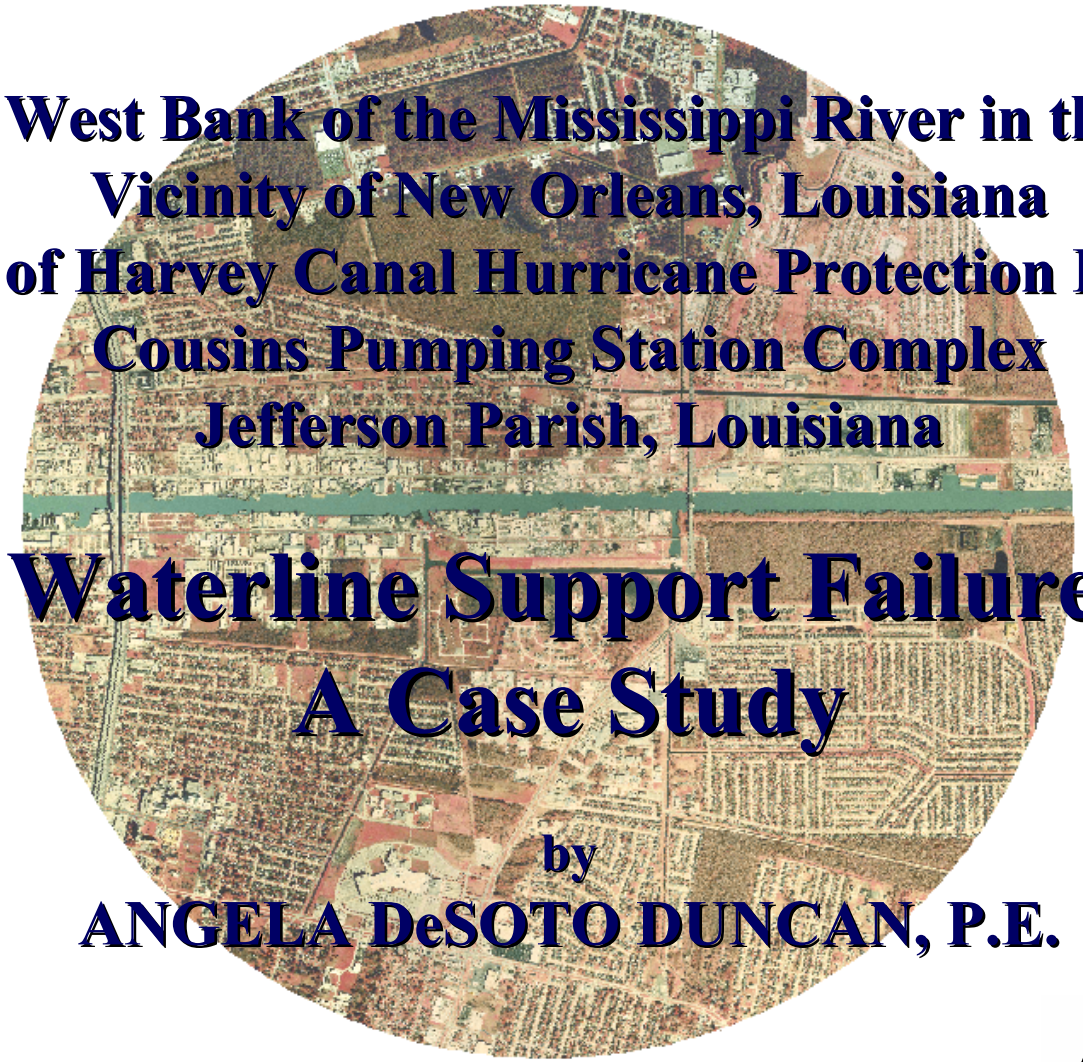
West Bank of the Mississippi River in the
Vicinity of New Orleans, Louisiana
East of Harvey Canal Hurricane Protection Project
Cousins Pumping Station Complex
Jefferson Parish, Louisiana



Waterline Support Failure: A Case Study

by

ANGELA DeSOTO DUNCAN, P.E.

US Army Corps of Engineers
New Orleans District

WEST JEFFERSON ENGINEERING SERVICES
- A JOINT VENTURE GROUP -
BKI BURK-KLEINPETER, INC. Shaw Shaw Coastal, Inc.

WEST JEFFERSON LEVEE DISTRICT
BOARD OF COMMISSIONERS

Jean Baptiste Le Moyne

Sieur de Bienville

Founded New Orleans in 1718


WEST BANK AND VICINITY,
NEW ORLEANS, LA
HURRICANE PROTECTION PROJECT
TROPICAL STORM FRANCES SEPTEMBER 1998

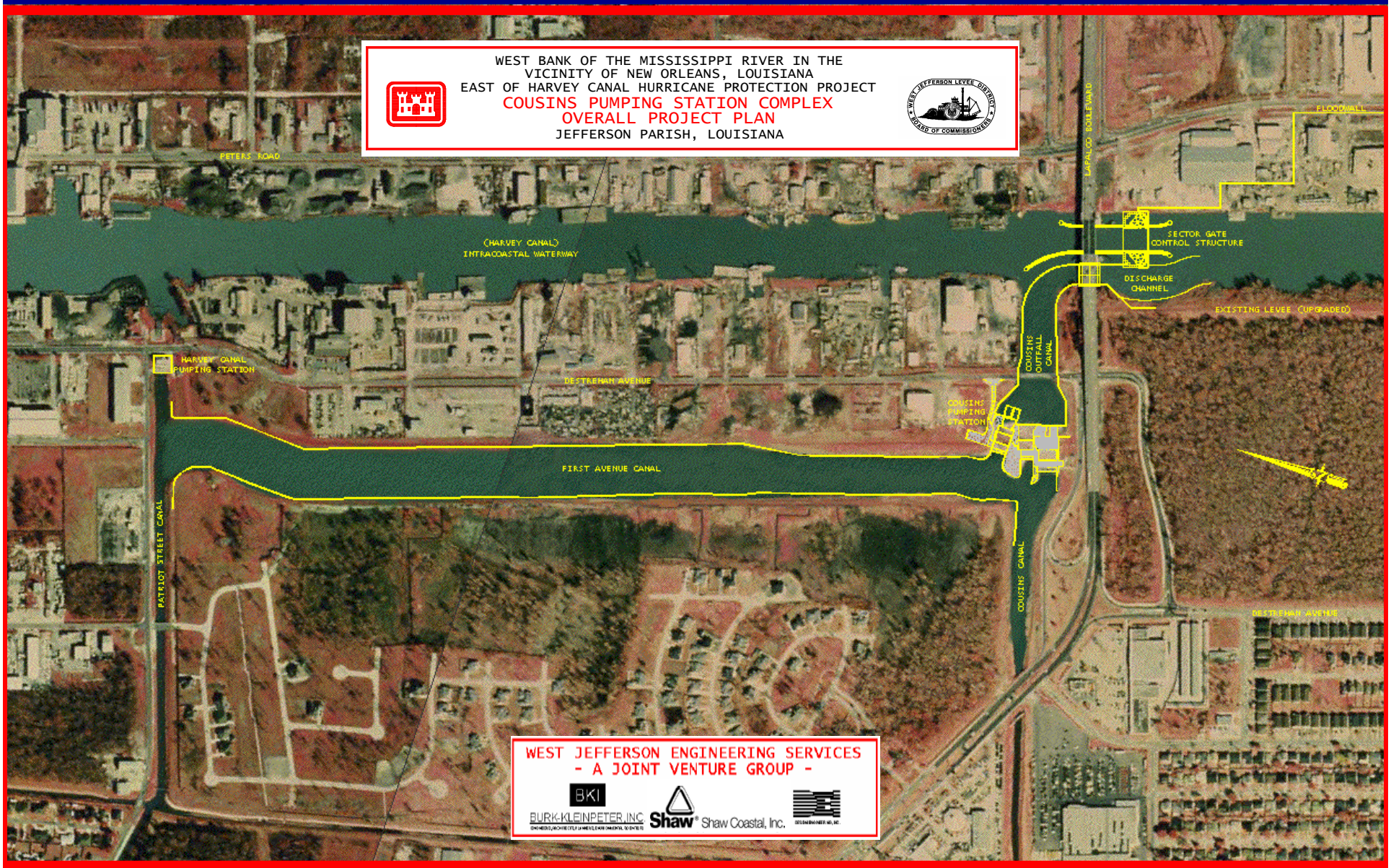
West Bank & Vicinity, New Orleans, LA Facts

- WRDA 1986
  - Authorized Westwego to Harvey Canal
- WRDA 1996
  - Modified project to add Lake Cataouatche
  - Also authorized East of Harvey Canal
- WRDA 1999
  - Combined the 3 projects into one
- Cost shared
  - 65% Federal / 35% Non-federal
- Sponsor
  - LADOTD for construction & WJLD for O&M
- Current estimated total project cost: $340M

West Bank & Vicinity, New Orleans, LA Summary

- Will protect approximately 250,000 citizens
- Will protect over 65,000 homes and businesses in Orleans, Plaquemines and Jefferson Parishes
- When complete, will cover over 65 miles of levees, floodwalls and floodgates in the tri-parish area
- Through the end of 2004, federal & local sources have spent over $150 million
- Project is 38% complete; completion date 2018

West Bank & Vicinity, New Orleans, LA, Hurricane Protection Project


WEST BANK OF THE MISSISSIPPI RIVER IN THE
VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL HURRICANE PROTECTION PROJECT
COUSINS PUMPING STATION COMPLEX
OVERALL PROJECT PLAN
JEFFERSON PARISH, LOUISIANA
WEST JEFFERSON LEVEE DISTRICT
BOARD OF COMMISSIONERS
PETERS ROAD
(HARVEY CANAL)
INTRACOASTAL WATERWAY
LAPALCO BOULEVARD
FLOODWALL
SECTOR GATE
CONTROL STRUCTURE
DISCHARGE
CHANNEL
EXISTING LEVEE (UPGRADED)
COUSINS
OUTFALL
CANAL
HARVEY CANAL
PUMPING STATION
DESTREHAN AVENUE
COUSINS
PUMPING
STATION
FIRST AVENUE CANAL
PATRIOT STREET CANAL
COUSINS CANAL
DESTREHAN AVENUE
WEST JEFFERSON ENGINEERING SERVICES
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Shaw
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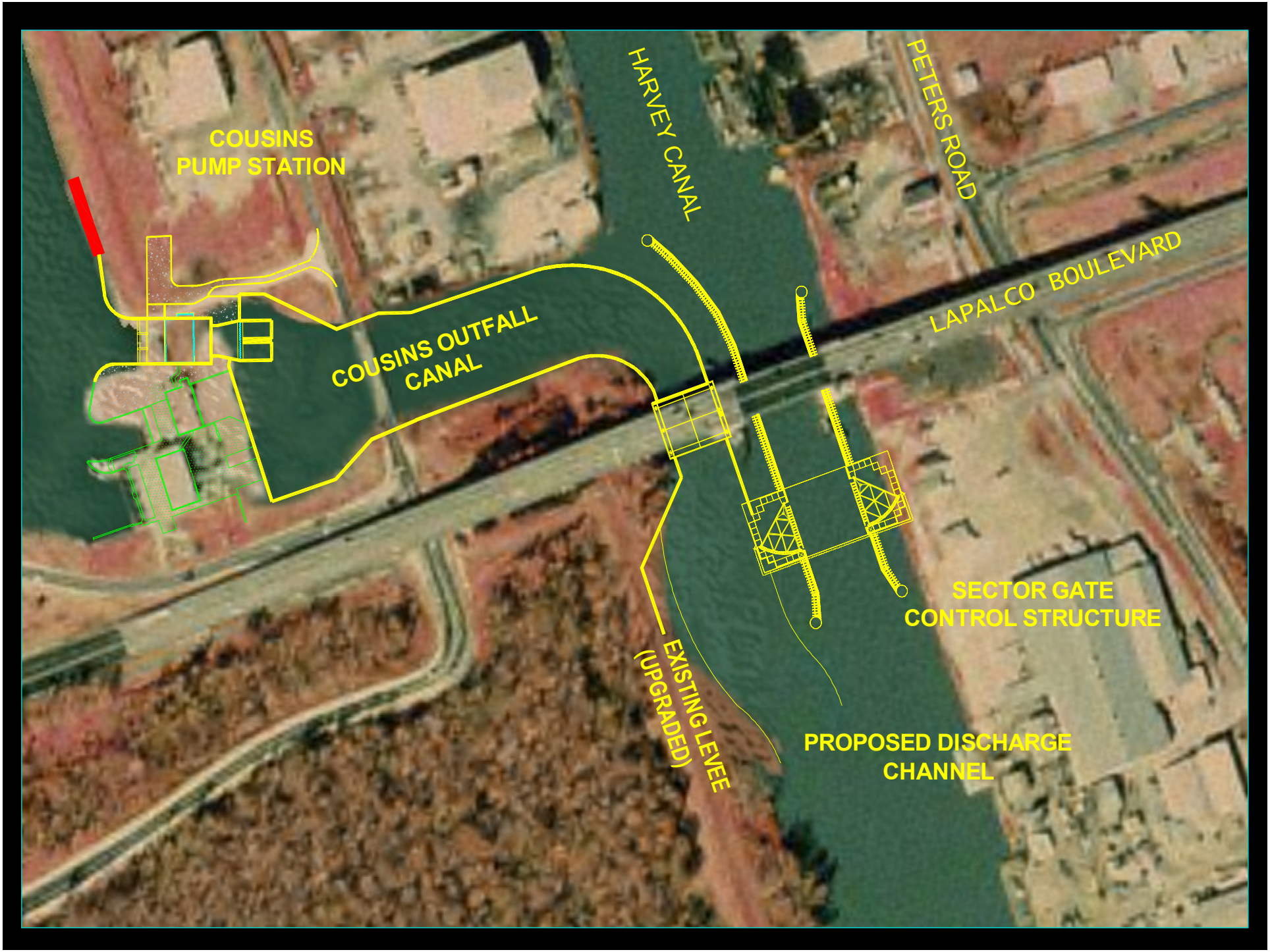
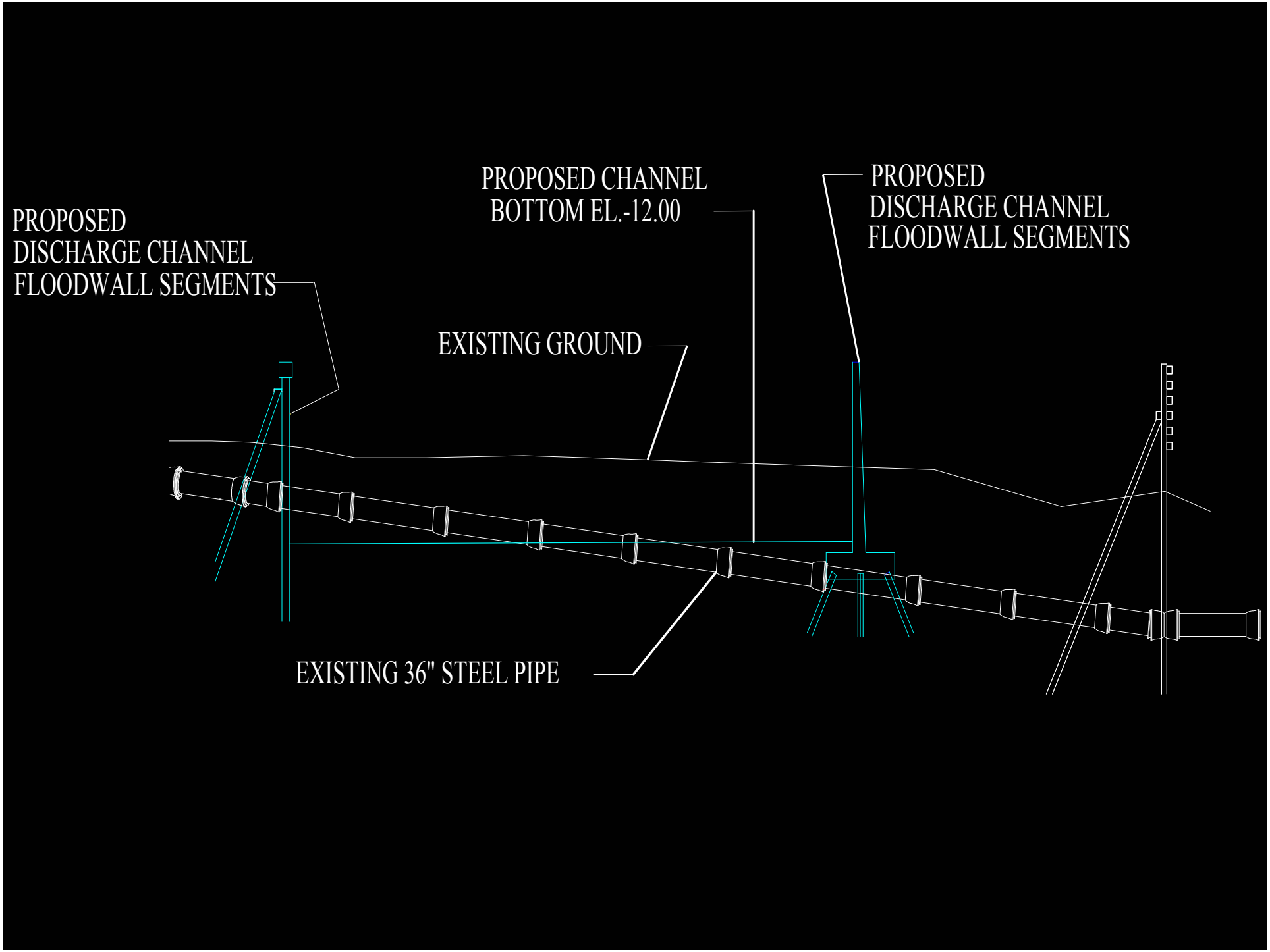
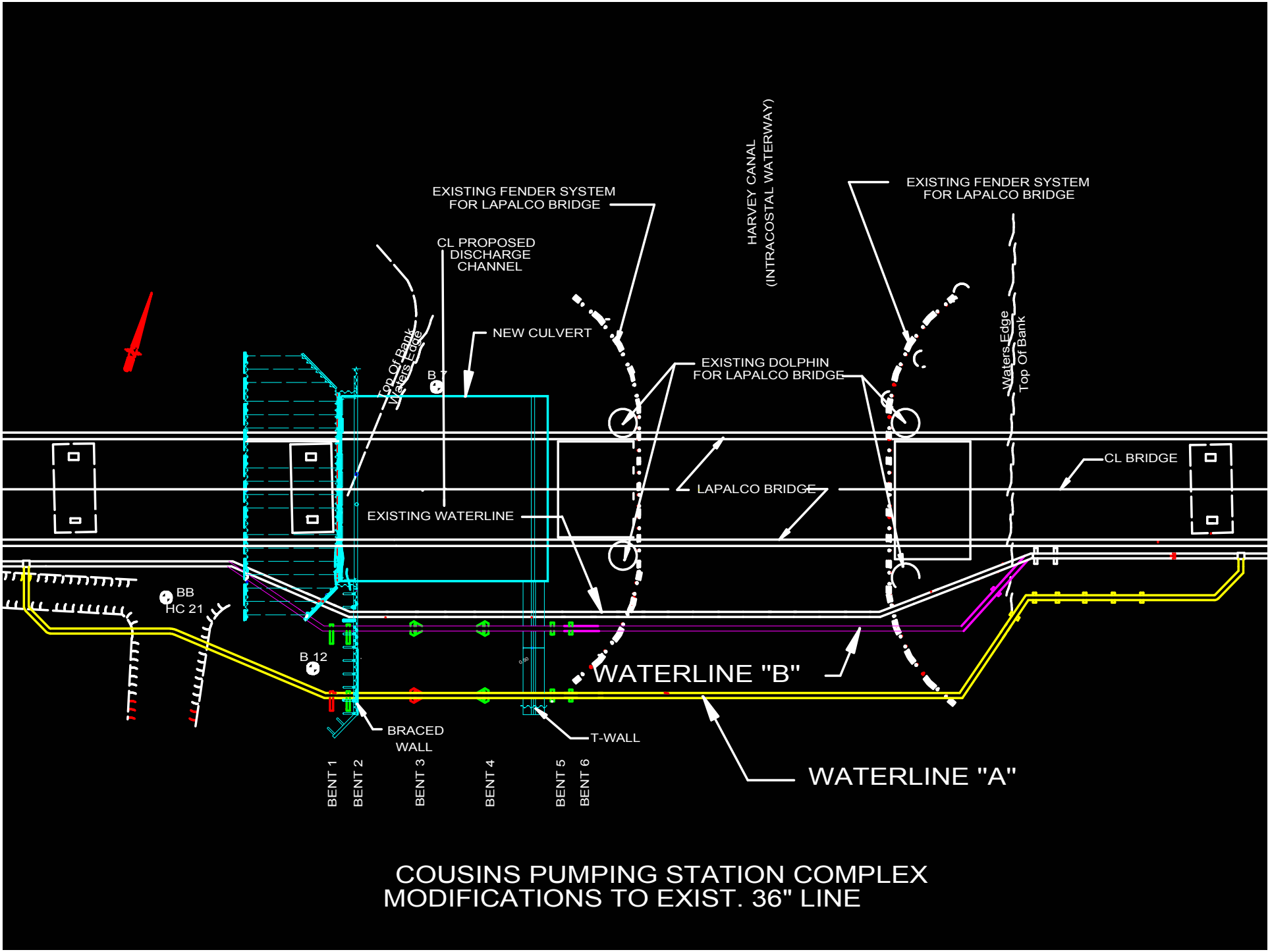
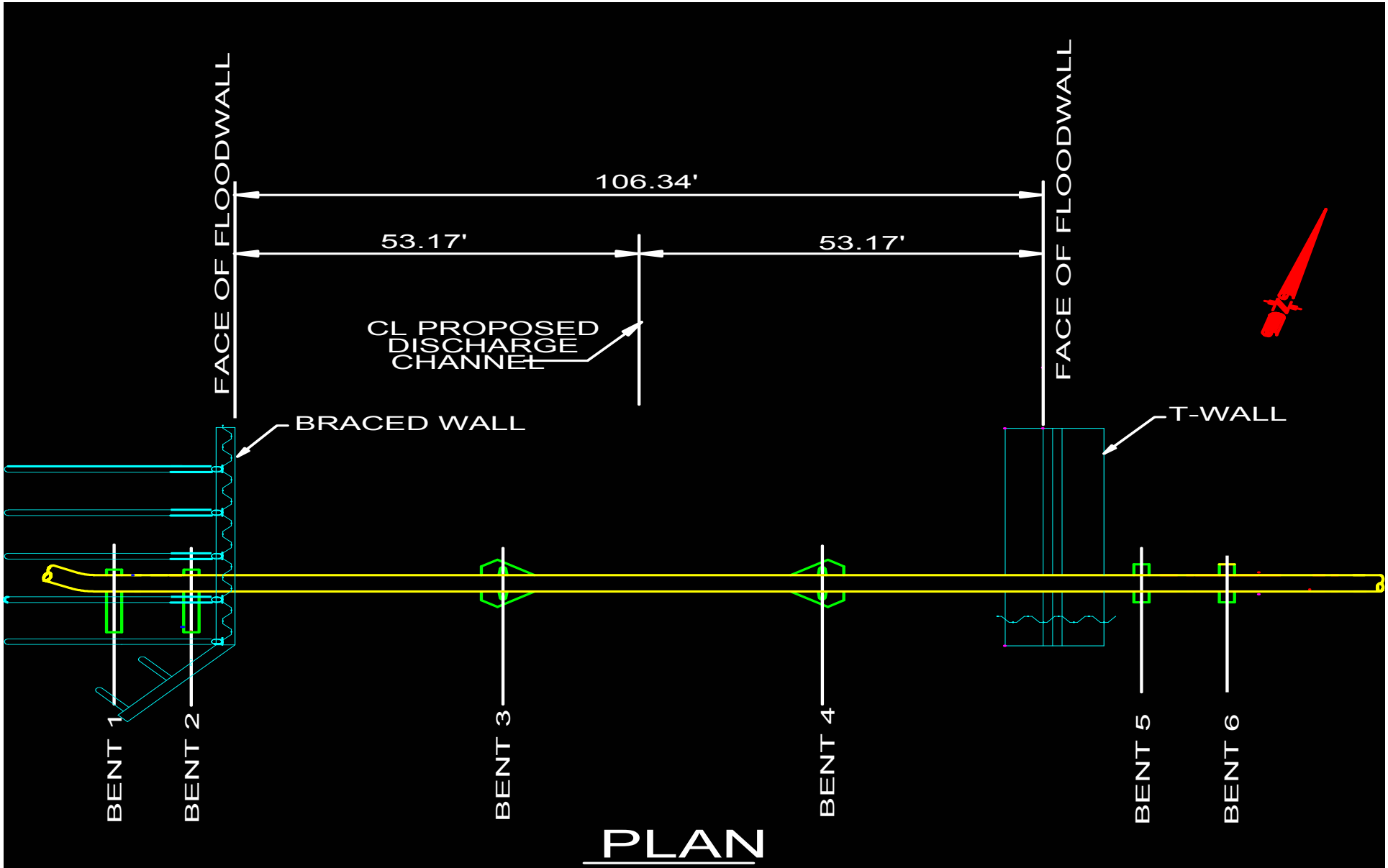

COUSINS
PUMP STATION
HARVEY CANAL
PETERS ROAD
LAPALCO BOULEVARD
COUSINS OUTFALL
CANAL
SECTOR GATE
CONTROL STRUCTURE
EXISTING LEVEE
(UPGRADED)
PROPOSED DISCHARGE
CHANNEL


FIRST AVE CANAL
First Ave. Canal &
Cousins Pumping Station


PROPOSED CHANNEL
BOTTOM EL.-12.00
PROPOSED
DISCHARGE CHANNEL
FLOODWALL SEGMENTS
PROPOSED
DISCHARGE CHANNEL
FLOODWALL SEGMENTS
EXISTING GROUND
EXISTING 36" STEEL PIPE

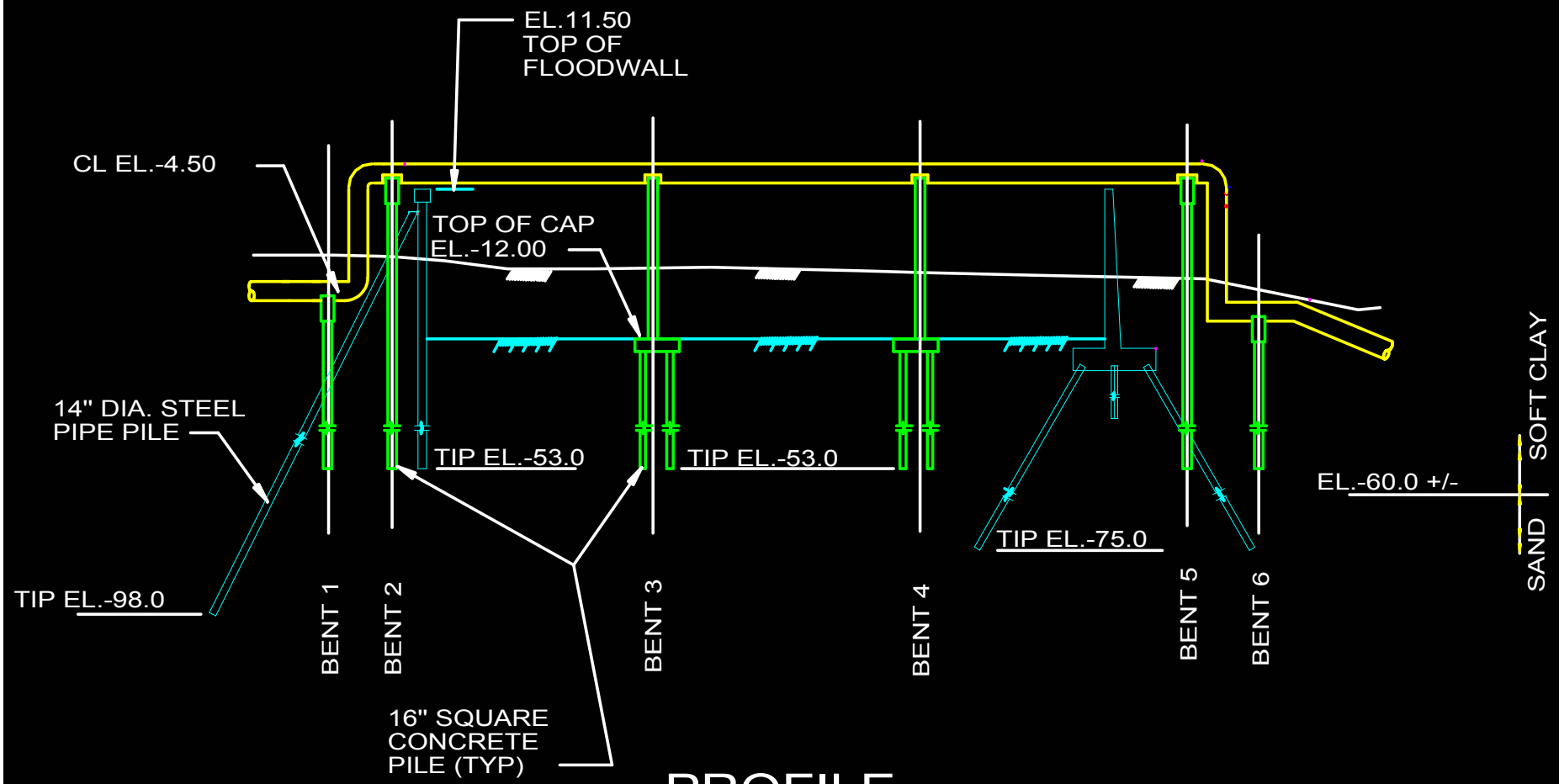


COUSINS PUMPING STATION COMPLEX
MODIFICATIONS TO EXIST. 36" LINE



PLAN

COUSINS PUMPING STATION COMPLEX
ORIGINAL WATERLINE CROSSING
(WATERLINES "A" AND "B")

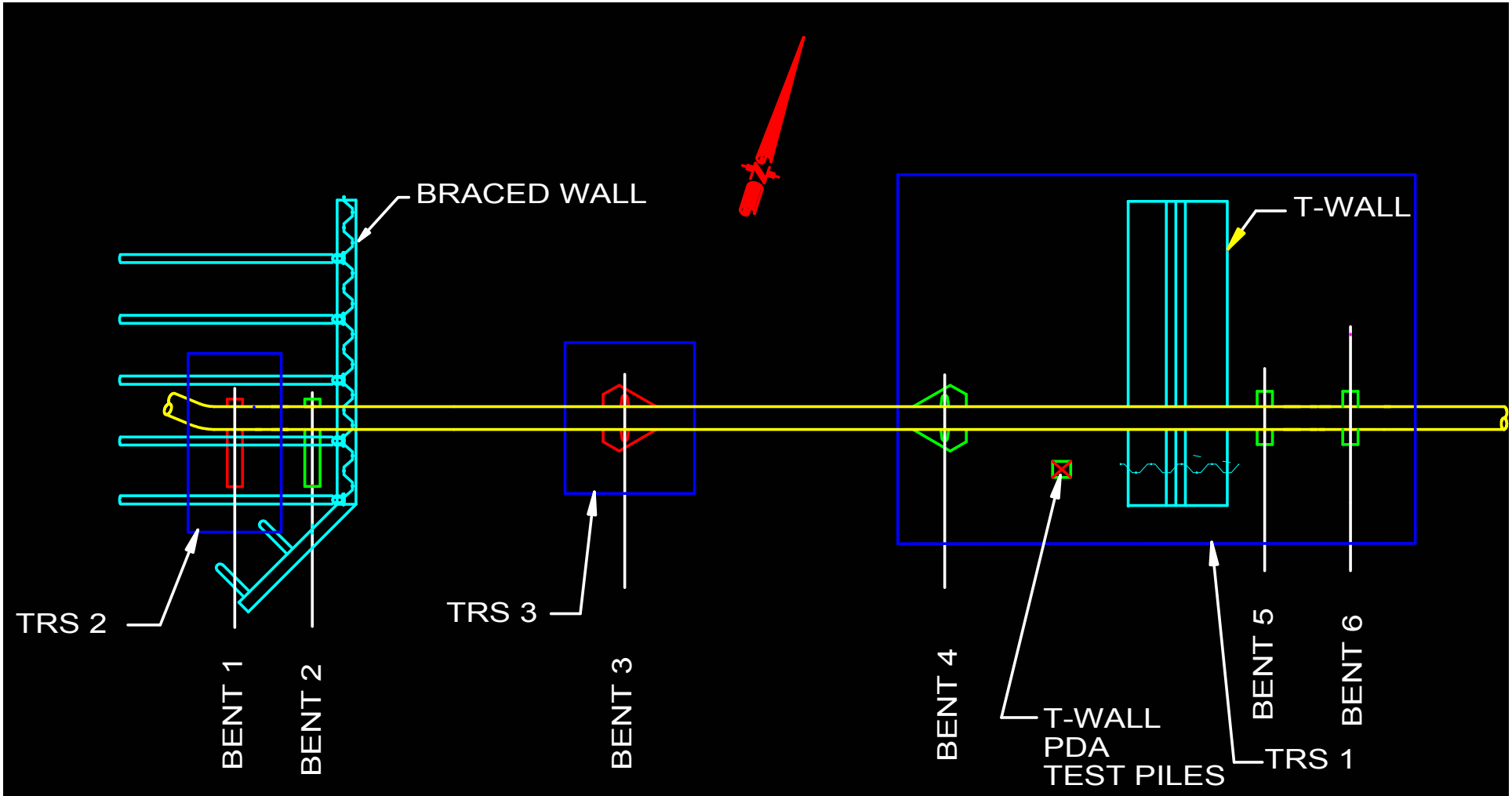


PROFILE

COUSINS PUMPING STATION COMPLEX
ORIGINAL WATERLINE CROSSING
(WATERLINES "A" AND "B")

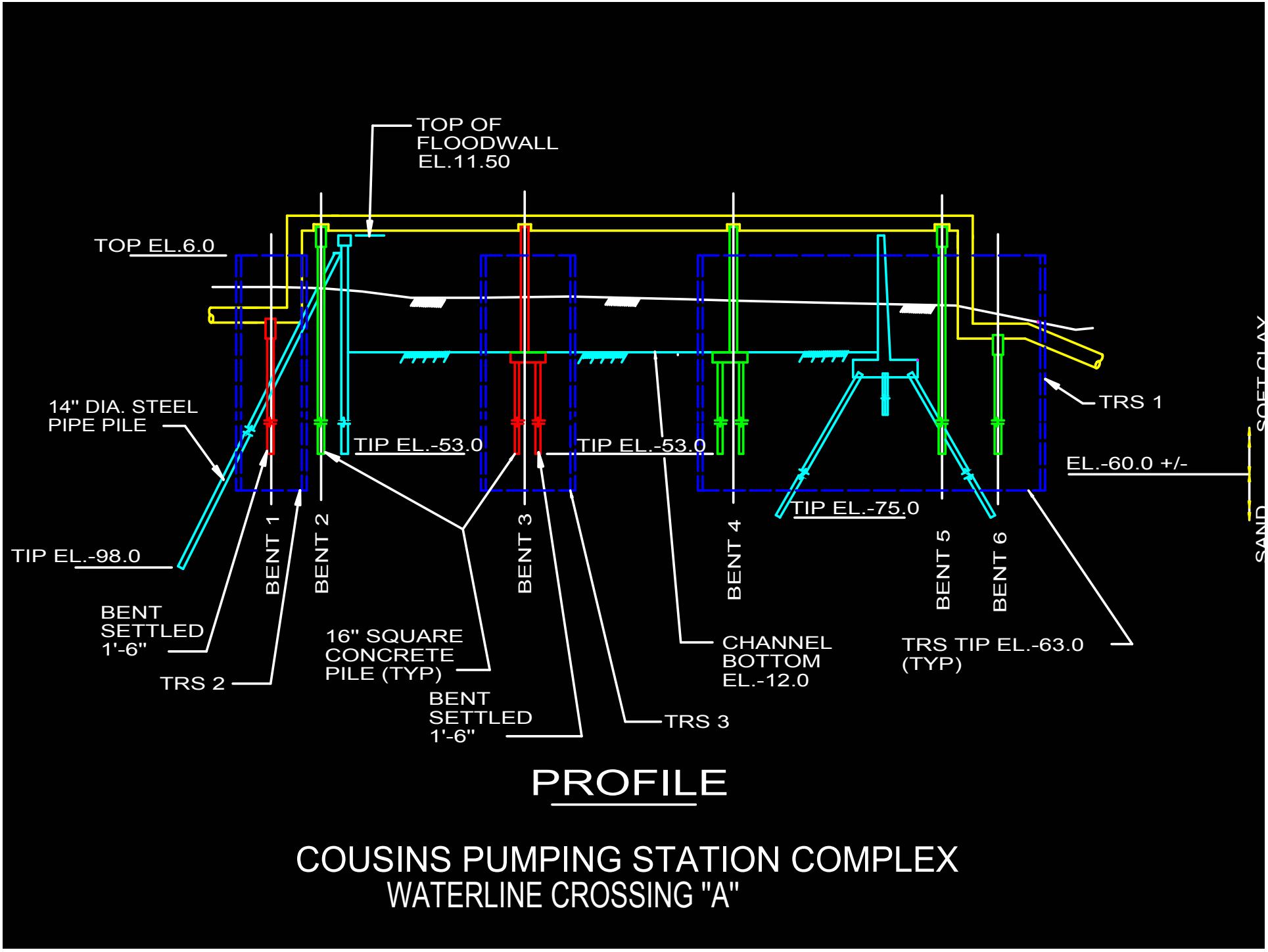
Pile Driving by Waterline “A”

Waterline Segment



PLAN

COUSINS PUMPING STATION COMPLEX
WATERLINE CROSSING "A"



PROFILE

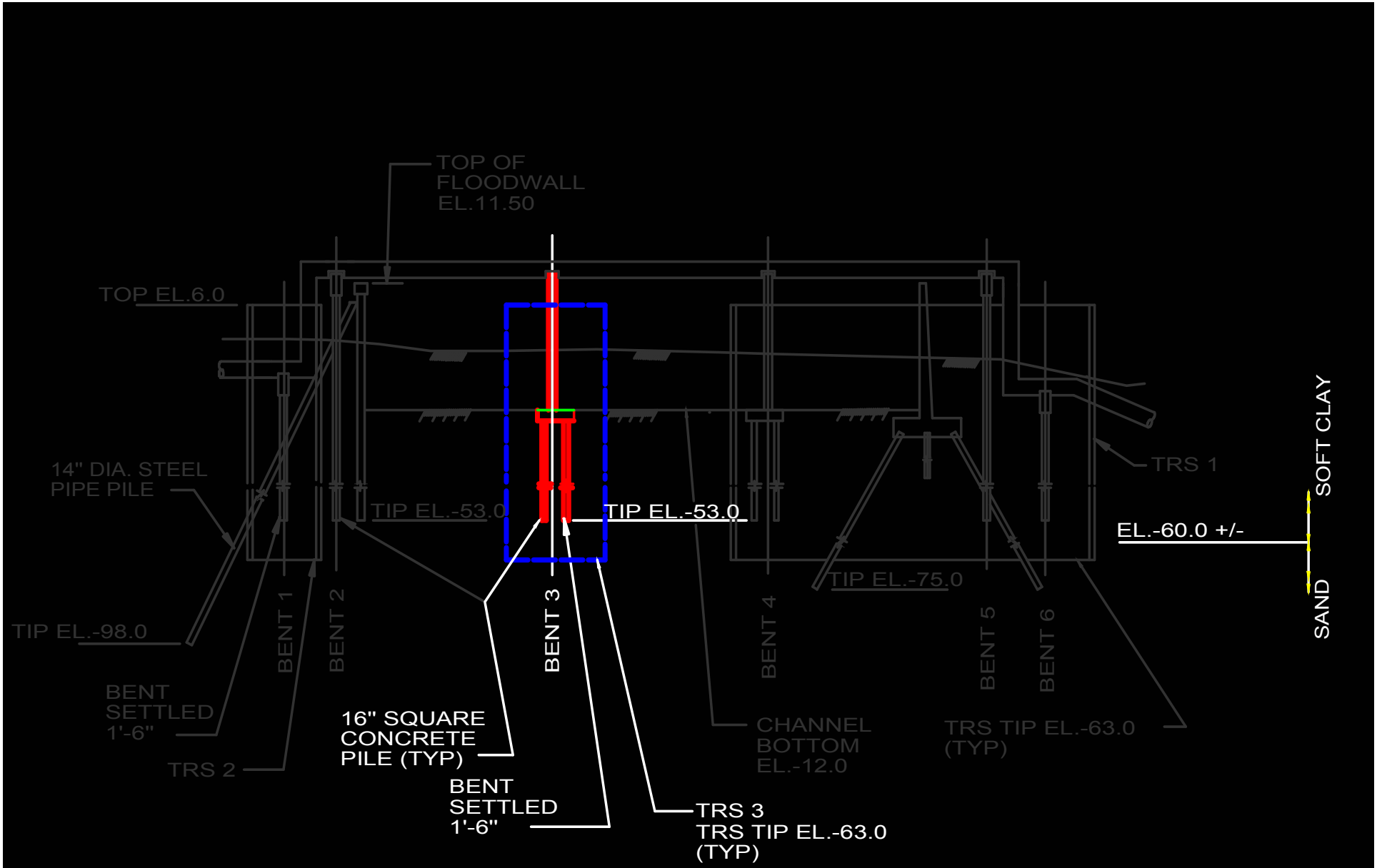
COUSINS PUMPING STATION COMPLEX
WATERLINE CROSSING "A"

Event Timeline - 2004

- Jan 8 & 9 – Contractor pulls cofferdam sheet piling around bent A-3
- Jan 12 – Contractor reports settlement of bent A-3. Bent surveyed. Settlement = 1’-6”
- Jan 26 – First Modification issued

Potential Cause

- Soil Wedge Filled the Void Caused by Cofferdam Removal
- Permanent Piles were COMPLETELY in the Soil Wedge that Moved

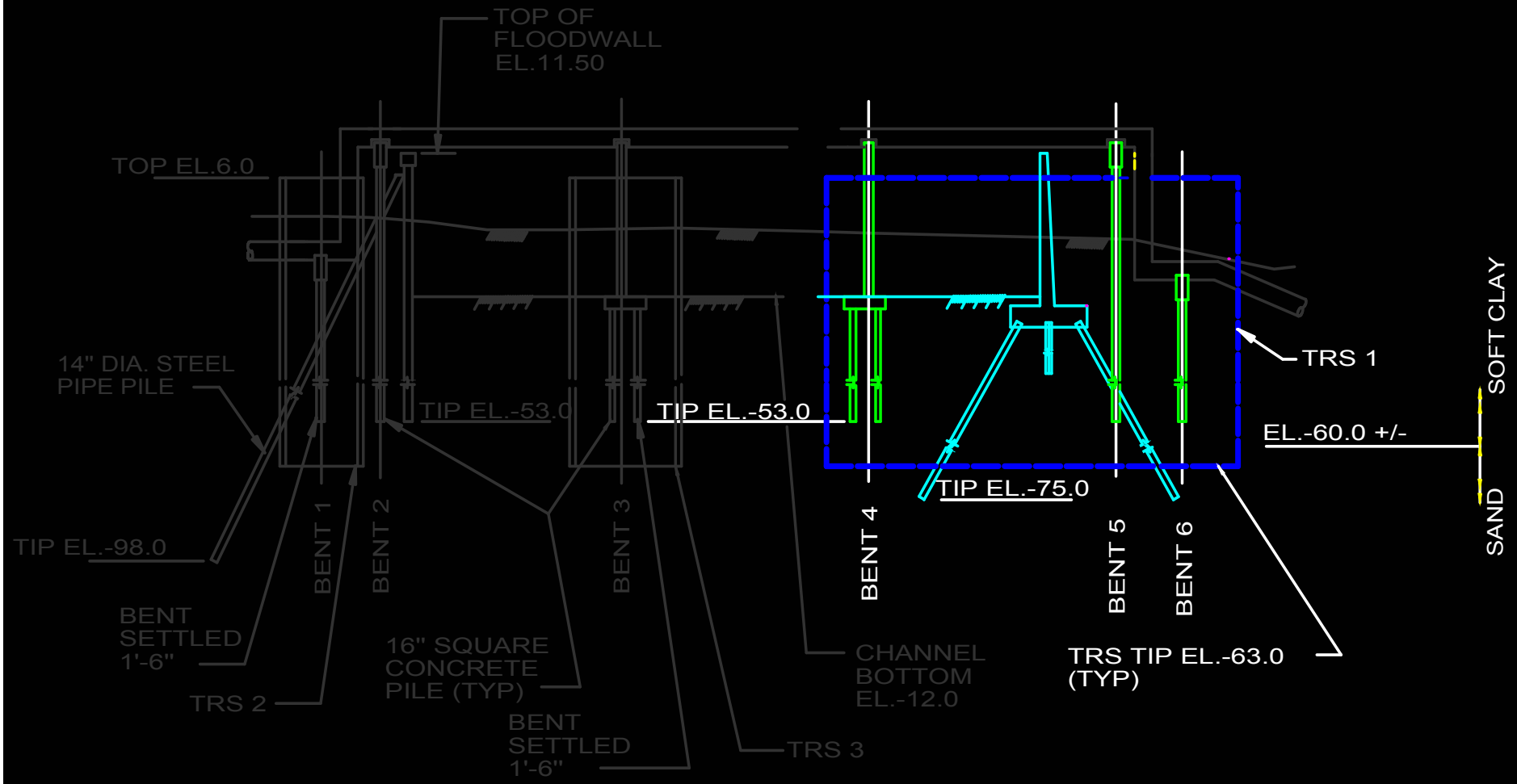


TRS 3

COUSINS PUMPING STATION COMPLEX

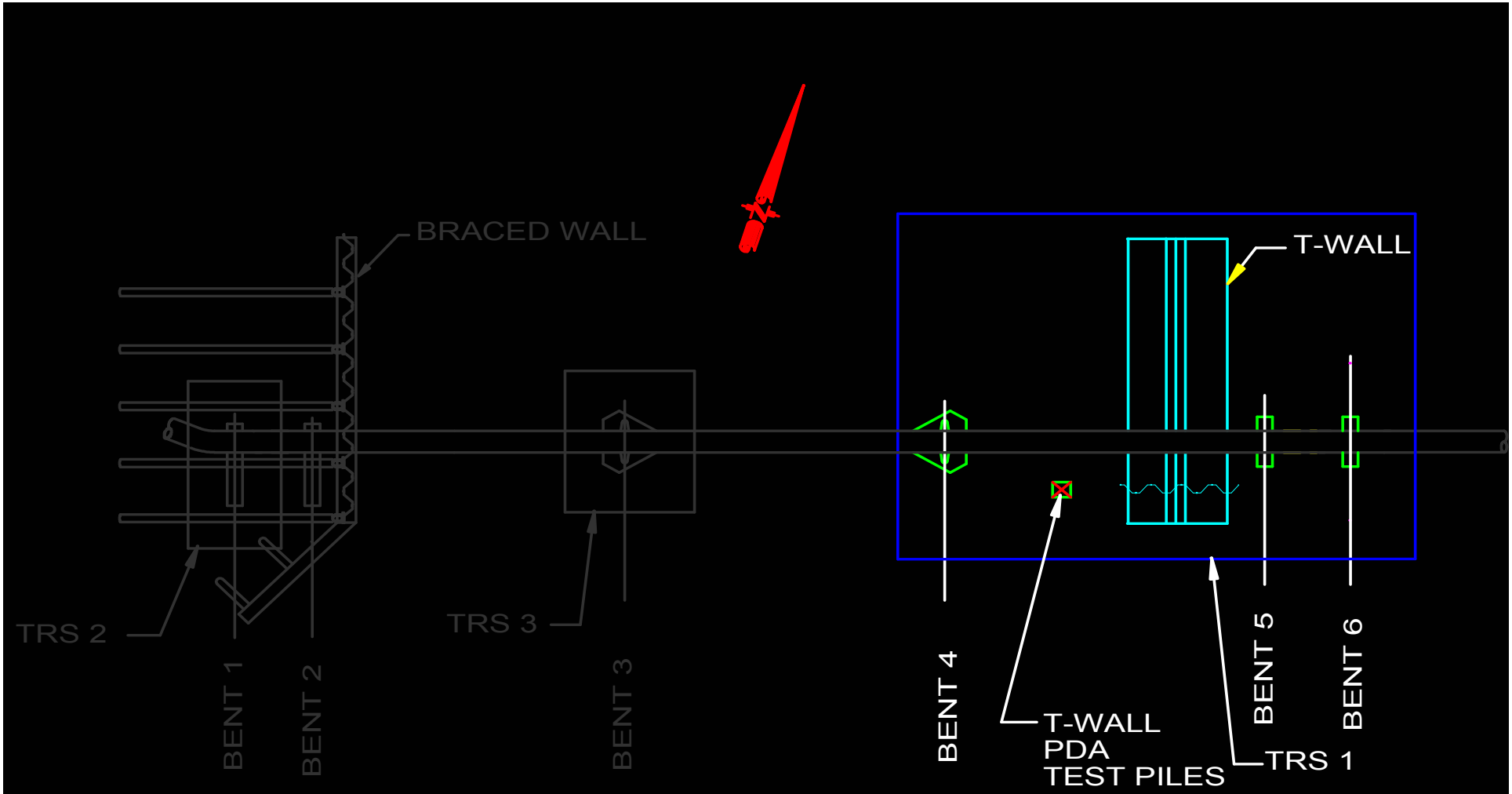
WATERLINE CROSSING "A"


04 07 2004



TRS 1

COUSINS PUMPING STATION COMPLEX
WATERLINE CROSSING "A"



PLAN

COUSINS PUMPING STATION COMPLEX
WATERLINE CROSSING "A"


03/10/2004

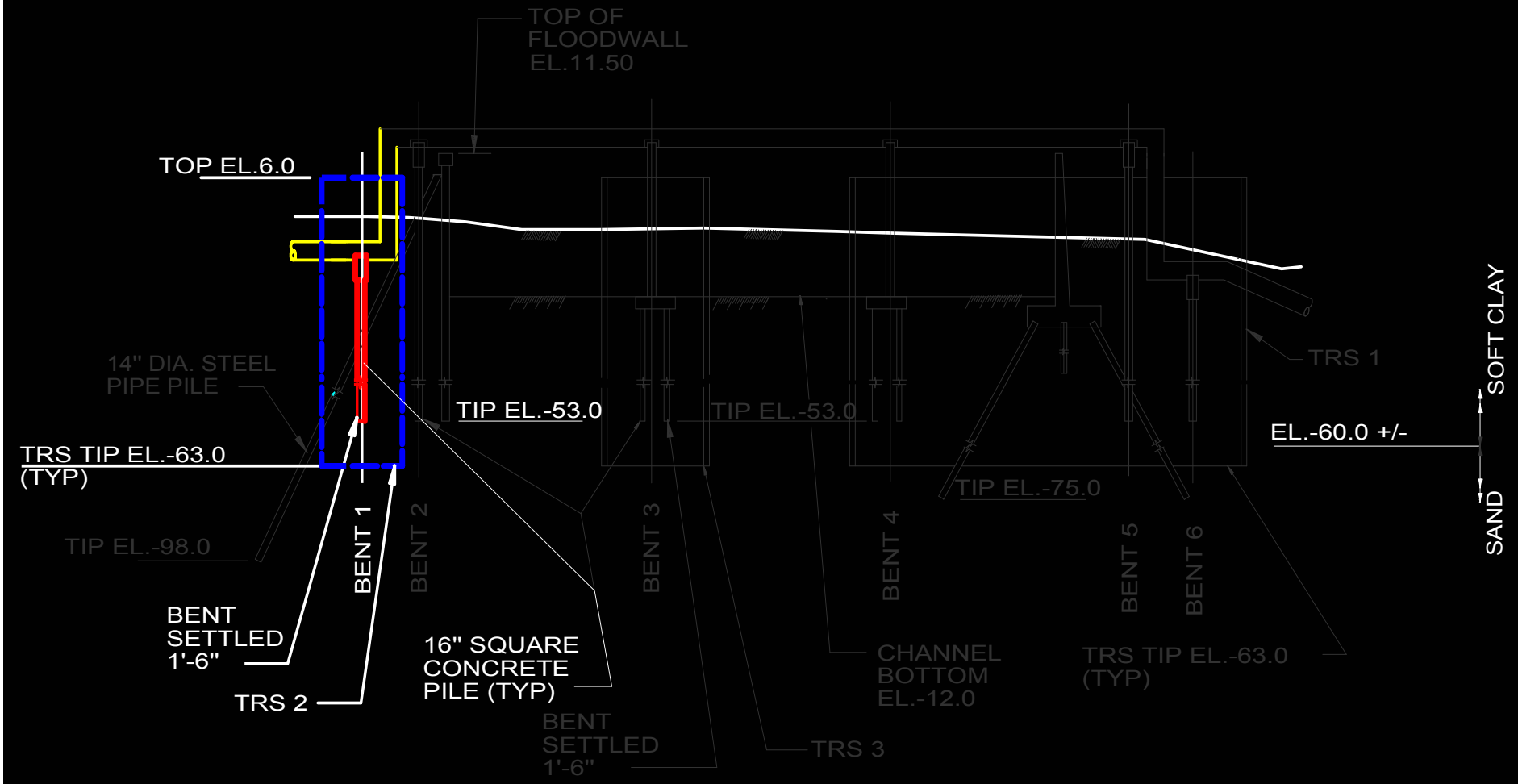
Pile Integrity Test – Bent A-6

Event Timeline - 2004

- Late Nov 2003 – Contractor pulls TRS-2 cofferdam sheet piling.
- Dec-Jan – Contractor drives permanent sheet piling and battered pipe piles for the braced wall.
- Jan 22 – Contractor reports waterline pipe on bent A-1 out of alignment
- Feb 4 – Contractor exposes and surveys bent A-1. Settlement = 1’-6”
- Mar 10 – Pile Integrity Test performed on bents A-1 and A-6
- Mar 19 – Second Modification issued
- May – First Waterline Complete and In Service

Potential Causes

- Soil Wedge Filled the Void Caused by Cofferdam Removal.
- Permanent Piles were COMPLETELY in the Soil Wedge that Moved.
- Vibrations from Driving the Adjacent Permanent Sheet Piling and Steel Pipe Piles for the Braced Wall.



TRS 2

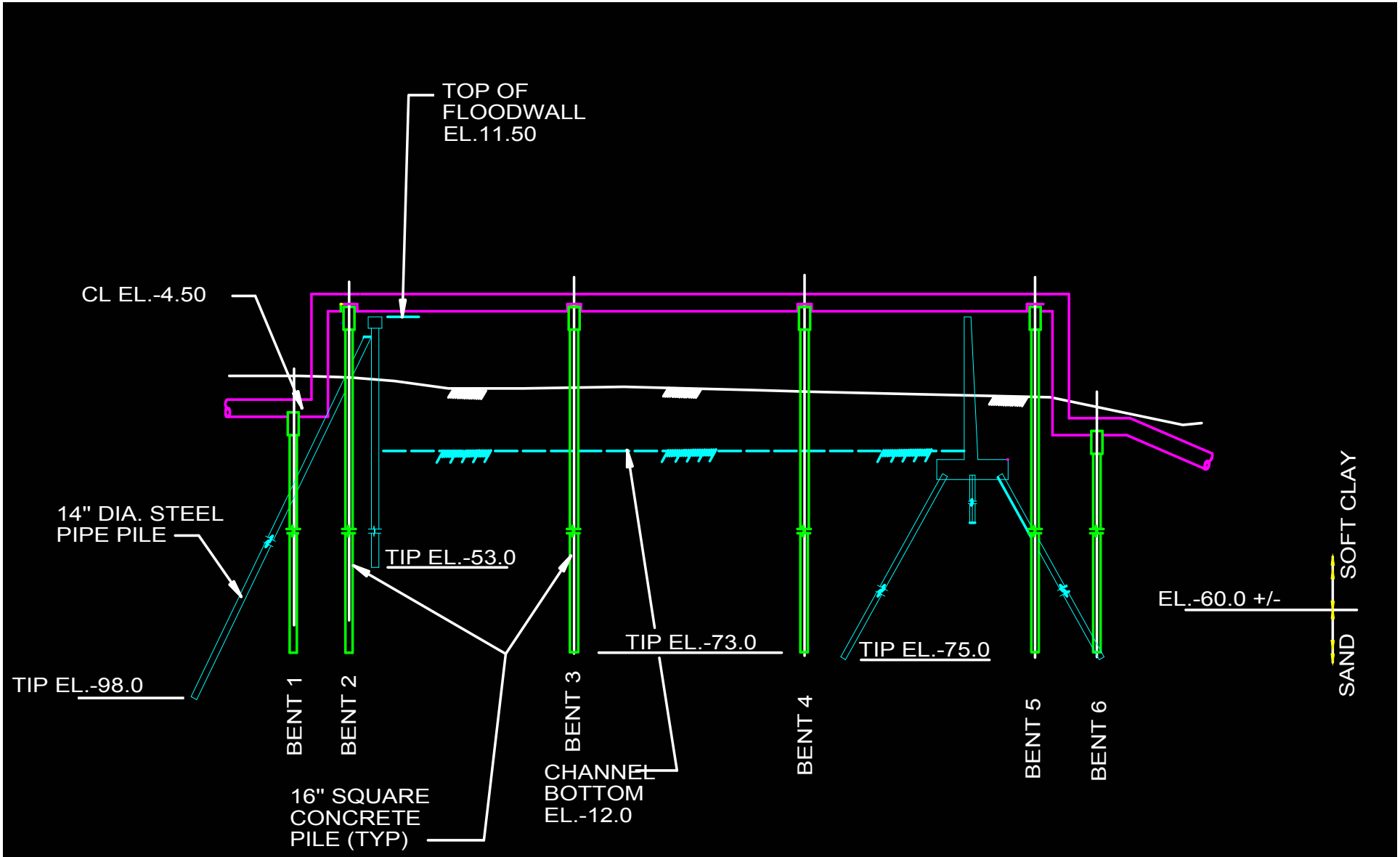
COUSINS PUMPING STATION COMPLEX
WATERLINE CROSSING "A"

Bent A-1

Bent A-1

Pile Integrity Test – Bent A-1

Bent A-2



PROFILE

COUSINS PUMPING STATION COMPLEX
WATERLINE CROSSING "B"

Waterline “A”


12 11 2004 12:40

Lessons Learned

- During Pile Design, Carefully Consider the Effects of Adjacent Construction, INCLUDING Temporary Construction.
- Compare Tip Elevations of Permanent Piles and Temporary Piles.
- Permanent Pile Tip Elevations Should ALWAYS be Lower than the Active Wedge of Temporary Piles.
- Don’t Design with Blinders On.
- Communicate, Communicate, Communicate!


01 06 2005


PETREX
01 06 2005

United States
Army Corps of Engineers
New Orleans District

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THANKS...