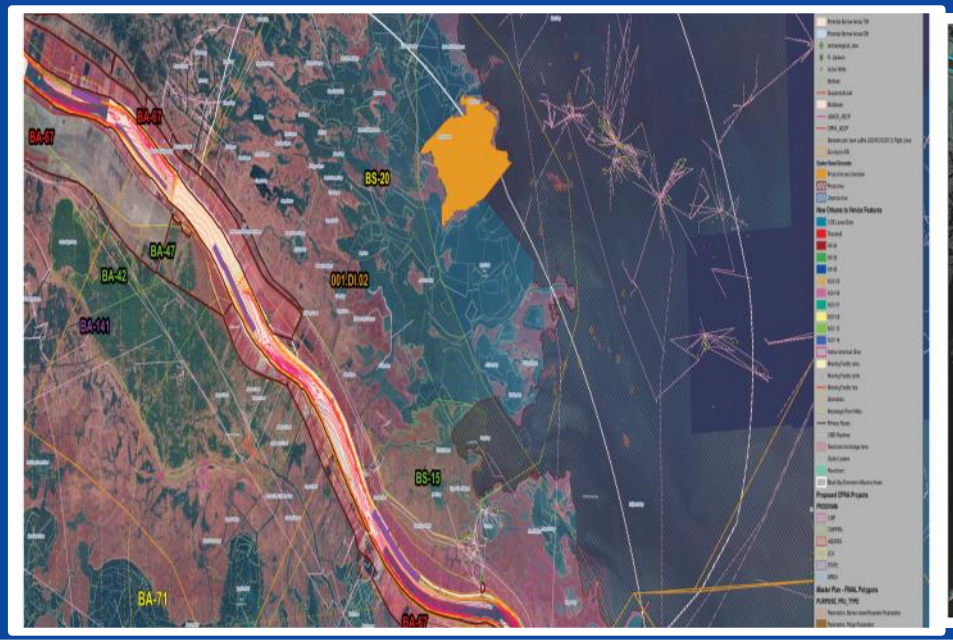


AECOM

COASTAL PROTECTION AND RESTORATION AUTHORITY
CPRA

EXPERT PANEL ON DIVERSION PLANNING AND IMPLEMENTATION

Lower Breton Sound Sediment Diversion

Conceptual Engineering Design Presentation

February 12, 2015

Topics

I. Introduction

II. Geotechnical Study

III. Hydraulic Study

  I. Armoring

  II. Modeling

  III. Outfall

IV. Major Project Features at Port Sulphur

V. Path Forward

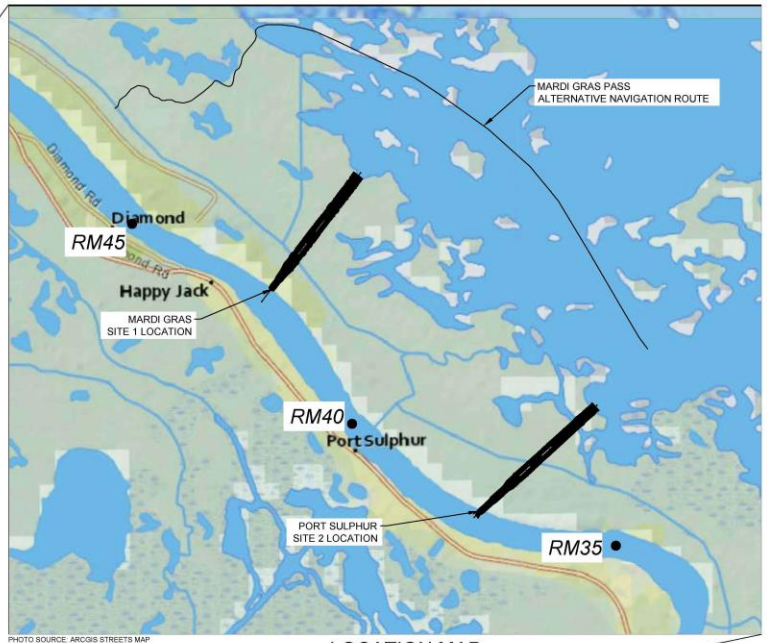
Introduction

- The purpose of the project is to construct a sediment diversion to transport sediment from the Mississippi River into the lower Breton Sound Basin in order to build, sustain, and maintain wetlands
- AECOM was selected to develop a conceptual level engineering design and order of magnitude life cycle cost comparisons as part of the screening criteria.
- The work conducted by AECOM for the December Decision has been to more thoroughly evaluate the two remaining alternatives by investigating design options that could significantly reduce the potential project costs, and refine the construction cost estimate.

Introduction - Final Proposed Sites

VICINITY MAP

SCALE: 1" = 20,000'



LOCATION MAP

SCALE: 1" = 5,000'

Introduction

Major Design Criteria

- Required Flow Capacity: **50,000 cfs** through the diversion structure for river flow of 1,000,000 cfs
- Top of Structures: El. **9.0'** based on El. 7.21' of record river flood stage
- 100-year hurricane storm surge inundation design elevations not considered
- River Intake: Invert El. **-40.0'**
- Gate Structure: Invert El**. -40.0'**
- Tainter Gates: **2 ea. at 60' wide**
- Discharge Elevation at Invert El. **-20.0'**

Geotechnical Study

- Limited existing geotechnical information
- Tasked to collect information for final two sites
- Coastal Use Permit received January 2015
- Oyster lease survey required and is pending
- Used Conservative Assumptions for side slopes, pile capacity and settlement

Hydraulic Study

Hydraulic Study

- Hydraulic Design determined the configuration of the system.
- The goal of the hydraulic study was to modify the conceptual design for a conveyance channel to increase efficiency and reduce the estimated cost of construction
- Developed approximately 15 channel sequences
- Utilized 5 of the scenarios developed to do a complete HEC RAS analysis of each of the channel's performances
- Developed the channel configuration as presented
- Two additional scenarios were run to investigate the head loss from the river through the gates and headworks to develop the final conceptual design

Hydraulic Study

Armoring

- Required to reduce Manning's coefficient
- Comparison of three types of armoring
  - USCOE Revetment System
  - Large Rip Rap
  - Articulated Concrete Block Mats.
- Selected system for study was a rip rap bottom with ACB mat side slopes to model
- Construction cost estimate also included a total rip rap system

Hydraulic Study - Design Basis Consideration

Model

- One Dimensional HEC-RAS program
- Channel with a general cross sectional area between 5,000 to 6,000 square feet
- Channel Roughness Coefficient – Manning's n=0.025 for ACB Mats on side slopes and Sand Filled Rip Rap for the channel bottom
- Flow Forcing Conditions
  - 1 million CFS in the Mississippi gives a water stage of +5.4' NAVD88
  - Water surface at Lower Breton Sound ranges from +2.7 to + 1.2 NAVD88
- Channel Exit Condition
  - Utilized a still water exit condition ranging from -35 to -20 NAVD88 as a still water exit "pool"

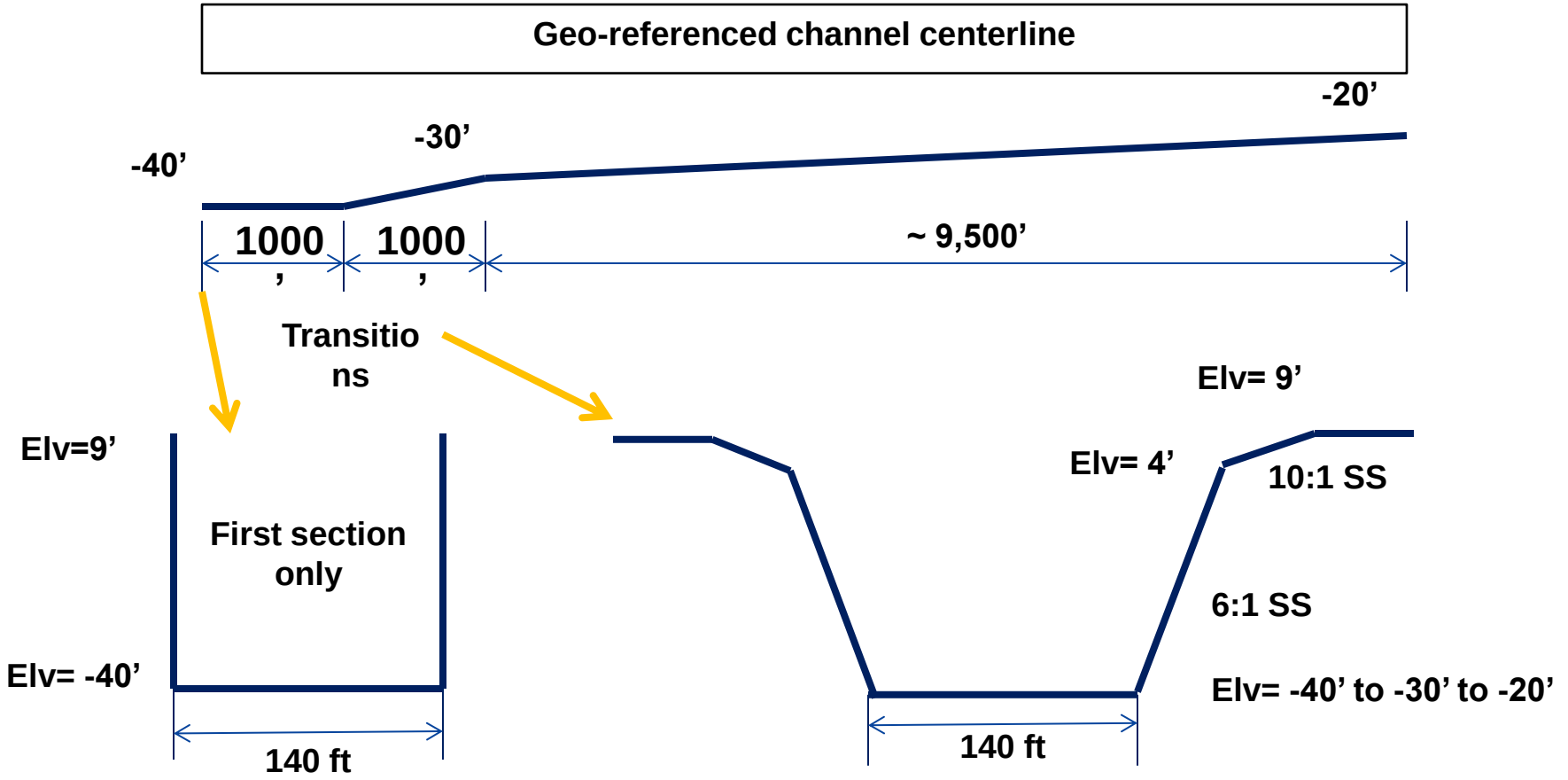
Hydraulic Study

Port Sulphur: Scenario 5a,b

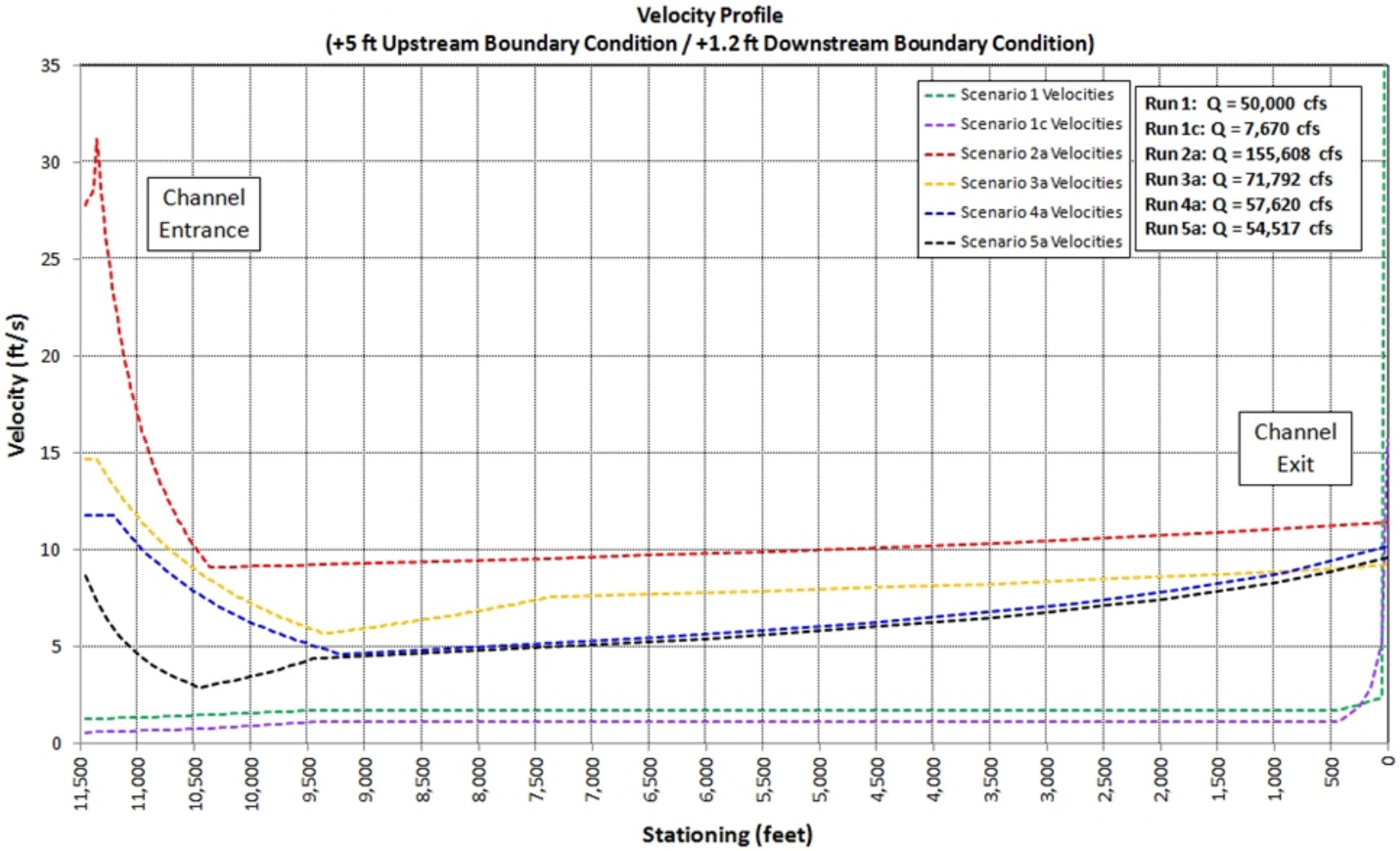
(All elevations in ft, NAVD88)
"n" value = 0.025, ABM

u/s BC
Z=+5 &3.4 ft, NAVD88

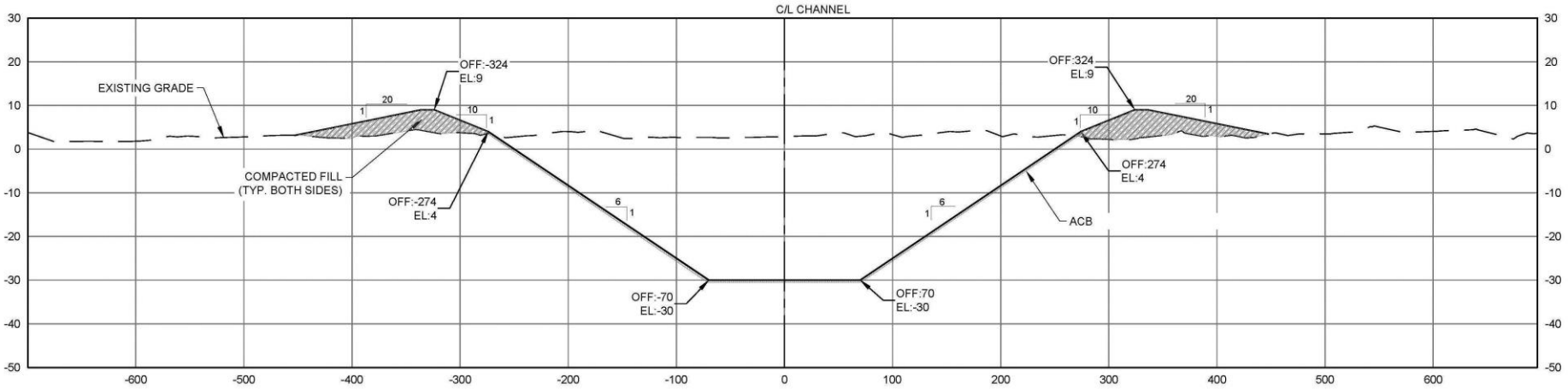
d/s BC
Z=+1.2 & +1.9 ft, NAVD88



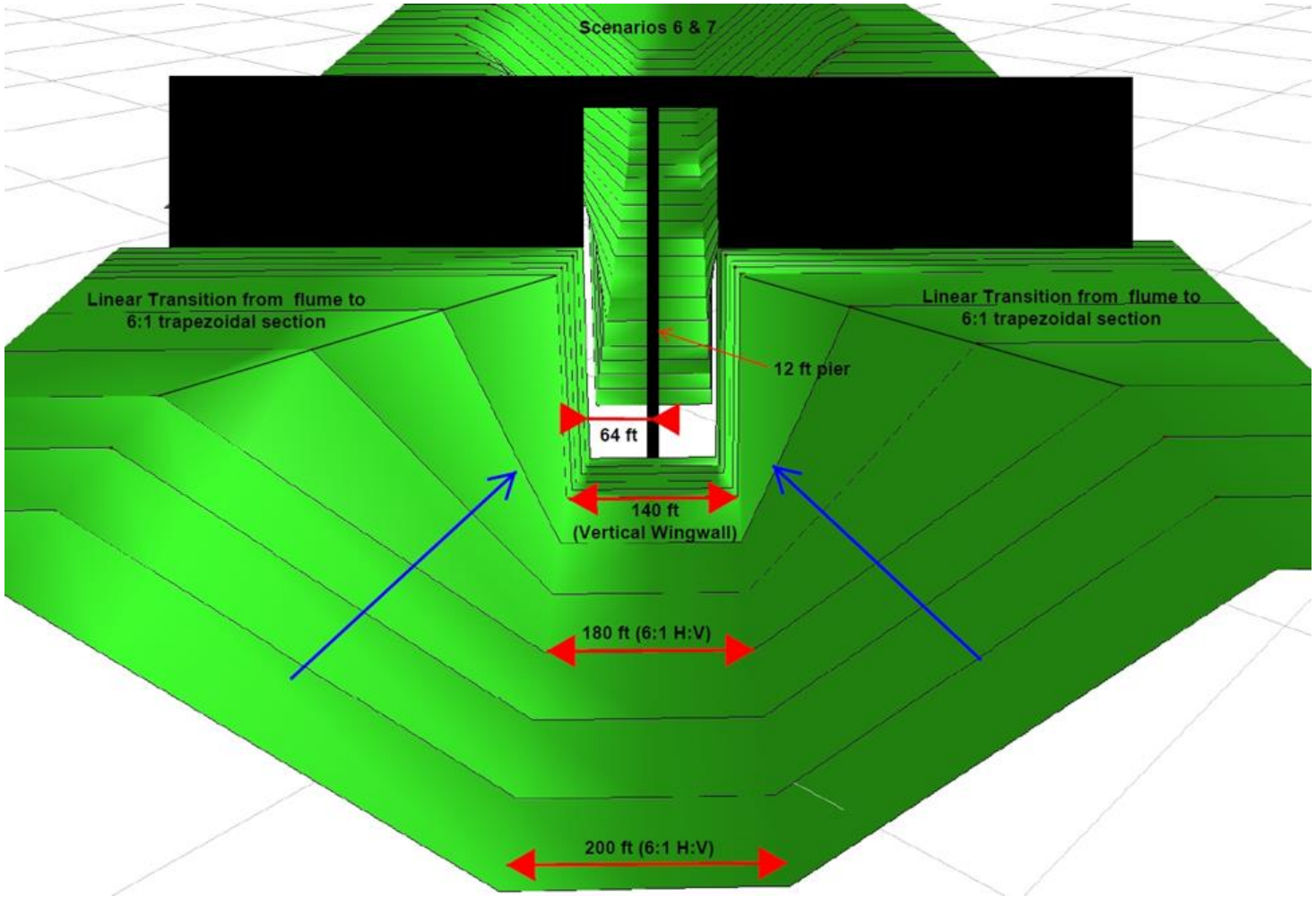
Hydraulic Study - HEC-RAS Results: Port Sulphur 5 Scenarios



Hydraulic Study: Conveyance Channel



Hydraulic Study: Gate Structure with Channel



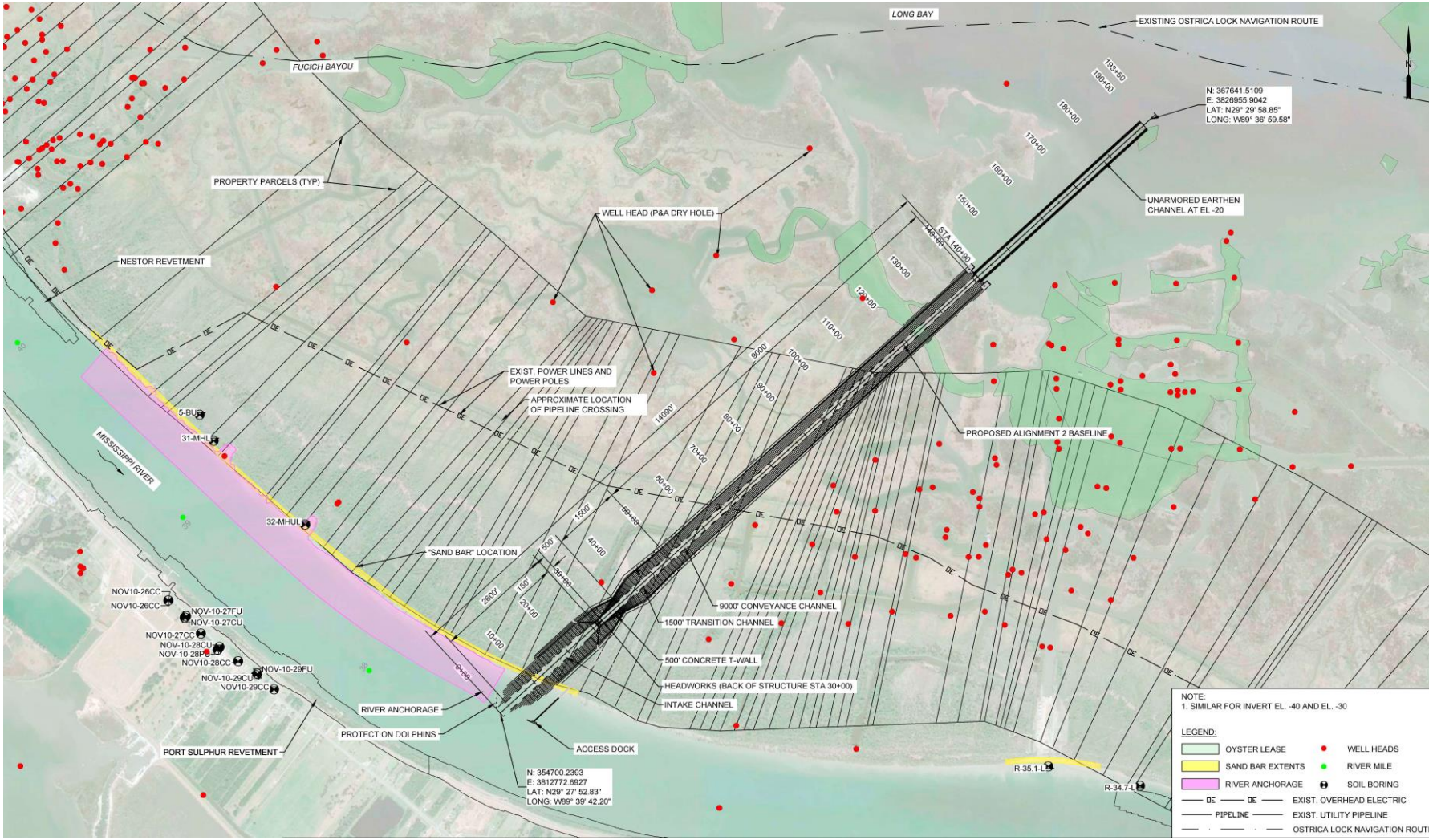
Hydraulic Study - Design Basis Consideration

Outfall

- Revised to utilize the energy of the exiting water to push sediment further out into the marsh
- Consists of dredging the bay an additional 5,000 lf to an elevation of -20.0 NAVD88 (same as end of armored channel)
- One-time construction cost to allow the flows to enter the bay unimpeded to begin the deltaic land building process earlier
- Reduces the amount of sediment accumulation in the conveyance channel
- Should be validated by 3D land building model

Major Project Features

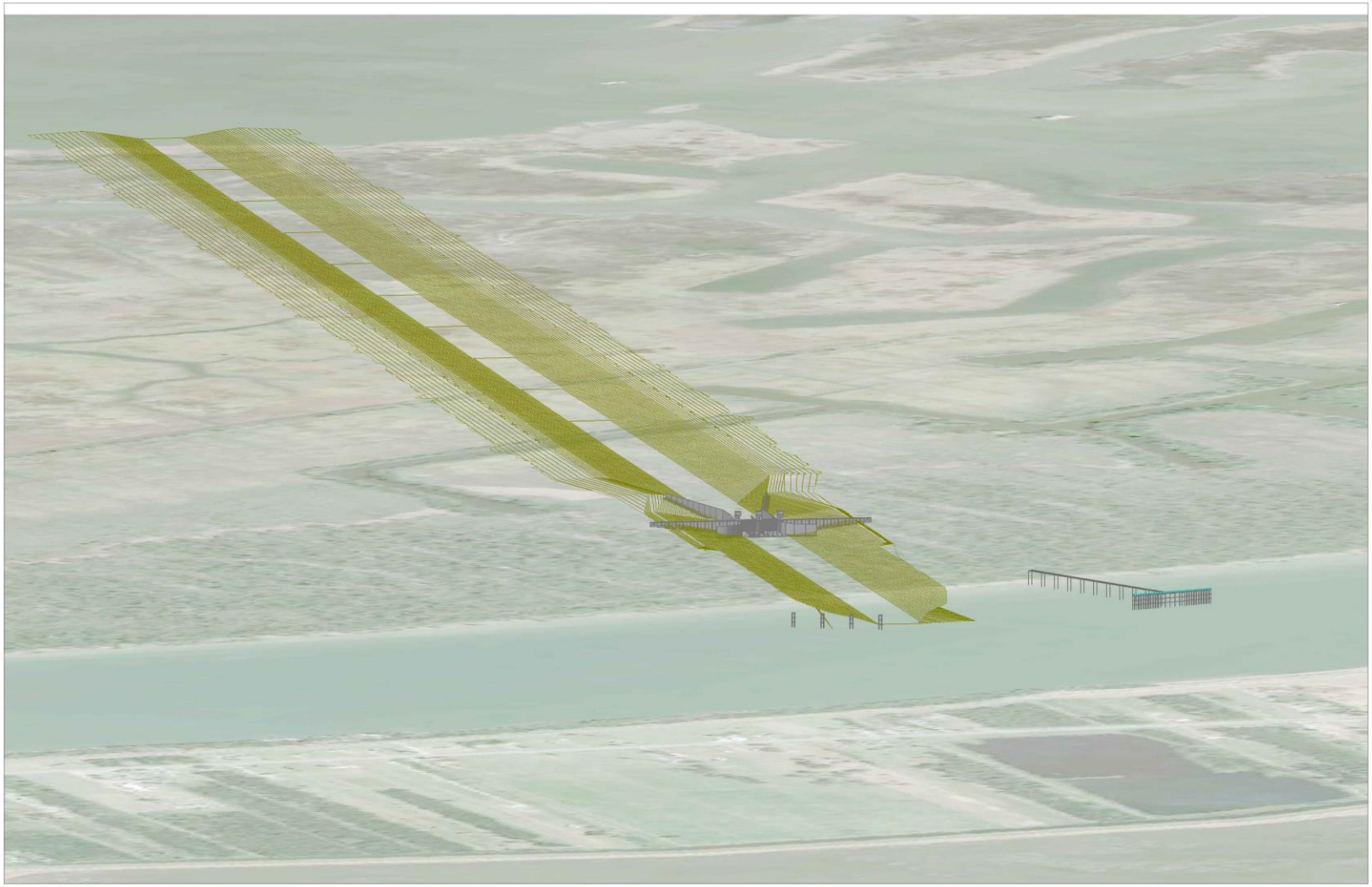
MAJOR PROJECT FEATURES: PLAN VIEW



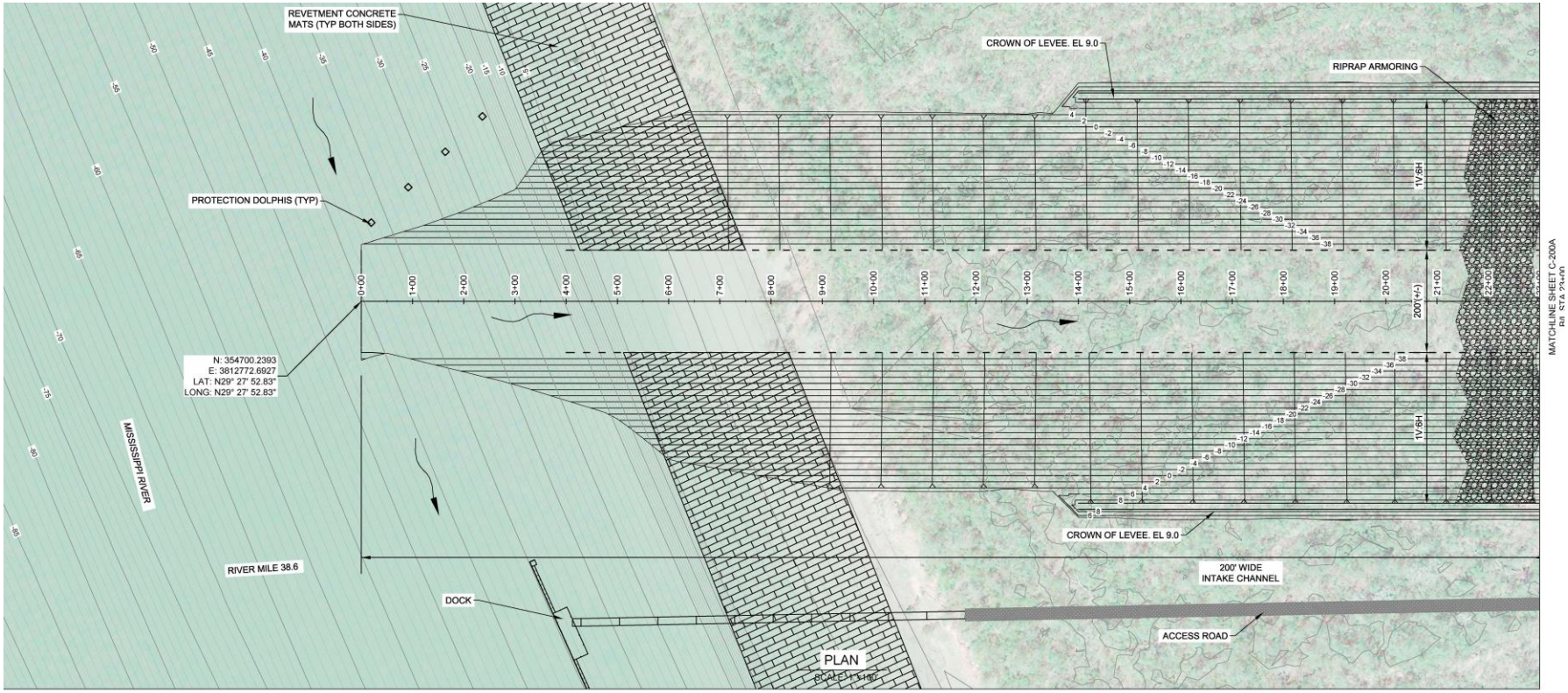
Major Project Features – Construction Methods

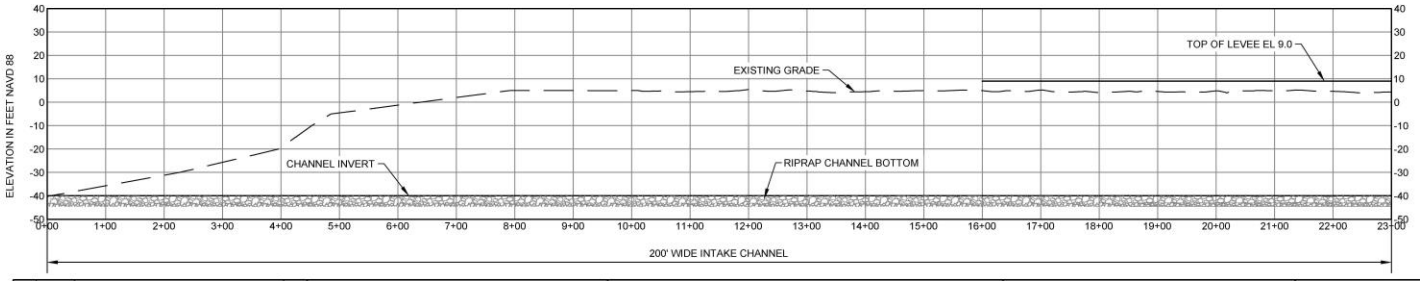
- INTAKE
  - In-the-wet construction
  - Concrete Revetment Mats
  - Rip Rap Armoring
  - Protection Dolphins
- HEADWORKS
  - In-the-dry construction
  - Pile-supported Monolithic Concrete Control Structure
  - Steel Tainter Gates & Drive System
  - Equipment Rooms
  - Tie-in/Wing Walls
  - Access Bridge
- DISCHARGE TRANSITION SEGMENT
  - In-the-dry construction
  - Lined with timber pile-supported concrete
  - Flaring T-walls used to create variable x-section geometry
- CONVEYANCE CHANNEL
  - In-the-wet construction (channel)
  - Trapezoidal cross-section
  - Armored with riprap and ACB Mats
  - Guide levees (in-the-dry)
- OUTFALL
  - In-the-wet construction
  - Toe sheets
  - Wing walls

MAJOR PROJECT FEATURES: ISOMETRIC VIEW



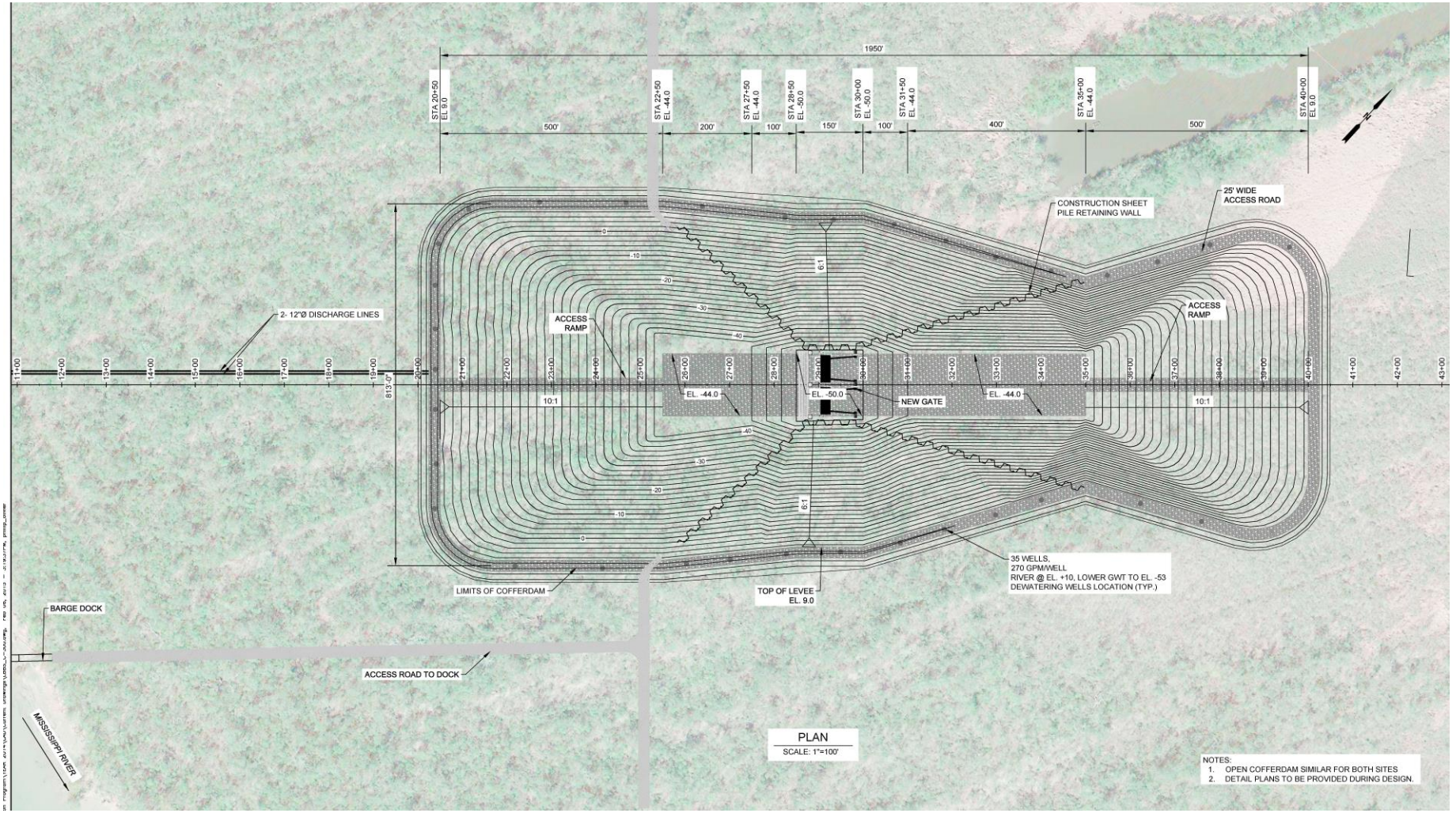
MAJOR PROJECT FEATURES: INTAKE CHANNEL



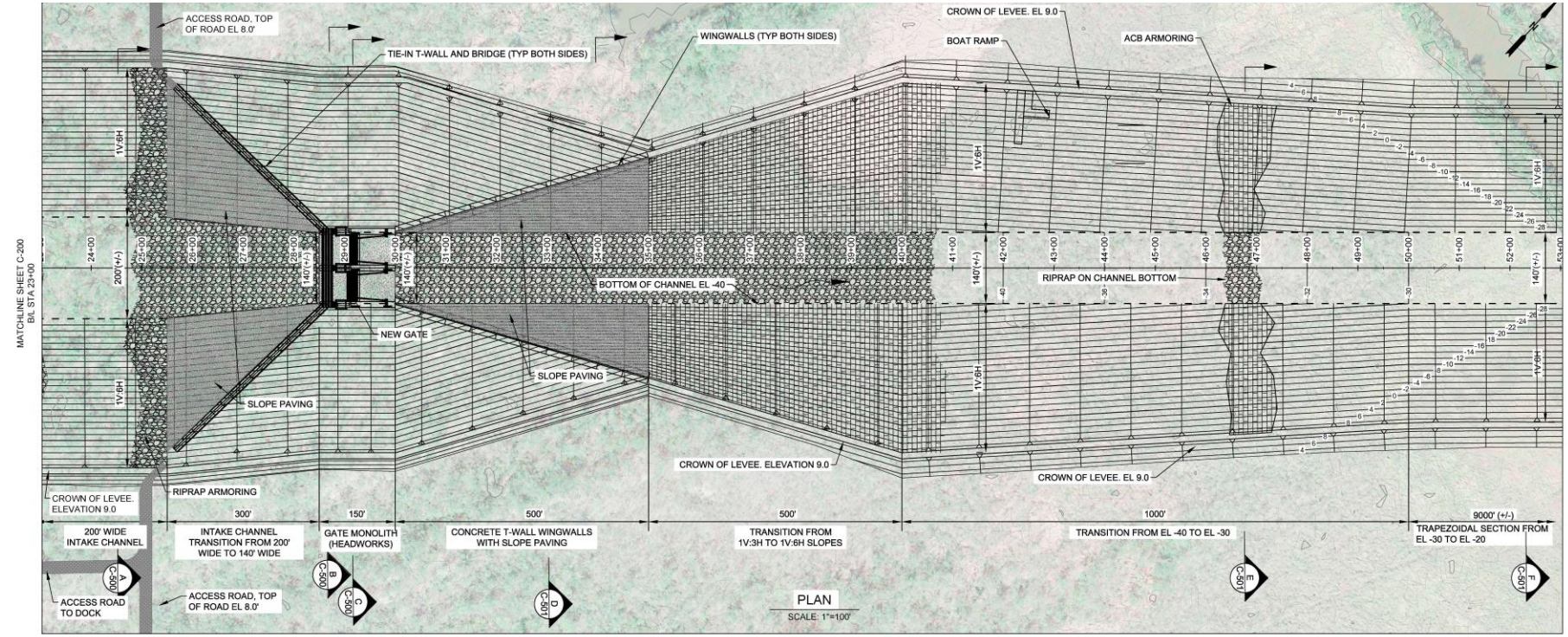


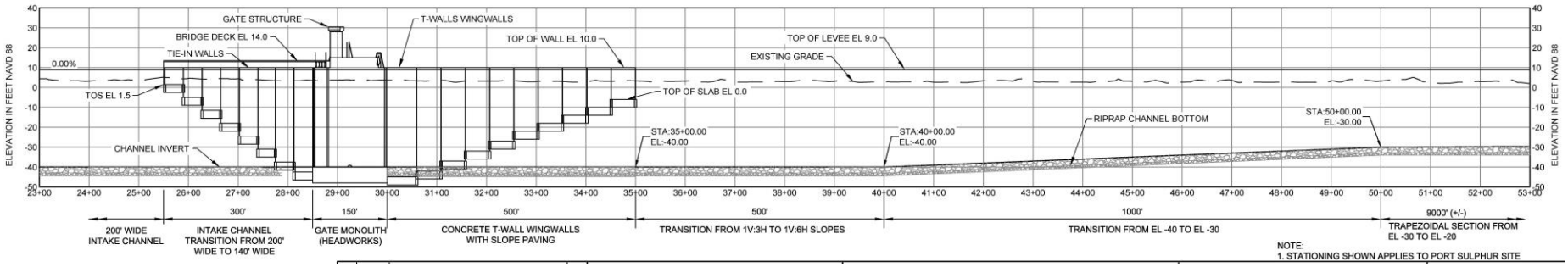
NOTE:
1. STATIONING SHOWN APPLIES TO PORT SULPHUR SITE

MAJOR PROJECT FEATURES: Closed Cell Coffer Dam

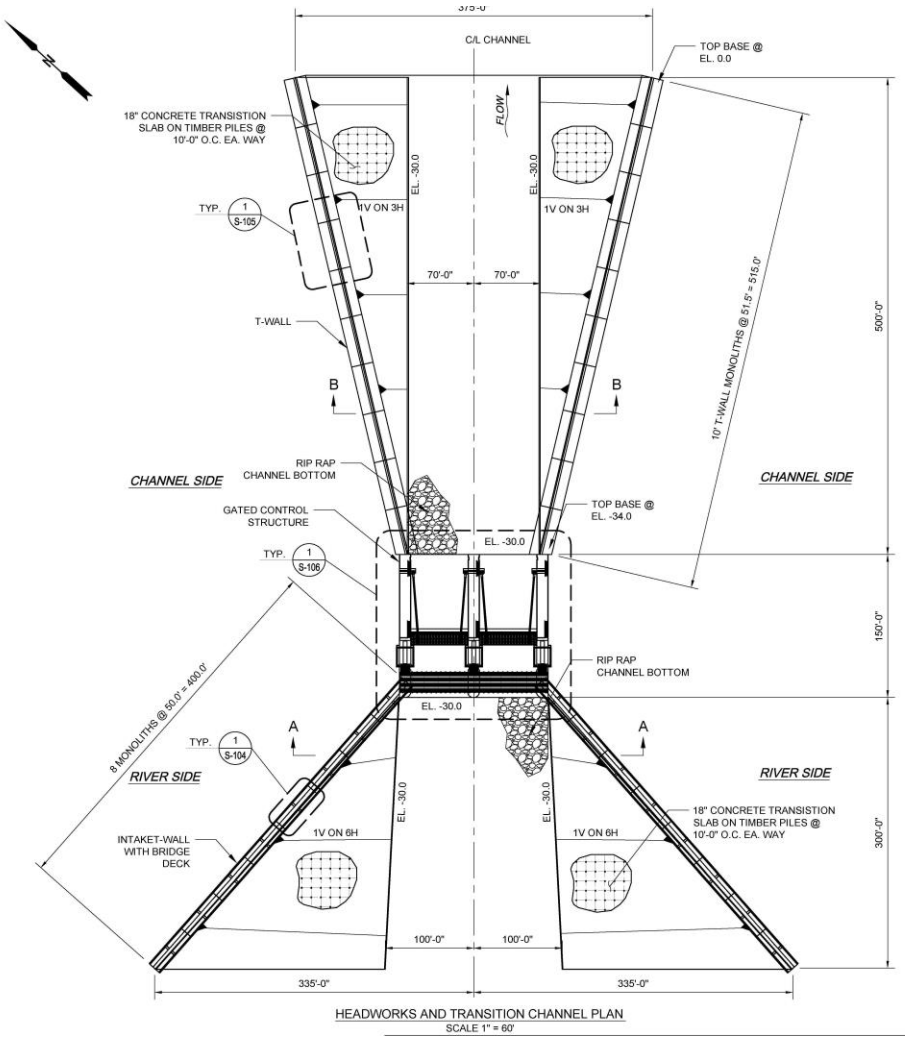


MAJOR PROJECT FEATURES: Gate Structure Plan

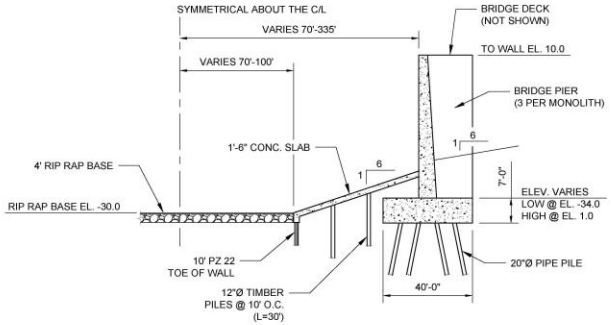




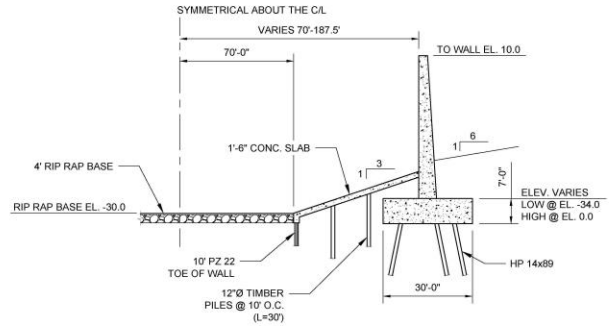
MAJOR PROJECT FEATURES: GATE STRUCTURE



HEADWORKS AND TRANSITION CHANNEL PLAN
SCALE 1" = 60'



SECTION A - A
INTAKE T-WALL WITH BRIDGE PIERS
SCALE 1/16" = 1'-0"

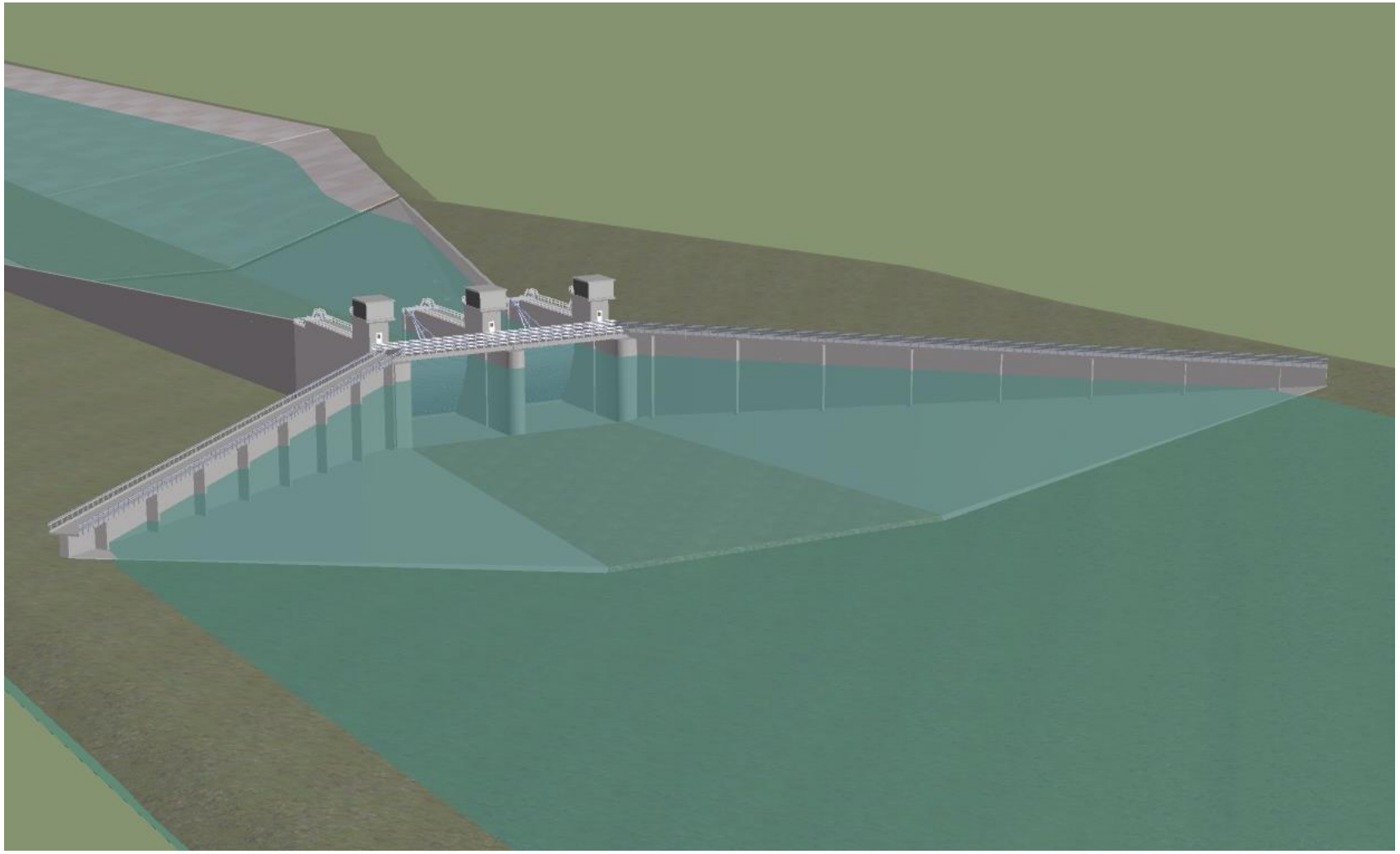


SECTION B - B
T-WALL MONOLITH
SCALE 1/16" = 1'-0"

60' 30' 0 60' 120'
1"= 60'

32' 24' 16' 8' 0 16'
1/16"= 1'-0"

MAJOR PROJECT FEATURES: Gate Structure



MAJOR PROJECT FEATURES: GATE STRUCTURE

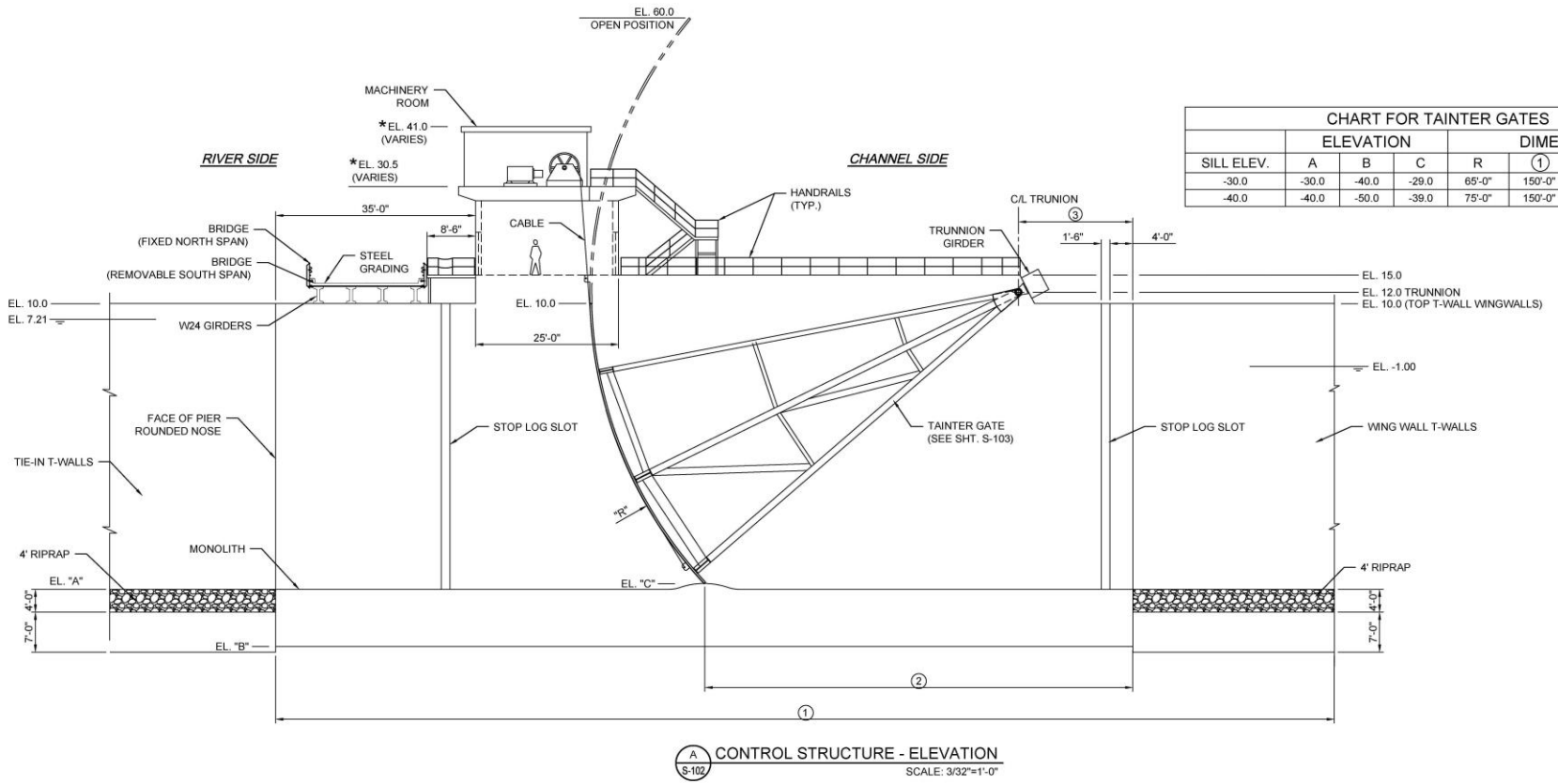
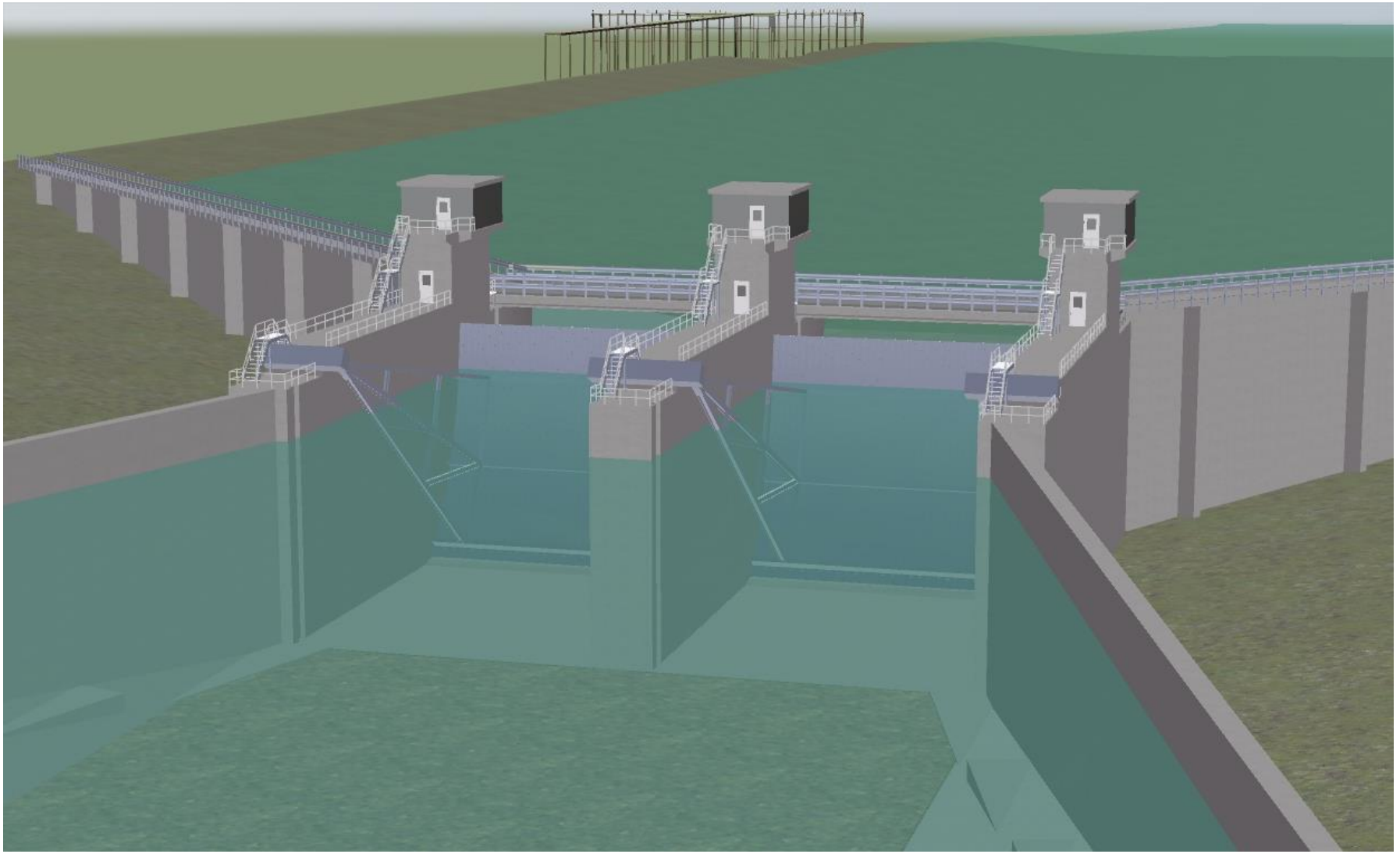


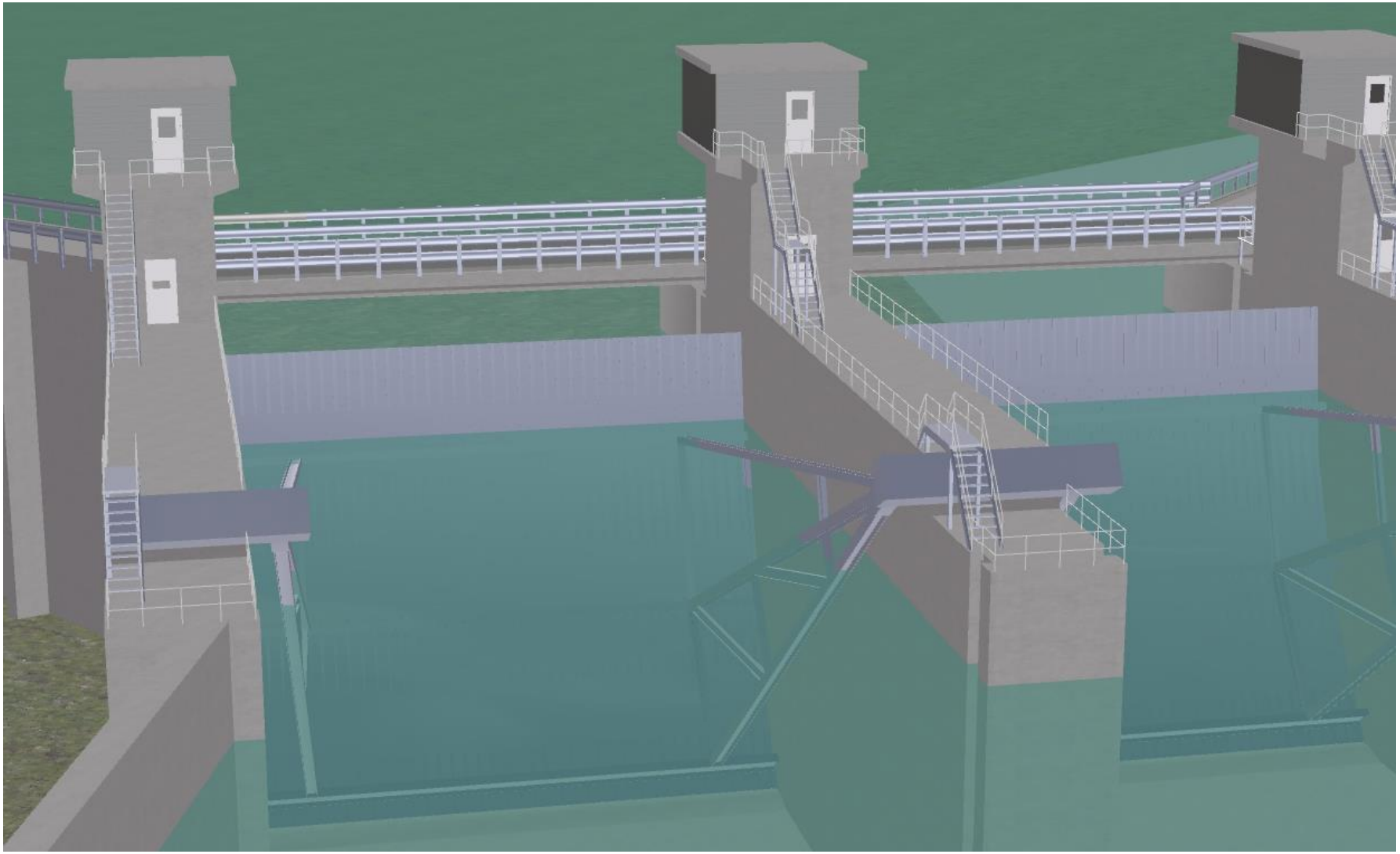
CHART FOR TAINTER GATES							
	ELEVATION			DIMENSIONS			
SILL ELEV.	A	B	C	R	①	②	③
-30.0	-30.0	-40.0	-29.0	65'-0"	150'-0"	75'-5"	25'-0"
-40.0	-40.0	-50.0	-39.0	75'-0"	150'-0"	75'-0"	20'-0"

A S-102 CONTROL STRUCTURE - ELEVATION
SCALE: 3/32"=1'-0"

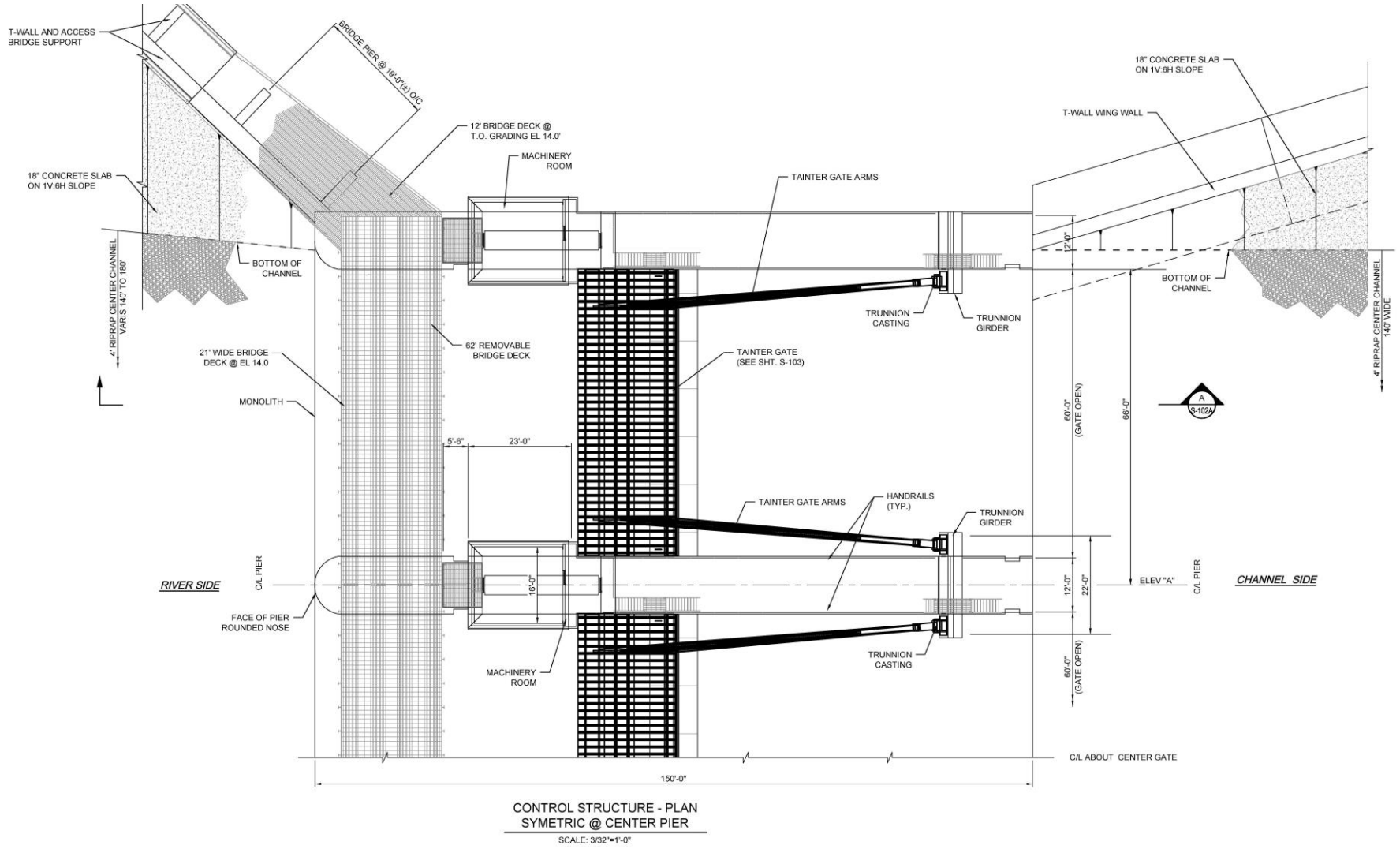
MAJOR PROJECT FEATURES: Gate Structure



MAJOR PROJECT FEATURES: Gate Structure

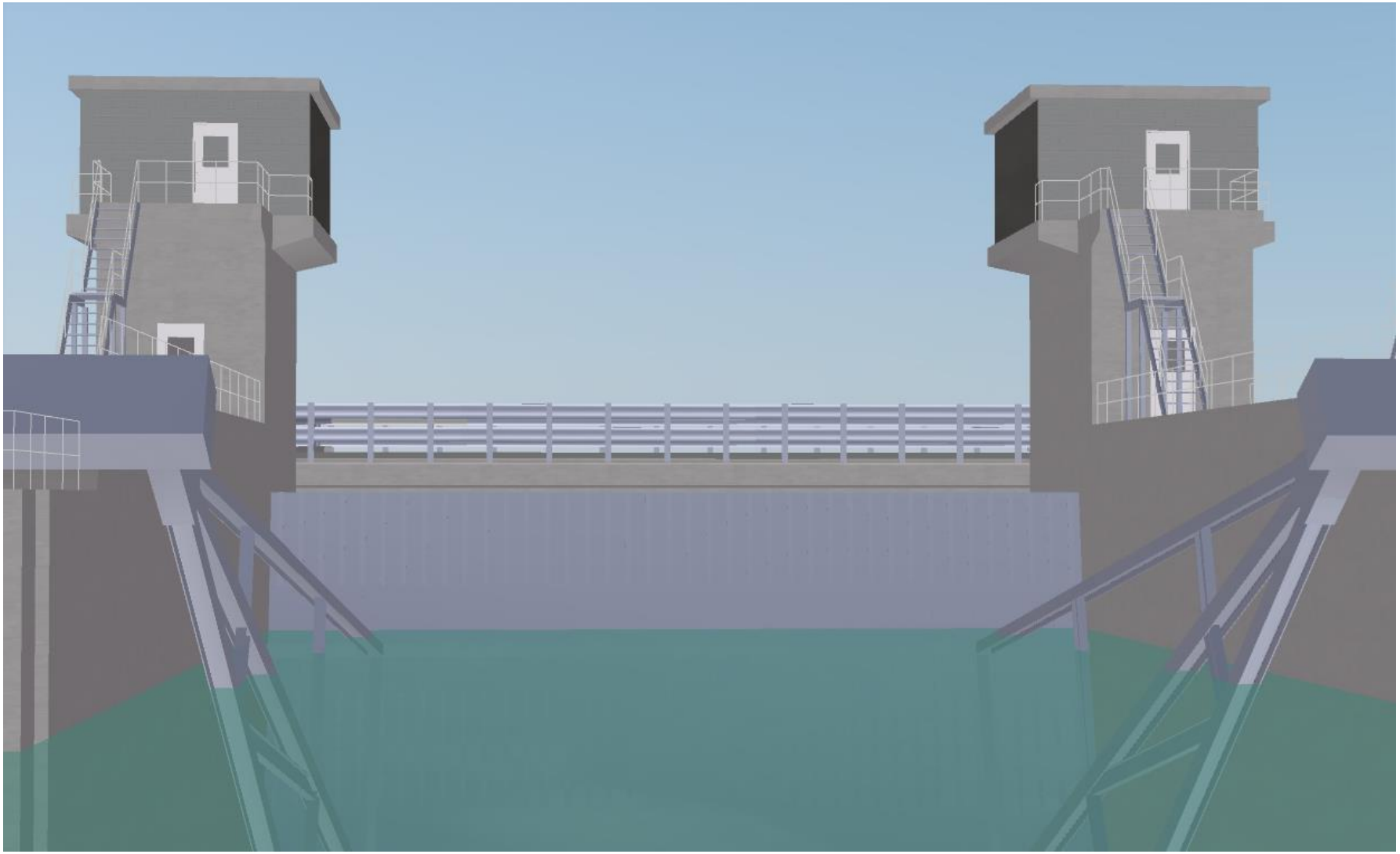


MAJOR PROJECT FEATURES: GATE STRUCTURE

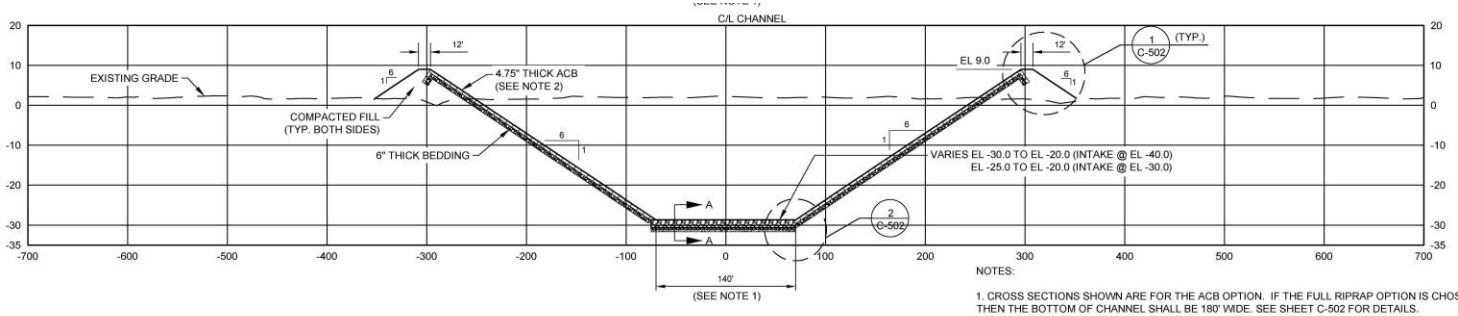


CONTROL STRUCTURE - PLAN
SYMETRIC @ CENTER PIER
SCALE: 3/32"=1'-0"

MAJOR PROJECT FEATURES: Gate Structure



MAJOR PROJECT FEATURES: Channel Cross Section



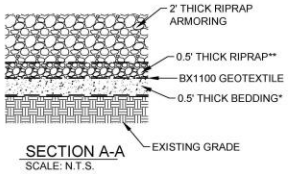
NOTES:

1. CROSS SECTIONS SHOWN ARE FOR THE ACB OPTION. IF THE FULL RIPRAP OPTION IS CHOSEN THEN THE BOTTOM OF CHANNEL SHALL BE 180' WIDE. SEE SHEET C-502 FOR DETAILS.

2. CROSS SECTIONS SHOWN ARE FOR THE ACB OPTION. IF THE FULL RIPRAP OPTION IS CHOSEN THEN THE SIDE SLOPE SECTION WILL MATCH THE BOTTOM SECTION. SEE SHEET C-502 FOR DETAILS.

SECTION THRU THE CONVEYANCE CHANNEL

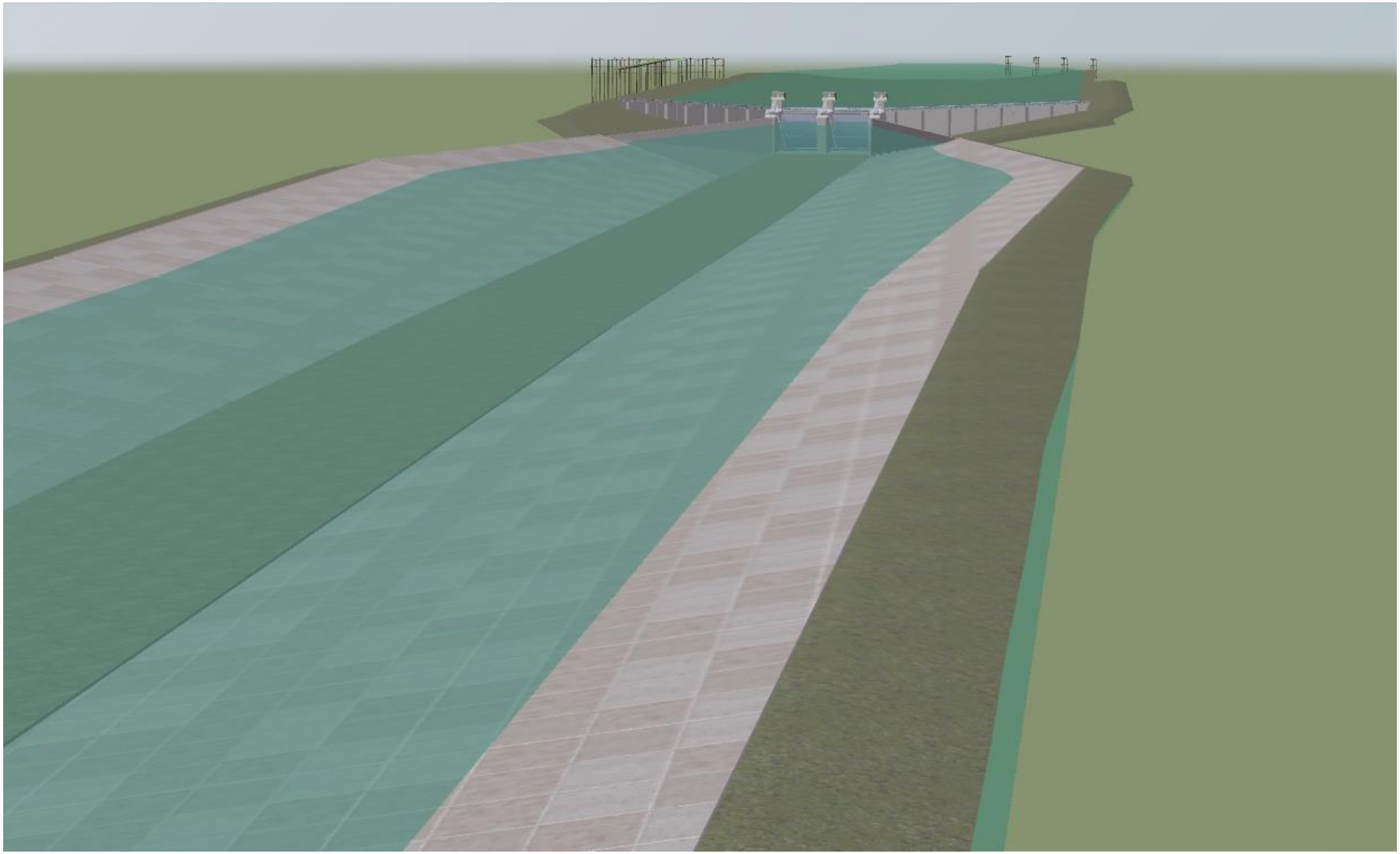
F C-200A F C-201A SECTION F
SCALE: 1"=60' (HOR) 1"=4' (VERT)



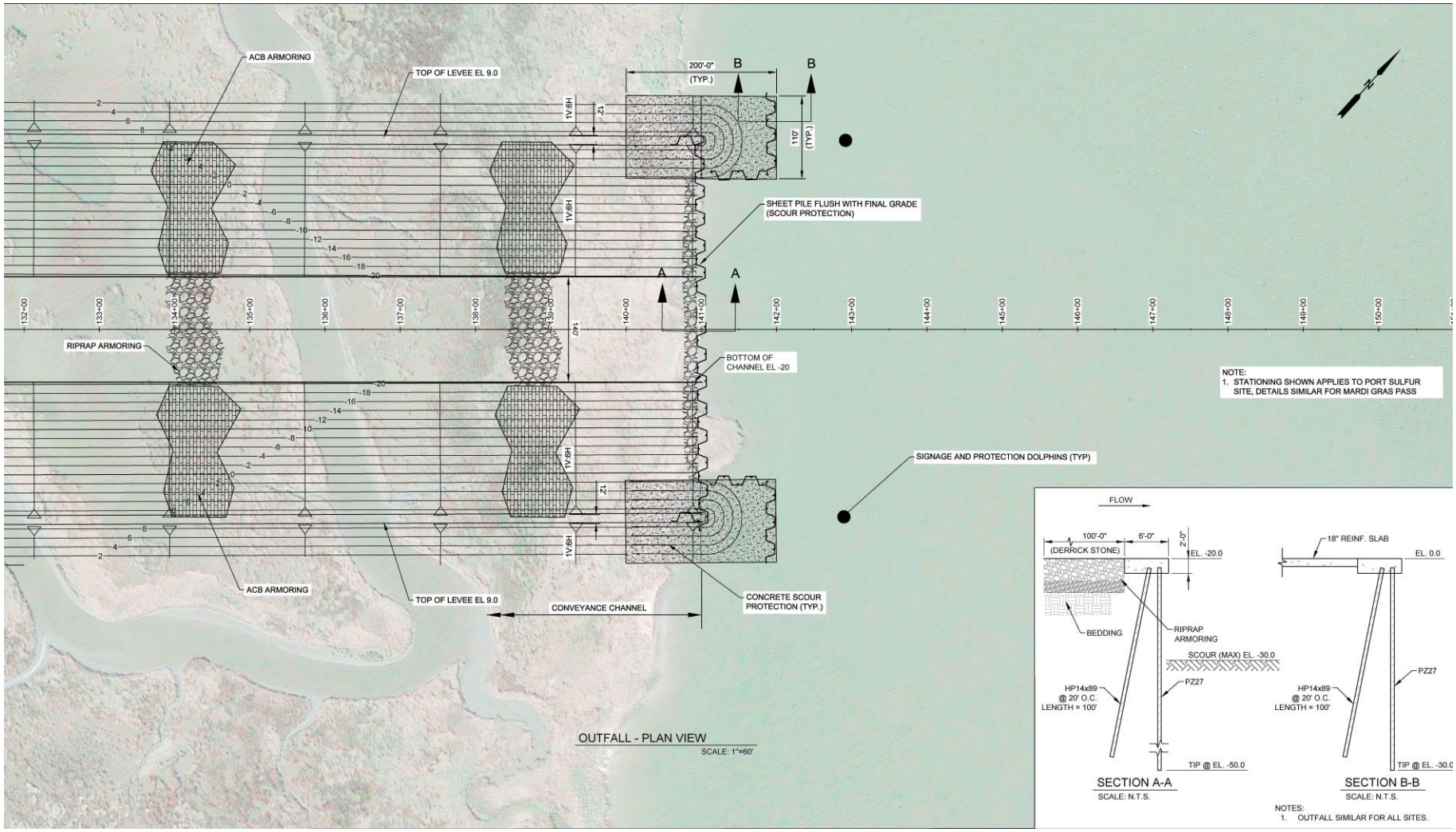
SECTION A-A
SCALE: N.T.S.

* APPLY LOSS FACTION OF 200%
** APPLY LOSS FACTION OF 150%

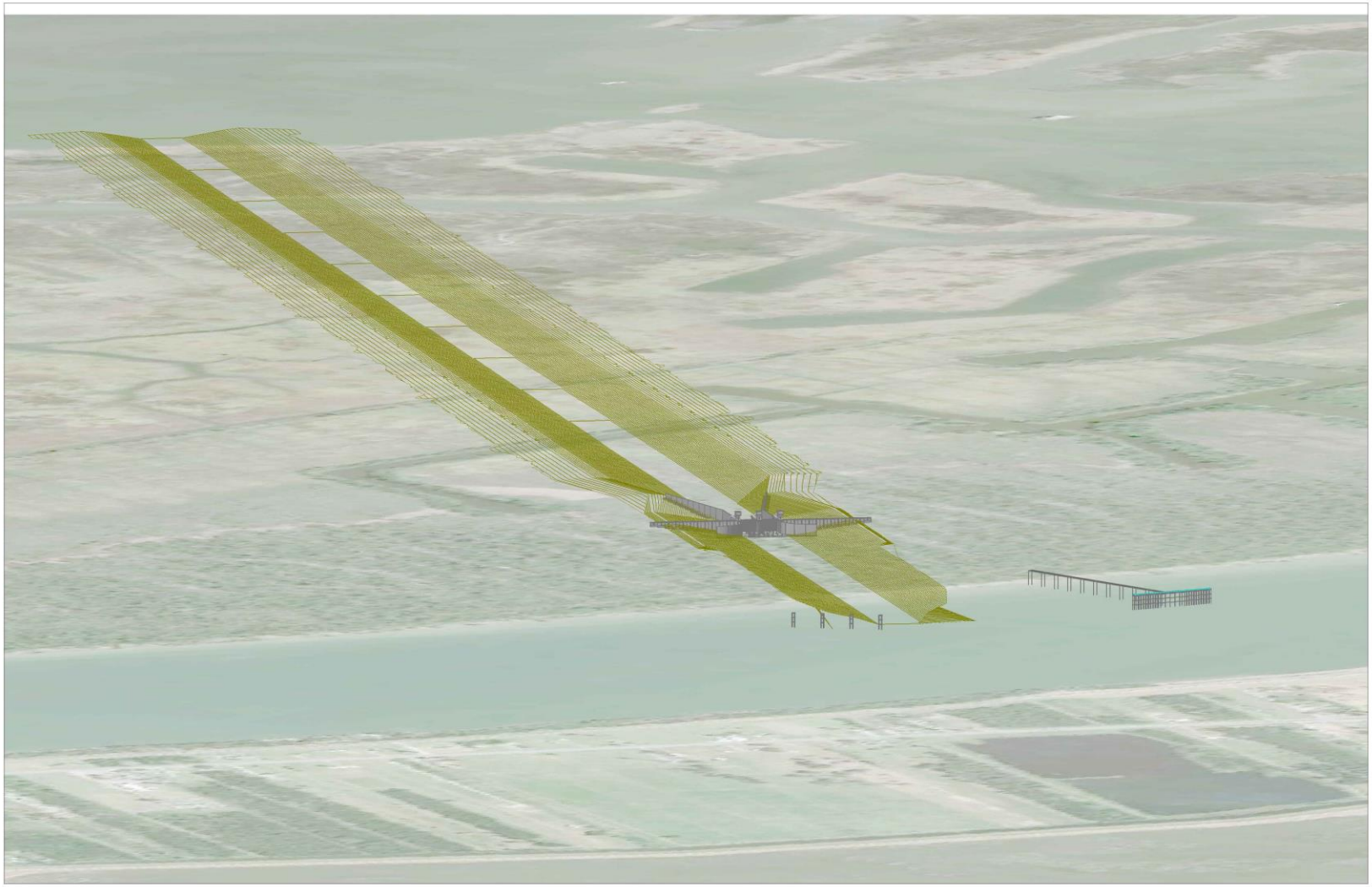
MAJOR PROJECT FEATURES: Gate Structure



MAJOR PROJECT FEATURES: Discharge Structure



MAJOR PROJECT FEATURES: ISOMETRIC VIEW



Path Forward

- Upon CPRA approval
- Additional 2D Modelling
- Complete Geotechnical Investigation for Preliminary Design
- Initiate Engineering design to the 30% level
- Initiate advanced 3-Dimensional modeling of the diversion system, including changing conditions over the 50 year service life
- Build physical model of complete system to refine design and cost estimate
- Develop potential Beneficial Use concepts for dredged material

Questions