Tampa Junction Chamber Emergency Repair Combines Two Pipe Rehab Solutions to Repair Large-Diameter PCCP

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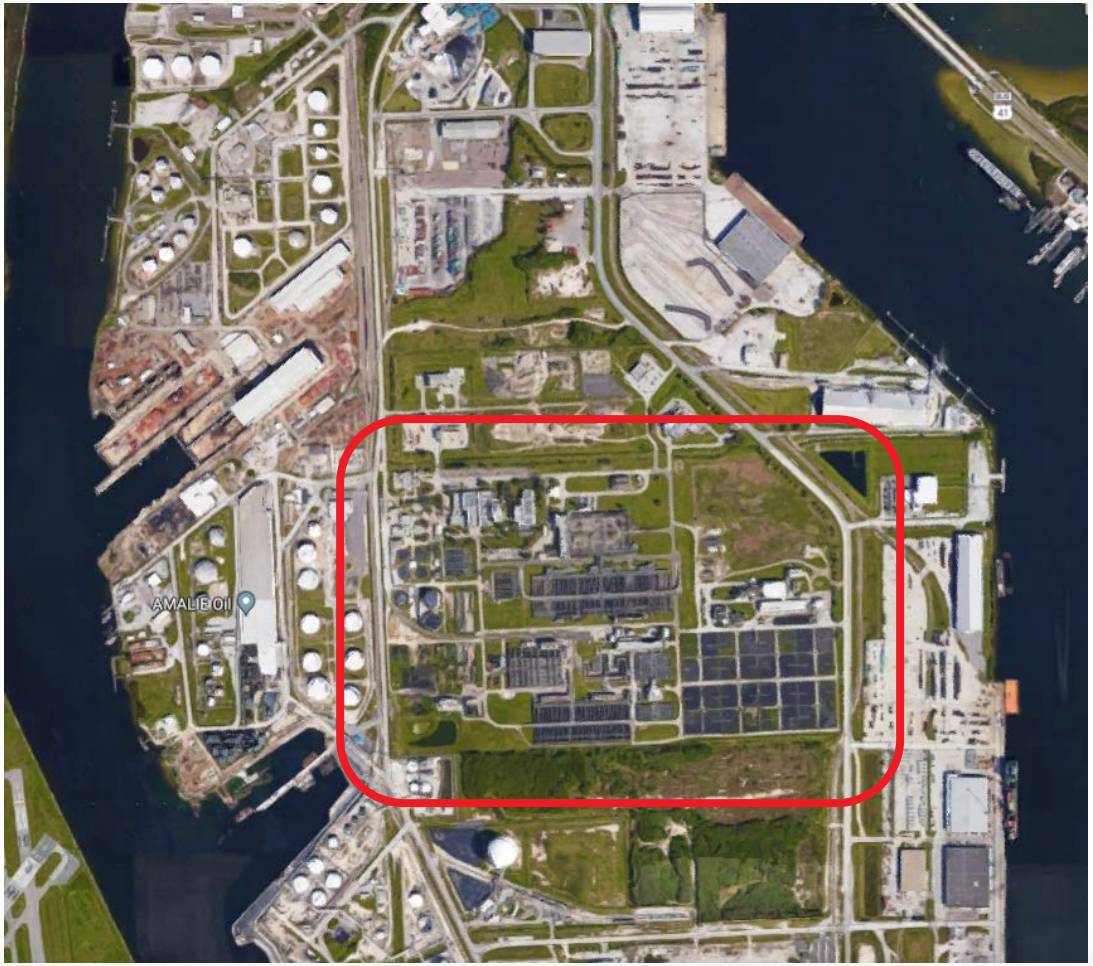
What to Expect

- **Project Overview**
  - Project Origin
  - Project Specifics
  - Original vs. Revised Scope
  - Challenges

- **CIPP & CFRP Materials**
  - Usage
  - Design
  - Combined Benefits

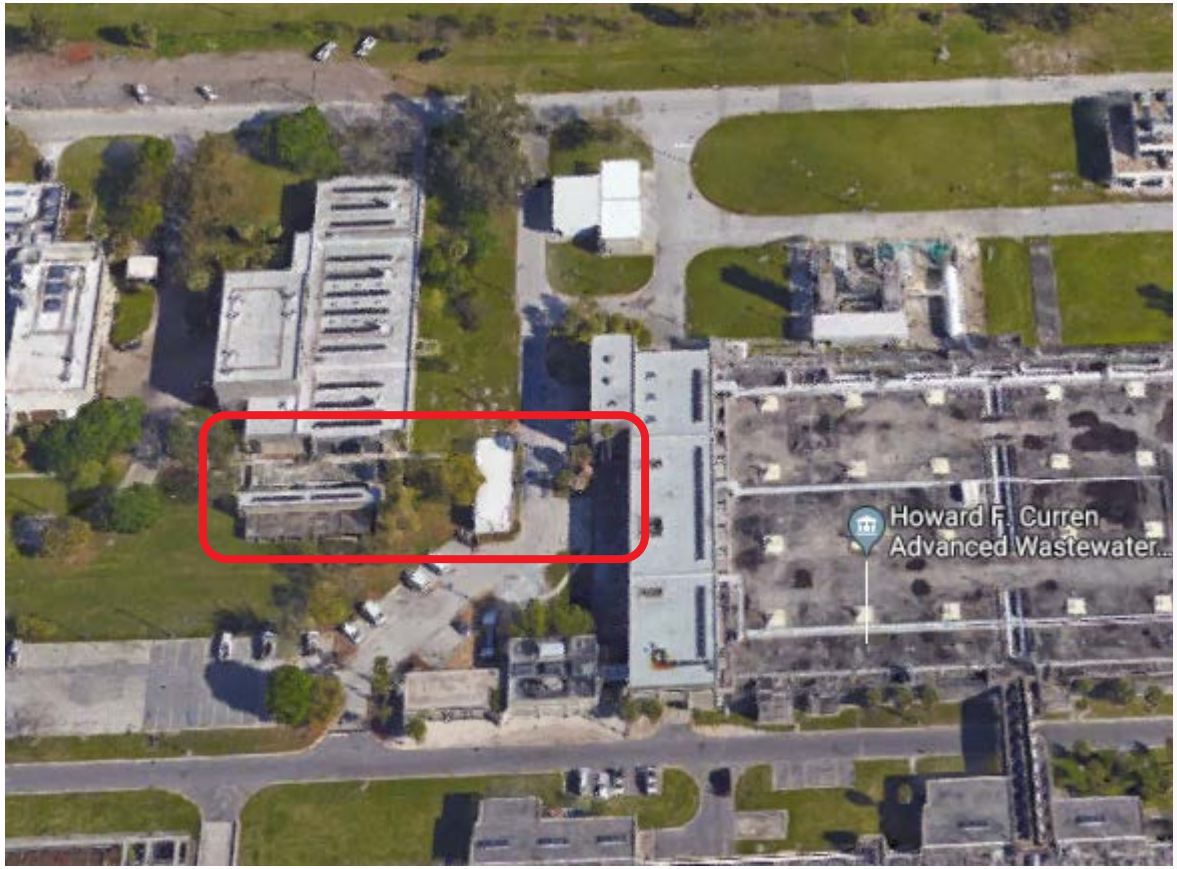
City of Tampa – Howard Curren AWTP

- 96 MGD Facility
- Average Annual Flow of 64 MGD
- Only WWTP for City of Tampa



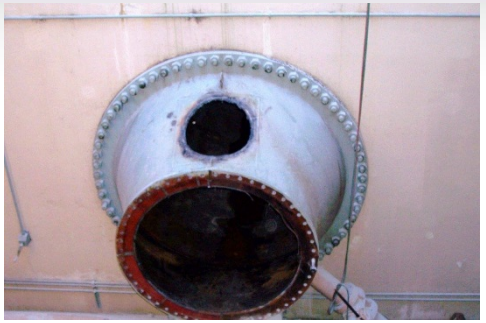
Project Structures

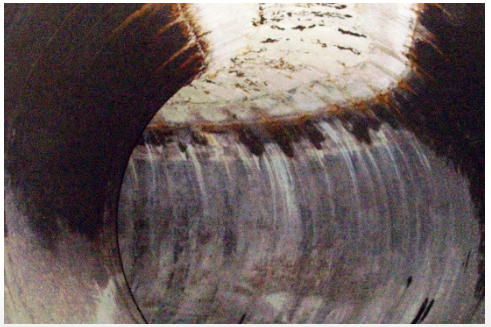
- Meter Vault
- Junction Chamber 2
- Wet Well



Project Origin

- Inspection/Assessment
- Severe Corrosion – 2 areas:
  1. Carbon Steel
     - 66” / 90” / 96” / Reducers
  2. PCCP
     - 66”
- Structural Deficiencies



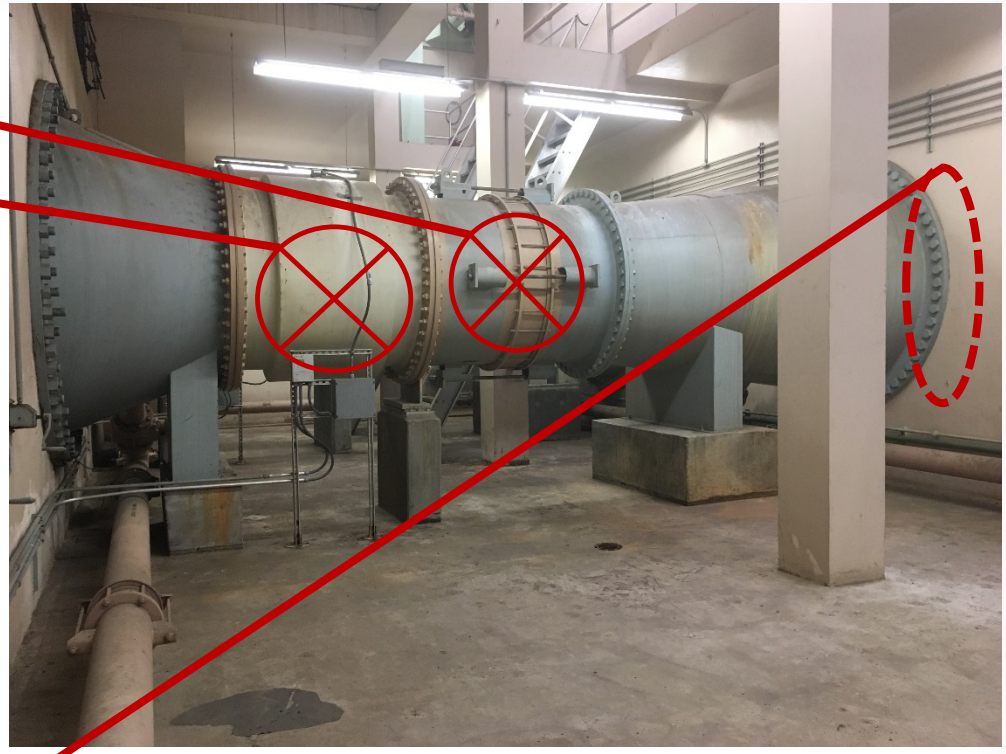


Original Project Overview – Part 1 – CIPP

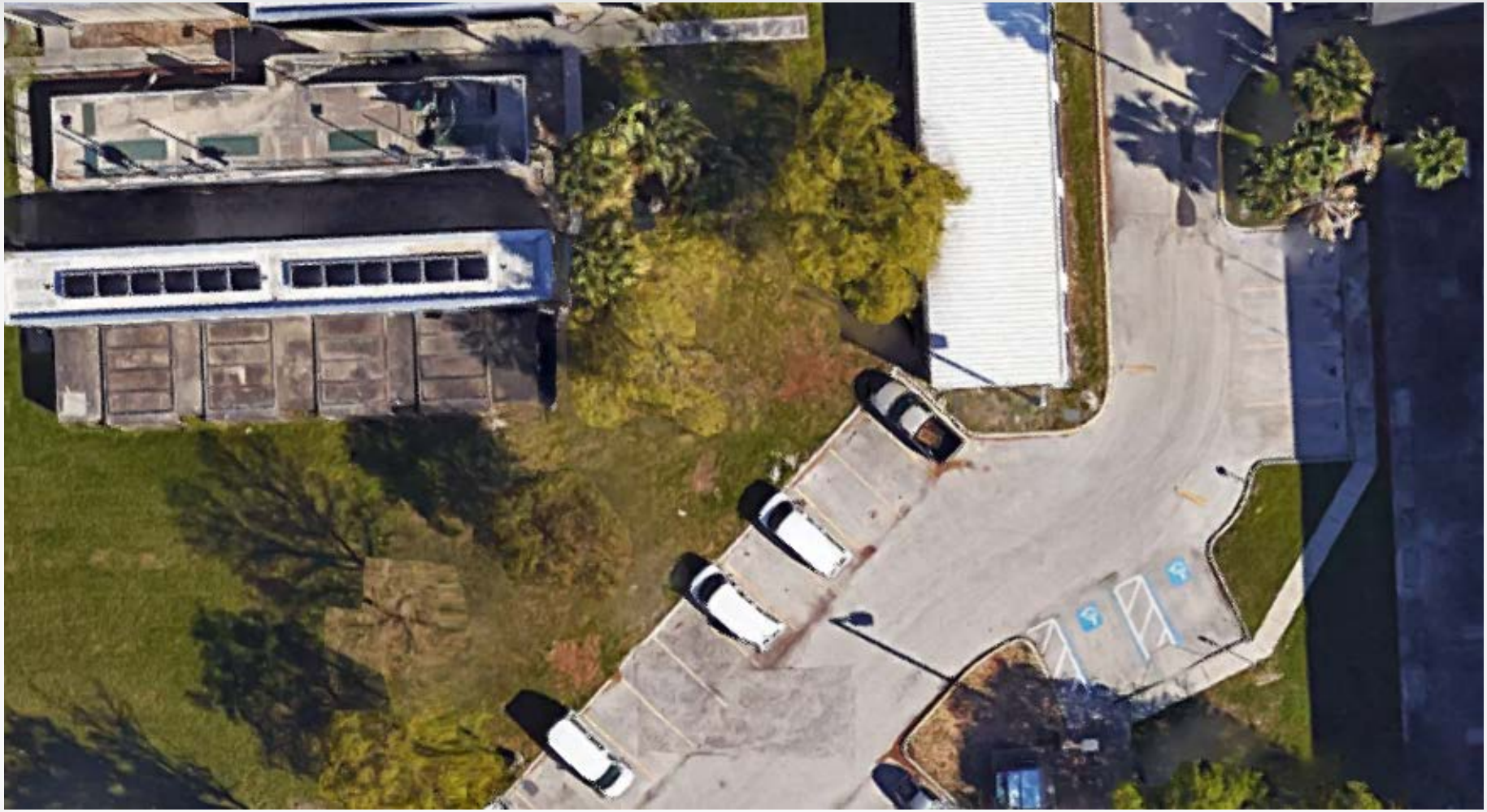
- CIPP lining
  - 150 LF of 66” PCCP
  - 90 degree bend
- Carries flow from JC2 to Wet Well

Original Project Overview – Part 2: Carbon Steel

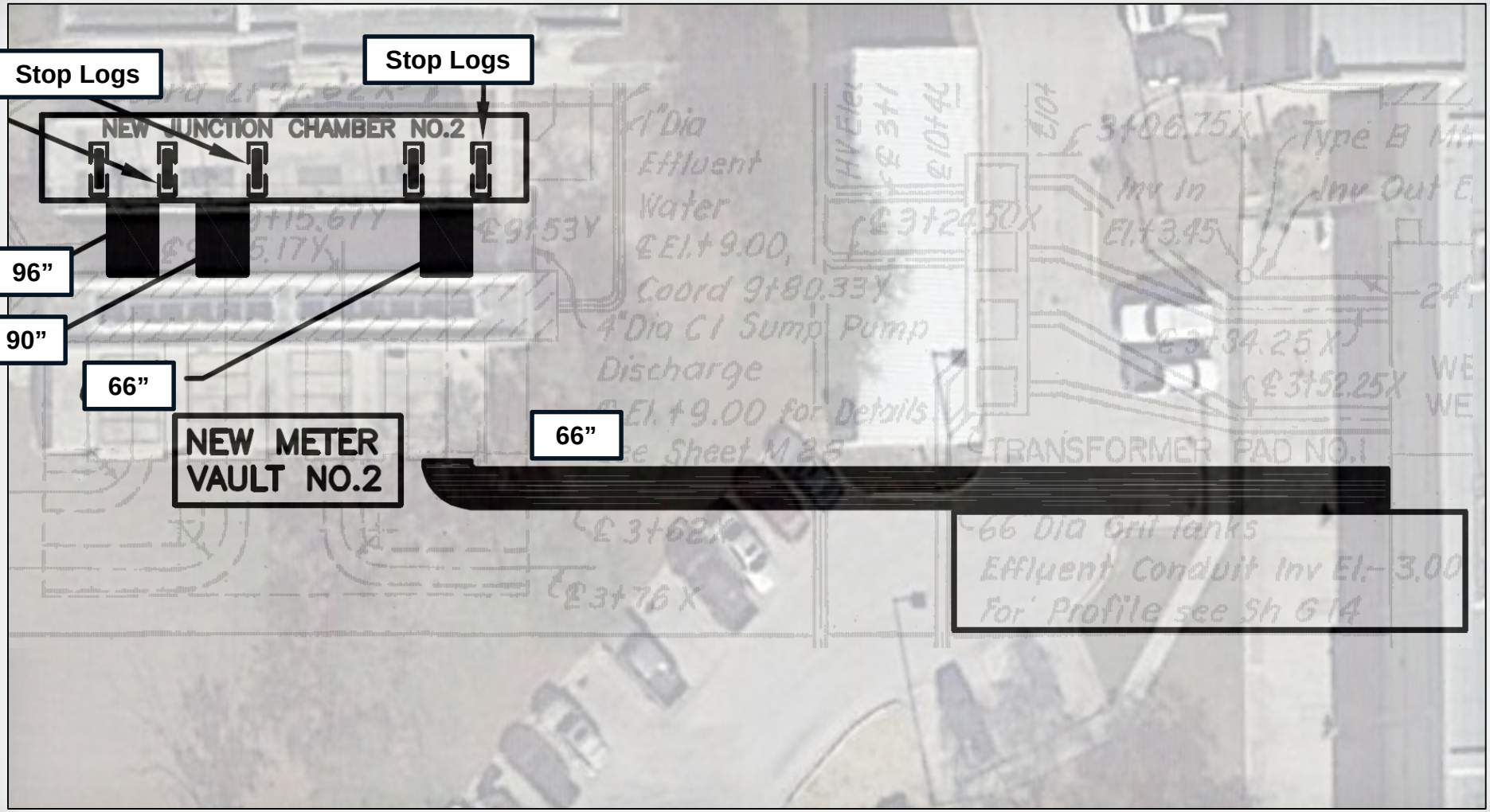
- Remove/Replace
  - 60” Dresser Couplings
  - 60” Metering Stations
- Removal & Interior coating of reducers:
  - 60” x 66”
  - 60” x 90”
  - 60” x 96”
- CIPP of pipes into Junction Chamber and to Wet Well
  - 10 LF each of 66”, 90” & 96”



Consideration for Project Planning



Consideration for Project Planning



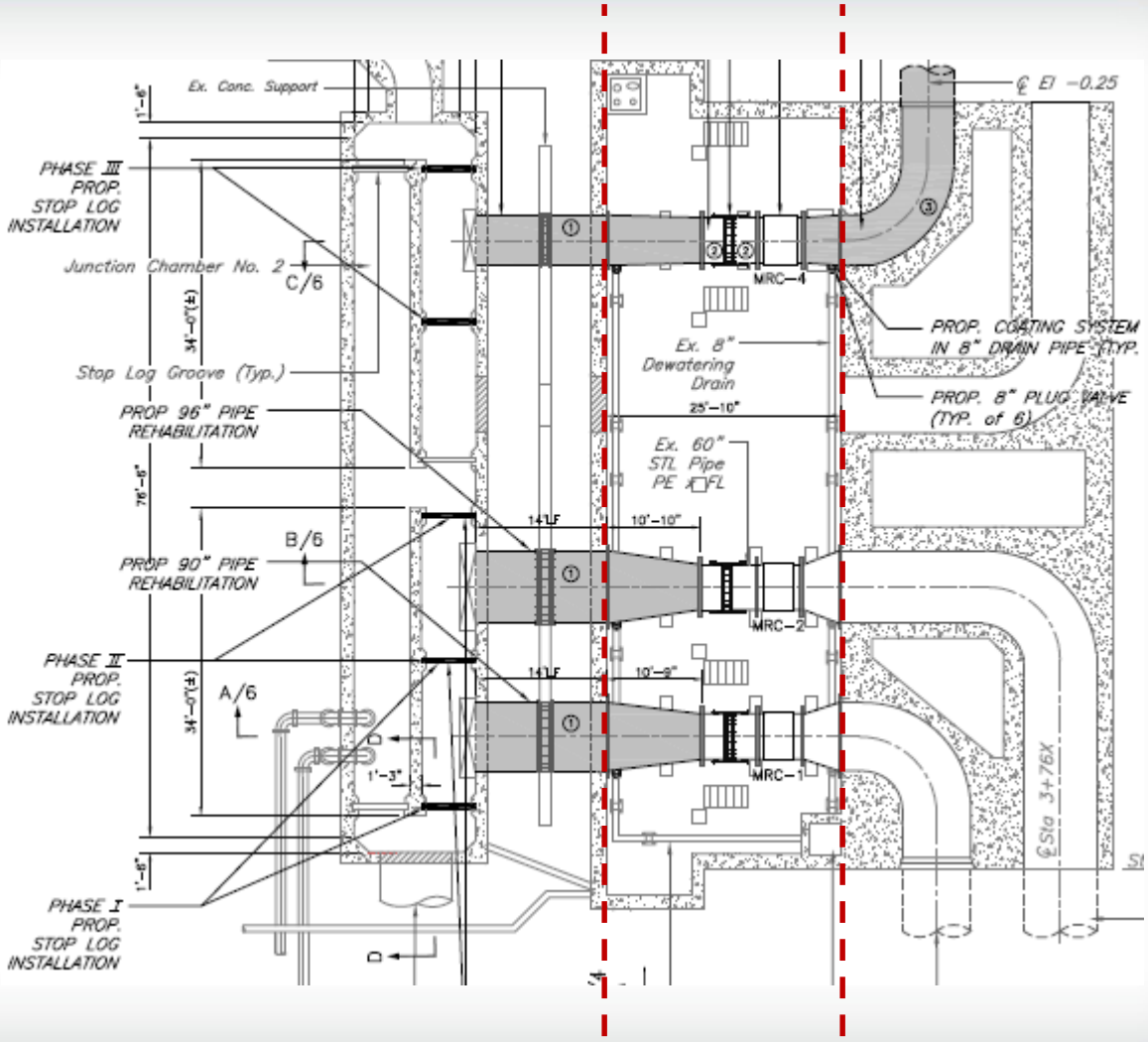
Project Planning Discussions

Project Planning Discussions

- **CIPP Logistics**
  - Access / Roof
- **Is CIPP the best option?**
  - Diameters
  - Shot Lengths
- **Other options?**

Revised Project Overview

- Remove/Replace
  - Dresser Couplings
  - Metering Stations
- CFRP wrapping of junction chamber pipes in lieu of CIPP
- CFRP wrapping of reducers in lieu of epoxy
- CIPP of 66” PCCP pipe into wet well



Carbon / Glass FRP Strengthening

- Origins in vertical structures:
  - Bridges
  - Columns
  - Beams

- Hand Applied – Wet layup process

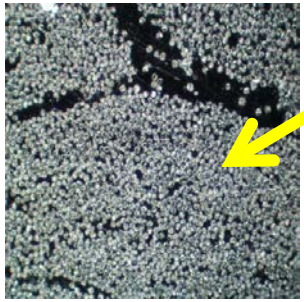
- Seismic strengthening / retrofits
- 20 years / 6,000+ projects
- Carbon/Glass FRP migration to Pipelines

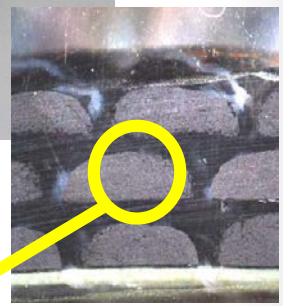
Carbon / Glass FRP Liners

- Effective in repair of buried pipes 36 in. diameter and larger
- In use more than 20 years on buried steel, PCCP, RCP, and FRP pipes
- More than 150 internal CFRP repairs
- Benefits:
  - No excavation / small footprint
  - Engineered to provide up to a Class IV design
  - Emergency repairs / rapidly implemented
  - Local or continuous repairs
  - Specialty repair in confined space
  - Up to 400 psi operating pressures
  - Minimal loss in cross-section
  - Improved flow characteristics (C=150)

Materials

- **Tyfo SCH Systems**
  - ✓Carbon Fiber Reinforced Polymers (CFRP)
- **Tyfo SEH Systems**
  - ✓Glass Fiber Reinforced Polymers (GFRP)





Design Summary – CFRP

Design Parameter:	Input:
Pipe Internal Diameter	66”, 90”, and 96”
Pipe Type	Ductile Iron
Design Standard	ASTM F1216
Operating Pressure	10 psi
Traffic Loading	Included
Soil/Water Height	6.5 ft (66”) 4.5 ft (90”) 4 ft (96”)

Longitudinal

Hoop

Notes on CFRP Design:

1. CFRP utilized for strength
2. Design Customized for Pipe Diameter
   - 66”: 3 layers total (1L + 2H) vs. 90”/96”: 4 layers total (1L + 3H)
3. GFRP layer utilized as a dielectric barrier only (non-structural)

CIPP Technologies

- Invented by Insituform in 1971
- Industry standard for trenchless gravity pipe rehabilitation
- Jointless, seamless, fully structural pipe-within-a-pipe
- Pressure Pipe rehab

Design Summary – CIPP

Design Parameter	Input
Pipe Internal Diameter	66”
Pipe Type	PCCP
Design Standard	ASTM F1216
Operating Pressure	10 psi
Traffic Loading	Included
Soil/Water Height	6.5 ft.

- 66” x 30mm CIPP
  - Standard tube
  - Water inversion

- Cost of CIPP vs. CFRP

Project Challenges

- CIPP install on 66” through reducer
  - Intention was dry tube through reducer
  - CFRP wrap of reducer eliminated
  - Mismeasurement - reducer was lined with CIPP and never utilized CFRP overlap

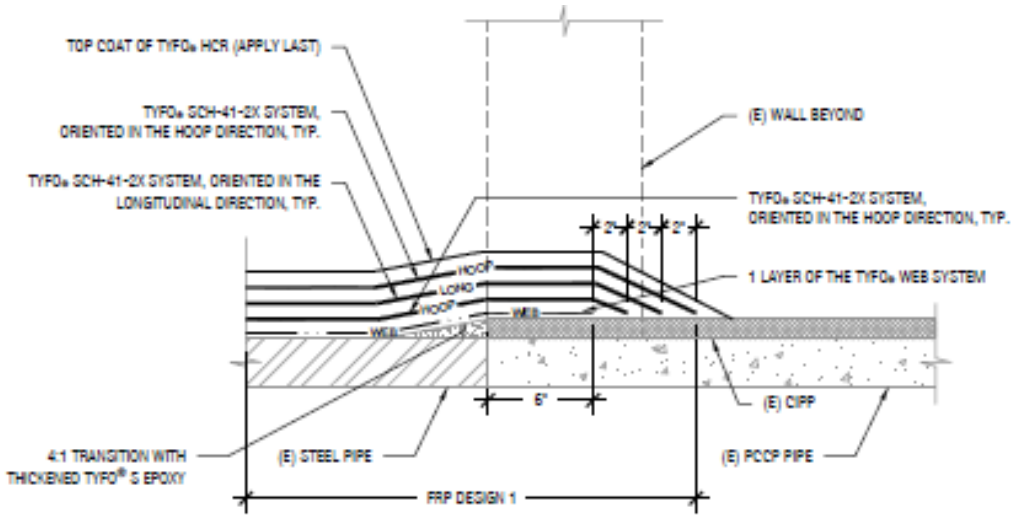
- Big deal? Not really…
  - Product flexibility
  - CIPP at reducer

Project Challenges

- CIPP termination in wet well
  - Small vault access
- Shot came up short
- 12” Epoxy transition at CIPP termination

Product Compatibility

- CIPP directly compatible for overlap with FRP – glass and carbon
- Scuff sand CIPP coating, apply FRP wrap
- Adhesion testing
  - ___ psi CIPP/CFRP bond
- Project planning Flexibility



1 Tyfo Fibrwrap System / CIPP Transition
N.T.S.

Product Compatibility

Projects:

Reading, PA - Schuylkill River Crossing

- 42” Force main CIPP with CFRP overlap
- Trenchless Technology 2014 POY Honorable Mention

South FL – large diameter RCP at WWTP

- 48” – 90” RCP with CIPP/CFRP combo

CIPP / CFRP Project Summary

CIPP

- One “shot” of 150 LF of 66” CIPP with 90^{o} elbow – 30 mm

CFRP / GFRP

- 10 LF each of 66”, 90” and 96” steel
- Reducers: 60” x 66”, 60” x 90” and 60” x 96”

Installation flexibility allowed for safer, cost competitive rehabilitation solutions.

Questions?

THANK YOU!

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