Wastewater Treatment Facility Influent Sewer Rehabilitation

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WSA Infrastructure Failures

- 2010 Flood ($14 Million)
- 2011 Cedar Swamp Pump Station Force Main ($2 Million)
- Other vulnerabilities identified including main influent pipe

CCTV Inspections

- Initiated in December 2011
- Pipe condition looked suspect
- Brown and Caldwell assistance 2014

Hydrogen Sulfide effects seen on influent sewer

Loss of concrete and exposed reinforcement were observed

Condition Assessment

- Wall section loss from 7 O’ Clock to 4 O’ Clock
- Section beneath I-95 deemed to have structural deficiencies
- Tech Memo containing an evaluation of rehabilitation and replacement options prepared by BC

Inspection Description	Length (ft)	Diameter (in)	PACP Structural Grade
4-280-eas-b to 4-280-3 (Main Influent Sewer crossing I-95)	317	48	5(63)3(63)
4-280-3 (first manhole northwest of highway ROW) to 4-280-3A (last manhole before headworks)	189	48	3(40)00
4-280-3A to Headworks	88	48	3(40)21

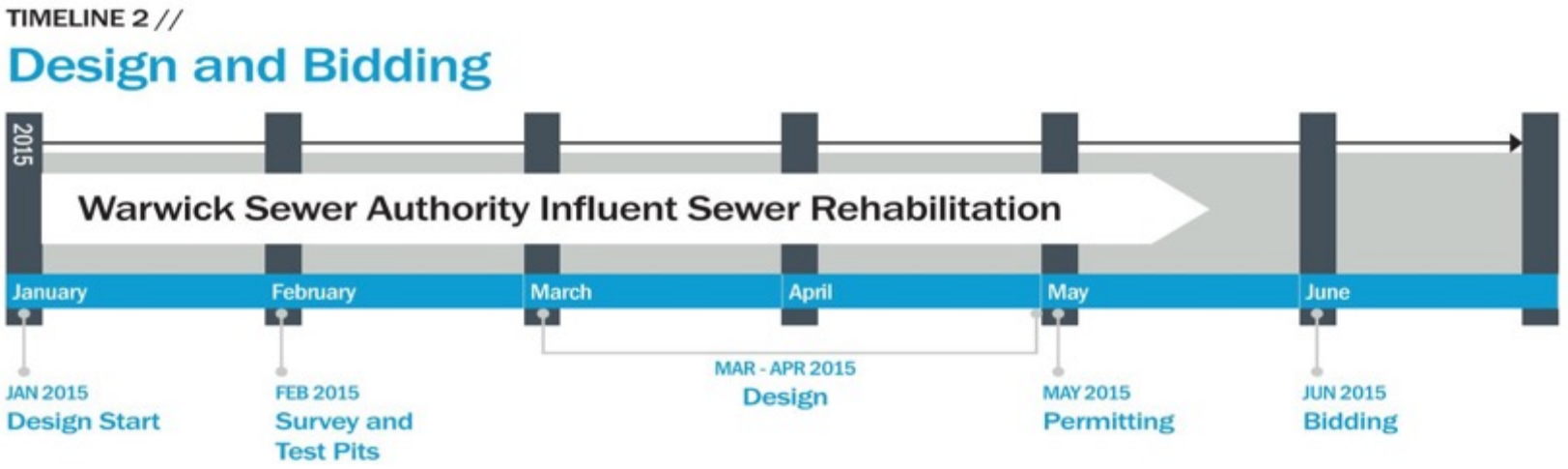
Technical Memo Recommendation: Sliplining

Existing Sewer exposed during construction

Rehabilitation Alternative	Service Life (years)	Advantages	Disadvantages	Estimated Construction Duration (days)	Probable Opinion of Cost ($)
CIPP Lining	50	Provides structural repair Proven method	Bypass required	28	520,000
Slip Lining	50	Lowest cost Bypass not required Proven method	Reduced diameter	10	350,000
Epoxy Lining	15 to 25	Provides corrosion protection	Does not restore structural integrity Bypass required	10	605,000
Pipe Replacement	50 to 100	Provides redundancy No bypass required	Highest Cost Significant Permitting Increased Risk	35	1,020,000

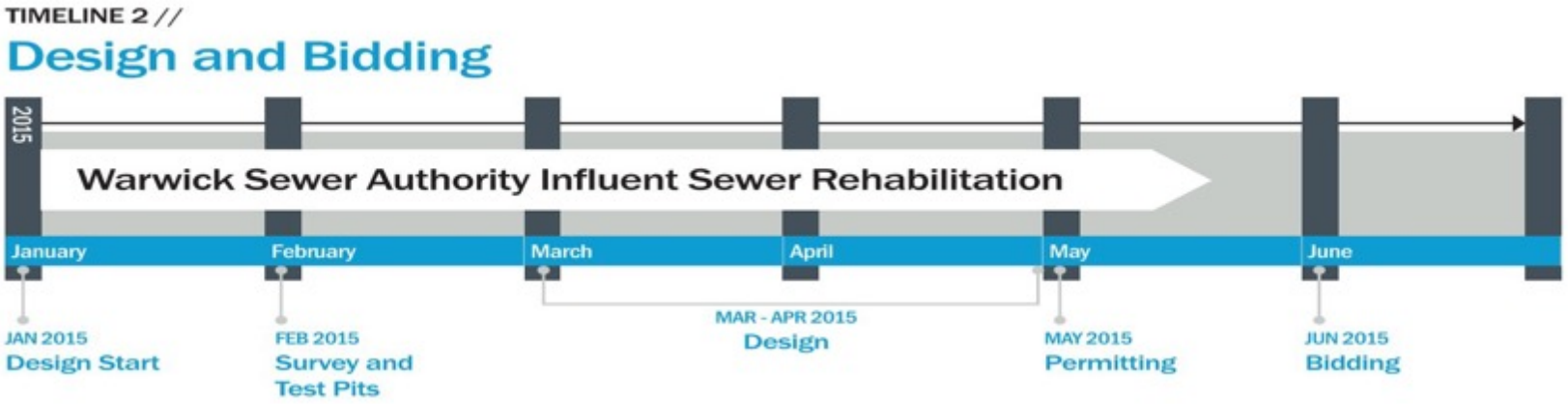
Design and Bidding

- Survey
- Test pits
- Contract Documents
- Permitting/Approvals – RIDEM & RIDOT



Design and Bidding – Key Issues

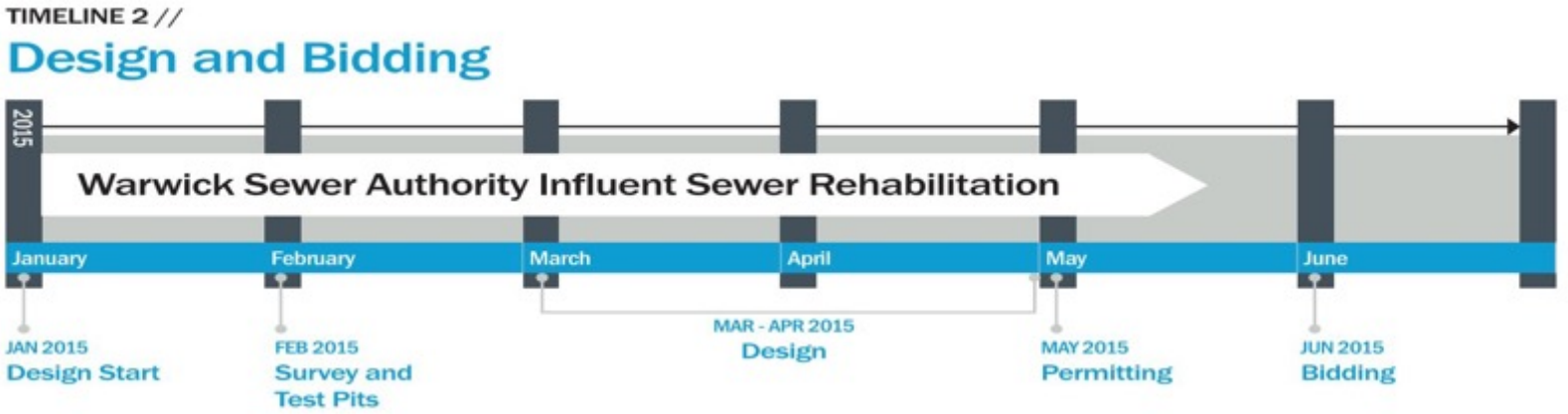
- Contractor Qualifications & Experience
- Pipe For Sliplining
- Base Bid & 2 Add Alternates
- Bulkheads & Grouting
- Fast Track Schedule – Complete 2015



Permitting

- ALL Work specified to occur outside ROW
- RIDOT Approval for Maintenance Activity
- RIDEM notified and Design Documents provided. No formal approval required for repair/maintenance activity

WSA fence removed – RIDOT fence intact

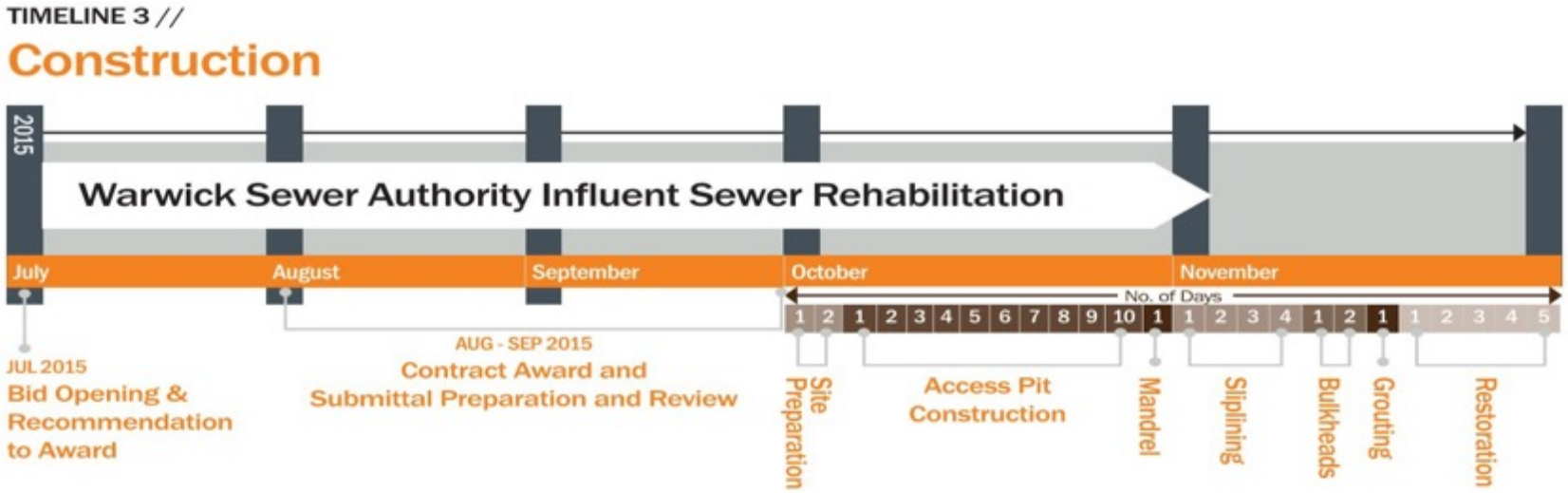


Project Costs

Project Cost Summary		
Amount	**Description**	**Notes**
$ 11,900	Condition Assessment & Tech Memo	
$ 70,000	Survey And Design	
$ 720,560	Construction	Engineer Estimate = $769,400 Bid Price = $753,900
$ 62,200	Construction Administration & Observation	Full/Part Time
$ 864,660	Total	Excluding WSA Admin. and Legal

Construction – Specialty Subcontractors

- CCTV – Pre & Post
- Concrete Cutting – Sewer and Manholes
- Grouting – Cellular Foam



Construction Activities

- Site Preparation
- Access Openings
- Mandrel
- Sliplining
- Grouting
- Restoration

Construction Entrance

Schedule Based on Pipe Delivery

Site Preparation

Staging and Laydown Area

Exposing Existing Sewer

Construction Activities

- Site Preparation
- Access Openings
- Mandrel
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- Grouting
- Restoration

Flow Containment Controls

Access Opening Construction

Access Openings

Concrete Cutting

Concrete Cutting at Manhole

Construction Activities

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Mandrel

Pipe Installation

Sliplining

Pipe Installation

Pipe Installation – Pipe held in place for joining

Construction Activities

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- Restoration

Grout Pump and Foaming Agent Truck

Bulkhead with Grout Port and Air Release Lines

Grouting

Grout Samples

Grout Leakage into Pipe

Construction Activities

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Completed Concrete Encasement

Rebar for Concrete Encasement

Restoration

Manhole Restoration

Sliplining Receiving Location Restoration

Construction Lessons Learned

- Bulkhead leakage contributed to pH spike
- Anticipate potential for excessive debris capture & removal
- Protection of existing facilities is important
- Teamwork to address issues
- Proactive approach dealing with project abutters minimizes issues
- Keeping regulators informed

Debris Removed from Screen Chamber in Headworks

Acknowledgements

- WSA Board Members
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- Chris Garrett, PE BC
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- DiPrete Engineering– Survey
- Sovereign Consulting – Geotechnical
- Inland Waters - CCTV

Questions?

Thank You for Your Attention!

Brown AND Caldwell