

**A RIVER RUNS THROUGH IT**

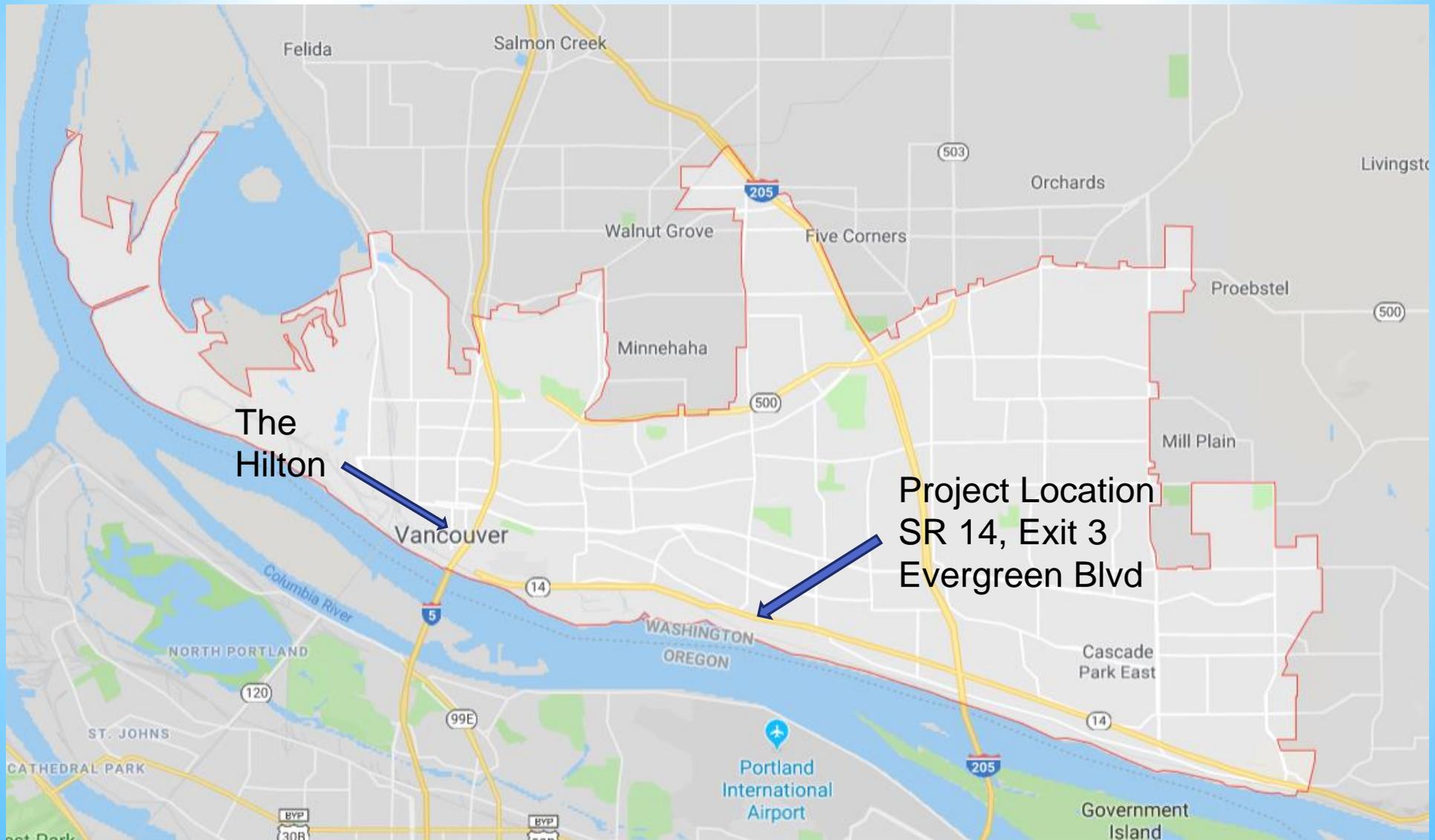
**LESSONS LEARNED  
IN USING  
CIPP FOR WATER MAIN  
REHABILITATION**

**Michelle Henry, PE  
City of Vancouver**

**May 3, 2019**

**2019 PNWS-AWWA CONFERENCE  
VANCOUVER, WASHINGTON**

# Project Location



# Project Location



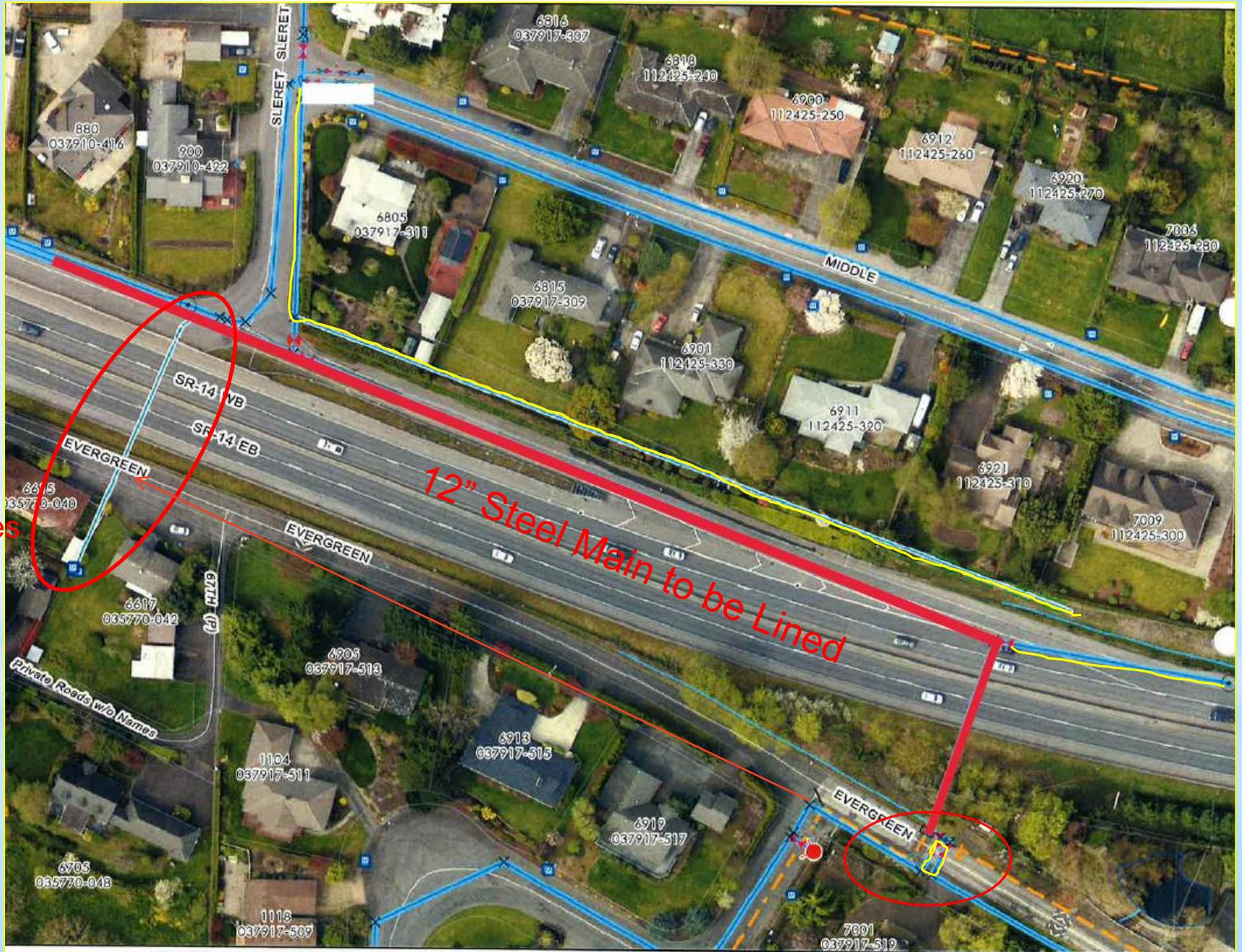
# WHY DO THIS PROJECT?



# LEAK REPAIR



# WATER LINE REHABILITATION LIMITS- OFF RAMP AND FREEWAY XING



# CURED IN PLACE PIPE

- Fully structural
- Felt or fiber combination
- NSF-61 certified for drinking water
- Maintain hydraulic capacity
- Tight fit – no annular space
- No special fittings
- Ability of liner to navigate bends
- Installation methods – invert or pull thru

# BID PROCESS (OCT 2016)

Estimated Construction Cost = \$325K

- \$200K for CIPP, \$125K in other work

Two Bids Received, Low Bid = \$405K

- \$185K for CIPP, \$220K in other work

# Scheduling Constraints

- Contract issued October 2016 -work to be complete by April 30, 2017
- 21 days to perform work - minimize traffic impacts
- WSDOT
  - daily shutdown ok but ramp must be open for the evening commute.
  - 1 full week closure allowed

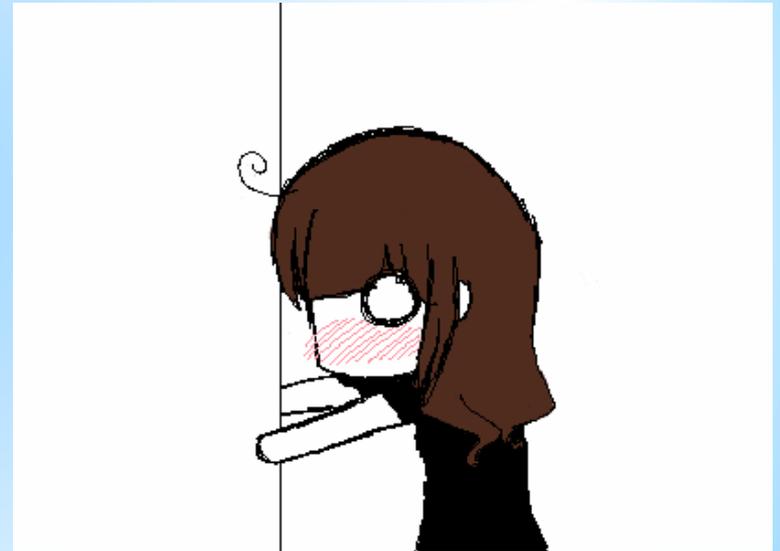


Required Completion Date

April 30, 2017

Actual Completion Date

May 7, 2018





**WHAT WENT WRONG?**

# Construction

- Step 1 - Install upstream butterfly valve - isolate host pipeline.
- Step 2 – Open pipe to inspect, clean, and prepare for lining.
- Step 3 – Insert liner, cure, disinfect, bac-t test, and pressure test.
- Step 4 – Reconnect pipe and close pit locations.
- Step 5 – Place rehabilitated main into service.
- Step 6 – Abandon other mains as planned.
- Step 7 – Final street restoration and clean up.

# Required Approval by WSDOT

## NOTIFICATION OF MAINTENANCE OPERATIONS WITHIN STATE RIGHT OF WAY

### Written Confirmation of Compliance

#### FAX three (3) Working Days Prior to Start of Construction

Inspector Cori Fahmi (360) 905-2180 cell (360) 609-3309 [fahmic@wsdot.wa.gov](mailto:fahmic@wsdot.wa.gov)

Utilities Project Delivery Engineer 360-905-2298 [novesd@wsdot.wa.gov](mailto:novesd@wsdot.wa.gov)

Utilities Engineer 360-905-2006 (cell) 360-567-5470 [henden@wsdot.wa.gov](mailto:henden@wsdot.wa.gov)

Fax No. (360) 905-2218,

Area 1 Bob Kofstad \_\_ Area 2 Scott Wilcox \_\_ Area 3 Charles Hazen \_\_ Area 4 Jay Chambers \_\_

**Note: In the event of a lane closure the contractor SHALL contact TMC at 360-759-1300 for notification of any lane closures including the M.P. to M.P. and for start and end times.**

Date: \_\_\_\_\_

To: Cori Fahrni \_\_\_\_\_, SOUTHWEST REGION UTILITIES

UTILITY CO: \_\_\_\_\_

Contact: \_\_\_\_\_ Address/ e-mail: \_\_\_\_\_

Phone: \_\_\_\_\_ Cell# \_\_\_\_\_

UTILITY'S CONTRACTOR: \_\_\_\_\_

Contact: \_\_\_\_\_ Address/email: \_\_\_\_\_

Phone: \_\_\_\_\_

Field Contact Person: \_\_\_\_\_ Cell #: \_\_\_\_\_

What: \_\_\_\_\_

When: \_\_\_\_\_

Where: SR \_\_\_\_\_ MP \_\_\_\_\_ to MP \_\_\_\_\_

Location: \_\_\_\_\_

Existing Permit/Franchise Number: \_\_\_\_\_

○ WSDOT: Signature \_\_\_\_\_  
NORTH \_\_\_\_\_ Date \_\_\_\_\_

Shall provide sketch of proposed work below:

R/W-----

EOP-----

C/L-----

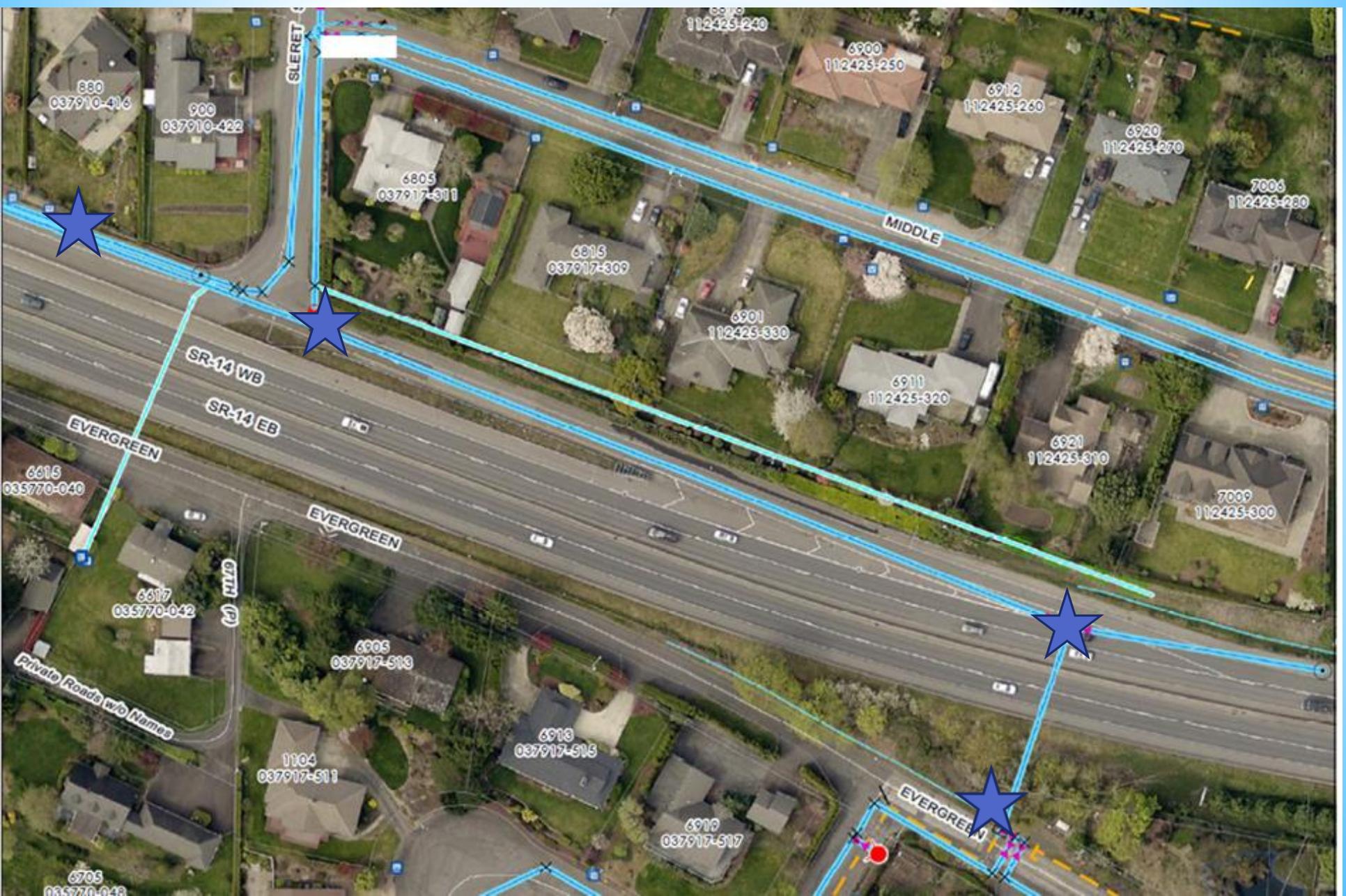
EOP-----

R/W-----

- Permit requirements for utility in WSDOT right of way.
- Line rehabilitation categorized as maintenance.



# Excavation Pit Locations:



# Coordination of Work

Prime self performing; pit excavations; general pipework, pipe cleaning in preparation of the liner, disinfection, testing, reconnections, and backfill.

Subcontractors for traffic control, CCTV inspection, **lining installation**, and final pavement restoration.



# City decides to delay work.

Preconstruction Meeting - February 7, 2017

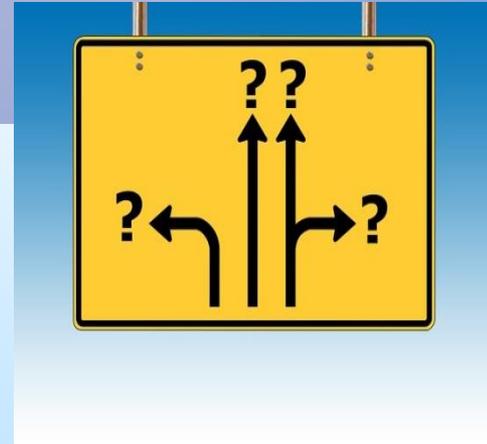
Completion Date per Contract – April 30, 2017

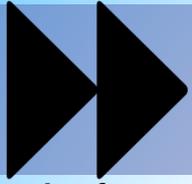
Shutting down the pipeline limited fire flow. It needed to be back in service before the dry season.

First Change Order – May 8, 2017 **Unable to coordinate work.**

Delay – new contract completion date of November 17, 2017 with work to start by October 1, 2017.

2017 SUMMER PASSES.....



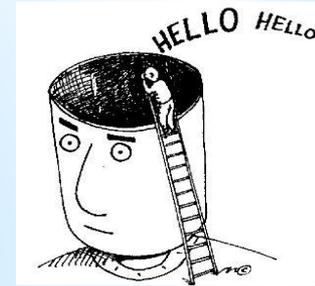


## FAST FORWARD ...

End of summer 2017 the City prompts the Contractor for updated schedule for work in October.

WSDOT approves permits for work to start on October 1<sup>st</sup>

First week of October goes by – no work.



Risks of not making a timely repair:

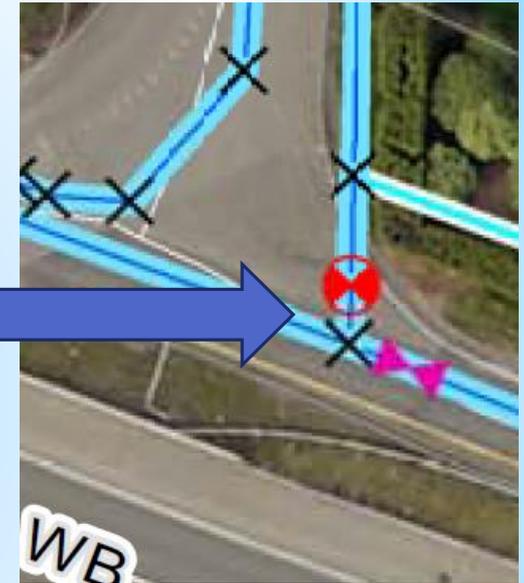
- 12” water main failure could flood ramp and SR 14, creating a complete closure
- Loss of fire protection to homes on the south side of SR 14.
- Extended traffic and construction impacts to the neighborhood.

Construction finally starts October 17<sup>th</sup> - 1 year after bid opening.

# 1<sup>st</sup> Excavation Pit -Valve Installed to Isolate Pipe



# 2<sup>nd</sup> Excavation Pit – Top of Ramp



# Excavation Pit 2 - Tee and Valve Cut-out



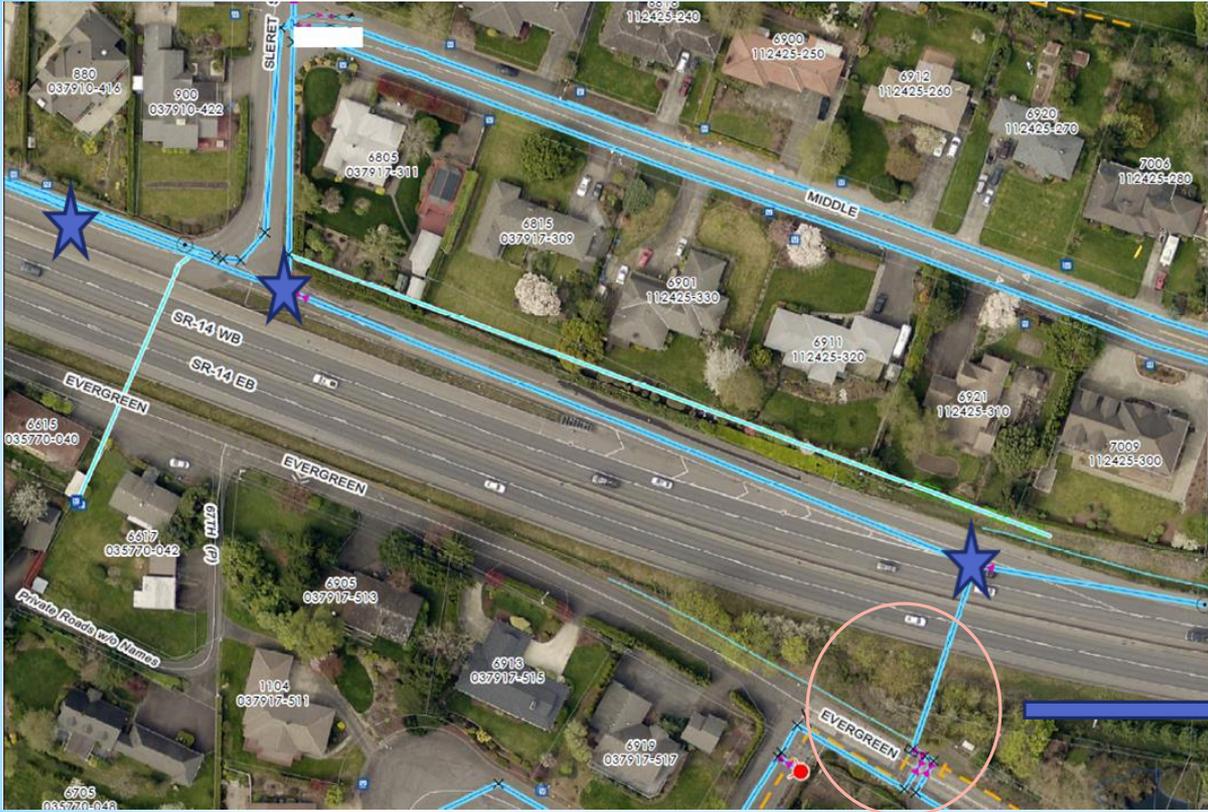
# 3<sup>rd</sup> Excavation Pit – Bottom of Ramp



# Excavation Pit 3 - Tee and Valve Cut-out



# 4<sup>th</sup> Excavation Pit – South of SR 14



# 4<sup>th</sup> Excavation Pit – South of SR 14





# 1<sup>st</sup> CCTV Inspection (after water jetting - Nov 6 2017)

Looking for:

- Protruding boiler plugs.
- Pipe abnormalities and condition
- Obstructions
- Unknown service connections.

Found:

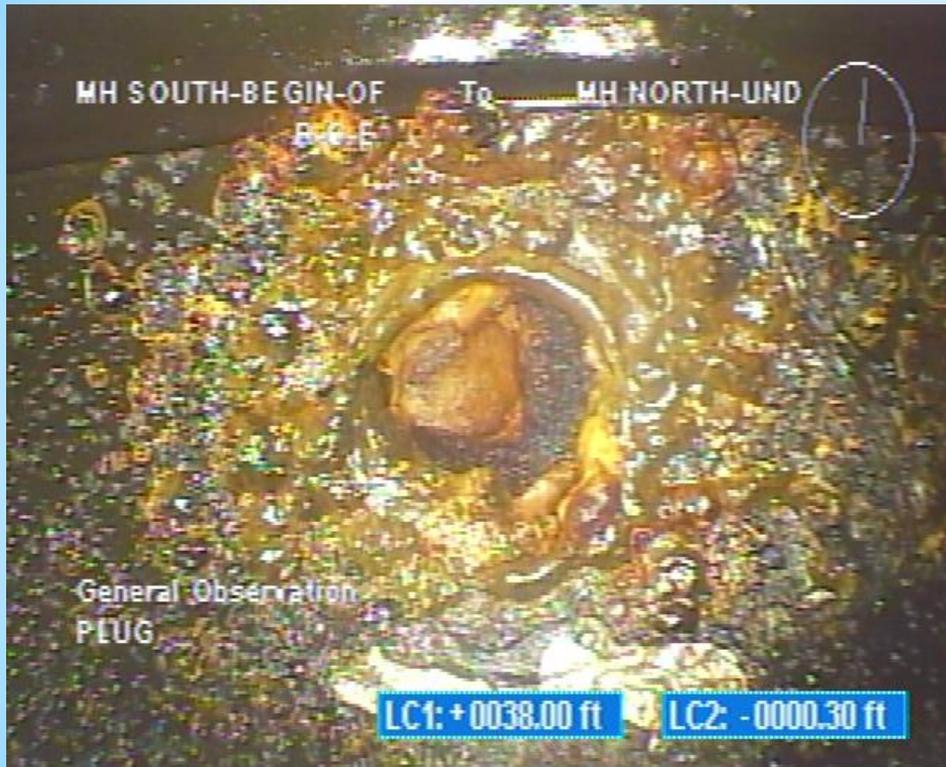
- 2 Inactive Service Taps
- Mitered Bends
- Heavy rust tubercles and sedimentation
- Water bellies - unable to get camera all the way thru pipe crossing SR14
- Obstruction

Not Found:

- Boiler Plugs (?)



# Service Taps



## Plugged Service - Corp Stop

# Mitered Bends



# Mitered Bends

# Internal Pipe Condition



## Rust Tubercles and Sedimentation

# Wood?



# Results of 1<sup>st</sup> CCTV

- Pipe not satisfactorily cleaned -3000 psi water jetting method failed to remove eroded materials in the form of tubercles and scaling which have built up on the inside of the pipe walls over time. In addition, sediments collected in the bottom of the pipe by using the water jetting method were not cleared from the pipe.
- Incomplete CCTV - water Jetting left standing water in areas which did not allow for camera inspection.
- City agrees to pay for excavation to remove wood chunk if not able to remove with additional cleaning.
- Contractor concerns about mitered pipe bends contradictory to CIPP manufacturer's literature— requiring written documentation from the lining manufacturer as to ability to navigate these bends.

Work suspended for 7 days

- To allow for notification of additional ramp closure to perform additional work in preparation of lining.

# Cleaning

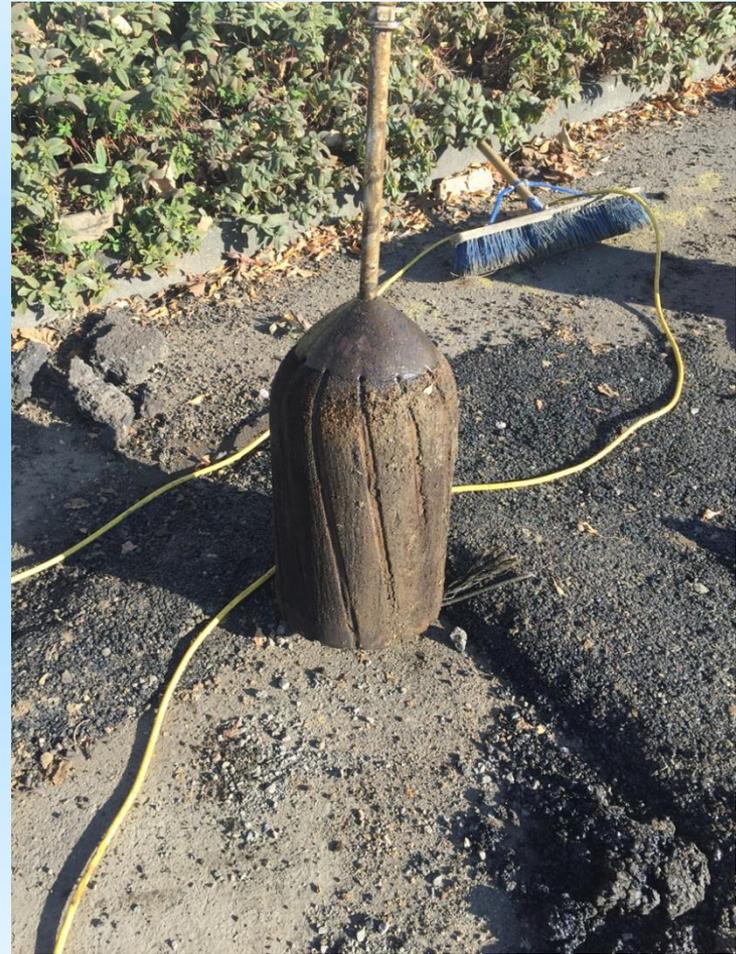
## Pressure Pipe Cleaning



# Cleaning – Foam Pig



# Pig



# Removed Mitered Bends



# Wood Removed



# 2<sup>nd</sup> CCTV Inspection (mid Nov 2017)



# 2<sup>nd</sup> CCTV Inspection (mid Nov 2017)



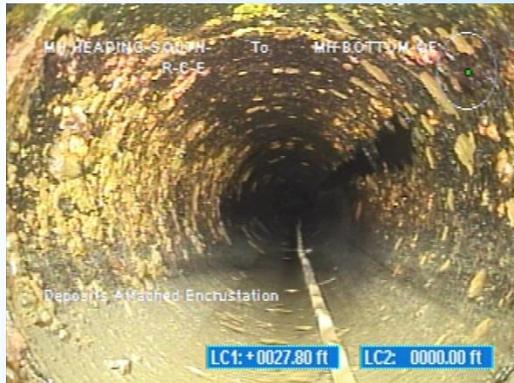
# Results of 2nd CCTV

- Pipe satisfactorily cleaned?
- Obstructions Removed
- Water Gushers



# Results of 2nd CCTV

Pipe satisfactorily cleaned? No



Six Gushers - Lining manufacturer recommends point repairs.

Work suspended for at least 7 days...

- To give time to the lining manufacturer to review TV reports and make recommendations for path forward.
- To allow for notification of additional ramp closure to perform additional work in preparation of lining.



# Point Repairs



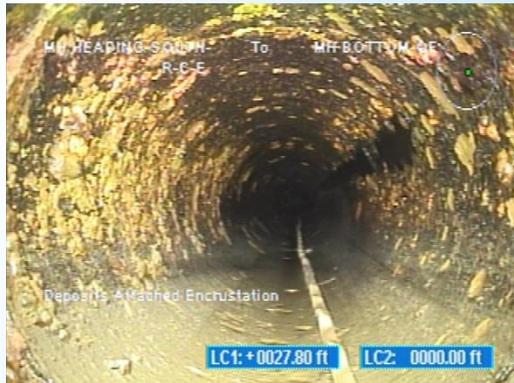
# 3<sup>rd</sup> CCTV after 3<sup>rd</sup> Cleaning - Dec 15, 2017



Dry due to drier weather.  
Pipe surface cleaner.

# Results of 3rd CCTV

Pipe satisfactorily cleaned? Yes per manufacturer.



Six Gushers – Point repairs not done but no gushers this time around. However, City decides to move forward with point repairs prior to lining.

Lining installation tentatively scheduled for 2<sup>nd</sup> Week of January 2018.

Finally making noticeable progress!

# WSDOT - Another Ramp Closure?

Contractor requesting another closure. This time for 2 weeks starting January 8.

First Week – Liner Installation

Second Week – Disinfection, Testing, and Backfill

News on January 8<sup>th</sup>, lining installer delayed for two weeks on another project.

New schedule to start on the Jan 22<sup>nd</sup>, finish on Feb 2<sup>nd</sup>.



# Liner Installation



# Lining Installation – Jan 29, 2018



# Lining Installation



# Lining Installation



# Lining Installation



# Liner Installed – Jan 26, 2018



# Hydrostatic Pressure Test

**FAIL**

# Where do we go from here?

After a 2<sup>nd</sup> hydrostatic test the lower segment across SR 14 passes - deemed acceptable.

The long segment in the ramp fails again and again.

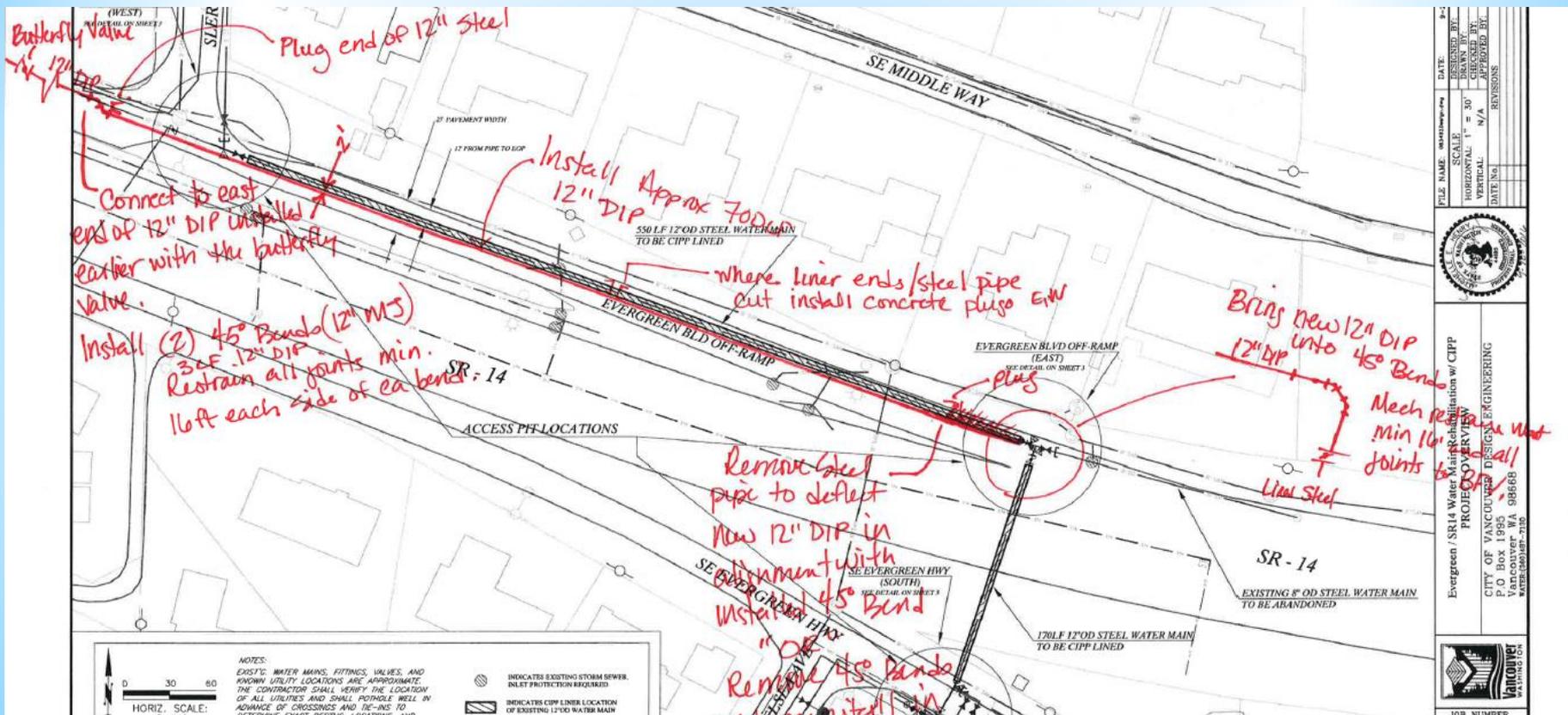
Potential reason for failure:

- No end seals? Is water leaking behind the liner and finding an exit?

Back to the drawing board...

# Install 700 LF 12" DIP in Off Ramp

Back to the drawing board...



# New DI pipeline installed - April 16, 2018

Open cut trench - install new pipe in Evergreen off ramp.



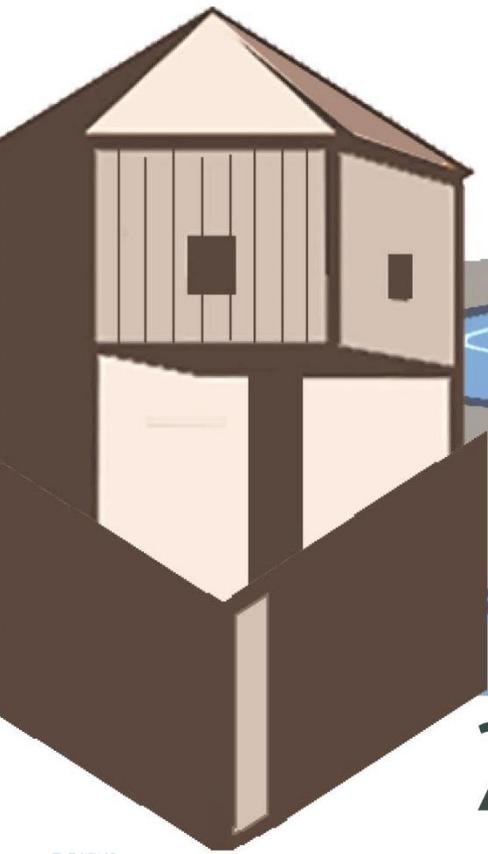
# Roadway Restored

Physical Completion  
May 7, 2018



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**QUESTIONS?**



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