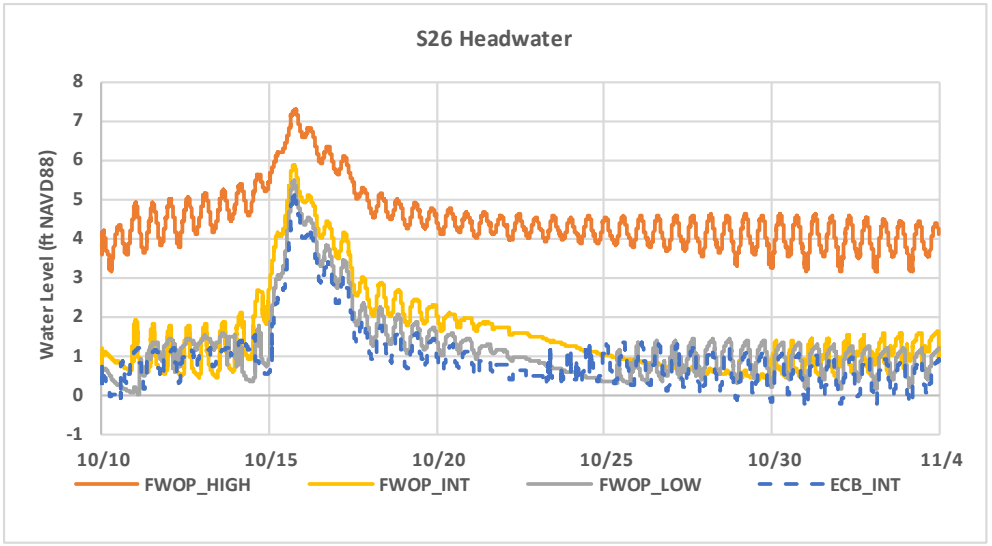


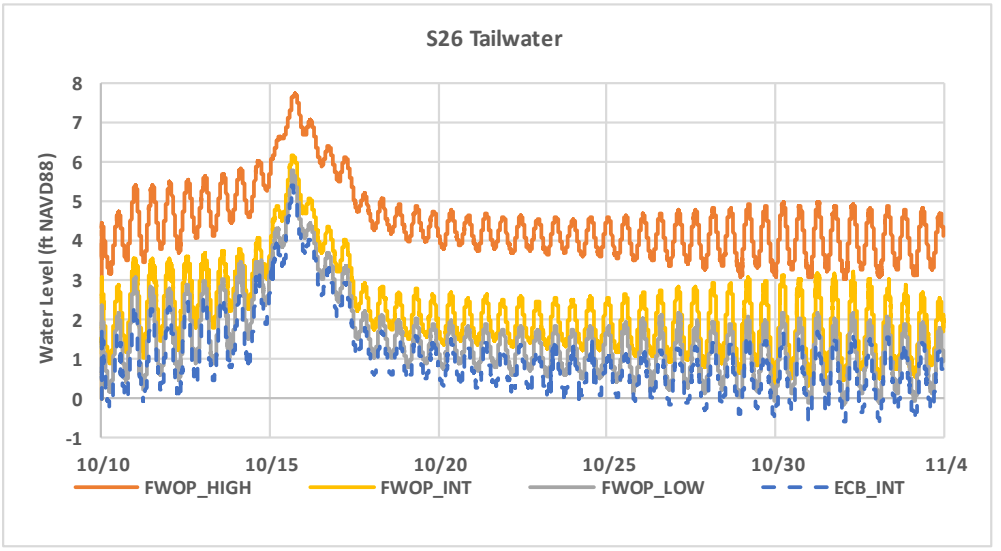




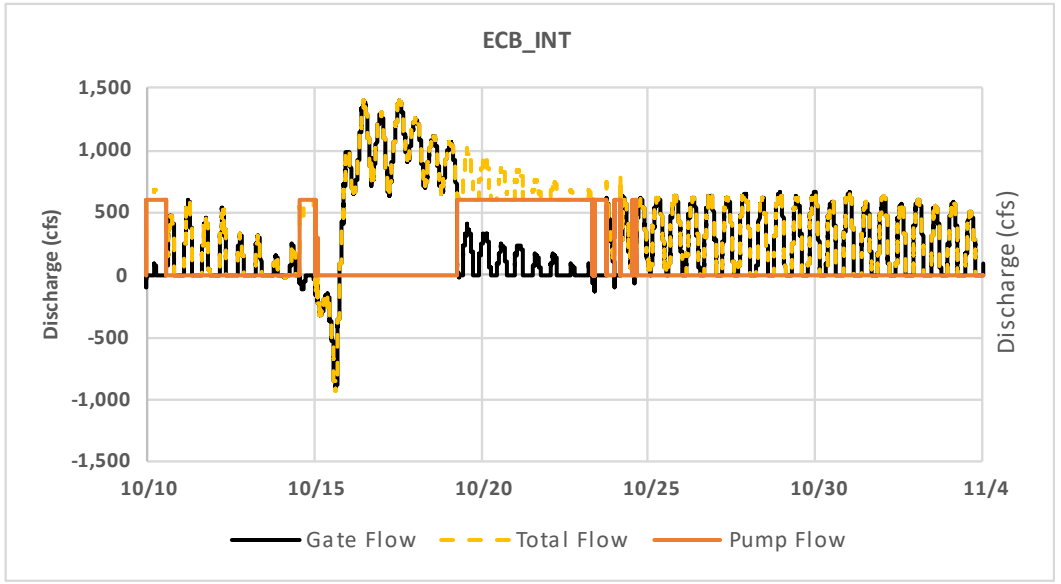
STRUCTURE PERFORMANCE, S26 – 20S25R

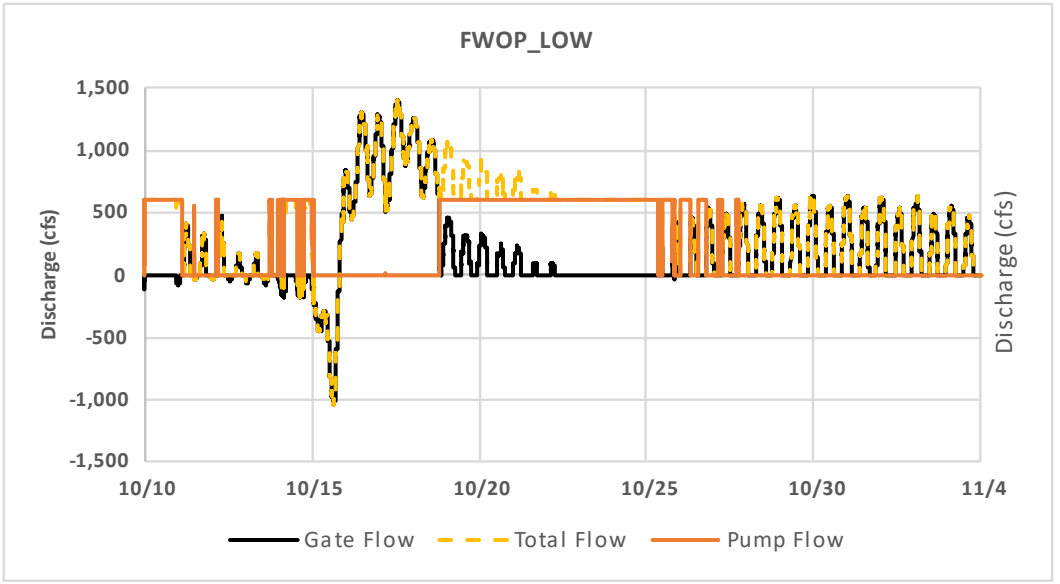


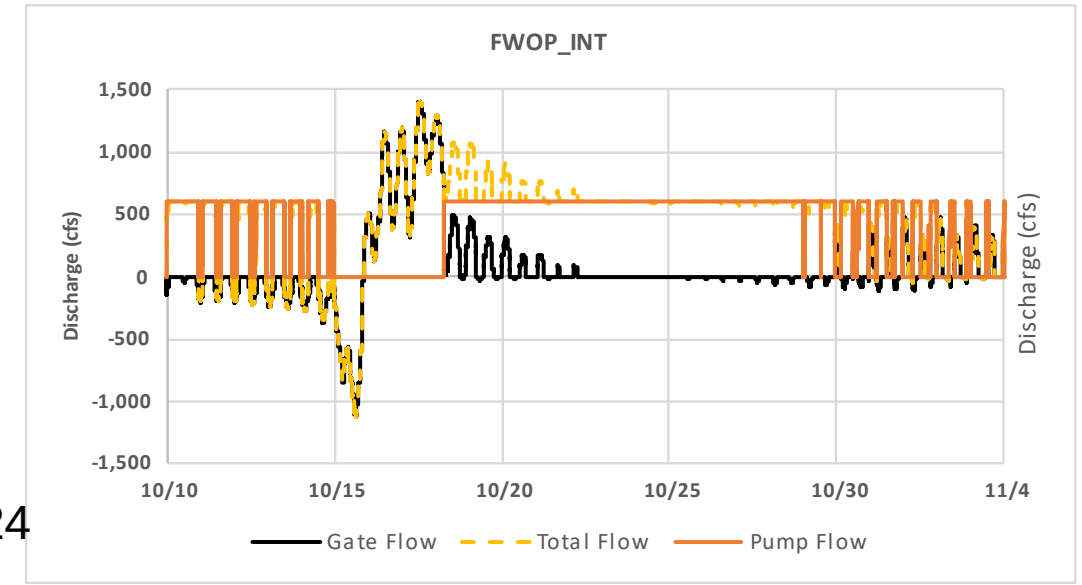


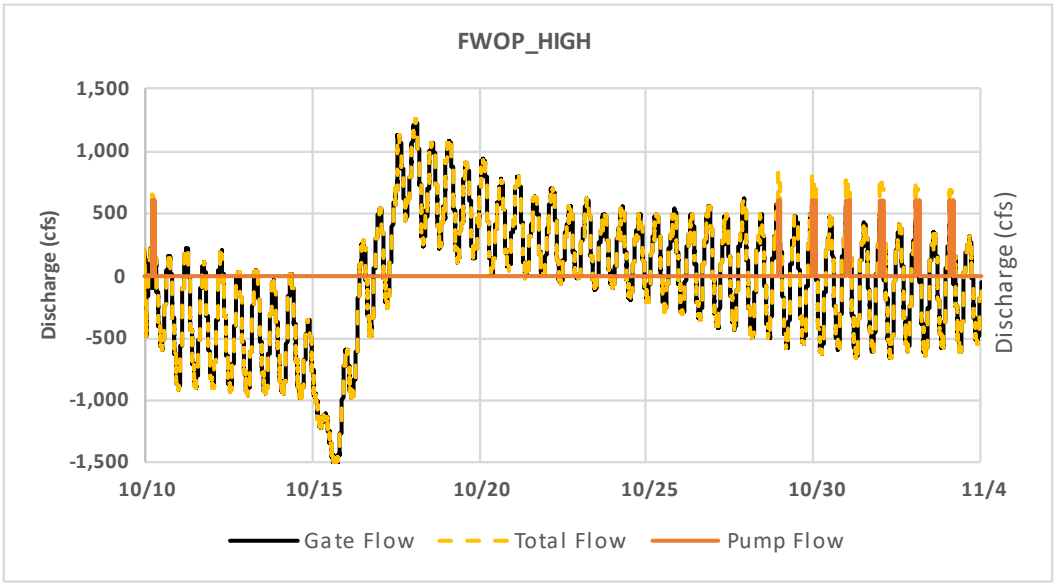


STRUCTURE PERFORMANCE, S26 – 20S25R









REACH C - Q&A

- Please **use the Q&A function** to submit questions OR **use the 'raise hand' function** at the bottom of your screen and we call on you to unmute.

- You are welcome to **submit follow up questions and additional comments** after the webinar via email to CSFFRSComments@usace.army.mil.

- Please take a moment to complete the **H&H Model Output Survey** at the provided link: https://forms.office.com/g/gkvZBCnCP3

BREAK

Workshop will resume at 2:40 PM

9. REACH D

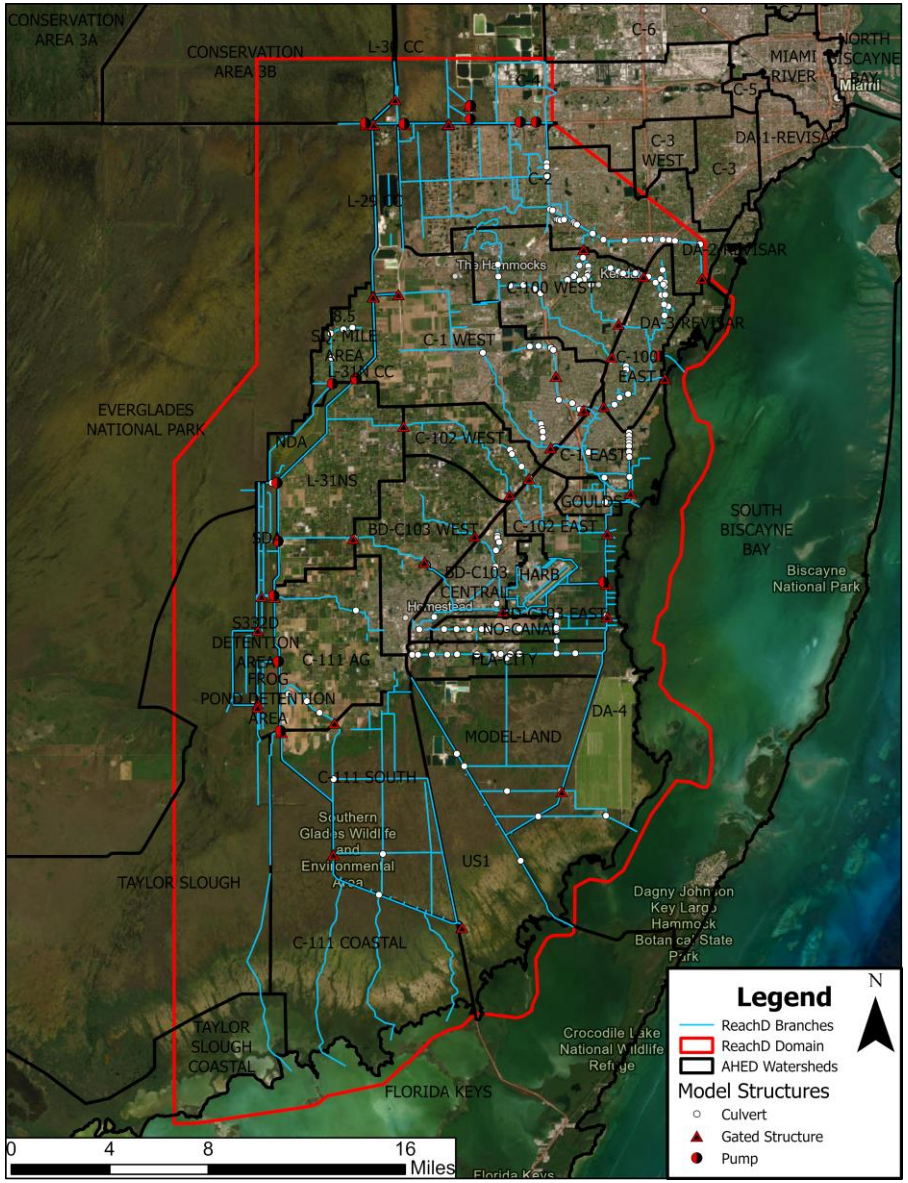
Presenters: Amanda Bredesen, P.E., H&H Model Subteam Lead, USACE
Carol Ballard, P.E. CFM, H&H Model Subteam Lead, SFWMD

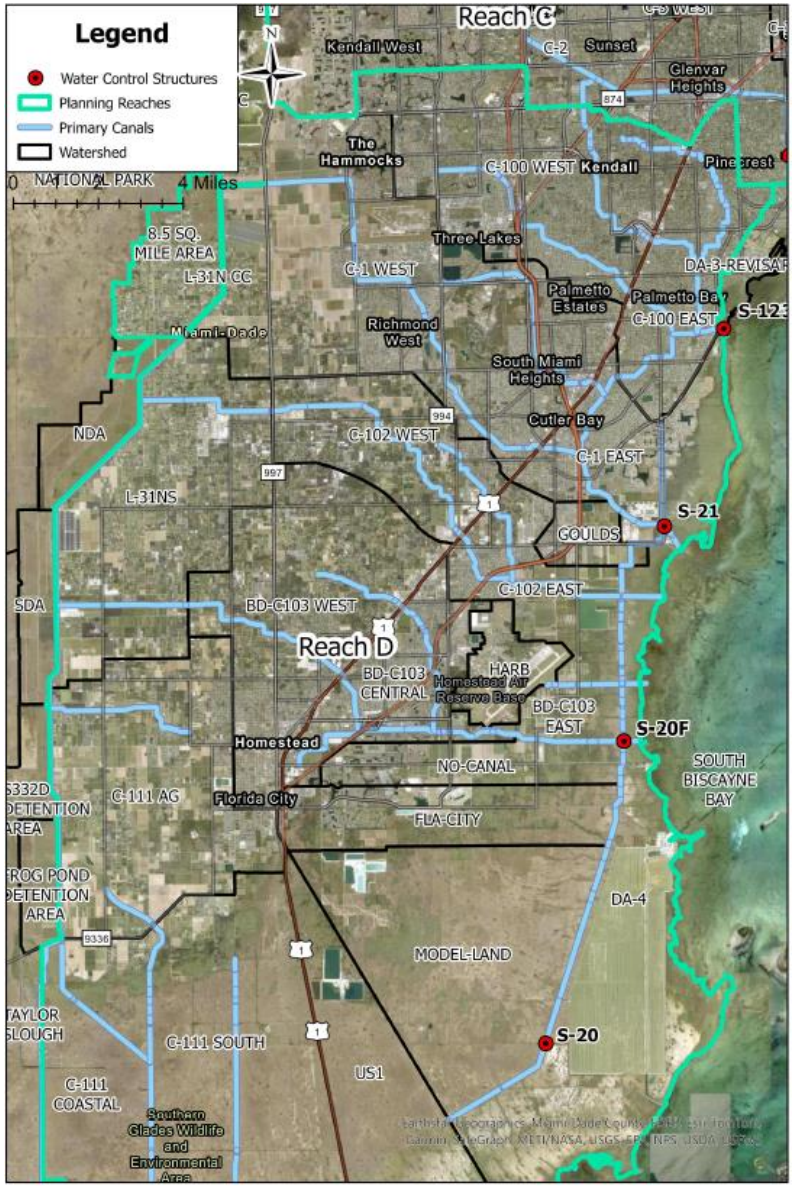
Modelers: Stephanie Long-Marquez, PhD., P.E., Lead Modeler, Chen Moore
Justin Tagle, P.E., Modeler, Chen Moore & Associates
Chinlung Wu, PhD., P.E., Technical Lead, SFWMD

PLANNING REACH OVERVIEW

- This Reach consists of thirteen managed watersheds upstream of the coastal structures with the northernmost watershed being the C-100 and continuing to the southernmost watershed of C-111 Coastal adjacent to the Florida Bay. The reach also includes the eastern coastal watersheds, ranging from the Snapper Creek Canal to Taylor Slough.

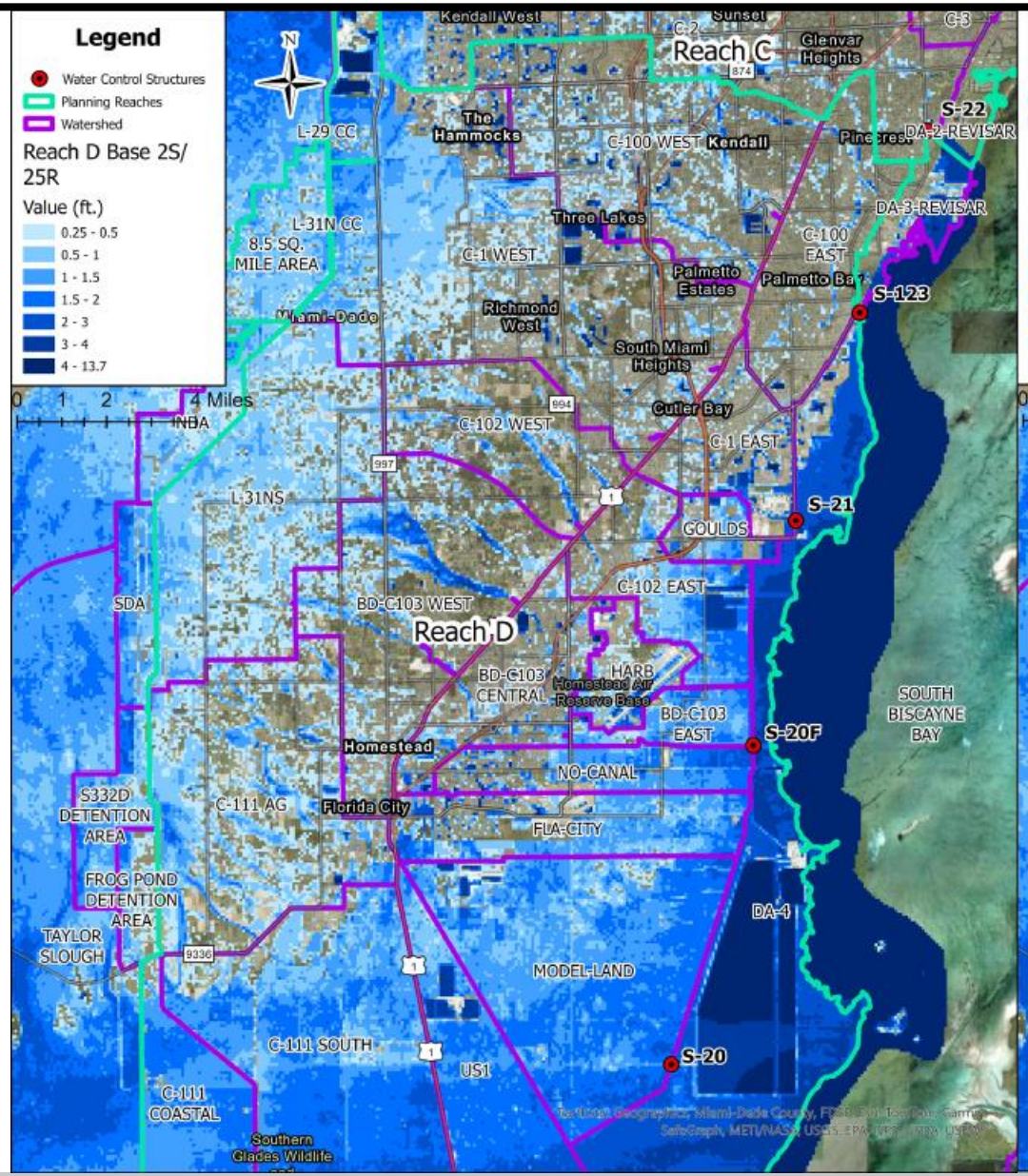
- Section 216 Focus: C-100/S-123, C-1/S-21, C103/S-20F and L-31E/S-20

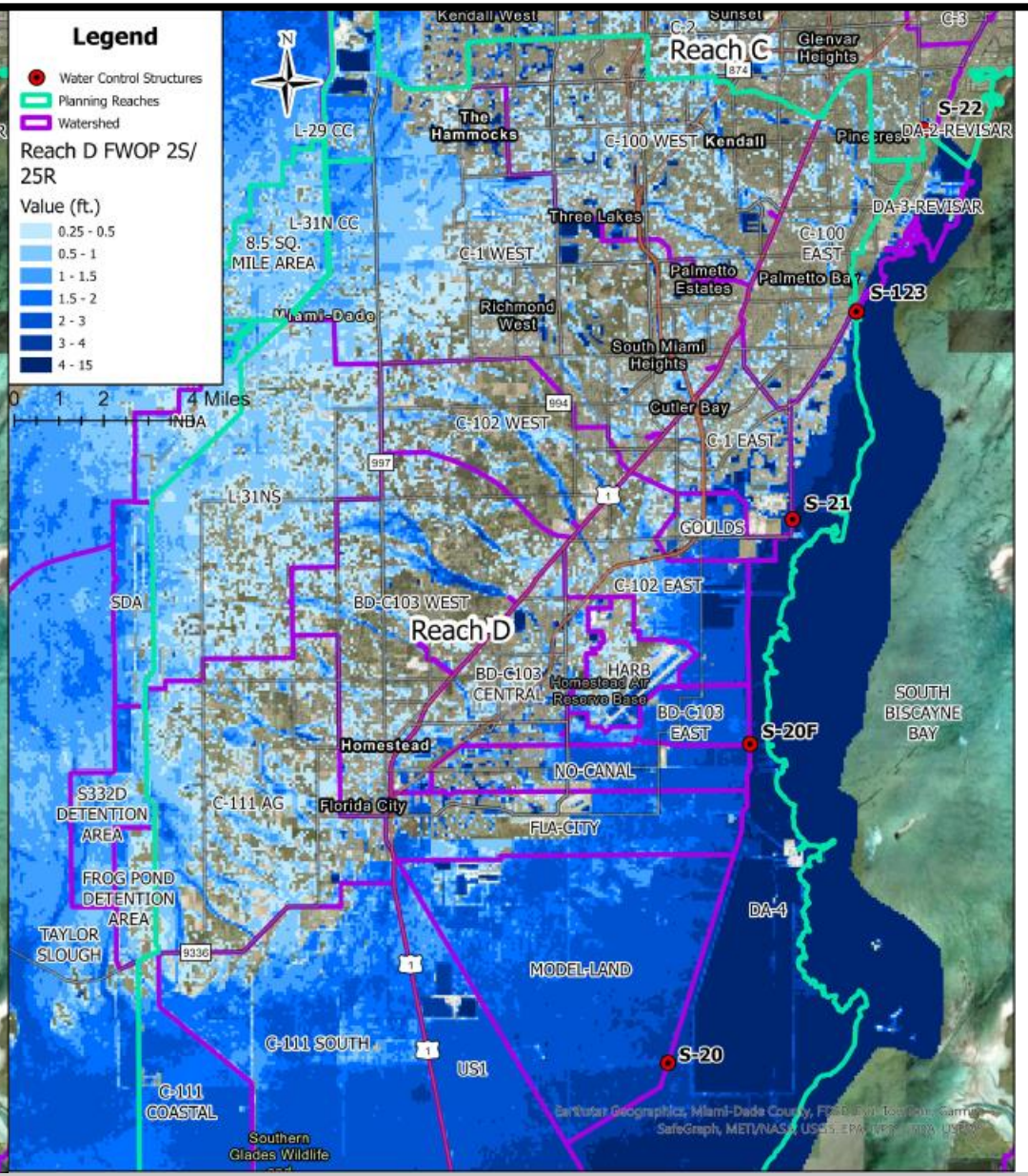




MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 2-YEAR COASTAL

Base Year

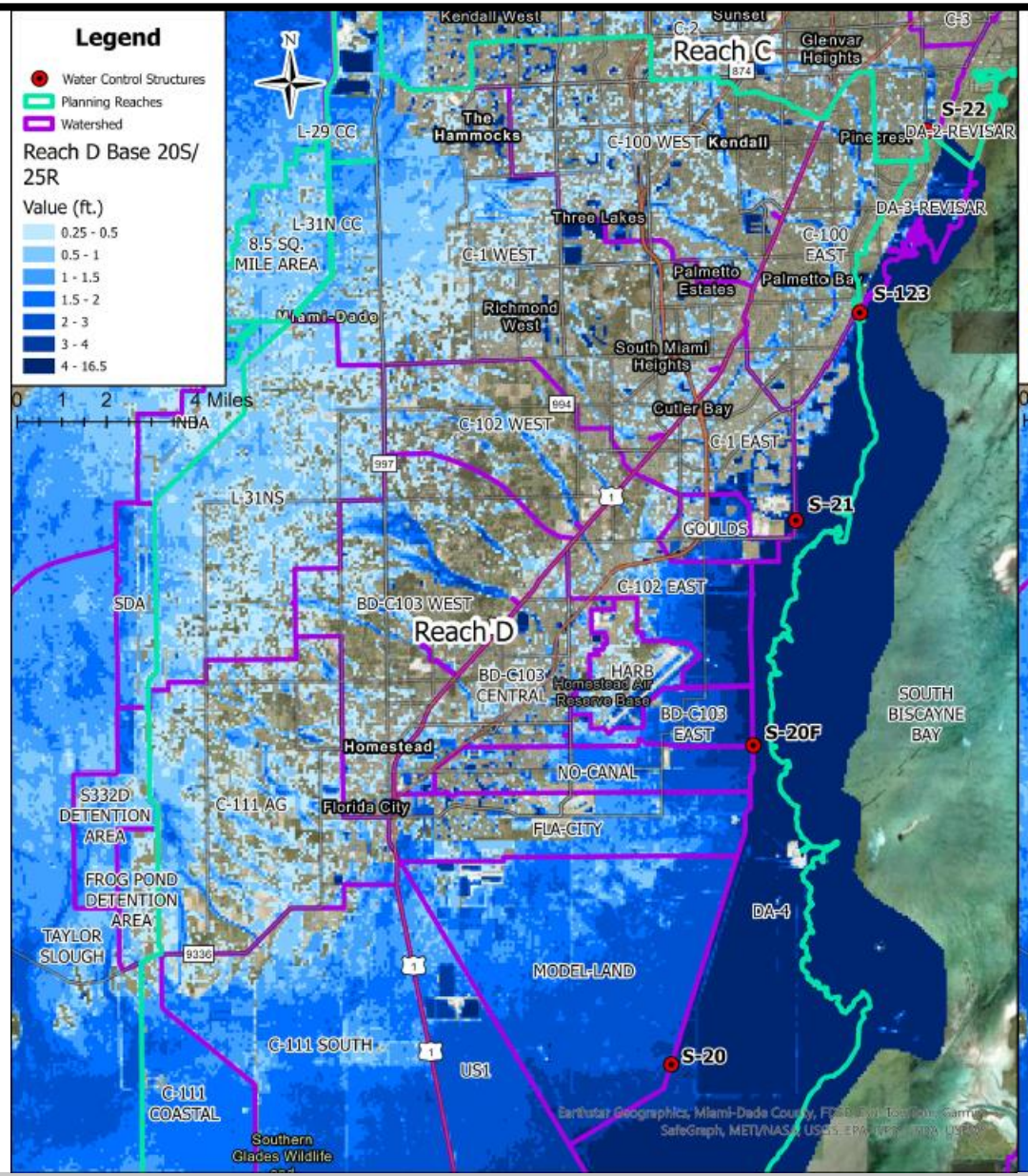


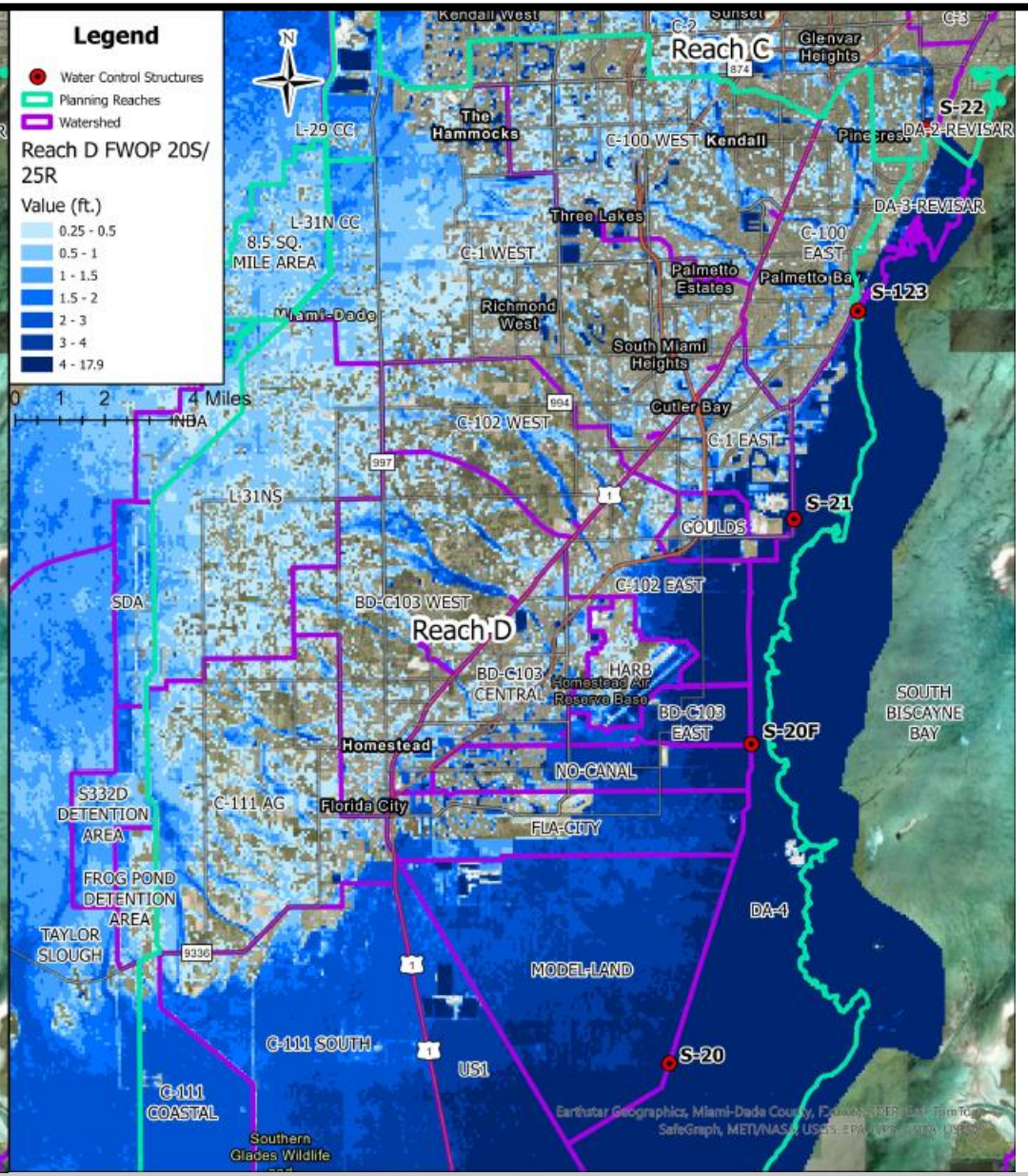


FWOP Int SLR

MAXIMUM DEPTH RASTER 25-YEAR RAINFALL, 20-YEAR COASTAL

Base Year

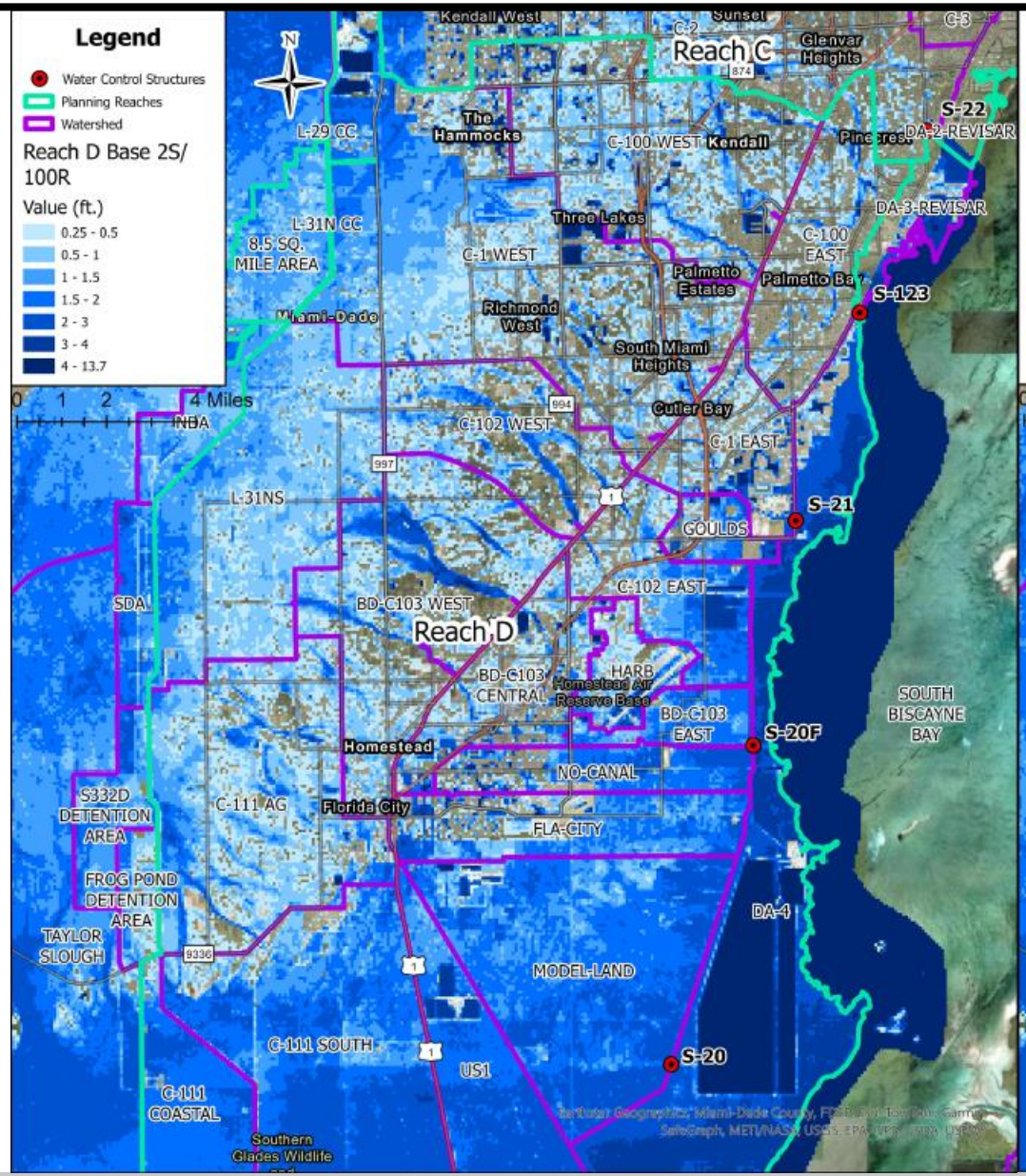




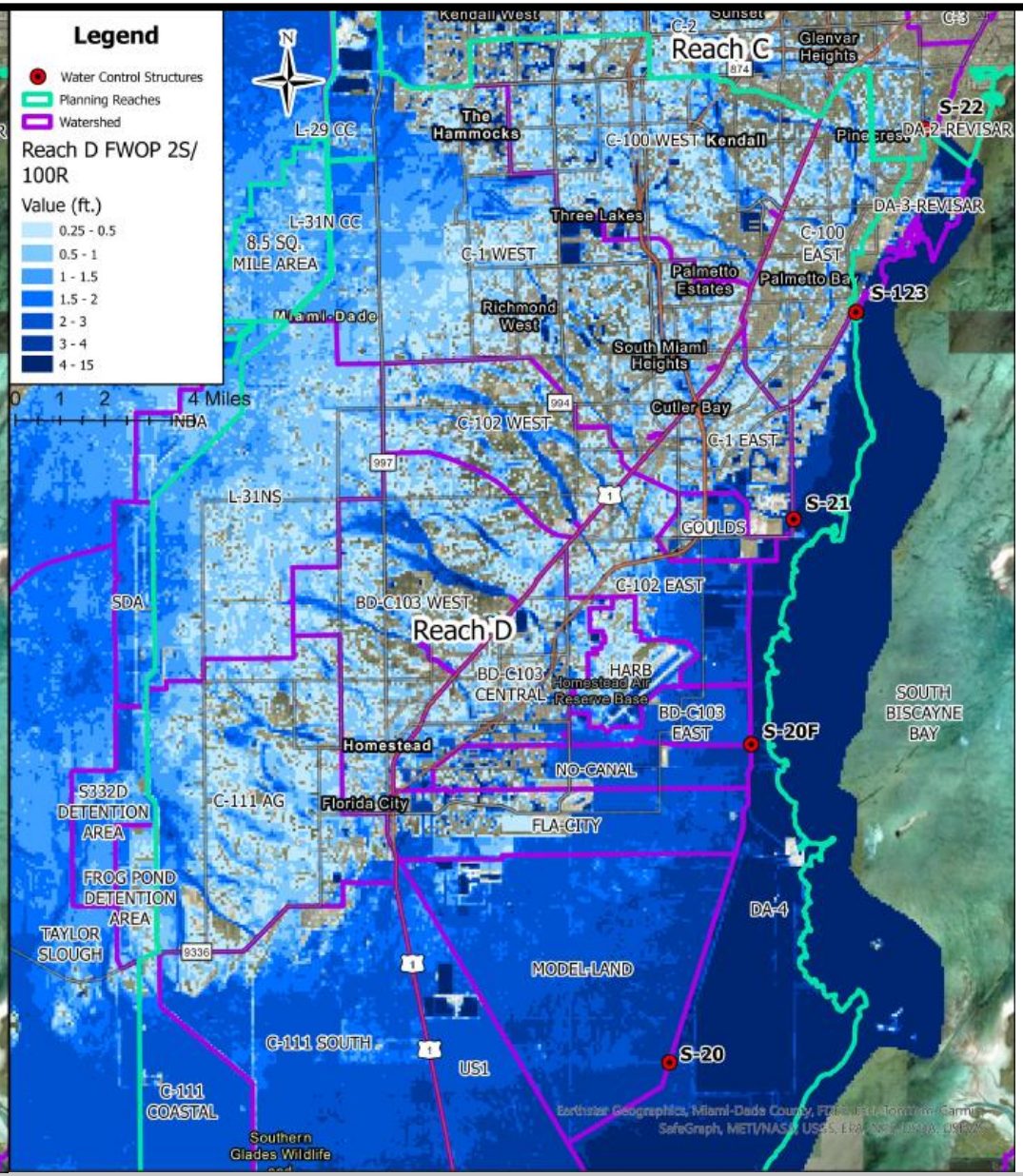
FWOP Int SLR

MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 2-YEAR COASTAL

Base Year

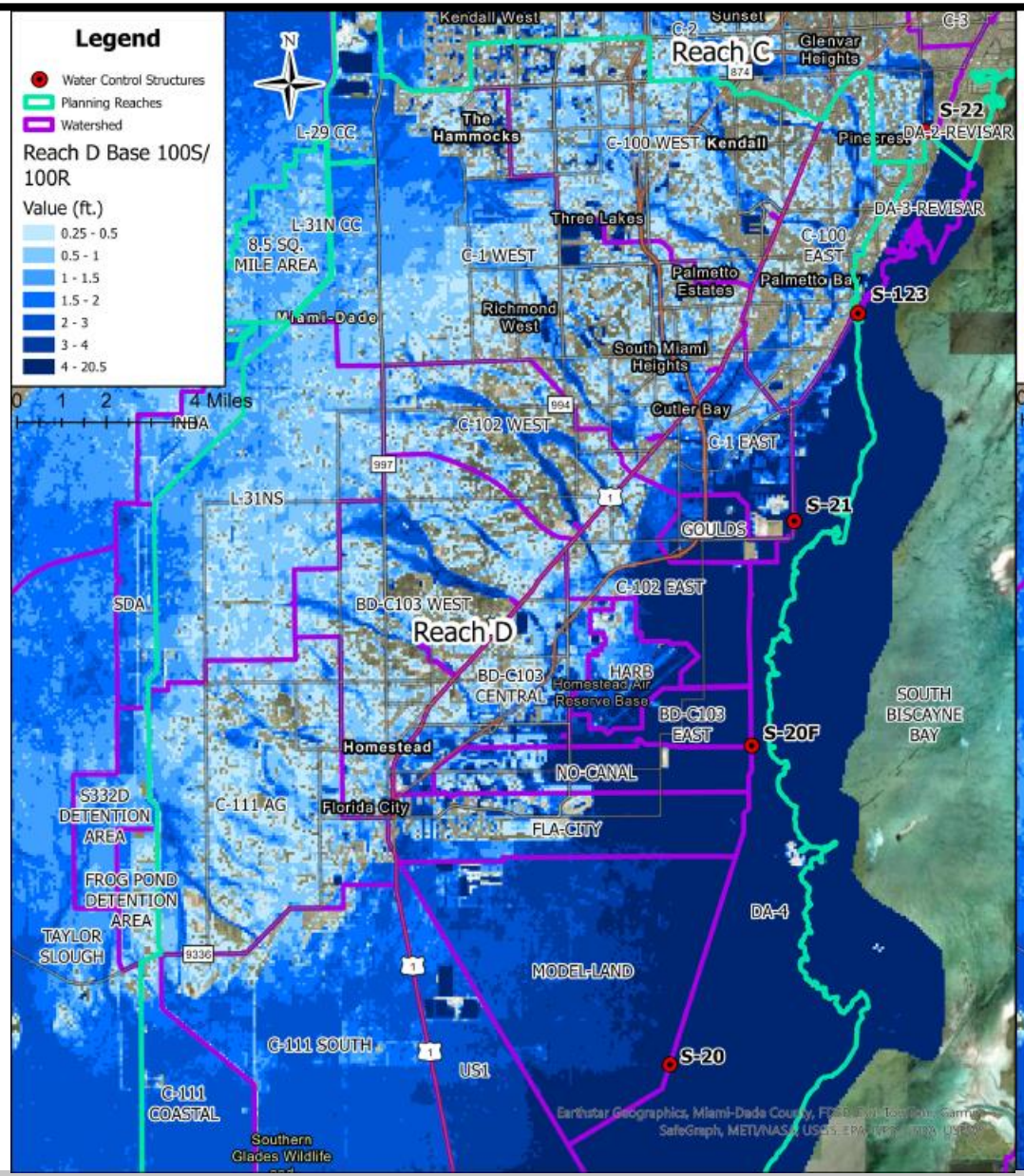


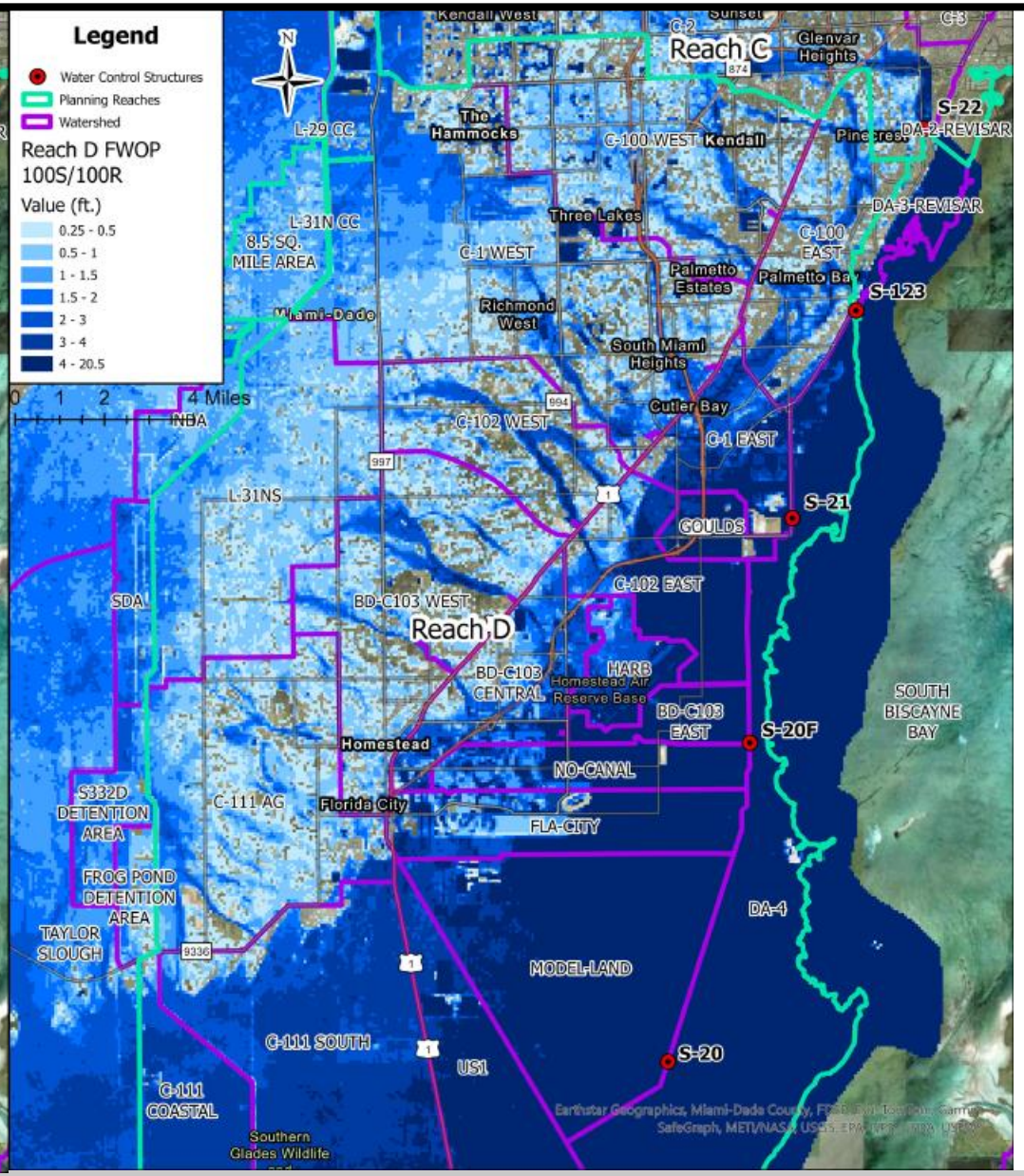
FWOP Int SLR



MAXIMUM DEPTH RASTER 100-YEAR RAINFALL, 100-YEAR COASTAL

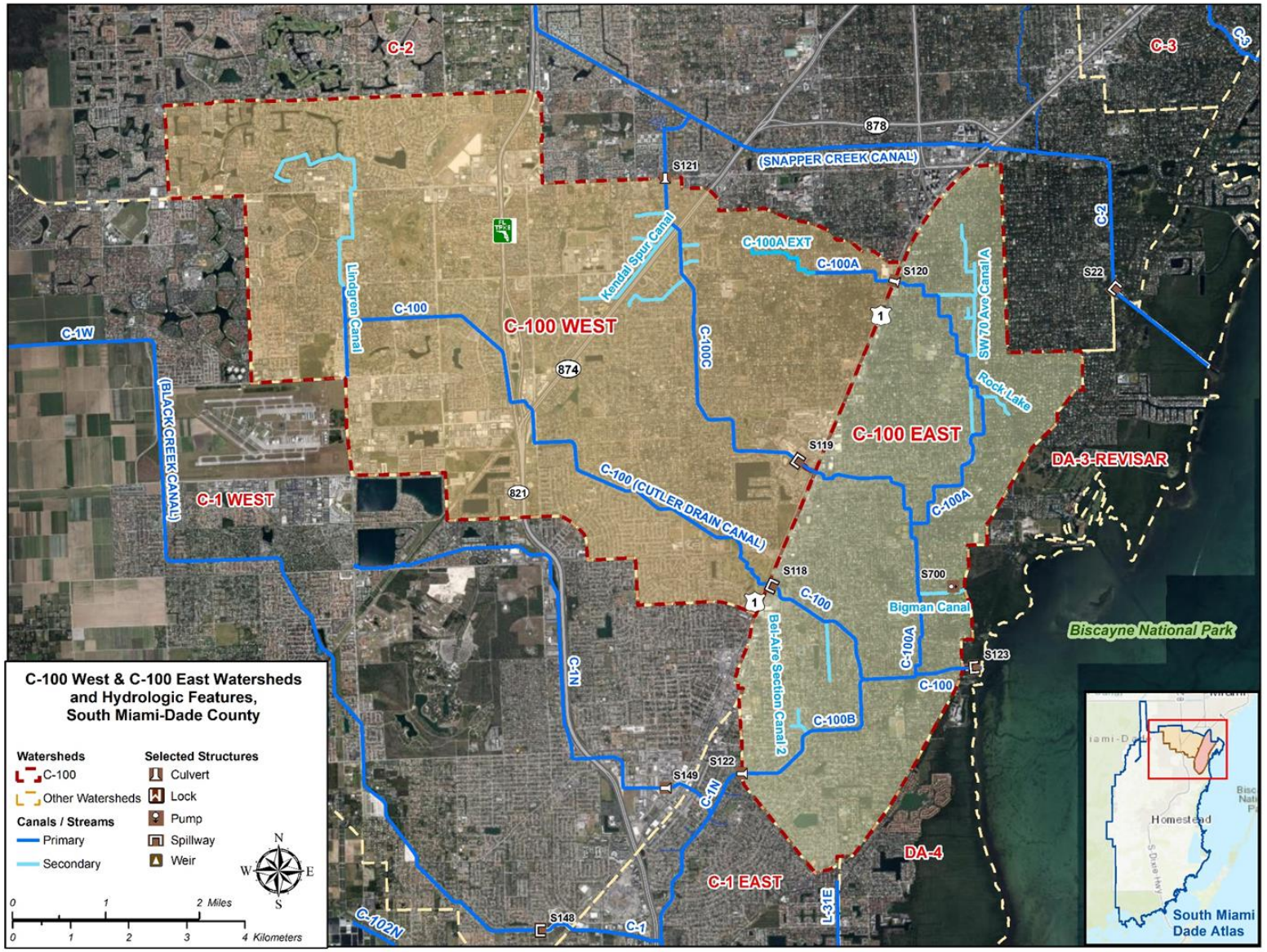
Base Year



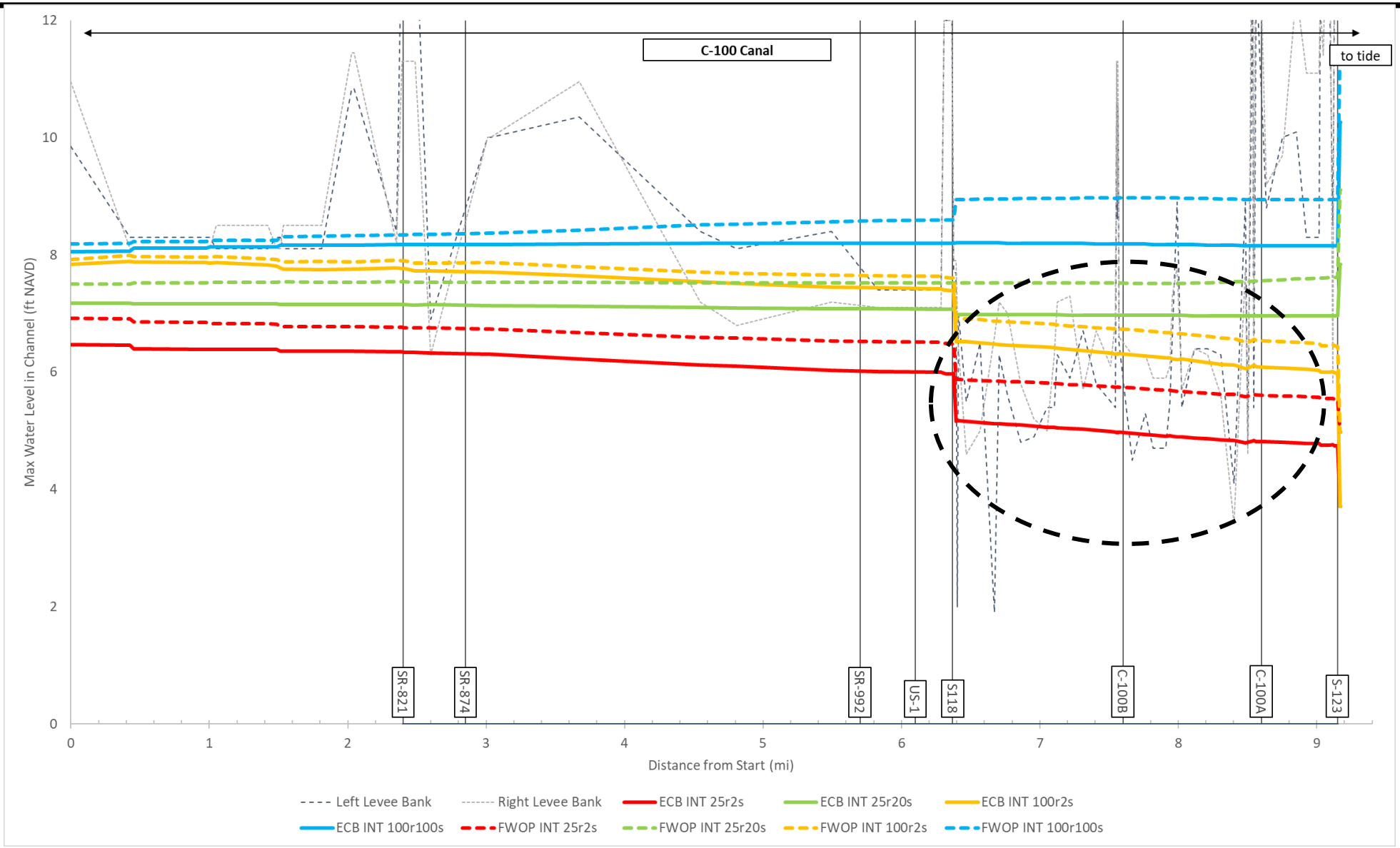


FWOP Int SLR

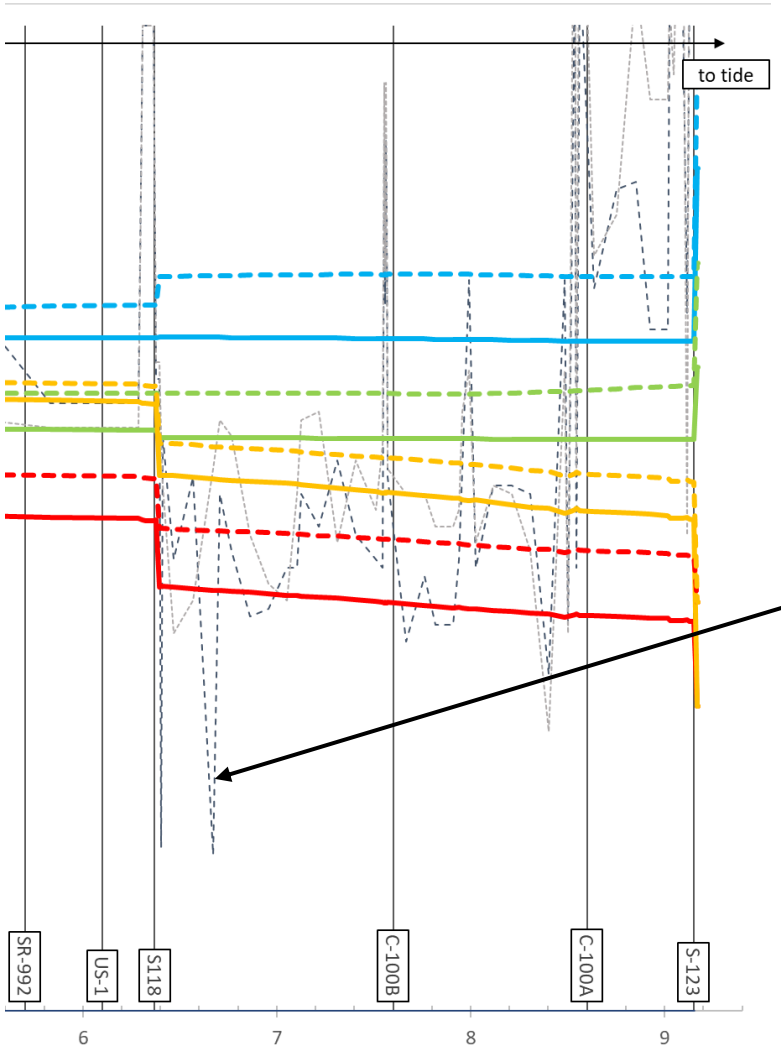
C100 CANAL/ S123

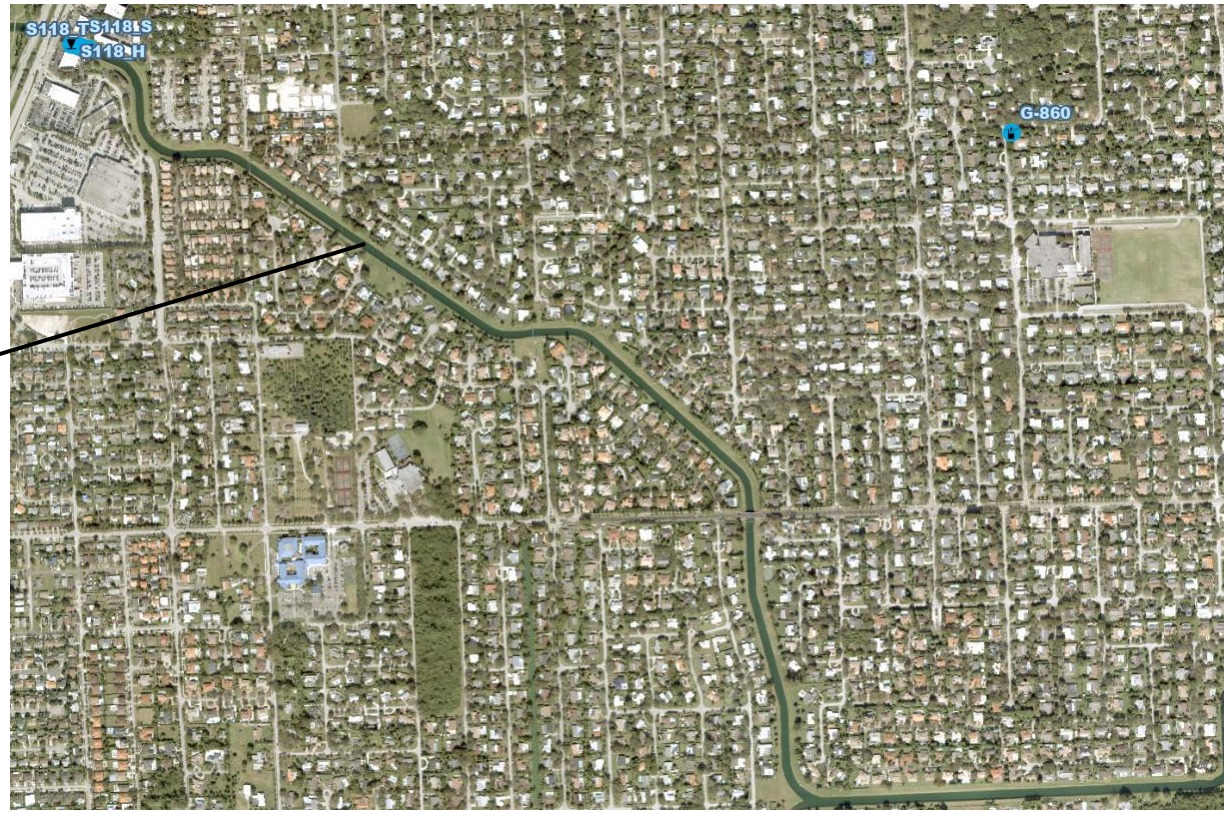


MAXIMUM STAGE PROFILE PLOT – C100 CANAL

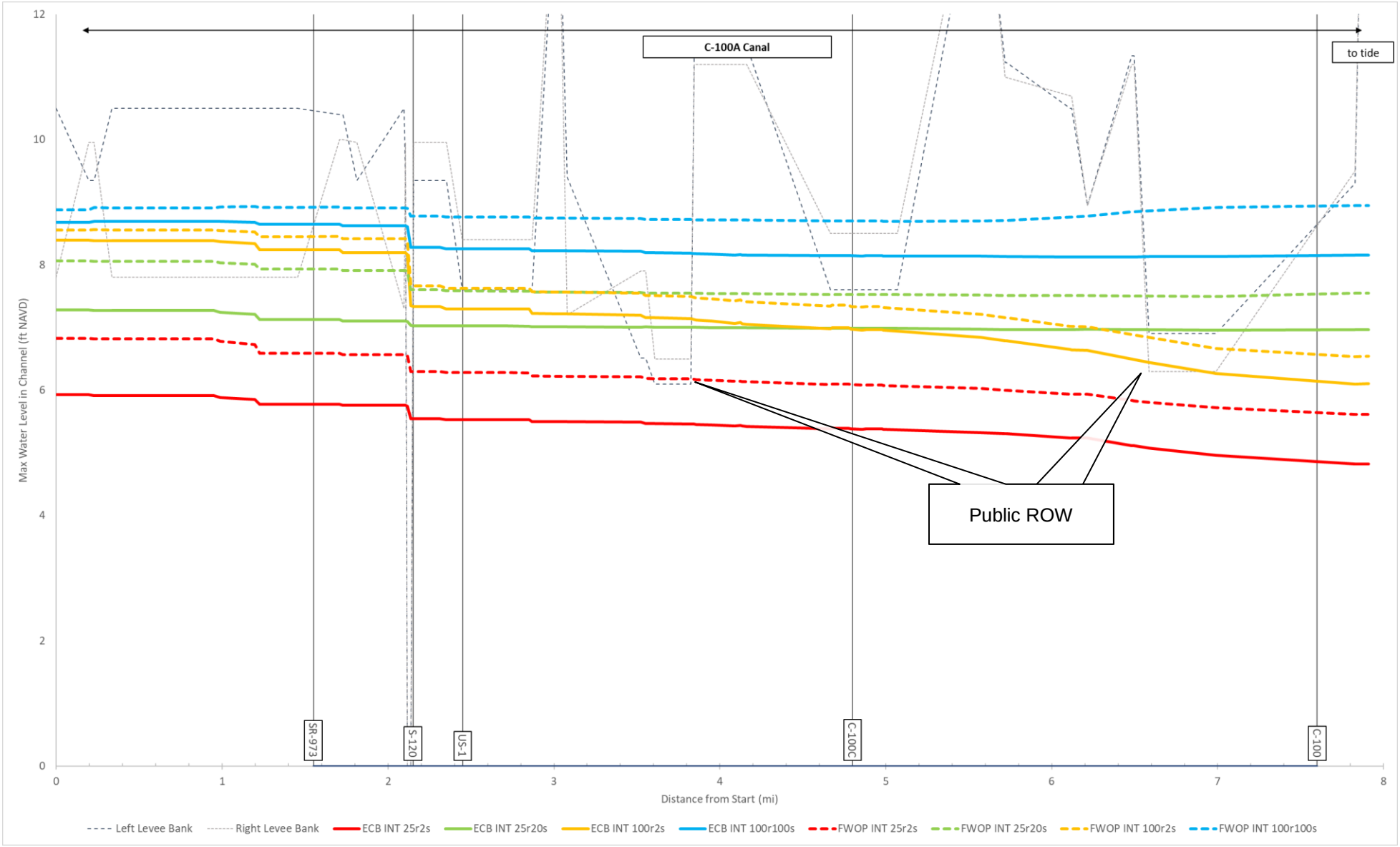


MAXIMUM STAGE PROFILE PLOT – C100 CANAL

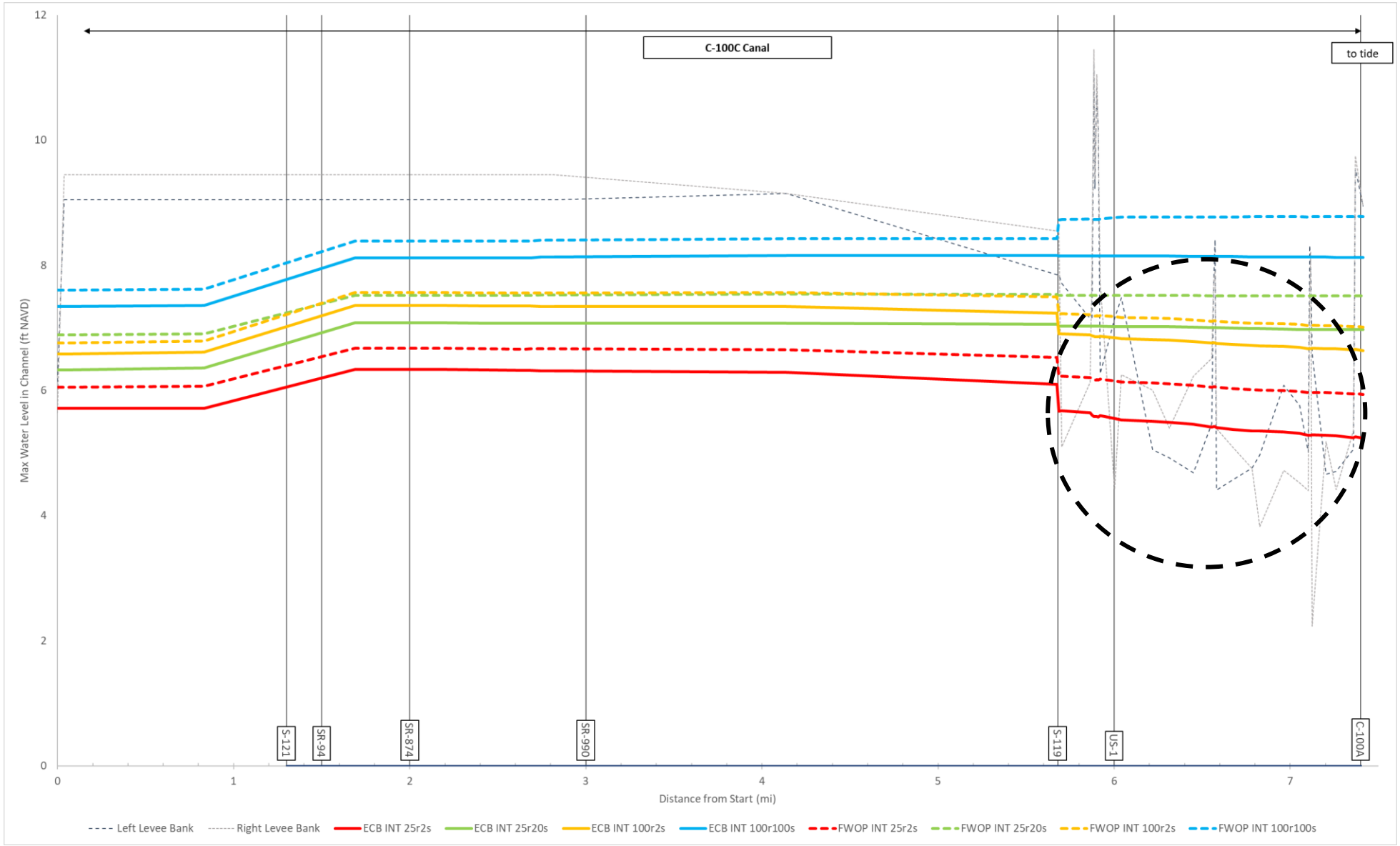




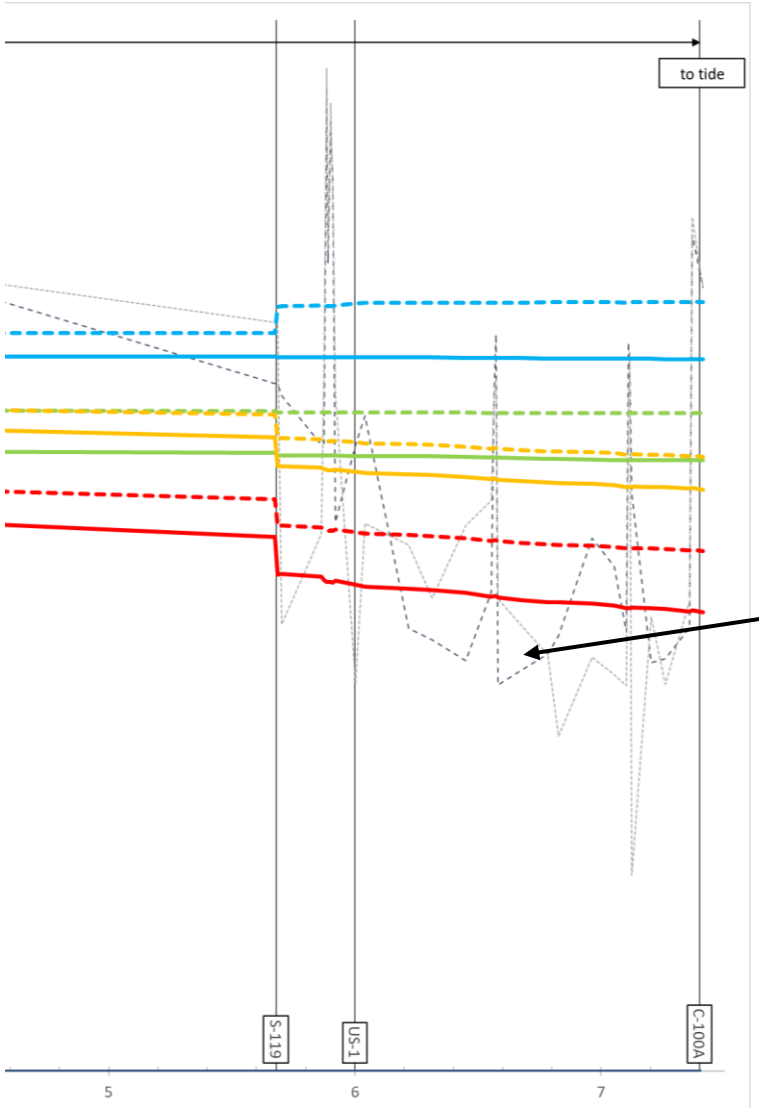
MAXIMUM STAGE PROFILE PLOT – C100A CANAL



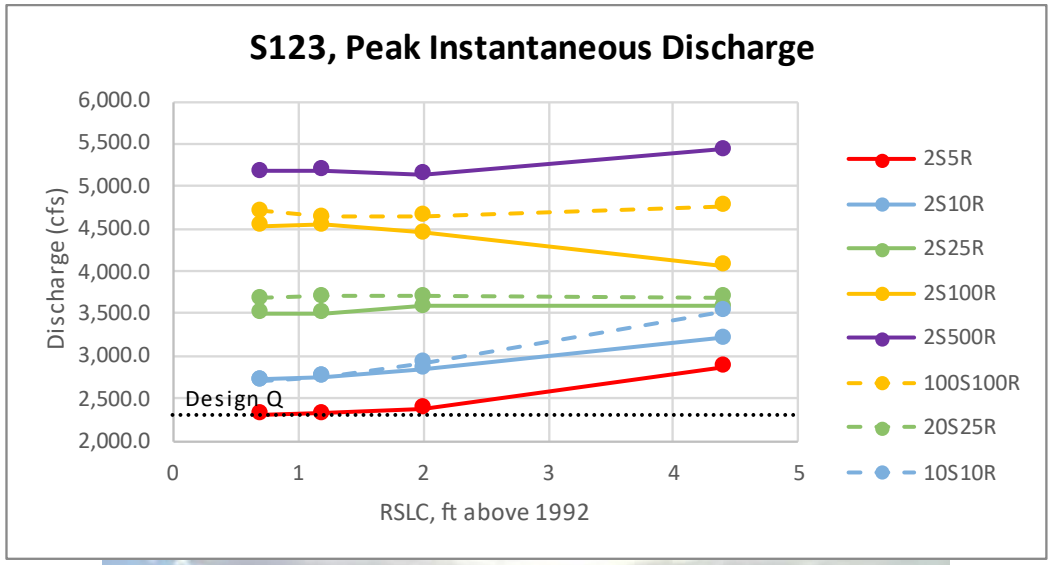
MAXIMUM STAGE PROFILE PLOT – C100C CANAL

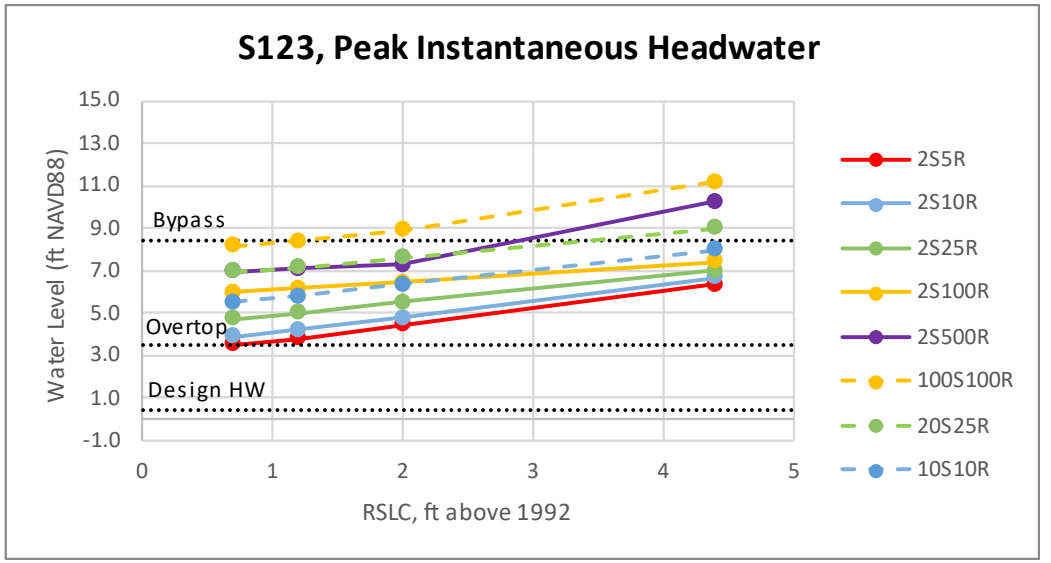


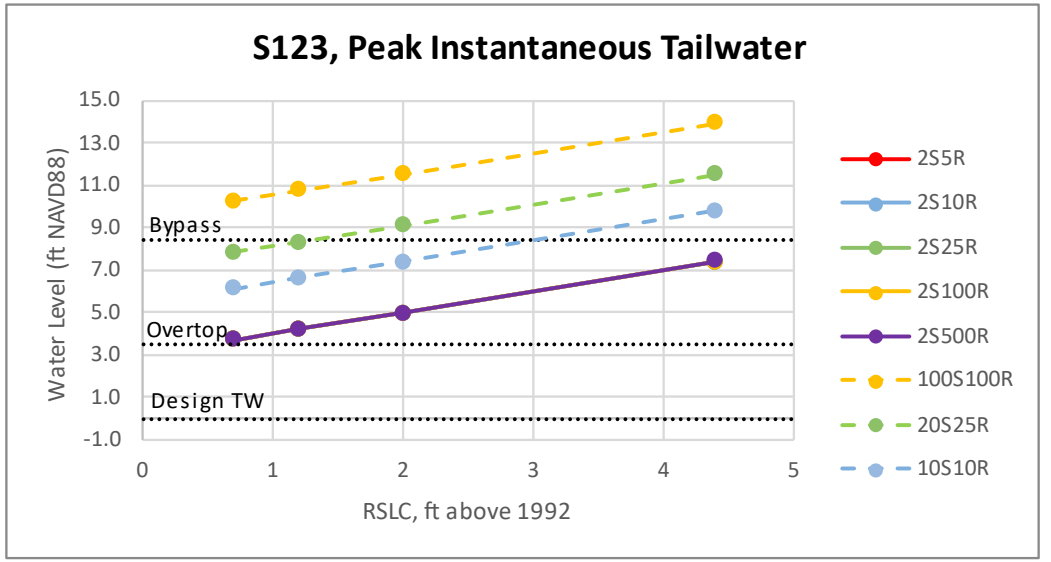
MAXIMUM STAGE PROFILE PLOT – C100C CANAL



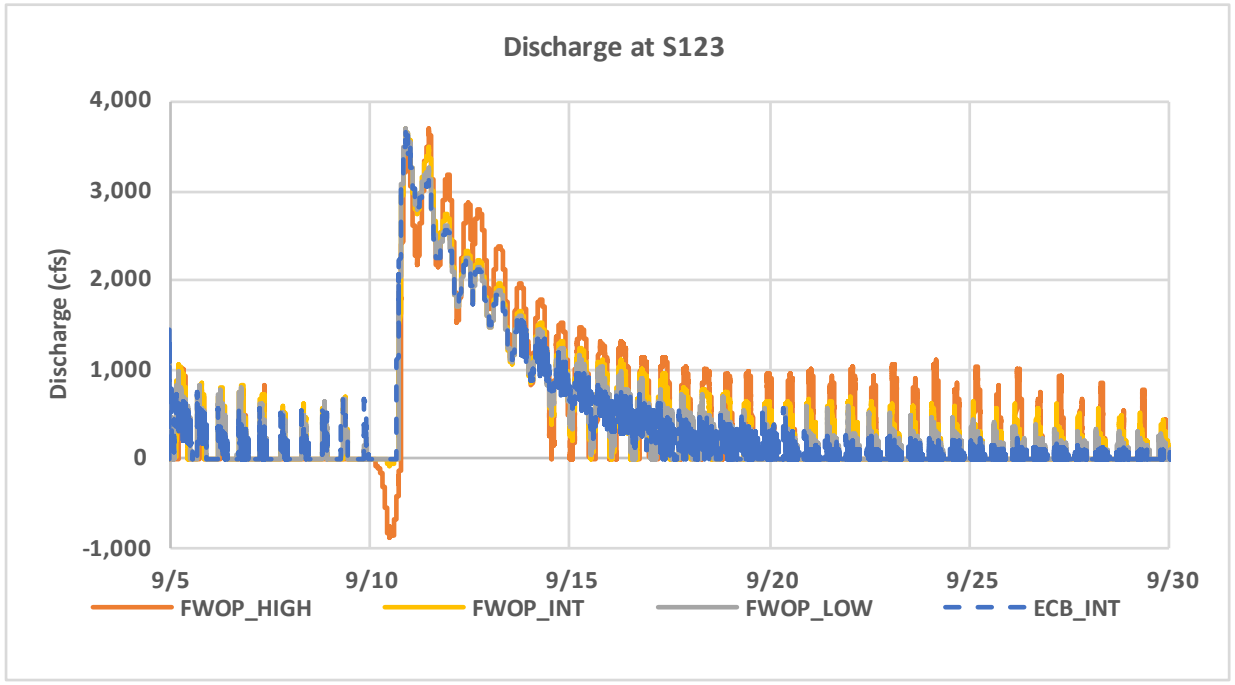
STRUCTURE PERFORMANCE, S123

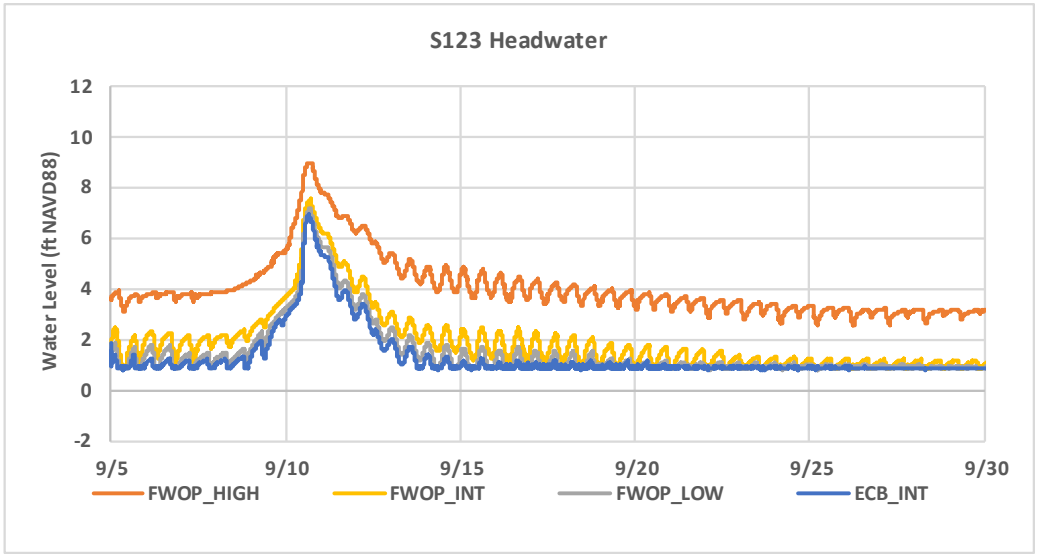


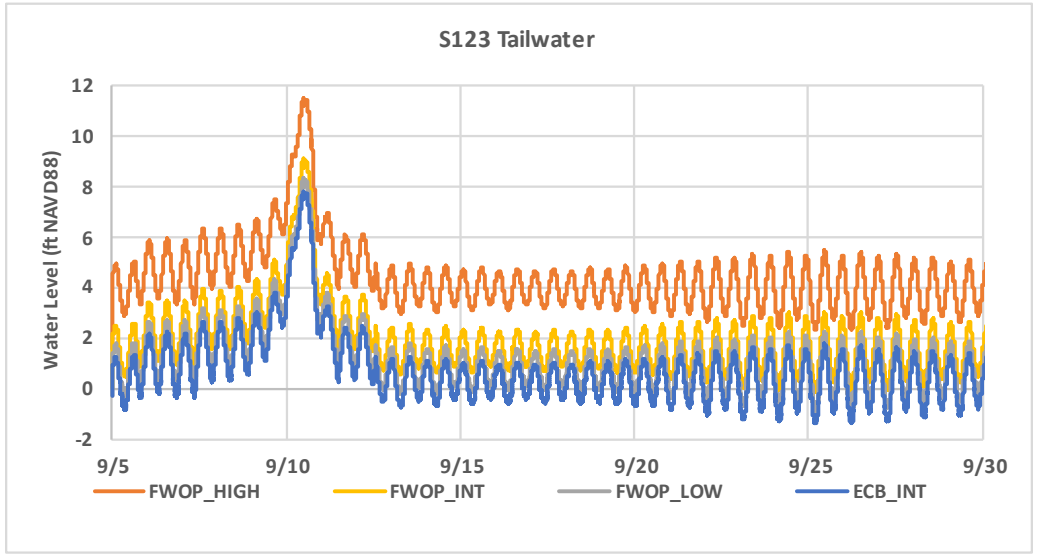




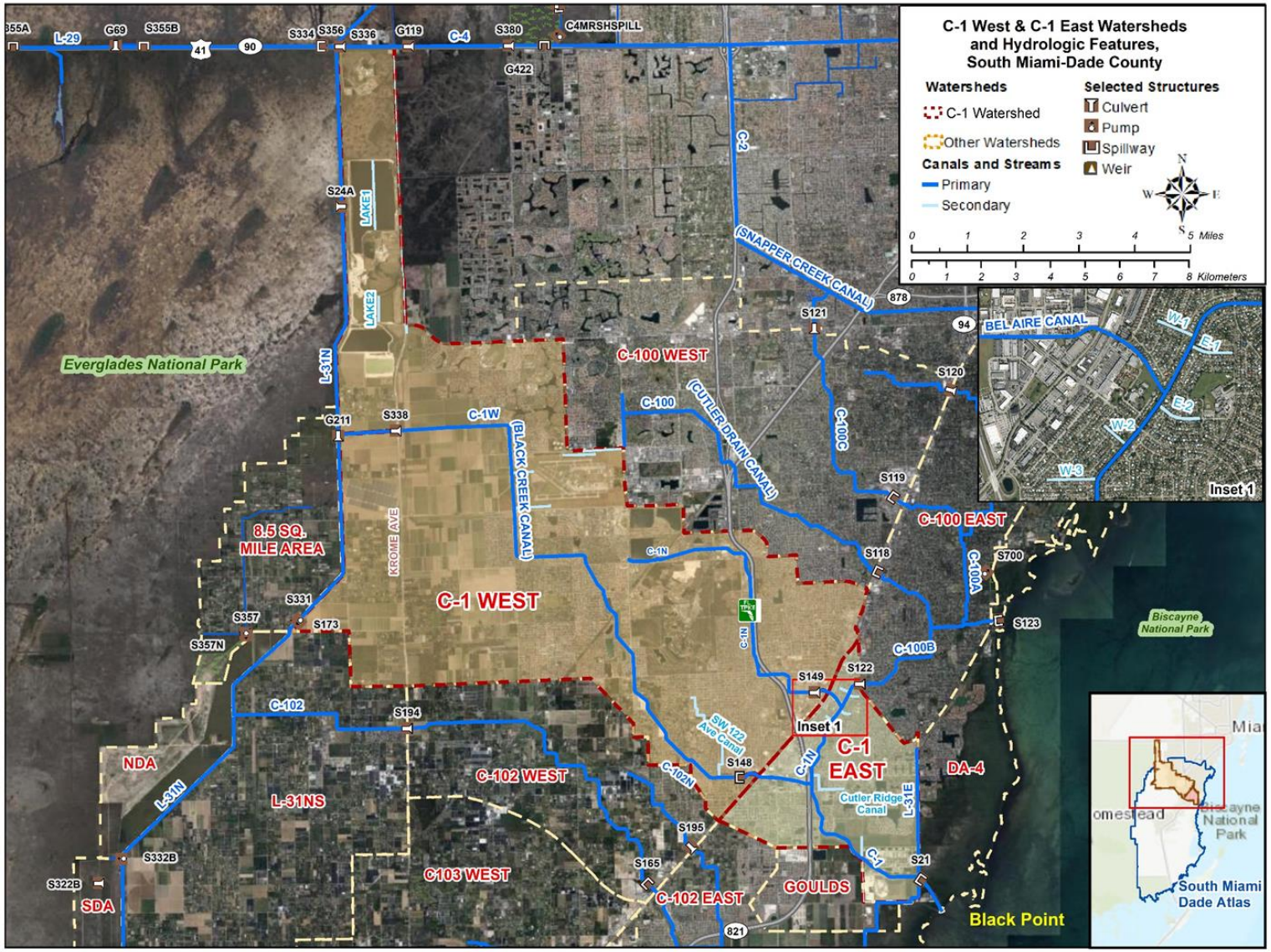
STRUCTURE PERFORMANCE, S123 – 20S25R







C1 CANAL/ S21


C-1 West & C-1 East Watersheds
and Hydrologic Features,
South Miami-Dade County
Watersheds
C-1 Watershed
Other Watersheds
Canals and Streams
Primary
Secondary
Selected Structures
Culvert
Pump
Spillway
Weir
5 Miles
8 Kilometers
Everglades National Park
C-100 WEST
C-1W
C-1 WEST
C-100 EAST
C-1 EAST
8.5 SQ. MILE AREA
NDA
SDA
L-31NS
C-102 WEST
C103 WEST
C-102 EAST
GOULDS
DA-4
Black Point
Biscayne National Park
BELLAIRE CANAL
SNAPPER CREEK CANAL
CUTLER DRAIN CANAL
BLACK CREEK CANAL
KROME AVE
Cutler Ridge Canal
SW 122 Ave Canal
Inset 1
South Miami Dade Atlas
Map Produced on Date: 4/21/2021 1:27:40 PM
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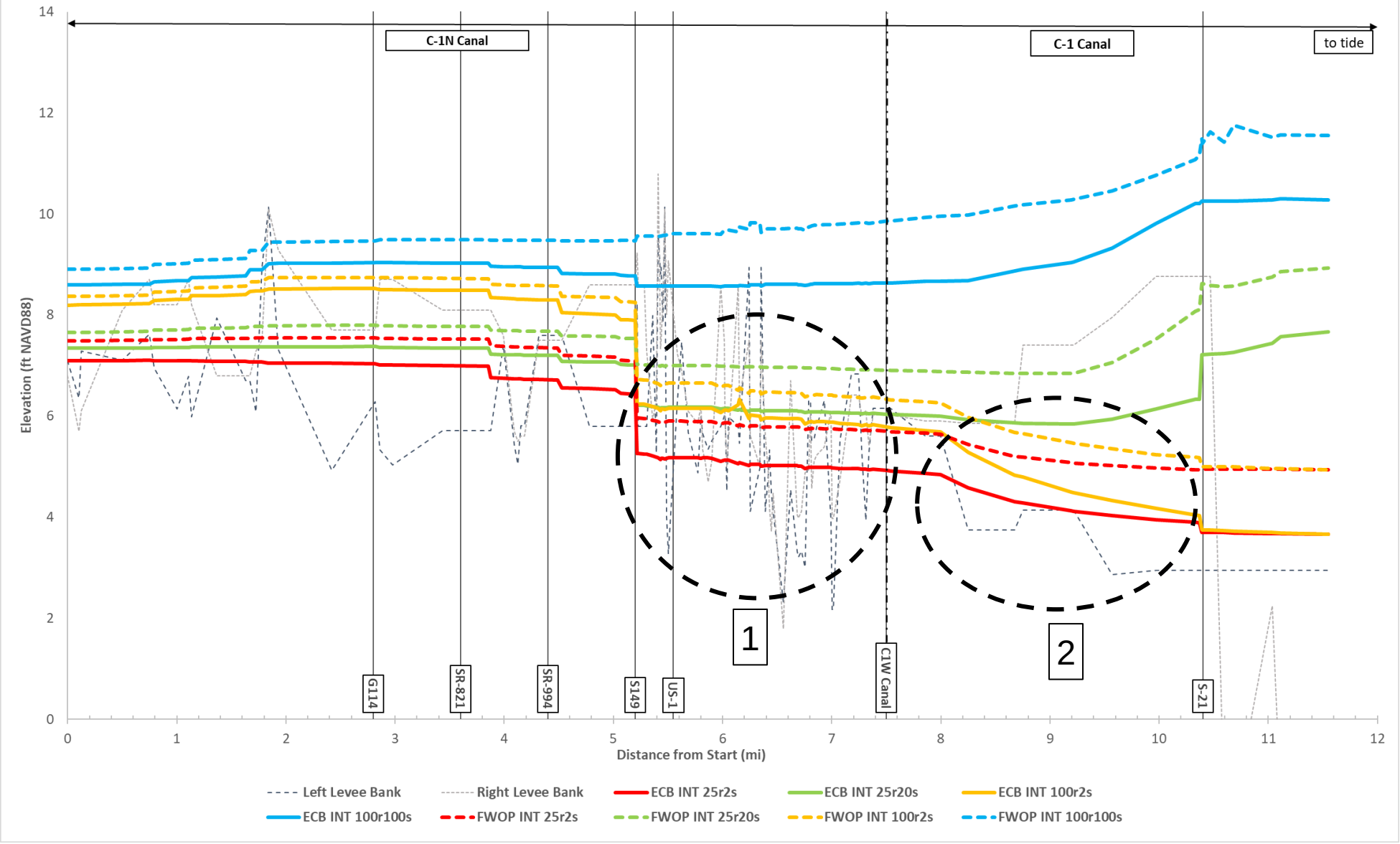
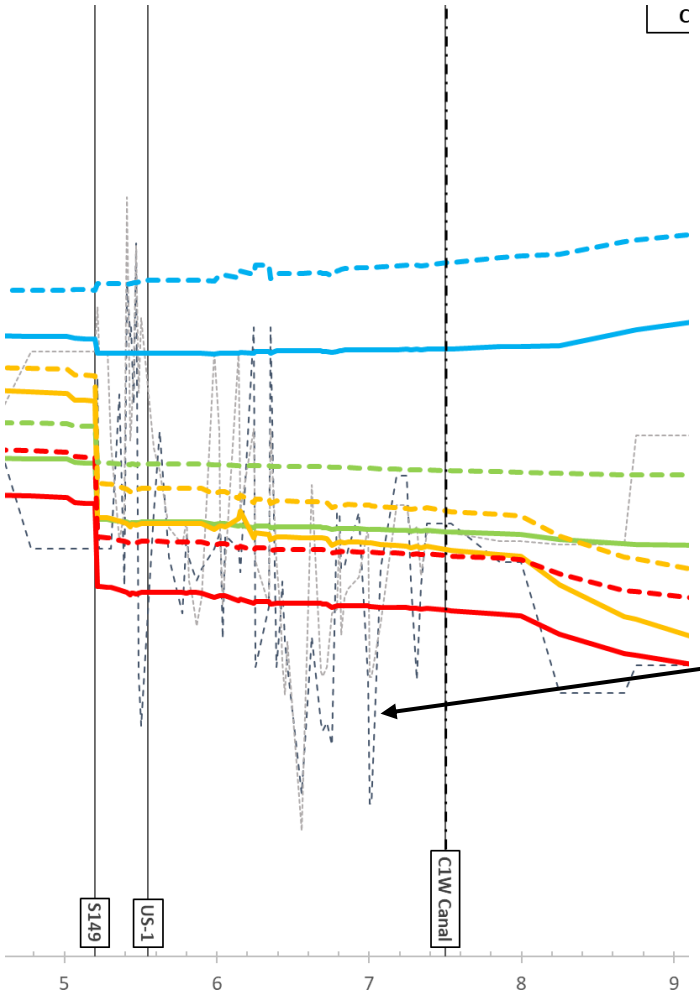
MAXIMUM STAGE PROFILE PLOT – C1 CANAL



MAXIMUM STAGE PROFILE PLOT – C1 CANAL



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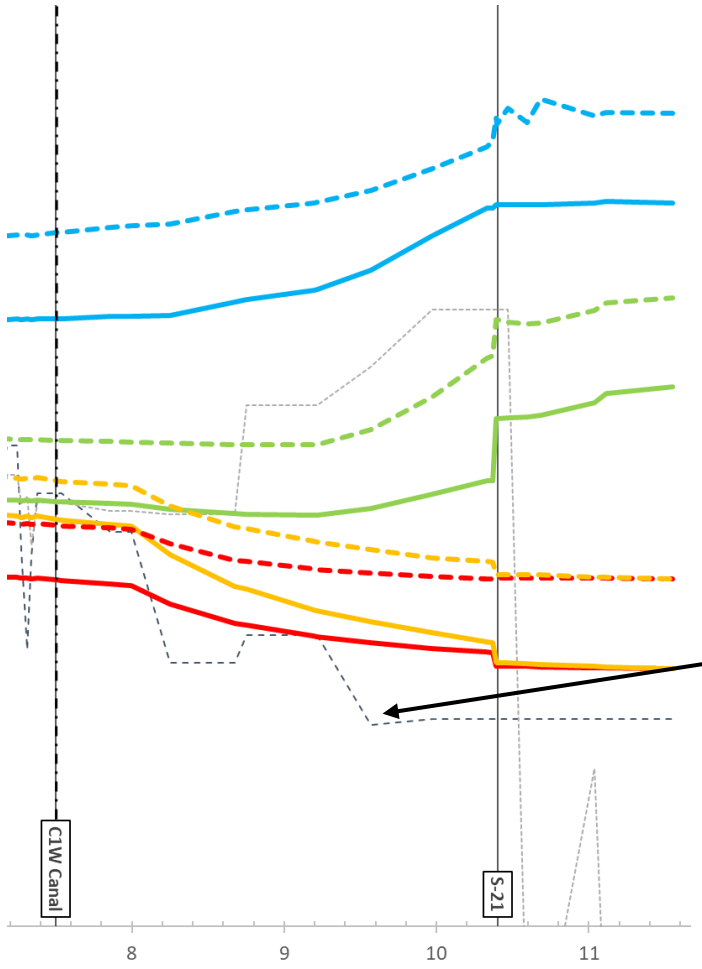
MAXIMUM STAGE PROFILE PLOT – C1 CANAL



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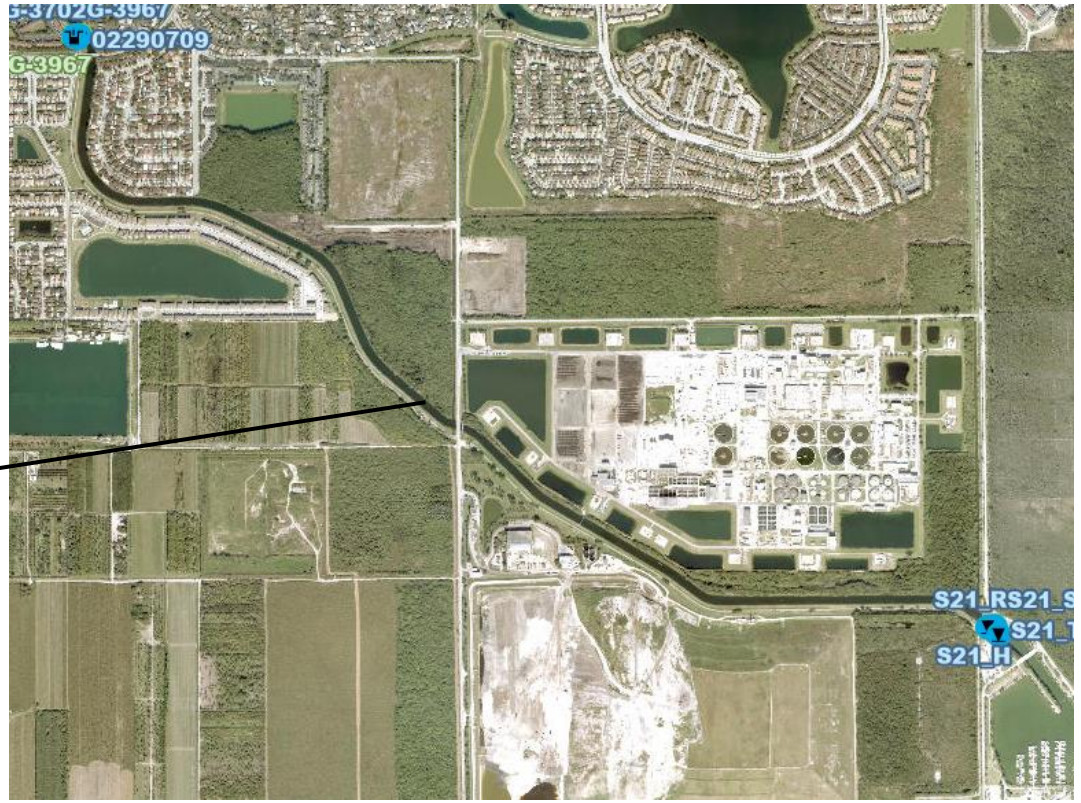
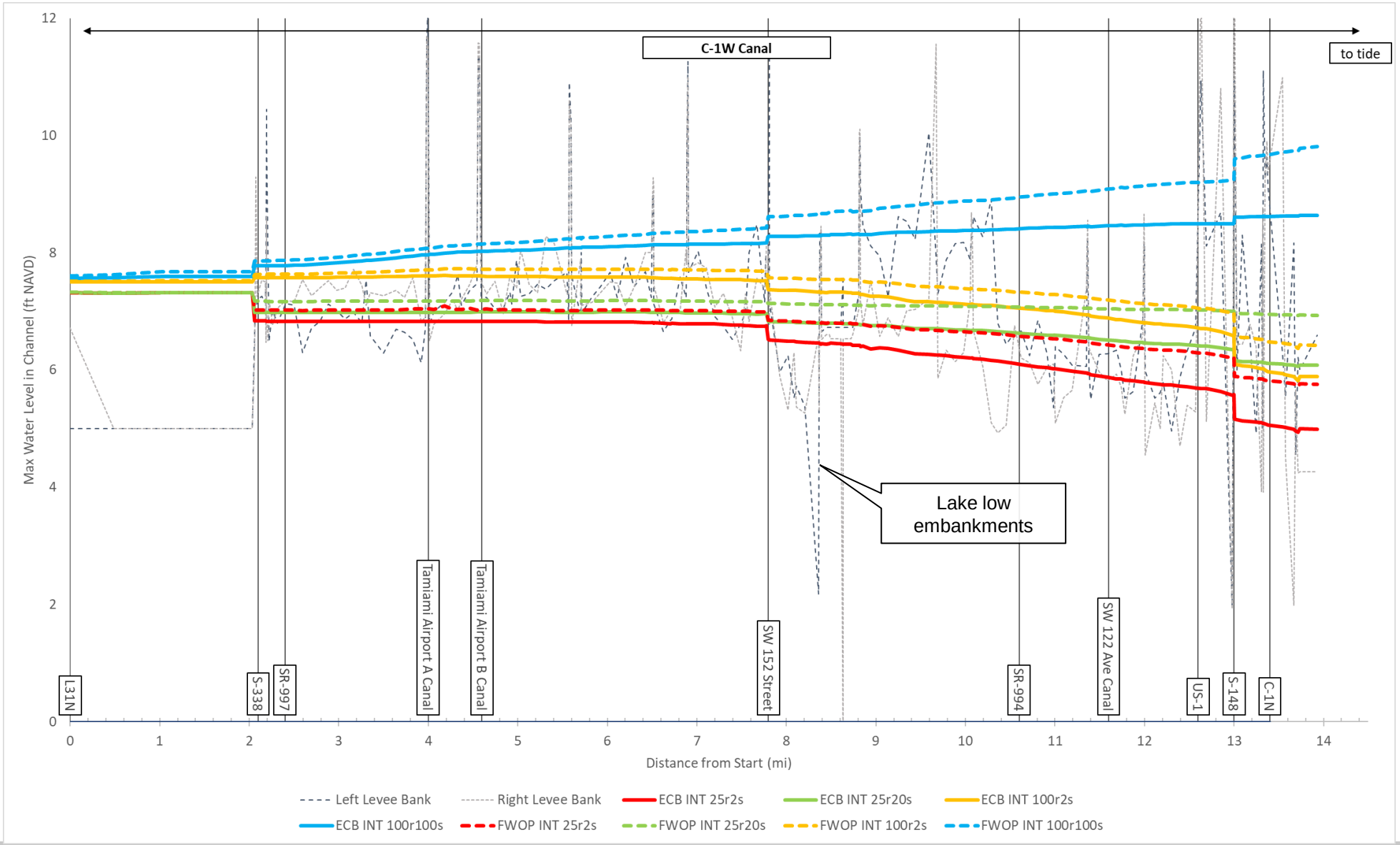
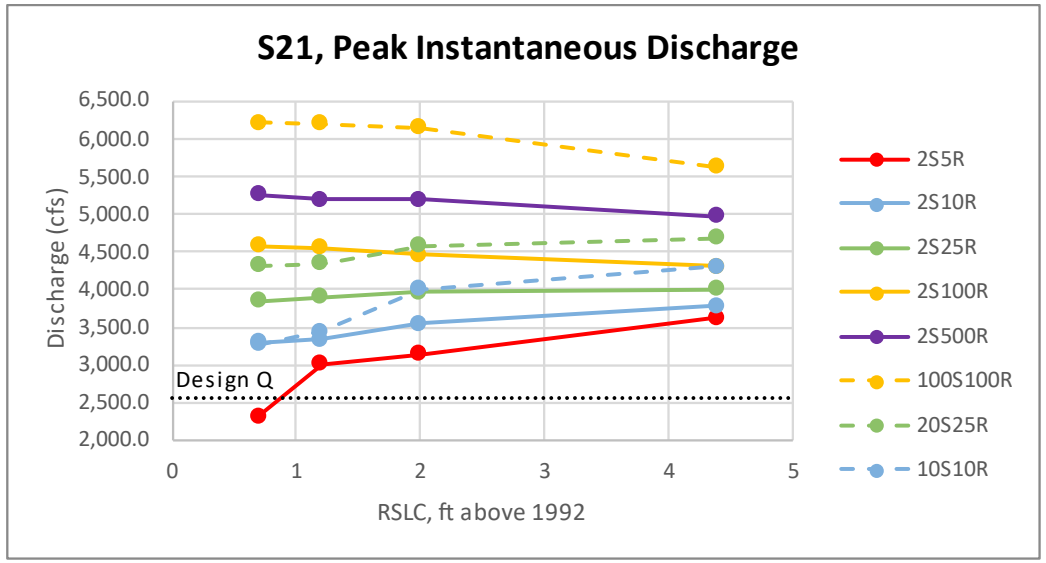
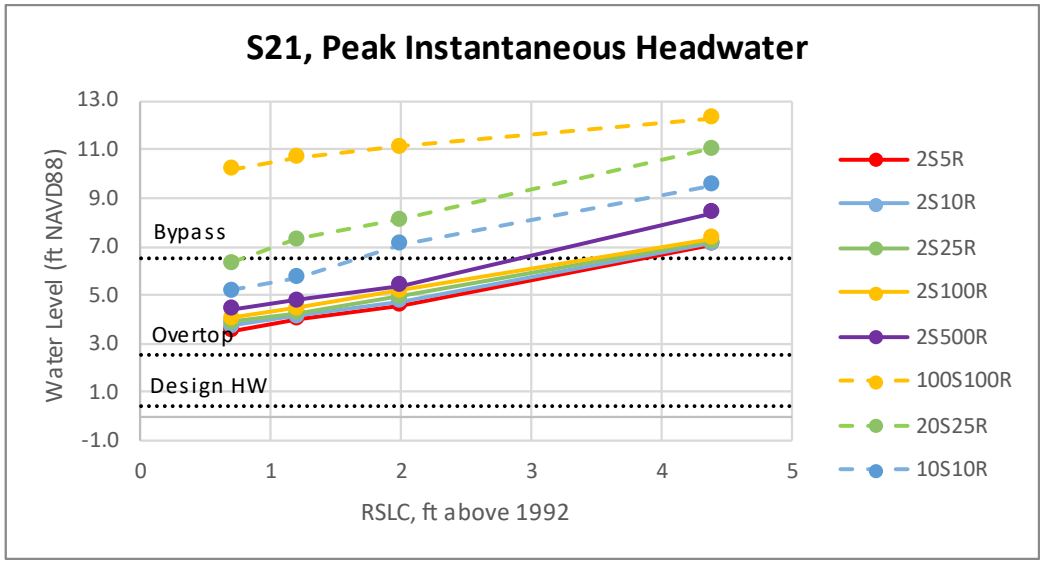


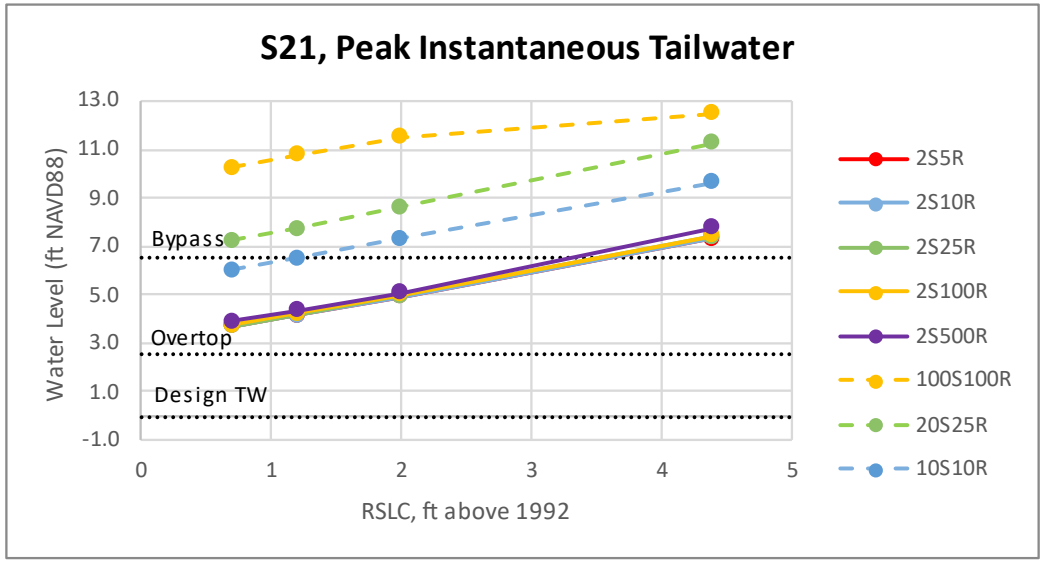
MAXIMUM STAGE PROFILE PLOT – C1W CANAL



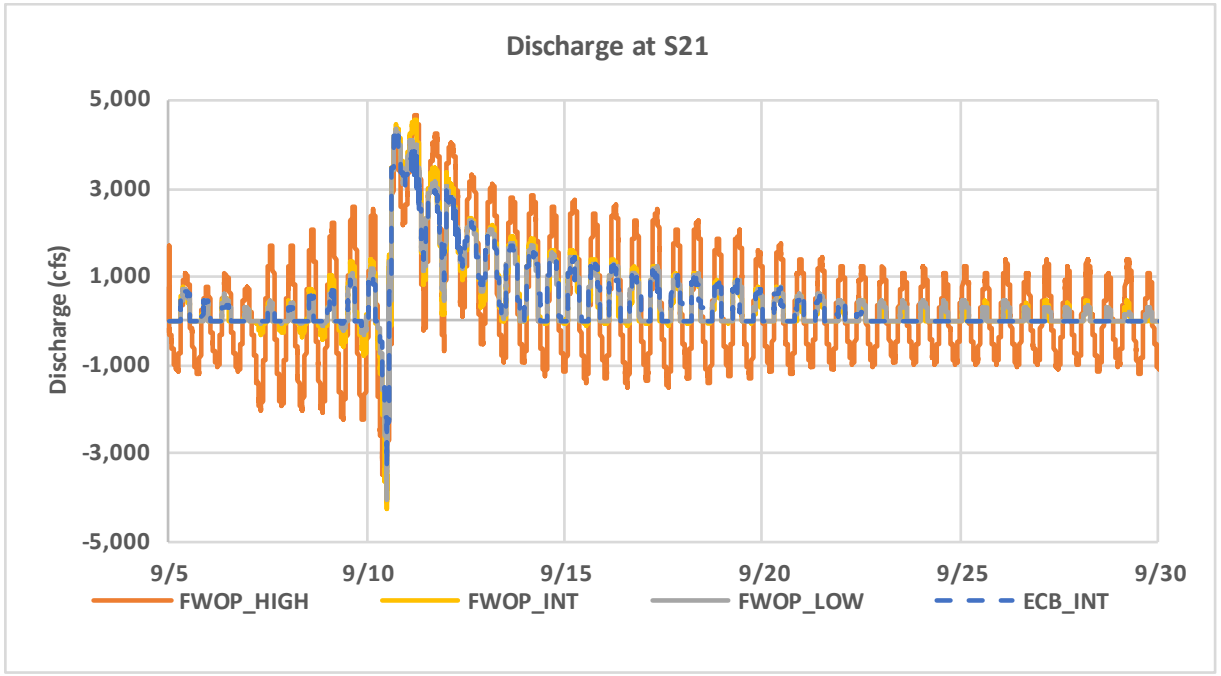
STRUCTURE PERFORMANCE, S21

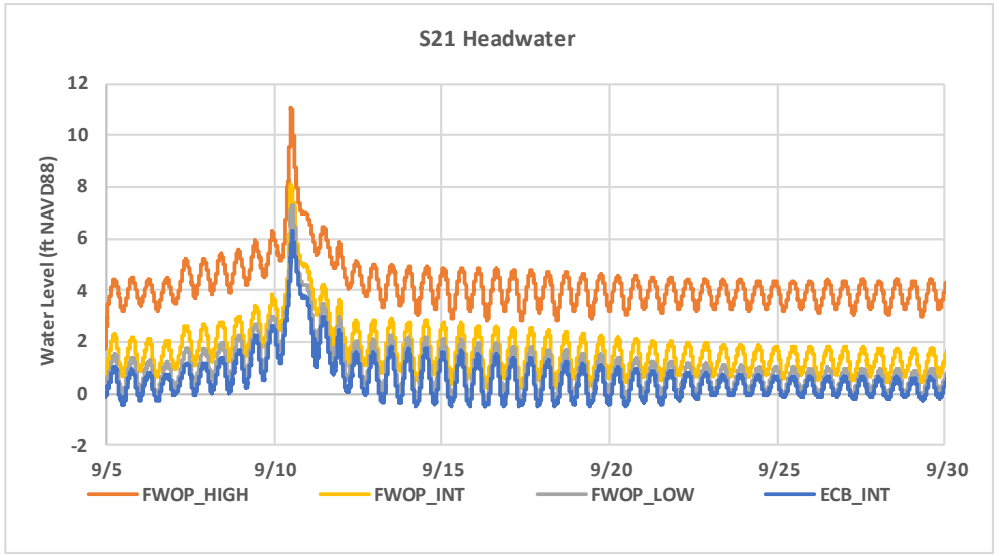


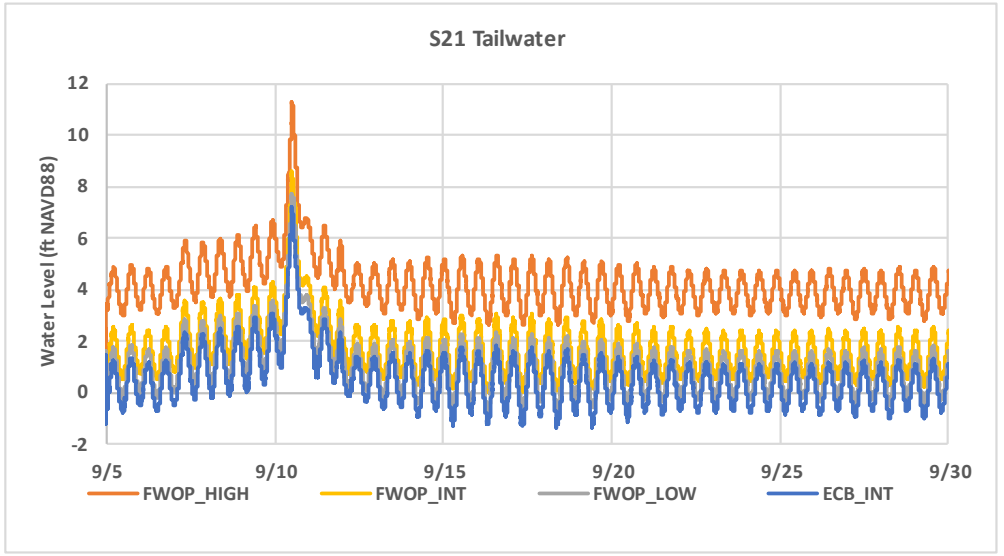




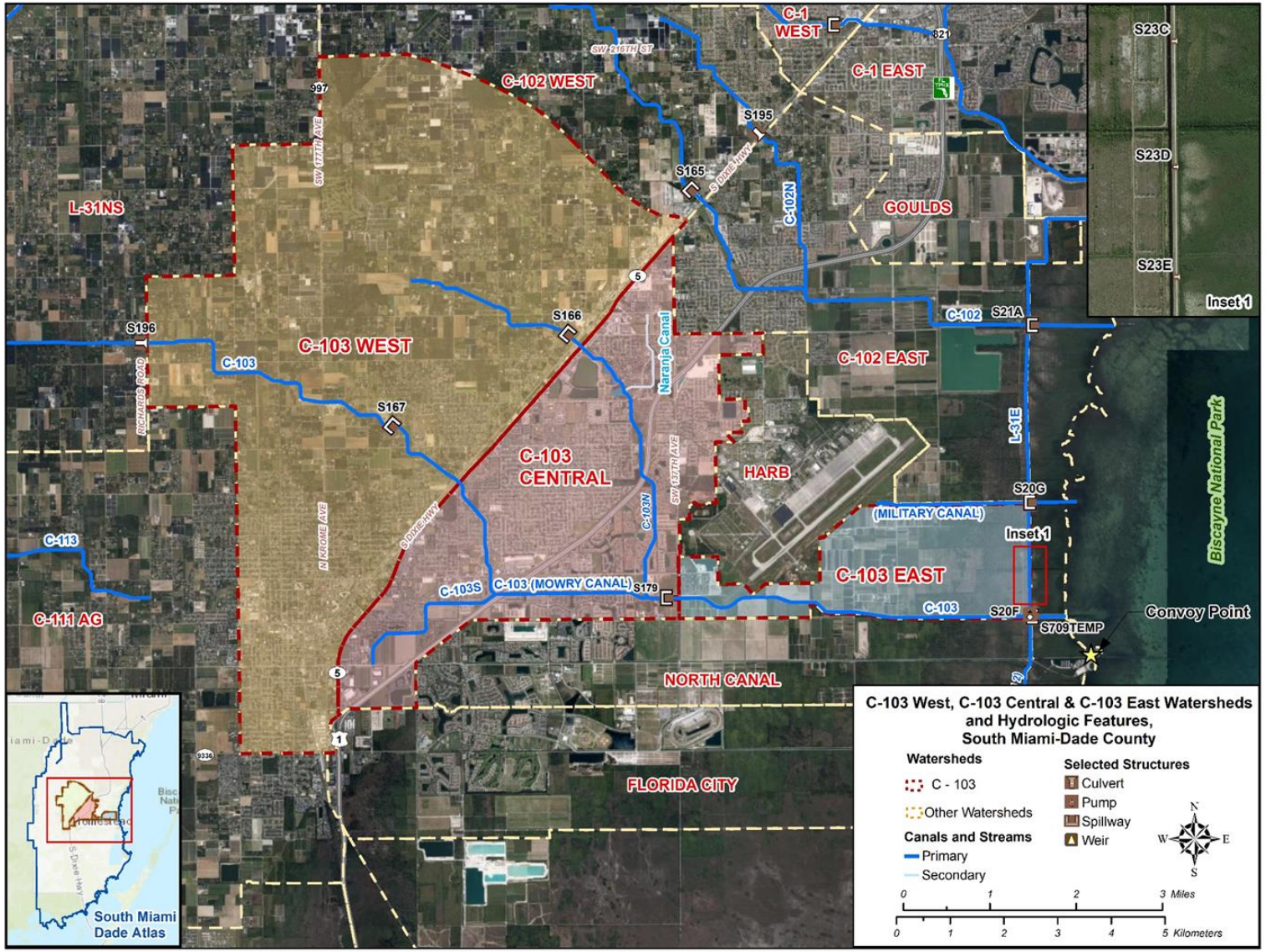
STRUCTURE PERFORMANCE, S21 – 20S25R



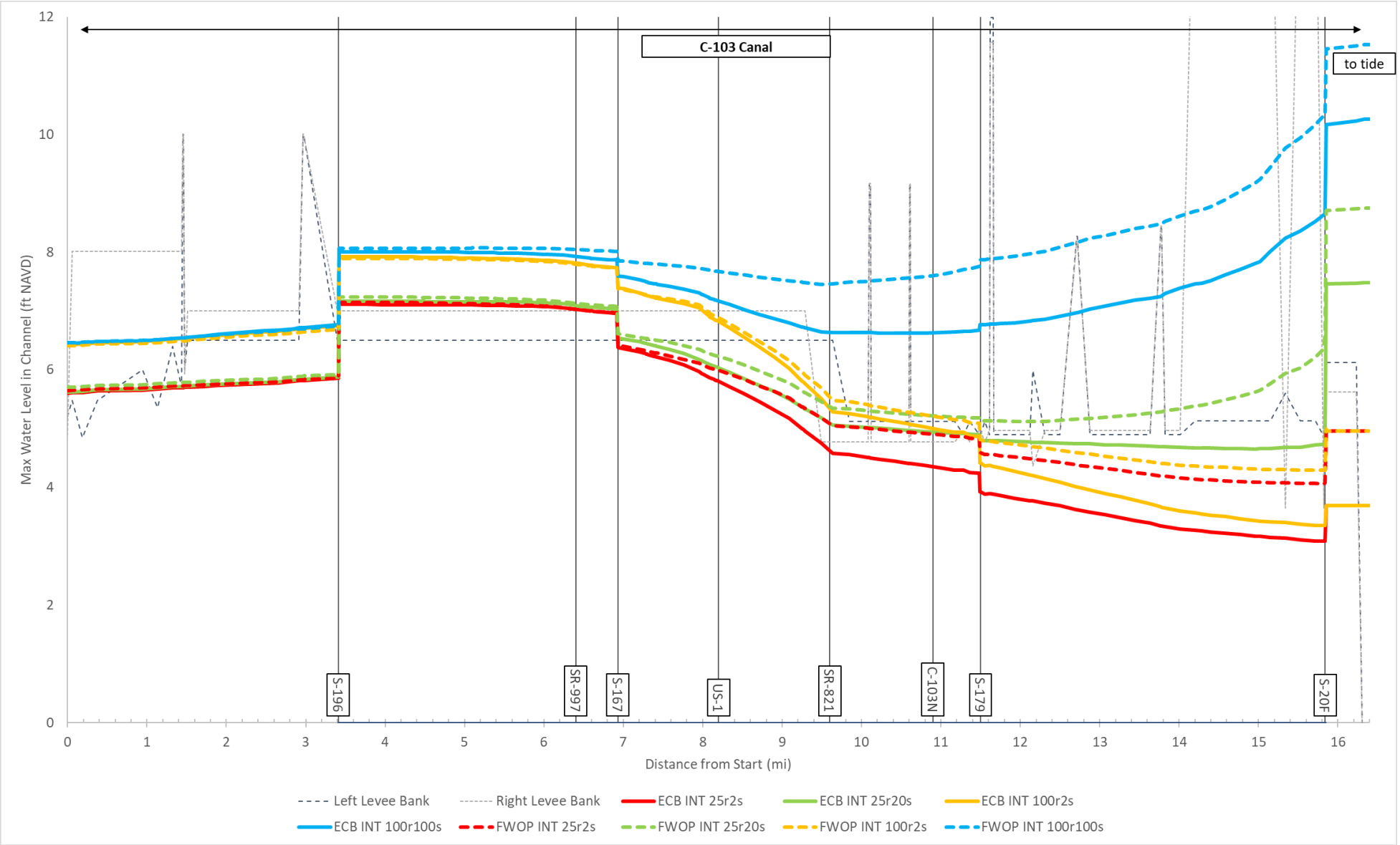




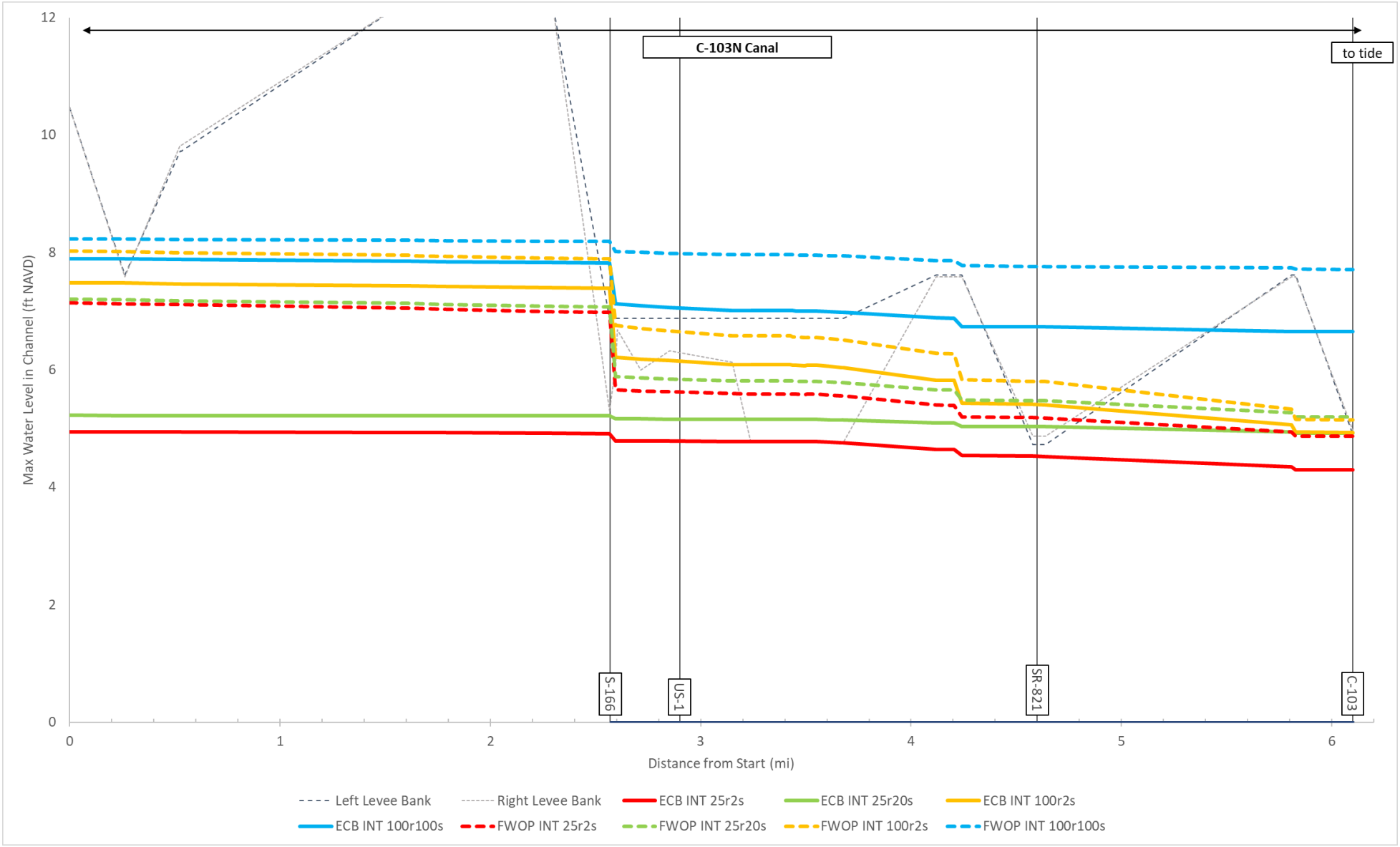
C103 CANAL/ S-20F



MAXIMUM STAGE PROFILE PLOT – C103 CANAL



MAXIMUM STAGE PROFILE PLOT – C103N CANAL



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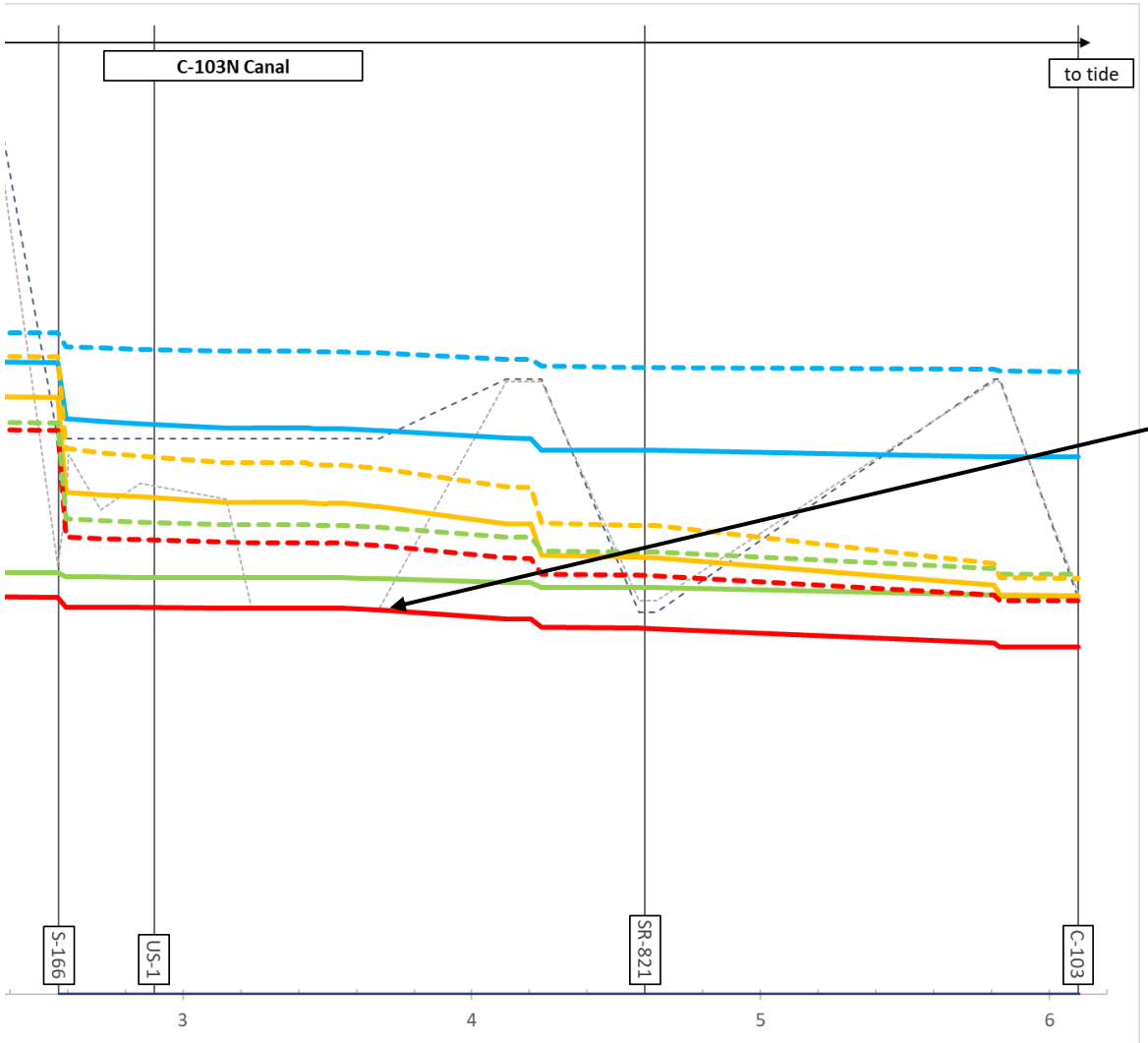
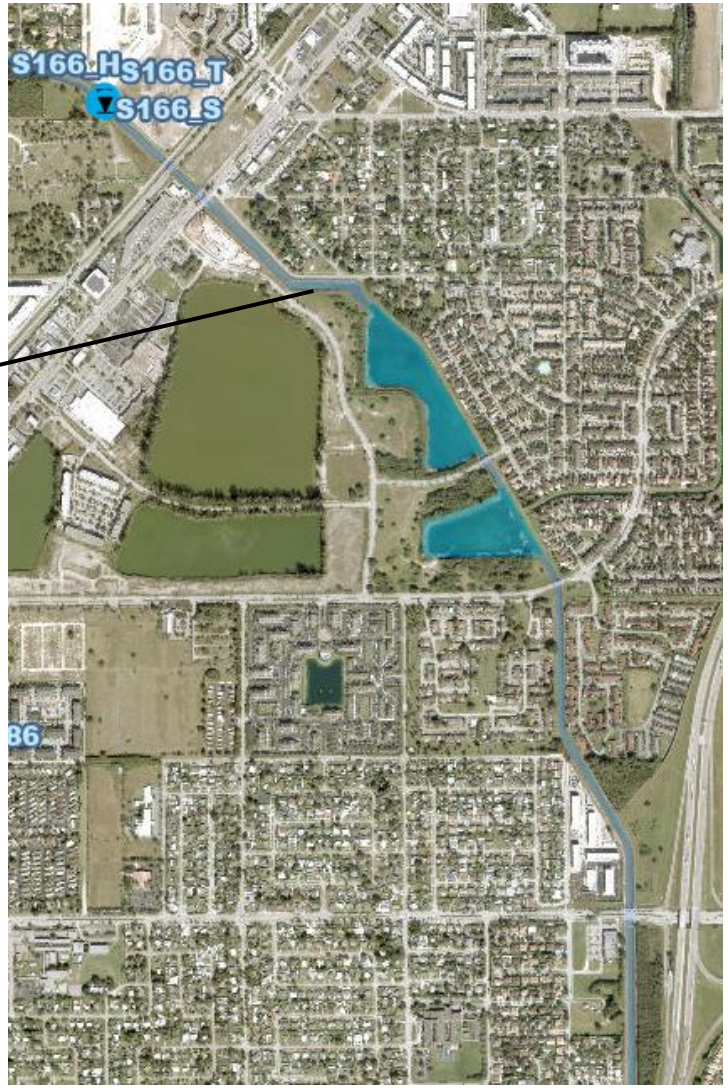
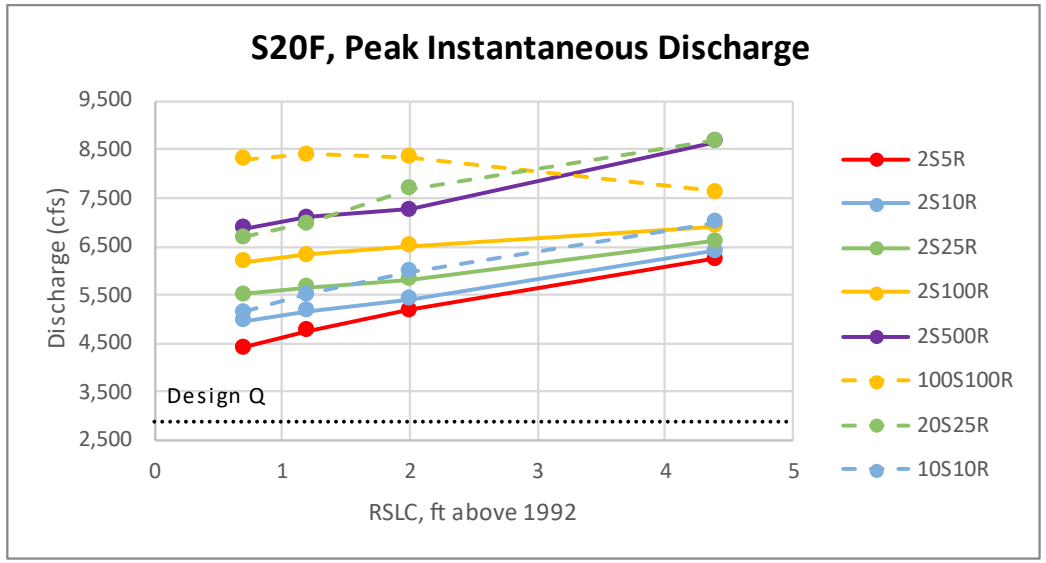
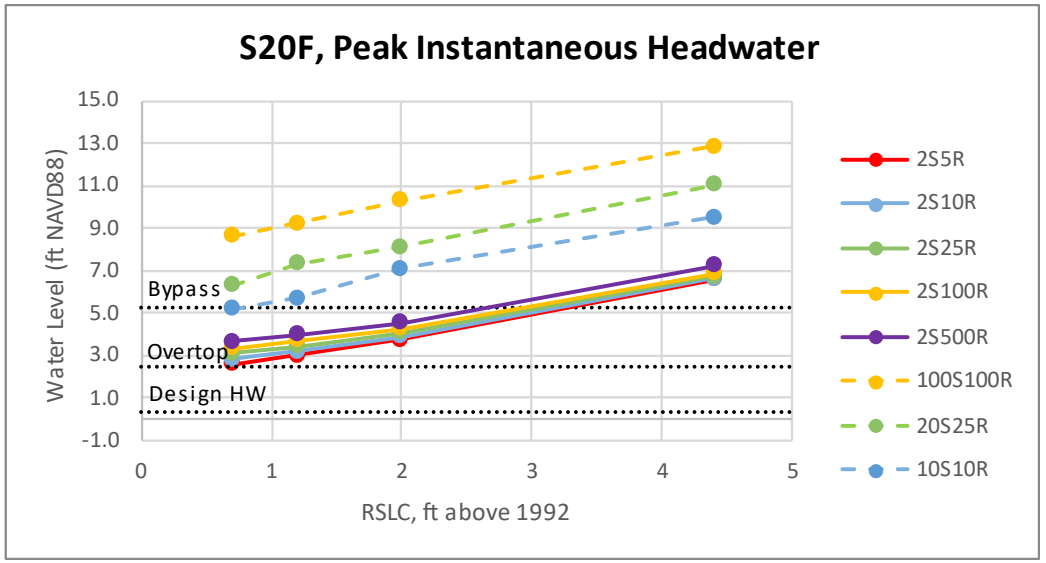
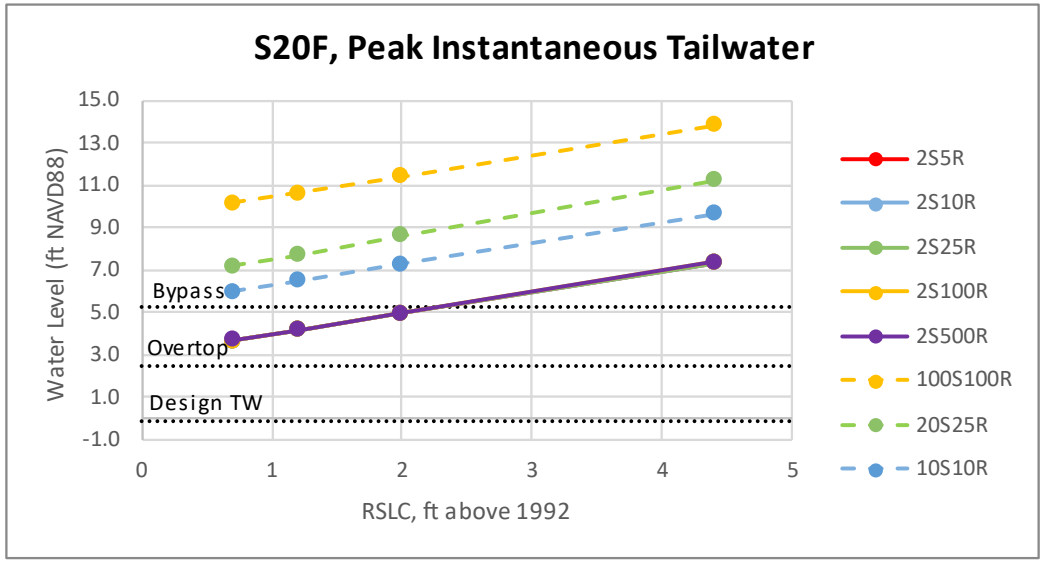




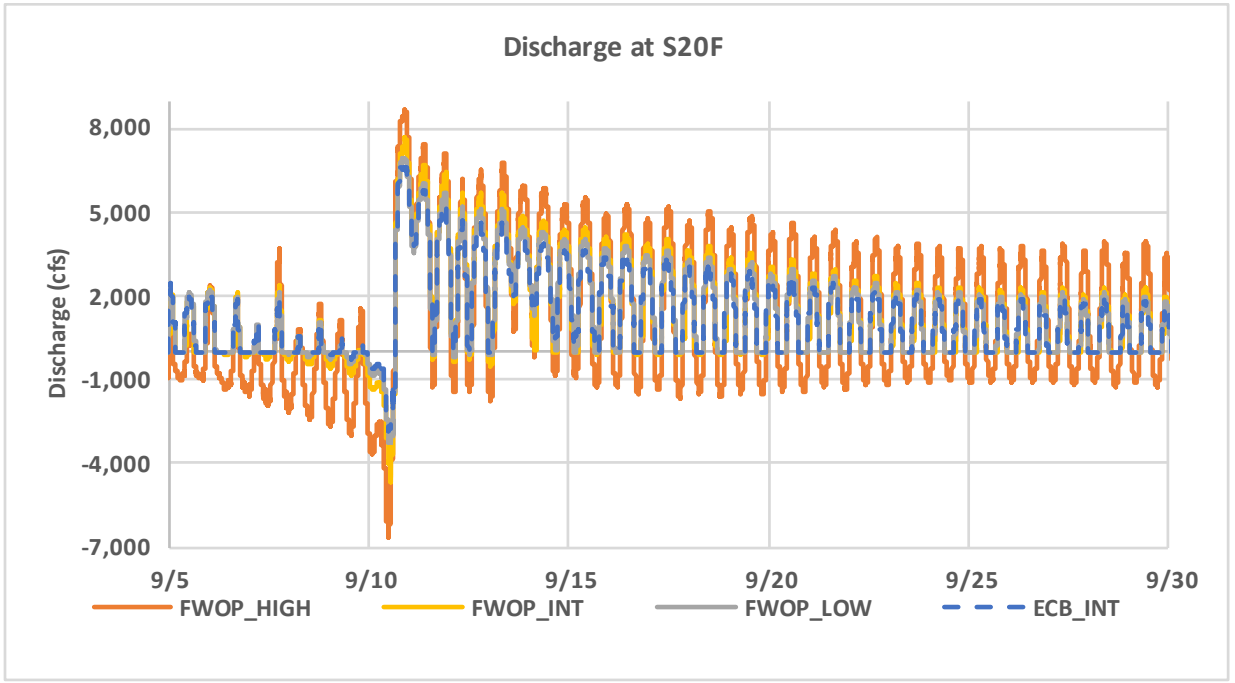
STRUCTURE PERFORMANCE, S20F

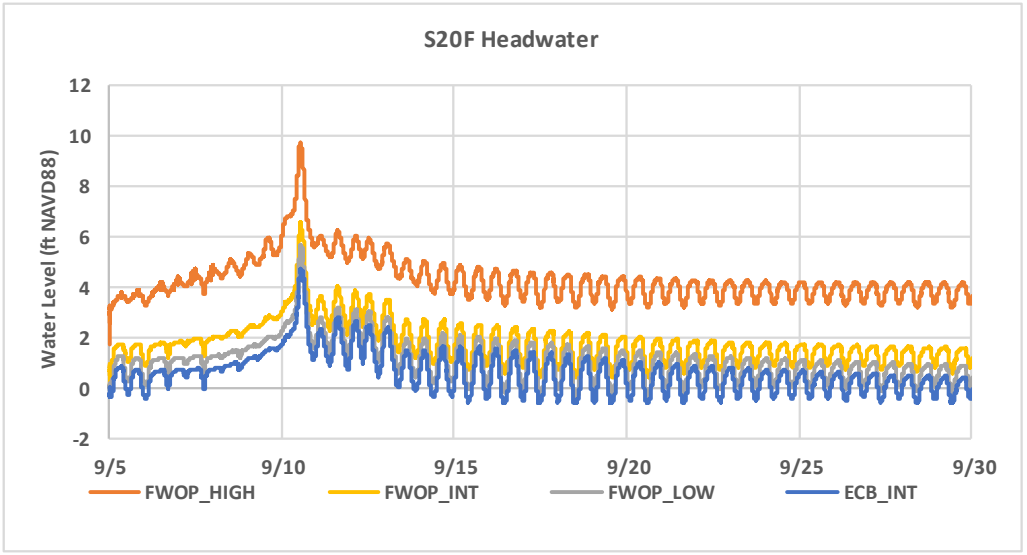


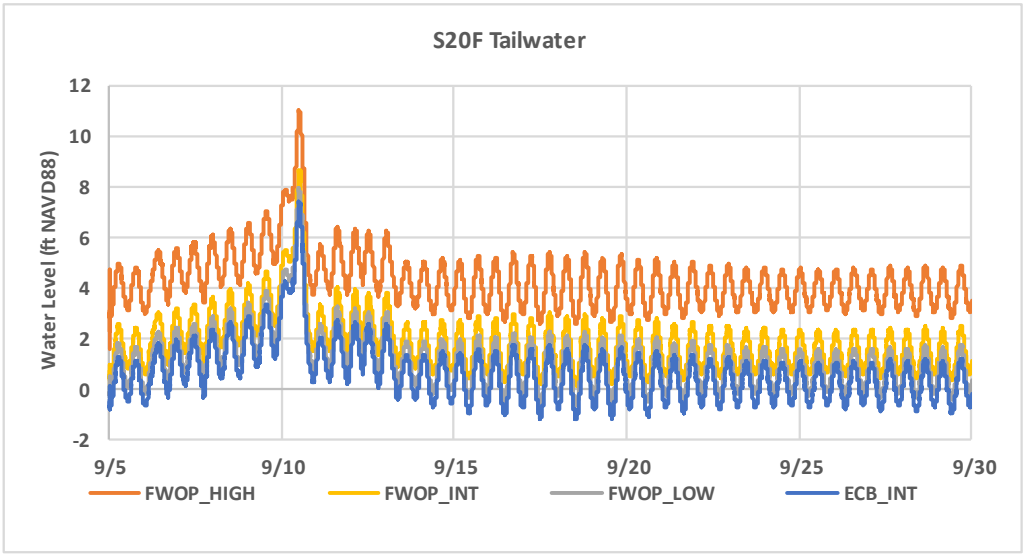




STRUCTURE PERFORMANCE, S20F – 20S25R

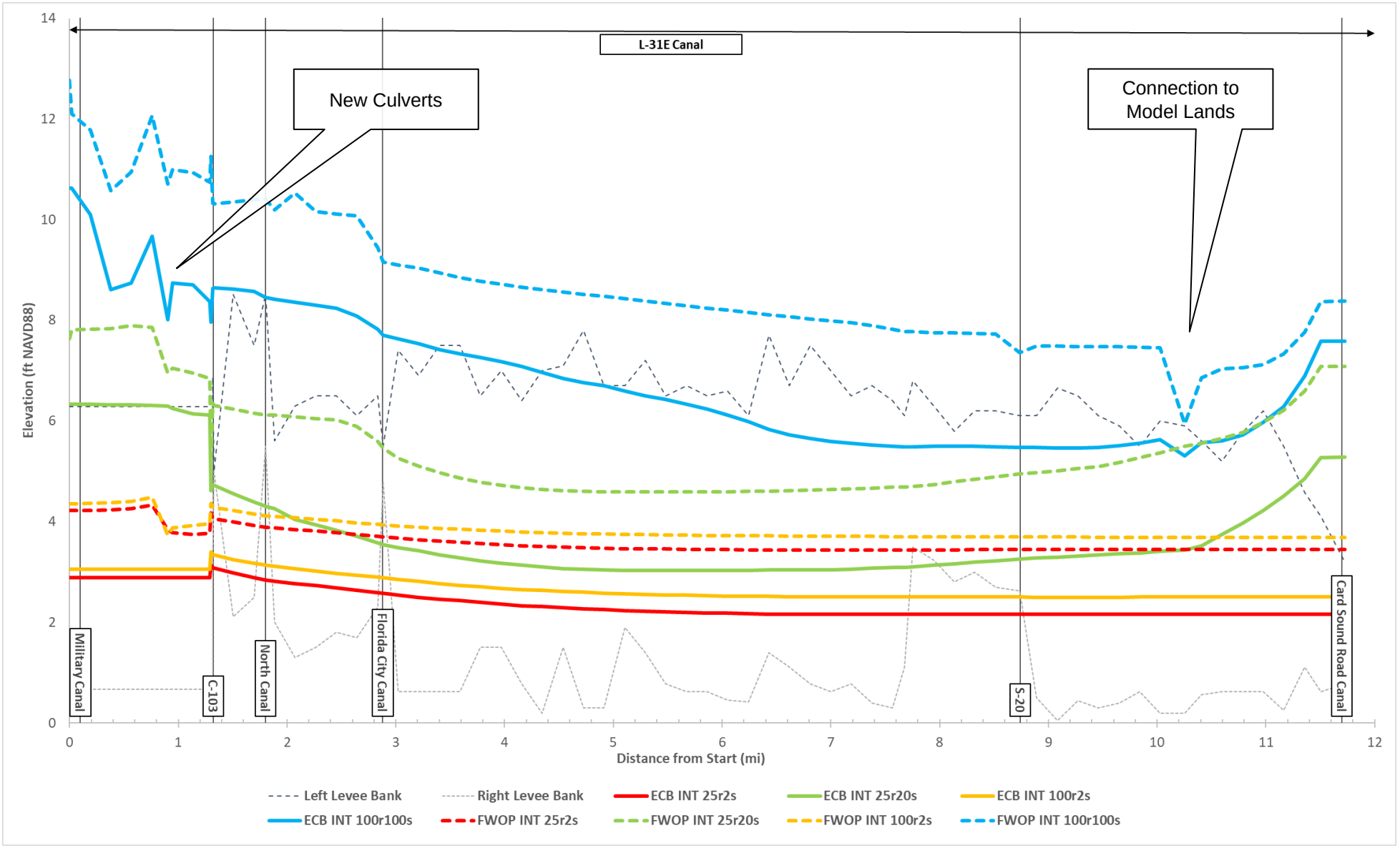




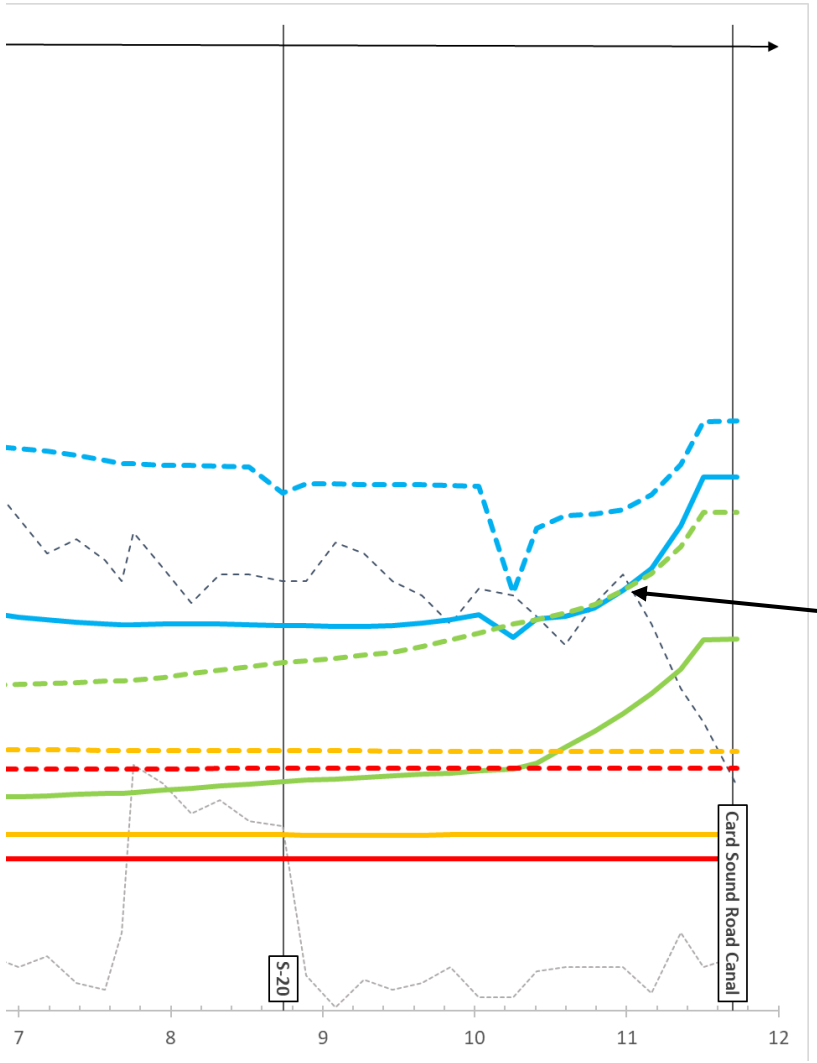


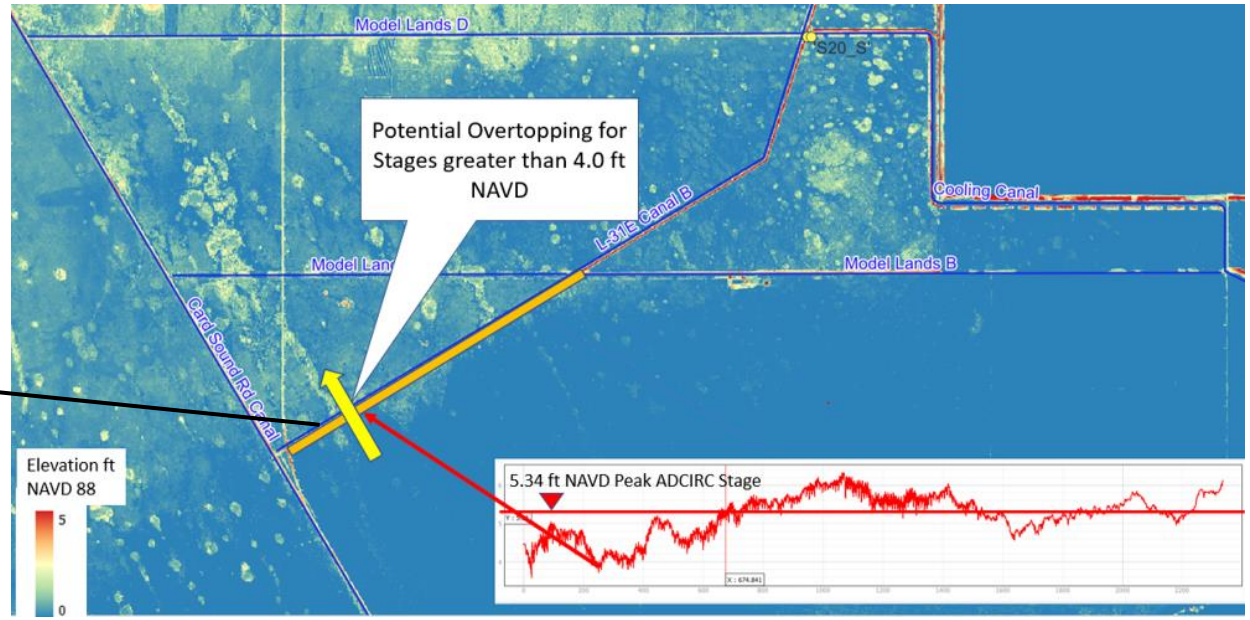
L31E CANAL/ S20

MAXIMUM STAGE PROFILE PLOT – L31E CANAL



MAXIMUM STAGE PROFILE PLOT – L31E CANAL





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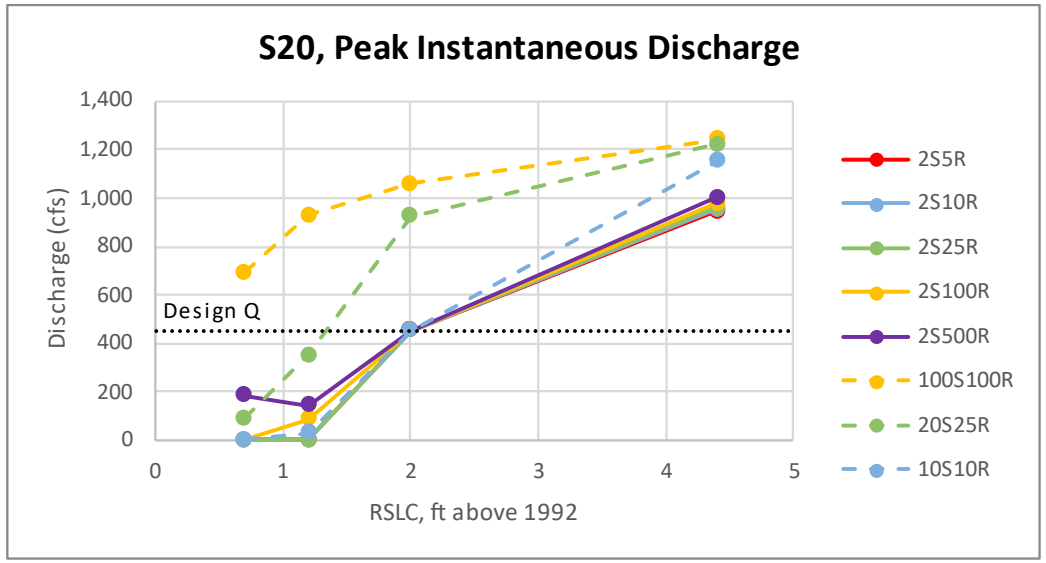
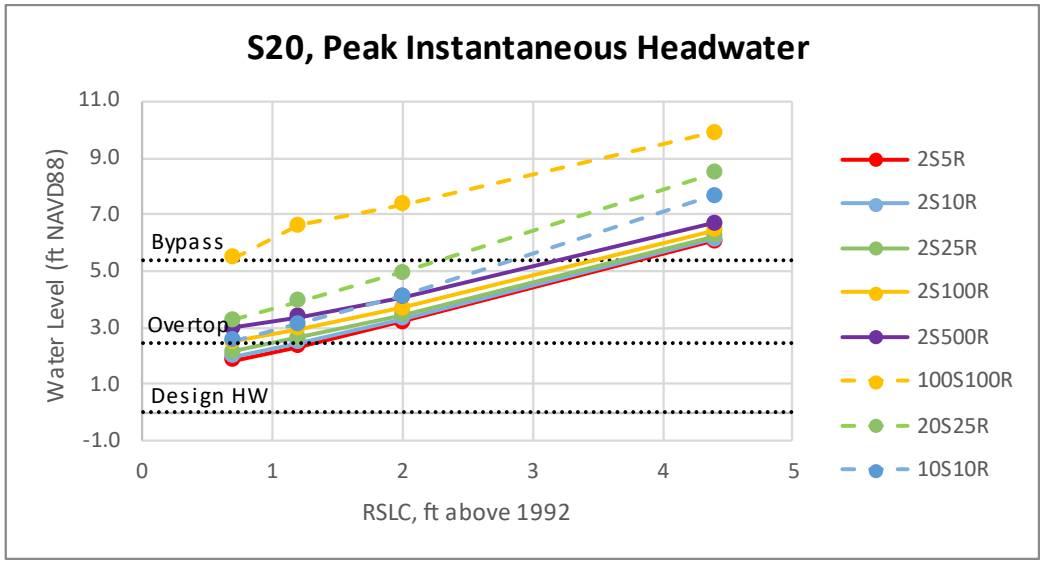
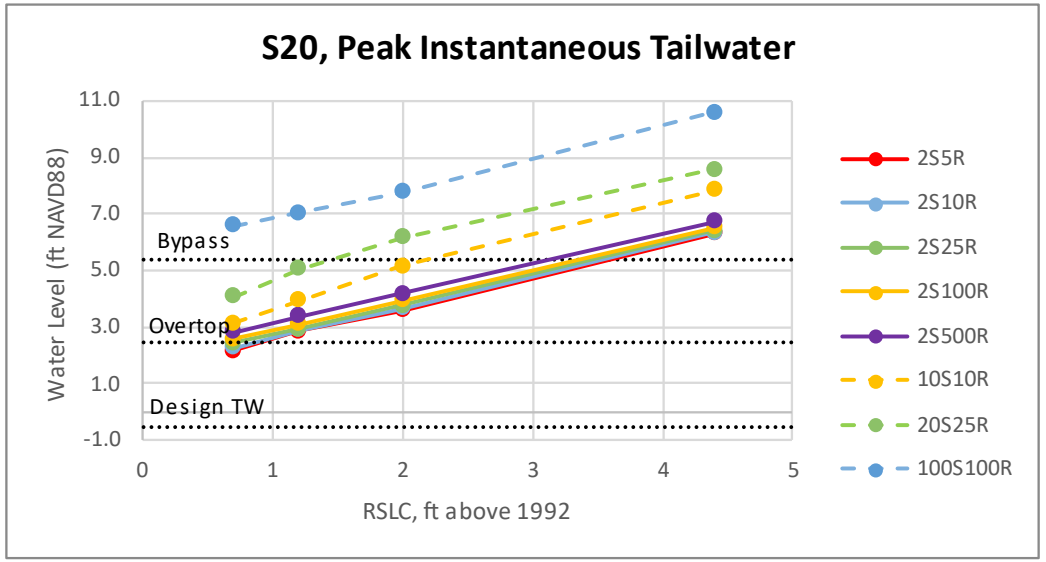
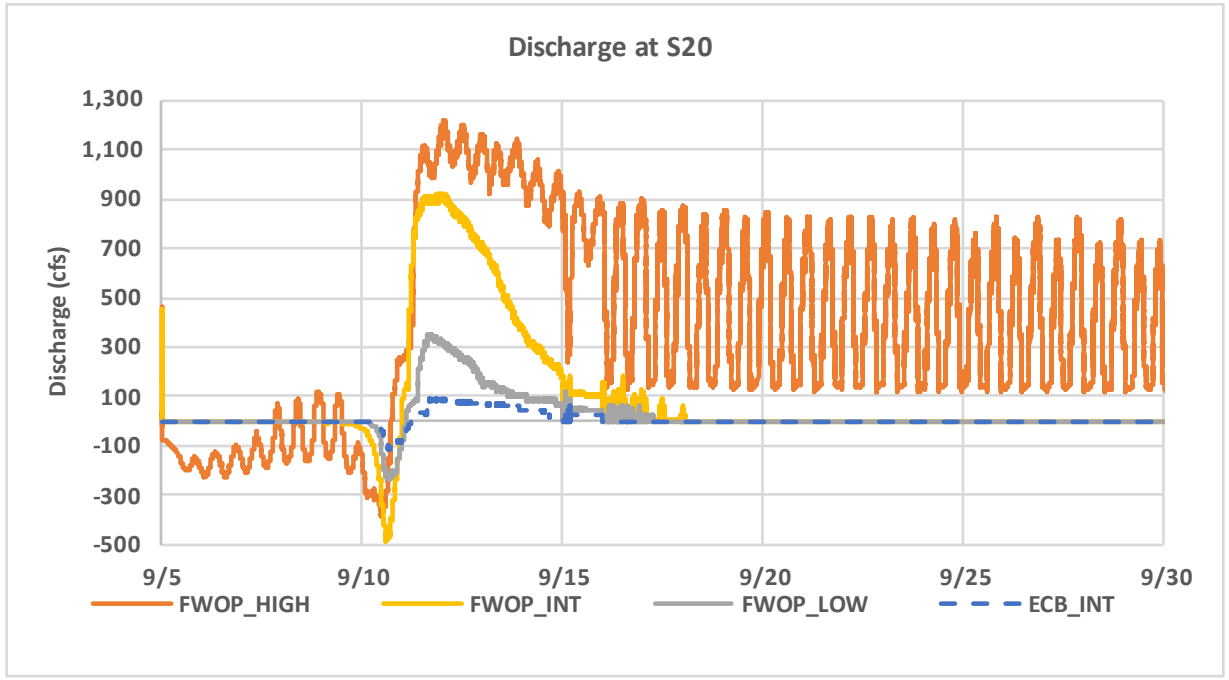
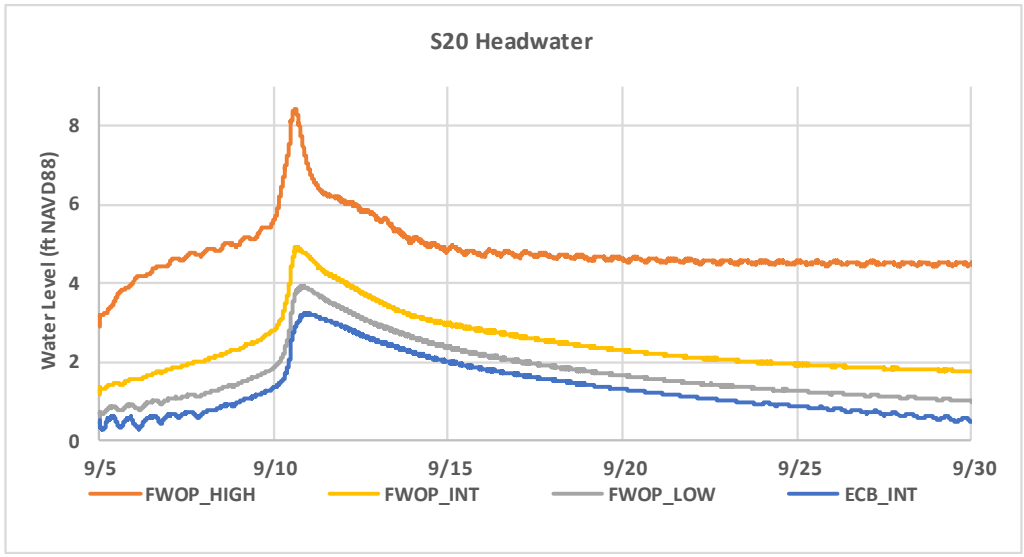


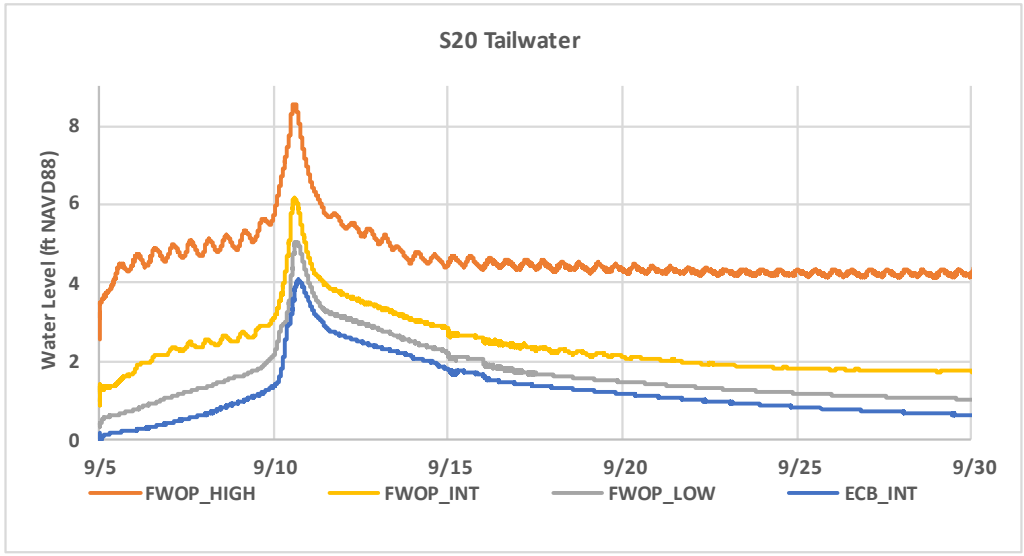




STRUCTURE PERFORMANCE, S20 – 20S25R







REACH D - Q&A

- Please **use the Q&A function** to submit questions OR **use the 'raise hand' function** at the bottom of your screen and we call on you to unmute.

- You are welcome to **submit follow up questions and additional comments** after the webinar via email to CSFFRSComments@usace.army.mil.

- Please take a moment to complete the **H&H Model Output Survey** at the provided link: https://forms.office.com/g/gkvZBCnCP3

10. PUBLIC COMMENTS

11. OVERVIEW AND NEXT STEPS

Presenter: Tim Gysan, Senior Resilience Project Manager, USACE

OVERVIEW AND NEXT STEPS

COMMENTS TO BE RECEIVED BY EMAIL AT CSFFRSCOMMENTS@USACE.ARMY.MIL

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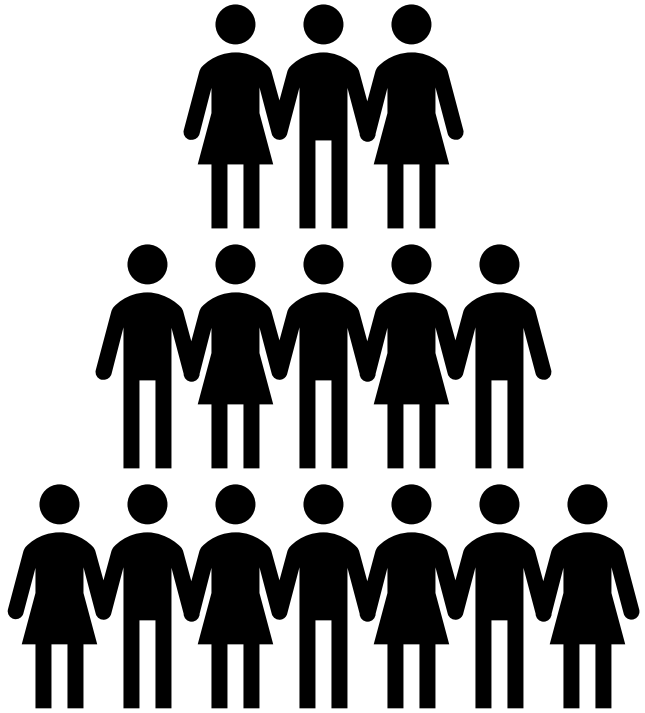

COLLABORATION!

OVERVIEW AND NEXT STEPS

- Please take a moment to complete the **H&H Model Output Survey** at the provided link: https://forms.office.com/g/gkvZBCnCP3

- **Additional questions and comments** can be sent to CSFFRSComments@usace.army.mil

12. ADJOURN