Yard Piping Improvements Project



Black & Veatch
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Experienced Leadership



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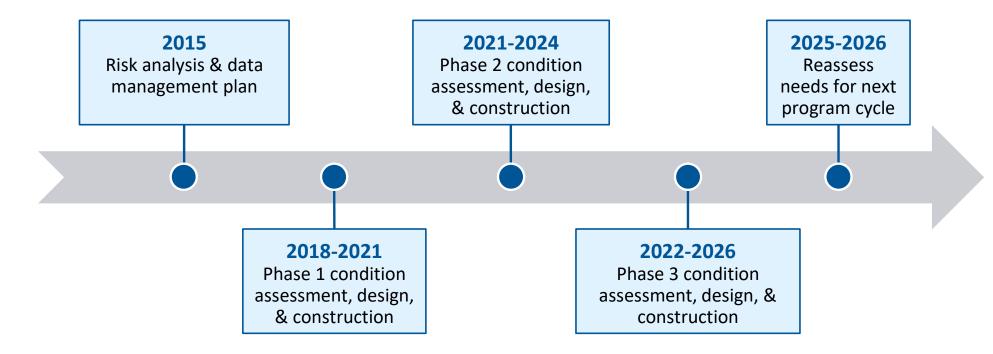
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Agenda

- Introduction
- Condition Assessment Planning (Prioritization)
- Field Investigations
- Rehabilitation Design
- Conclusions

The Journey



Process Piping Within Project



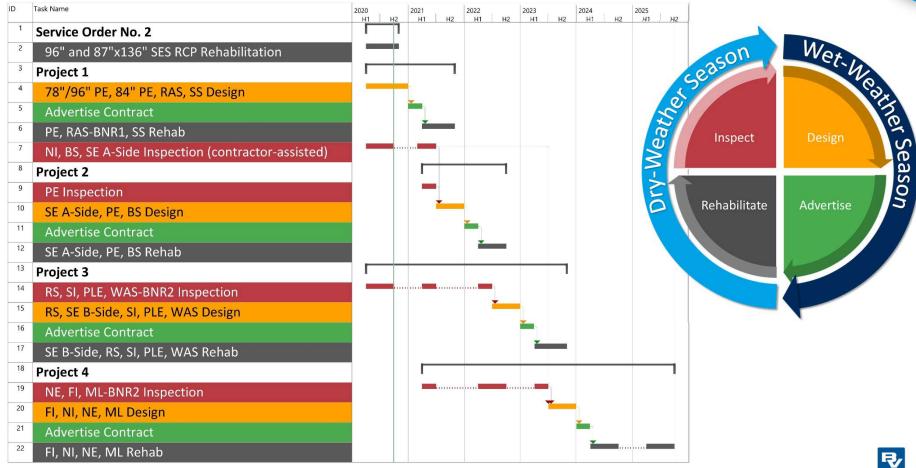
Condition Assessment Planning



Piping Prioritization



Program Schedule



Field Investigations



Inspections to Date

- ~12,800 linear feet inspected
- Scheduled based on:
 - Pipe priority
 - Availability
 - In conjunction with other CIP efforts





Inspection Methods



Multi-Sensor Inspection



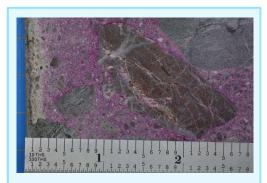
Topside Inspection



Remote Operated Vehicle



Thickness Testing



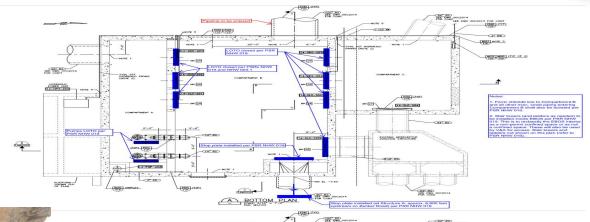
Concrete Testing

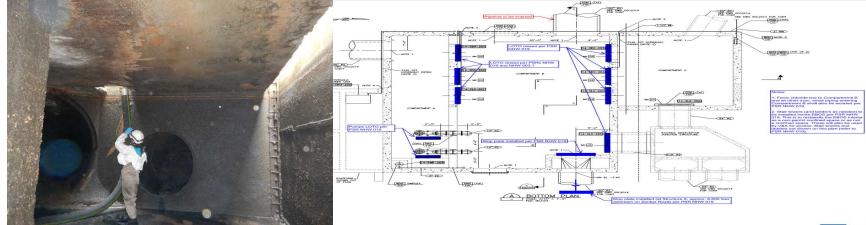


Confined Space Inspection

Safety as a Priority

- Well developed confined space program
- Rescue onsite
- Detailed LOTO plans
- Prefer double isolation





Process Shutdown Requests

- Field schedule
- Step-by-step work sequencing plan
- Assessment and testing approach
- Site-specific safety plan
- City requirements
- Flow diversion & isolation memos
- Work closely with City and other projects
- Final approval and sign off meeting

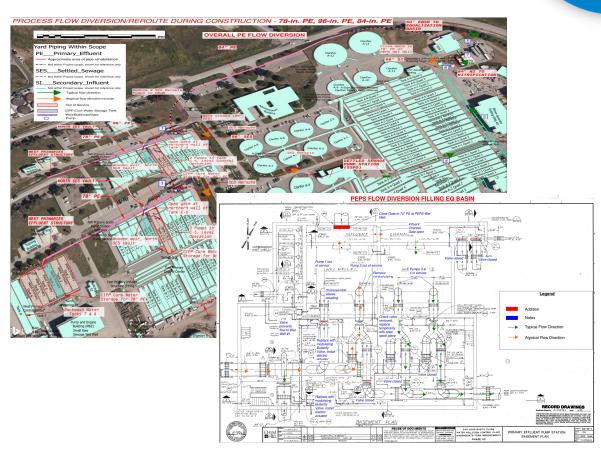






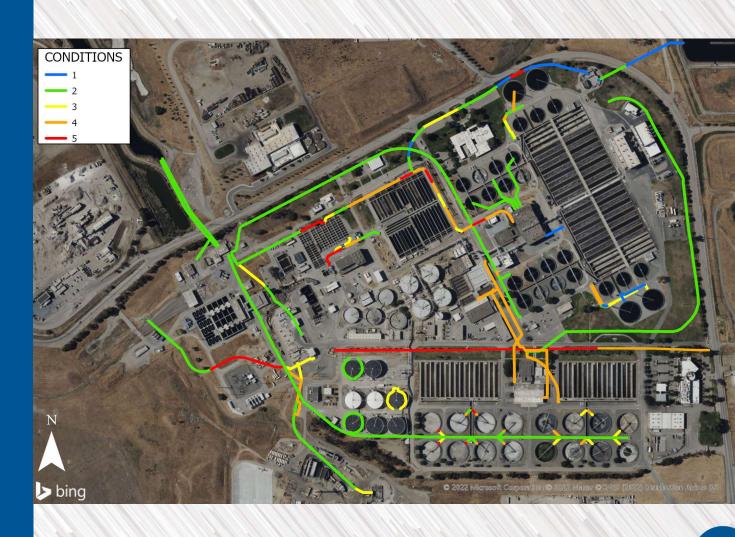
Case Study – 84" PE

- ~1,500 linear feet
- B&V designed provisions to support future inspection and bypass
 - Stop plates
 - Stop logs
 - Motor-operated BFV



Condition Scores to Date

- Primarily good condition
- Damage trend for SES, ML, & RS



Key Findings



Crown Corrosion (Concrete)



Crown Corrosion (Metal)

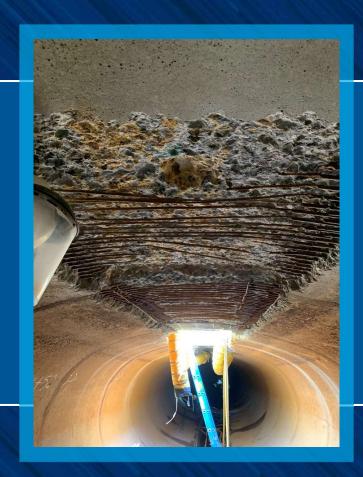


Access Constraints



Isolation Constraints

Rehabilitation Design



Rehabilitation Selection Criteria

Hydraulic Impacts

 Hydraulic model to determine effect on upstream water surface elevation

Service Life

• 50-year minimum for structural rehab methods

Constructability

 Construction schedule and sequencing, process disruption, required access, other CIPs

Cost

 Class 5 for alternative selection and Class 2 for selected alternatives

Rehabilitation Methods

- Trenchless rehab options generally selected:
 - Reduce site disruptions
 - Avoid congestion of crossing utilities



Cured-in-Place Pipe



Concrete Repair



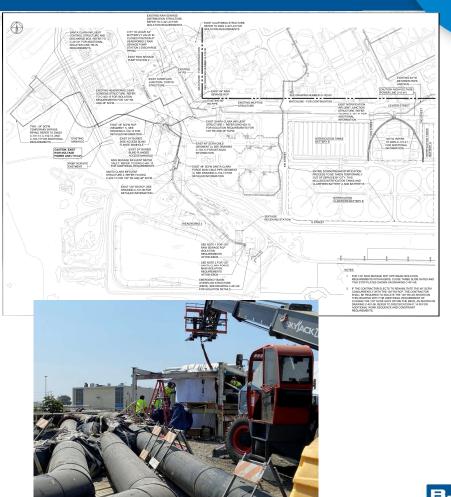
Carbon Fiber Reinforced Polymer



Protective Coatings

Constructability

- Safety and isolation
- New gate installations
- Temporary bypass systems
- Programming changes for flow rerouting
- Work closely with City and other projects
- Staging and accessibility
- Detailed work constraints and sequencing specification
- Work limits clearly delineated on Drawings

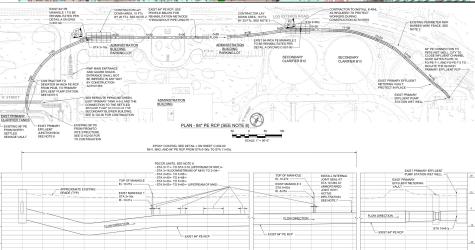


Case Study – 84" PE

- B&V designed stop logs and temporary bypass systems
- Localized concrete repair (pipe & MHs)
- Protective coating on ~1,100 linear feet
- Localized internal seal
- Sediment removal



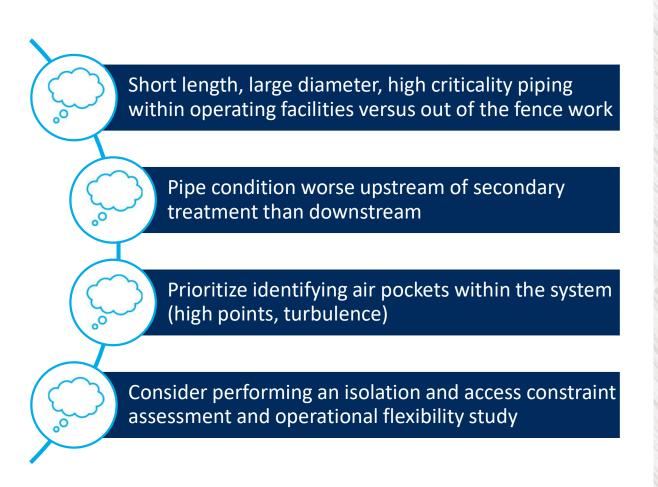




Conclusions



Food for Thought



Lessons Learned



Risk-based prioritization allowed focused effort and maximum return on investment



Pre-planning and flexibility were critical to collecting the highest-resolution data over the furthest coverage while keeping **safety** as a priority



Buy-in from all stakeholders early on lead to success, including Owner, Engineer, Contractor, and other projects



Field verified data identified right design, minimizing surprises during design and construction

Questions

THANK YOU

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