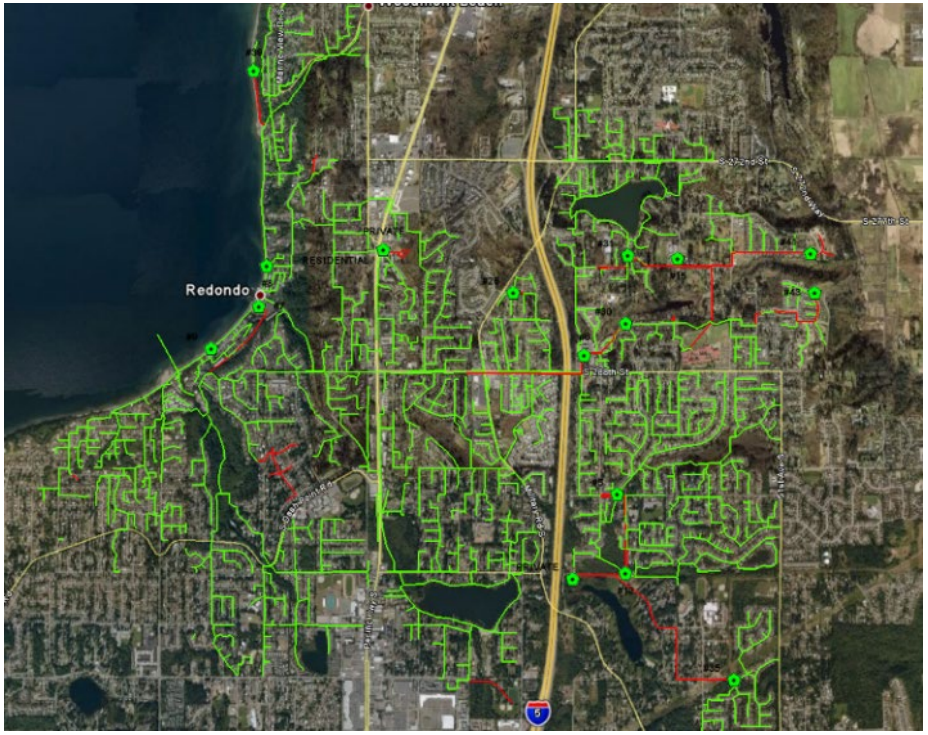
Lakehaven Water and Sewer District

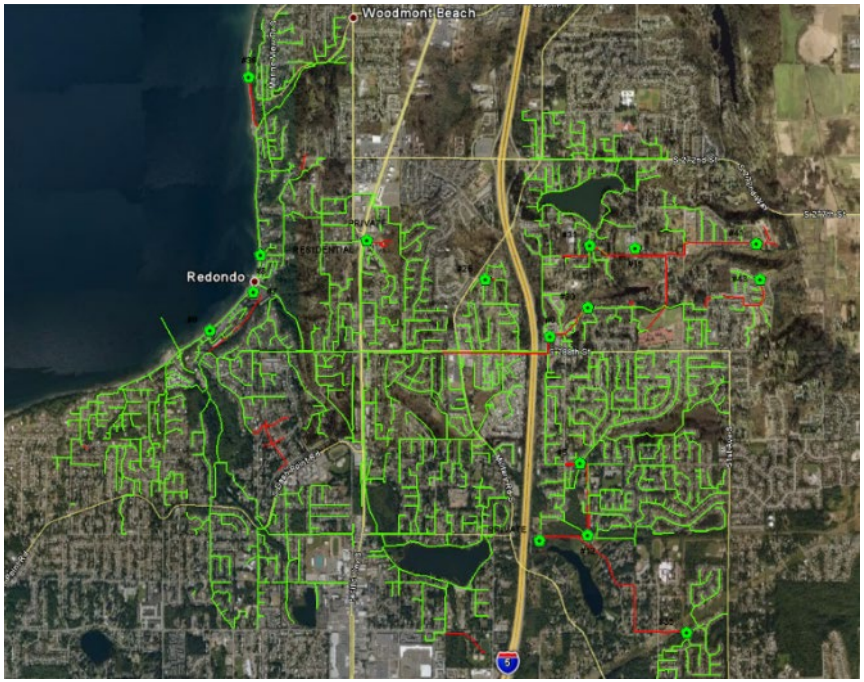
CIPP Lining for Infiltration Reduction and Asset Renewal

October 3, 2019



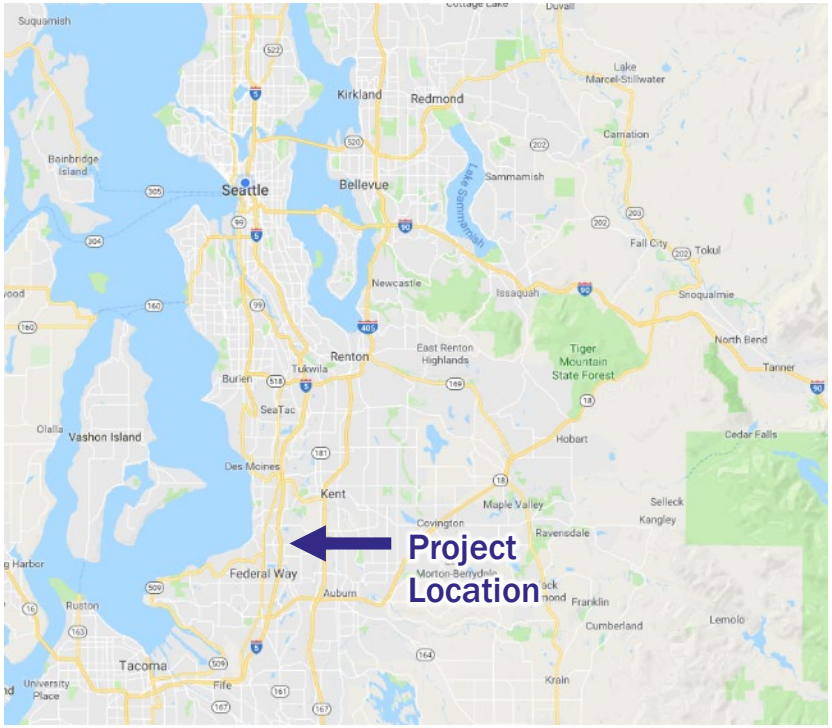
Agenda

- Location and Issues
- Planning and Decisions
- Public Outreach Process
- Project Bidding
- Construction
- Final Construction Statistics and Cost
- Post Construction Monitoring
- Thoughts on Private Property



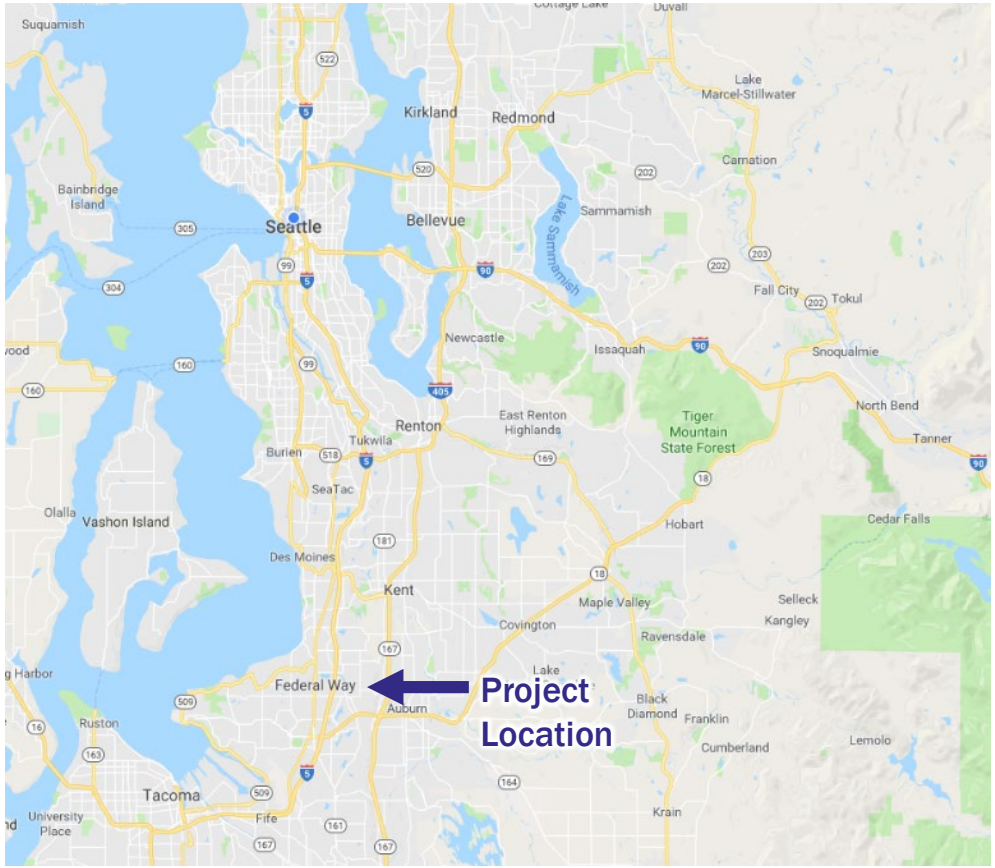
Project Location and Issues

- Lakehaven Water and Sewer District (LWSD)
  - 2 WWTPS
    - Redondo WWTP
    - Lakota WWTP
  - 32 pump stations
  - 312 miles of separated sewer pipes



Project Location and Issues

- Lakehaven Water and Sewer District (LWSD)
  - 2 WWTPS
    - Redondo WWTP
    - Lakota WWTP
  - 32 pump stations
  - 312 miles of separated sewer pipes
  - Aging infrastructure leading to increased treatment and O&M costs

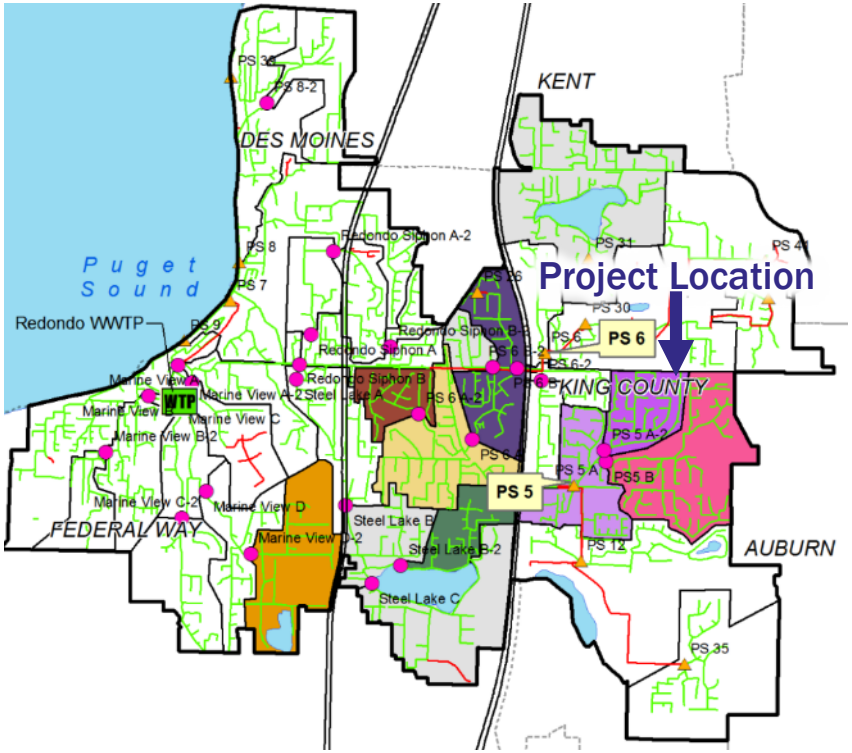


Why is I/I an Issue?

- Increases peak flows >14 fold
- Risk of sanitary sewer overflows (SSOs) and basement backups
- “Steals” system, treatment, and outfall capacity
- Increases operational costs
- Dilutes/cools sewage <200 mg/l
  - 85% removal rule lowers effluent limits
- Element of NPDES permit
- Problem increases as system ages

Development of a Program

- BC developed I/I program goals and identified project location
- Completed 2 years of flow monitoring
- Developed a prioritization method to meet identified goals

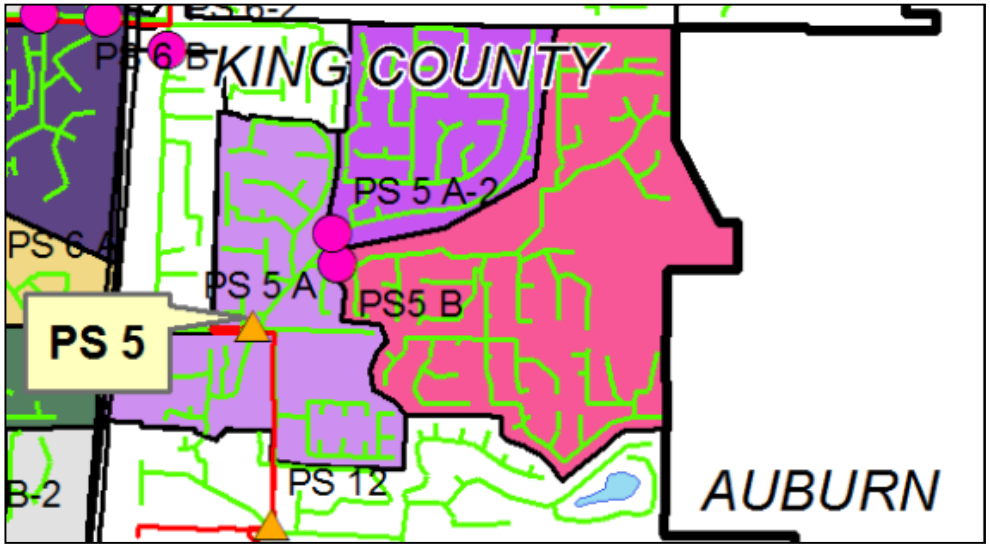


Program Goals

1. Meet hydraulic capacity of Redondo WWTP
2. Reduce flows to protect against SSOs
3. Reduce flows to EPA and WA Ecology I/I guidance
   - <120 gpcd wet season dry weather flow rate
   - <275 gpcd peak wet weather flow rate
   - Pump Station Capacity
4. Meet industry target goals
   - <1,500 gpad within drainage basins

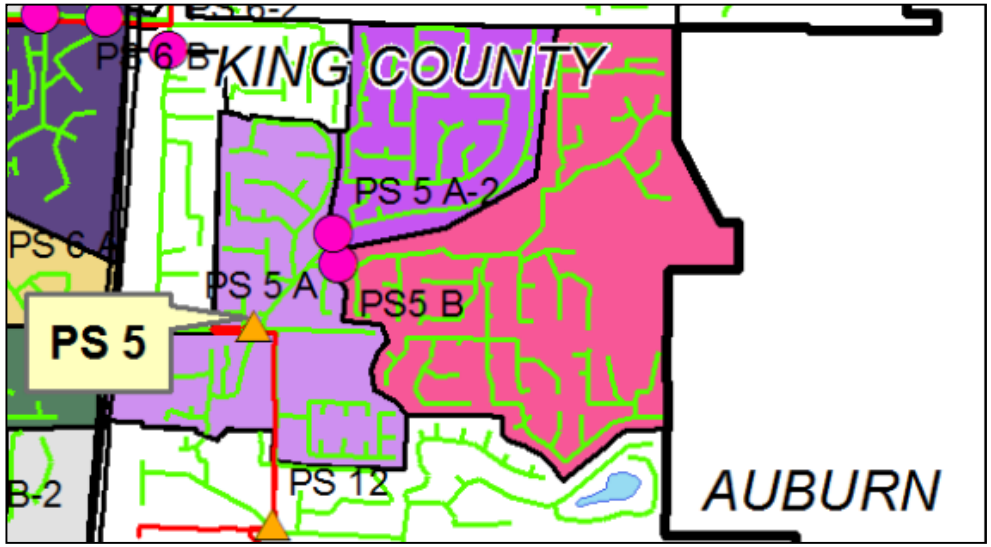
Pump Station 5

- Highest I/I rates
- Repeated wet-weather SSOs
- Aging assets (1960s vintage concrete pipes)

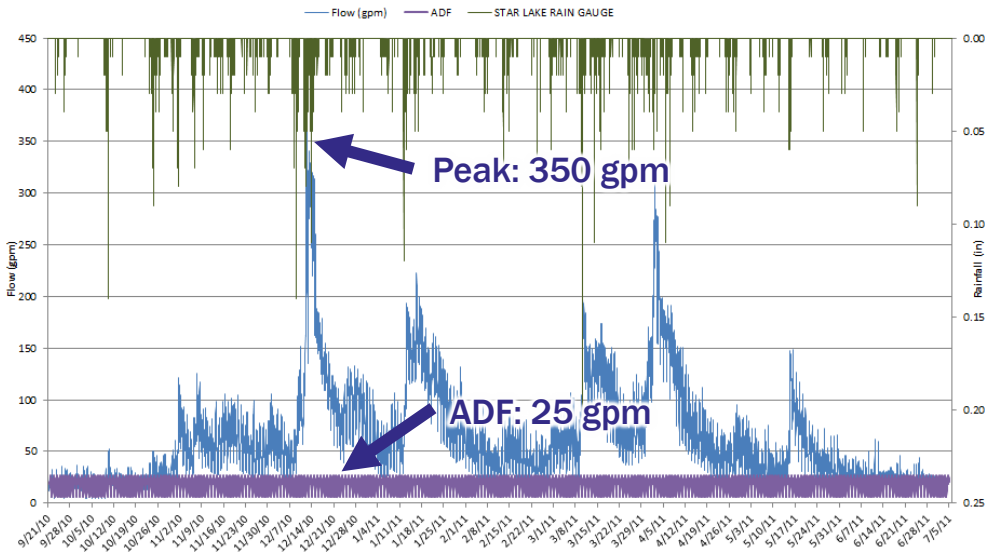


Pump Station 5A-2

- PS5 sub-dived into 3 areas
- Area A-2 chosen for pilot program
  - Reduce infiltration
  - Renew aging assets

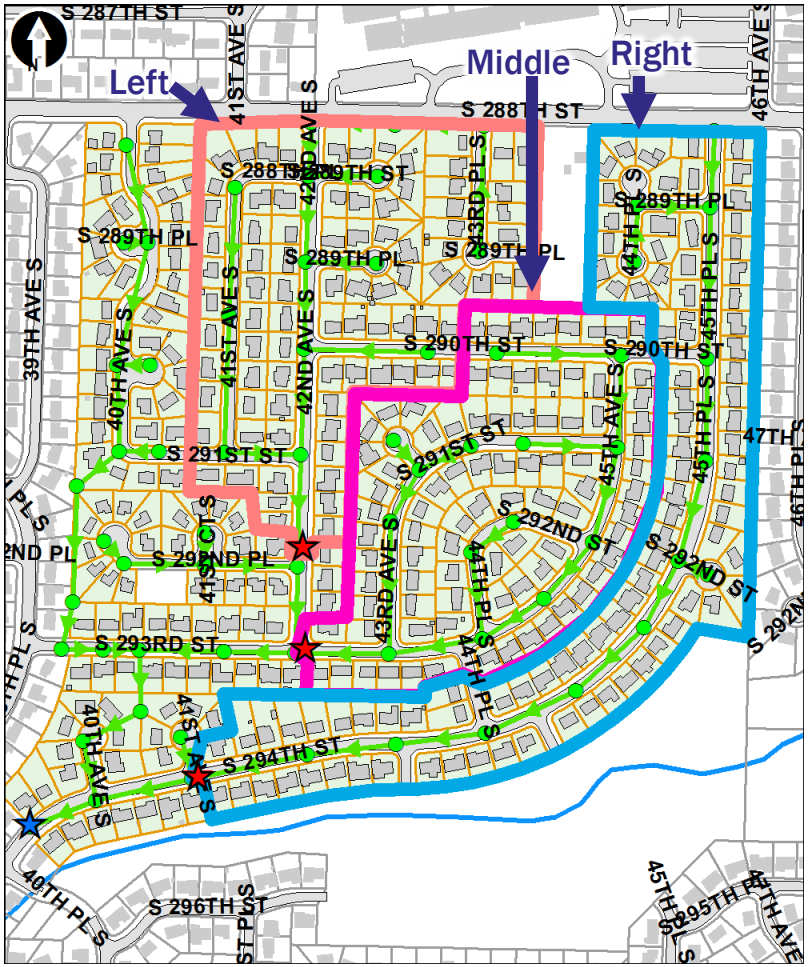


PS 5A-2



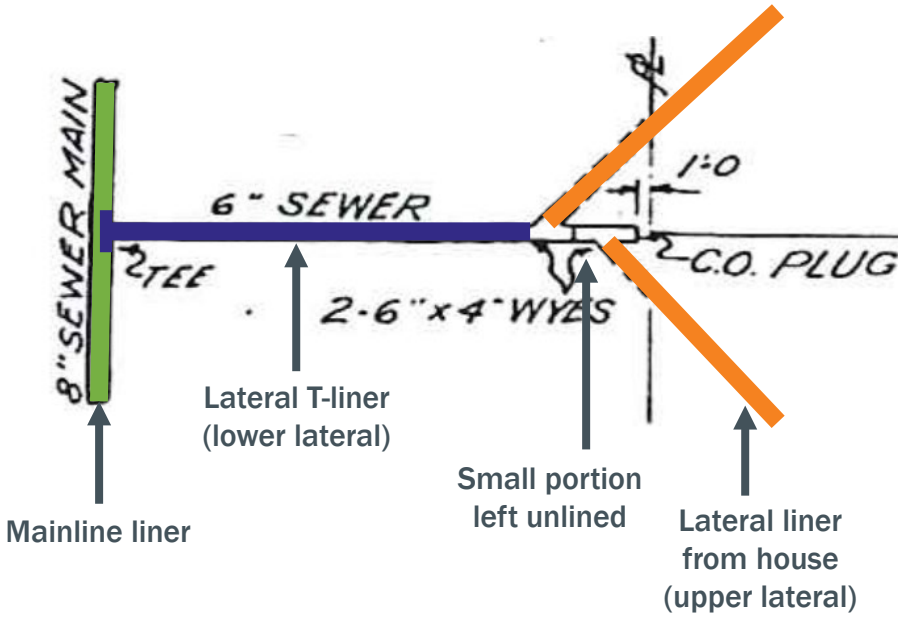
Pump Station 5A-2 Left

- 85–100 houses
- 4,000 LF of 8-inch-diameter sewer main
- All basins had equal WW response
- Chose “Left”
  - No observed surcharging
  - Good hydraulics for metering



Pilot Project Planning and Decisions

- Needed to address side sewers
  - District funded side sewer work to maximize participation
- Access required ROE permits
  - 75-80% of ROEs needed to proceed with construction



Lining of Shared Side Sewers

Public Outreach Process

- Necessary to inform neighborhood and gain acceptance
- Methods:
  - Mailer
  - Door-to-door contact
  - Public Meeting at local High School
- Coordination through construction

LAKEHAVEN WATER AND SEWER DISTRICT

LAKEHAVEN SANITARY SEWER INFILTRATION REDUCTION PILOT PROJECT

April 26, 2017

Dear Resident or Property Owner:

As you were previously notified, Lakehaven Water and Sewer District (LWSD) is initiating a pilot project in your neighborhood to evaluate a technique for reducing wet weather infiltration into the sanitary sewer system that occurs in the area during periods of wet weather.

PERMISSION TO ENTER PRIVATE PROPERTY

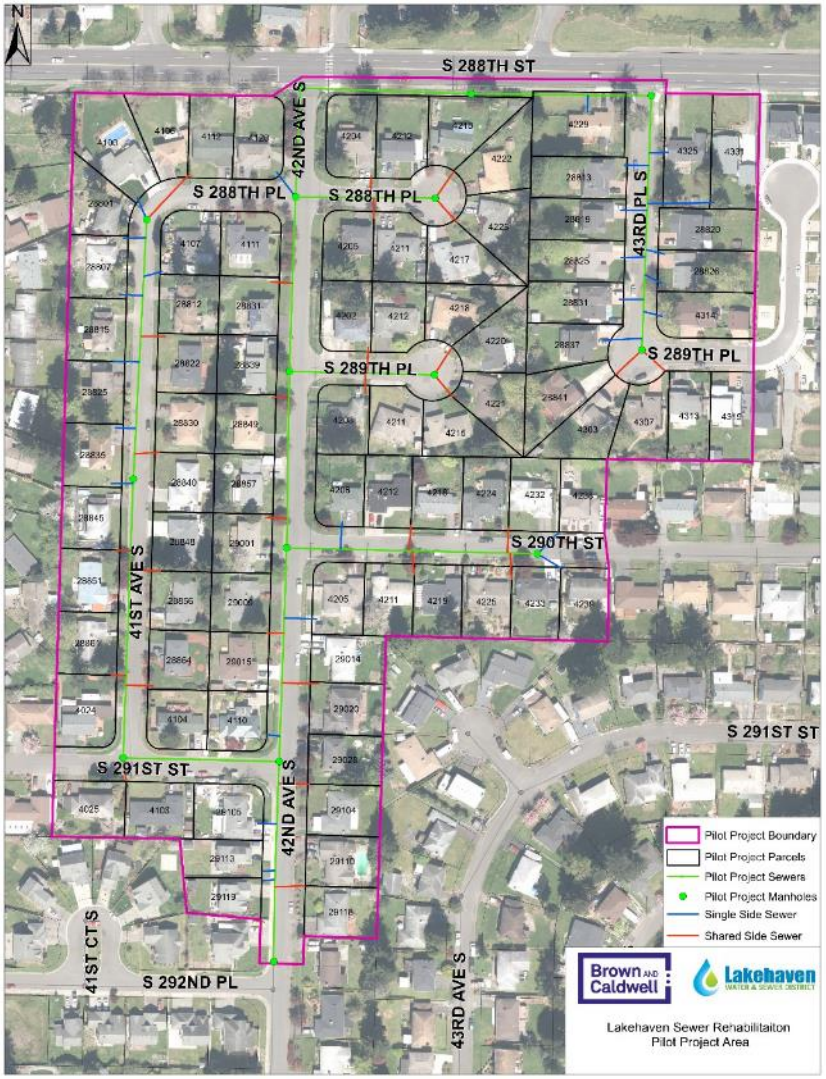
PROJECT: LWSD Sewer Infiltration Reduction Pilot Project

RECITALS

Lakehaven Sewer Rehabilitation Pilot Project

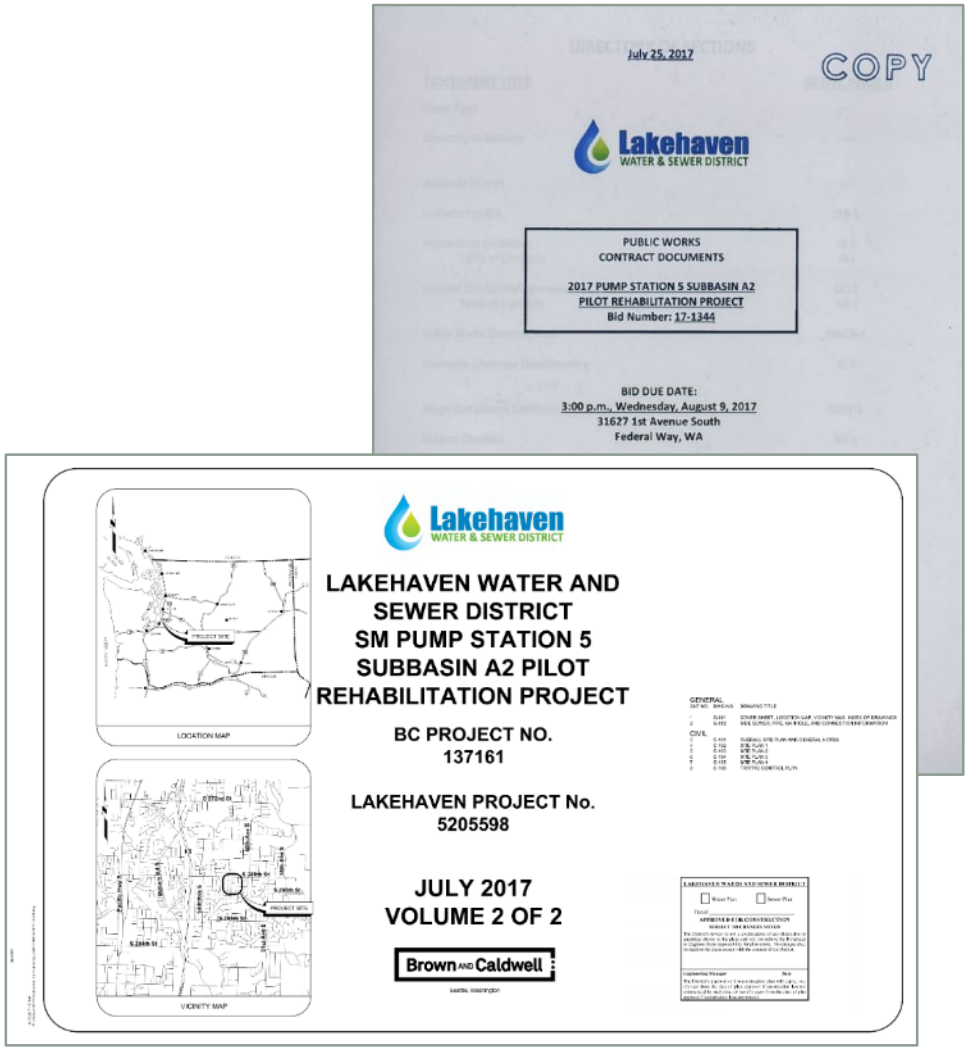
Project Overview

- Bidding
- Pre-lining work
  - Pre-inspection
  - Cleanout installation
- Mainline lining
- Upper lateral lining
- Lower lateral lining



Bidding

- Advertised on July 2017
  - Left CIPP method open (steam cure vs UV cure)
- Received 1 bid
  - 20% over engineers estimate
- Vetted contractor references and reviewed prices
- Awarded to Iron Horse, LLC.
  - Decided on UV lining method



Pre-Lining Work

- CCTV of mainline and side sewers
- Cleanout locations
- VAC-A-TEE cleanout installations

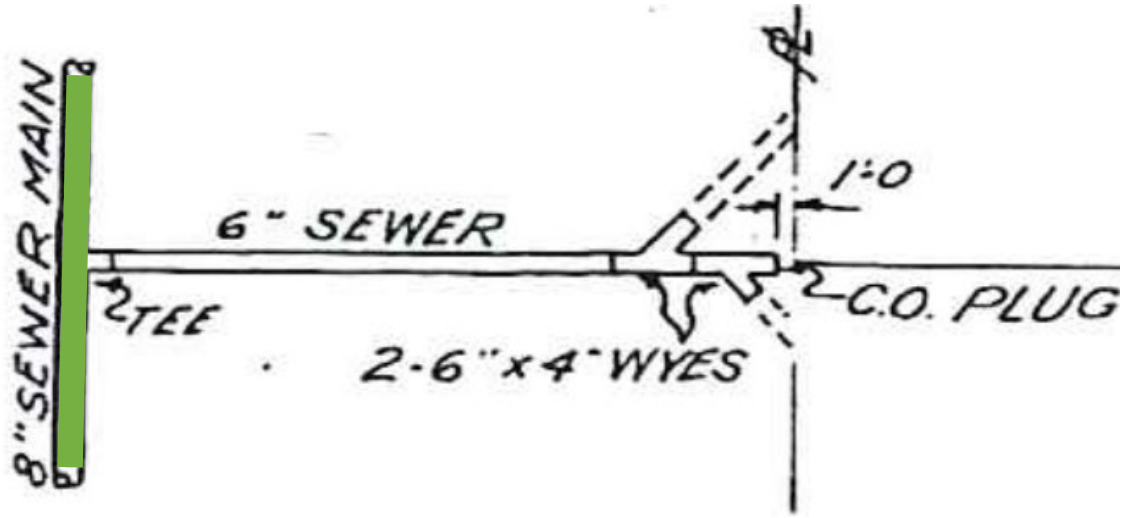

LMK VAC-A-TEE installation


LMK VAC-A-TEE excavation


Typical cleanout installation ready for lining

Mainline Lining

- UV Lining Process



Mainline Lining

- UV Lining Process:
  - Side sewer locations measured

Side sewer location measurement

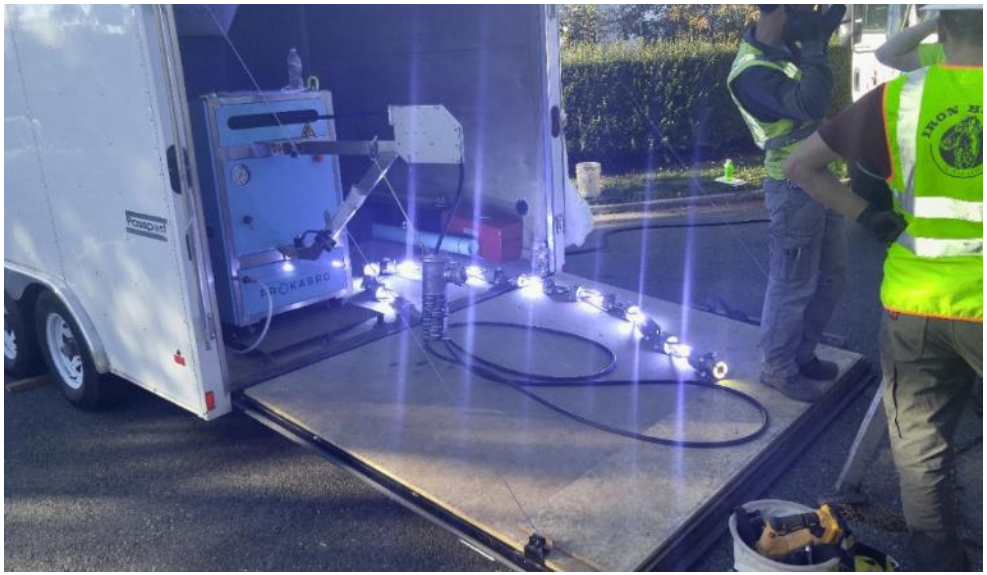
Mainline Lining

- UV Lining Process:
  - Side sewer locations measured
  - Line jetted
  - Flows plugged/diverted
  - Sleeved UV liner pulled through

UV liner inserted through manhole

Mainline Lining

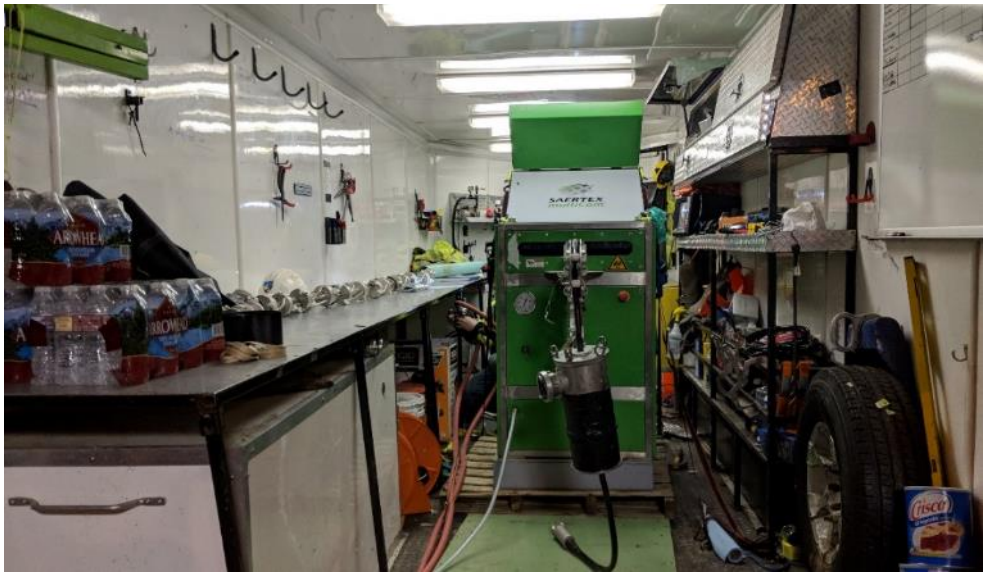
- UV Lining Process:
  - Side sewer locations measured
  - Line jetted
  - Flows plugged/diverted
  - Sleeved liner pulled through
  - **Light train pulled through to opposite end**



UV light train

Mainline Lining

- UV Lining Process:
  - Side sewer locations measured
  - Line jetted
  - Flows plugged/diverted
  - Sleeved liner pulled through
  - Light train pulled through to opposite end
  - **“Safety Caps” installed**



Packer

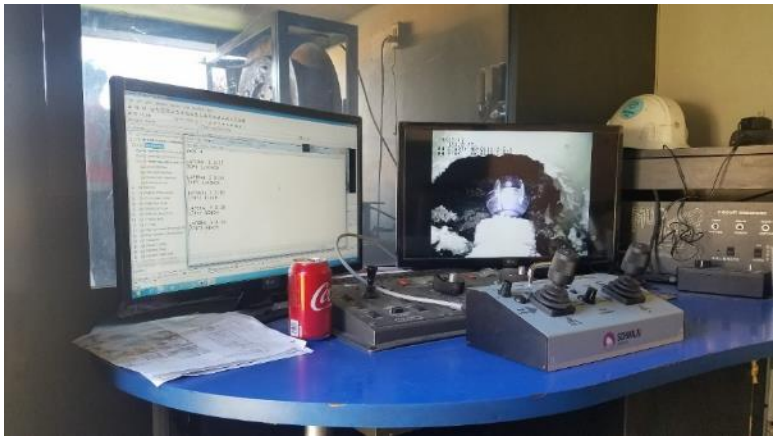
Mainline Lining

- UV Lining Process:
  - Side sewer locations measured
  - Line jetted
  - Flows plugged/diverted
  - Sleeved liner pulled through
  - Light train pulled through to opposite end
  - “Safety Caps” installed
  - **Pipe pressurized to specifications**
  - **Light train pulled back according to specified rate and pressure**

Curing of UV Lining

Mainline Lining

- UV Lining Process:
  - Side sewer locations measured
  - Line jetted
  - Flows plugged/diverted
  - Sleeved liner pulled through
  - Light train pulled through to opposite end
  - “Safety Caps” installed
  - Pipe pressurized to specifications
  - Light train pulled back according to specified rate and pressure
  - **Side sewers reinstated**



Side sewer reinstatement

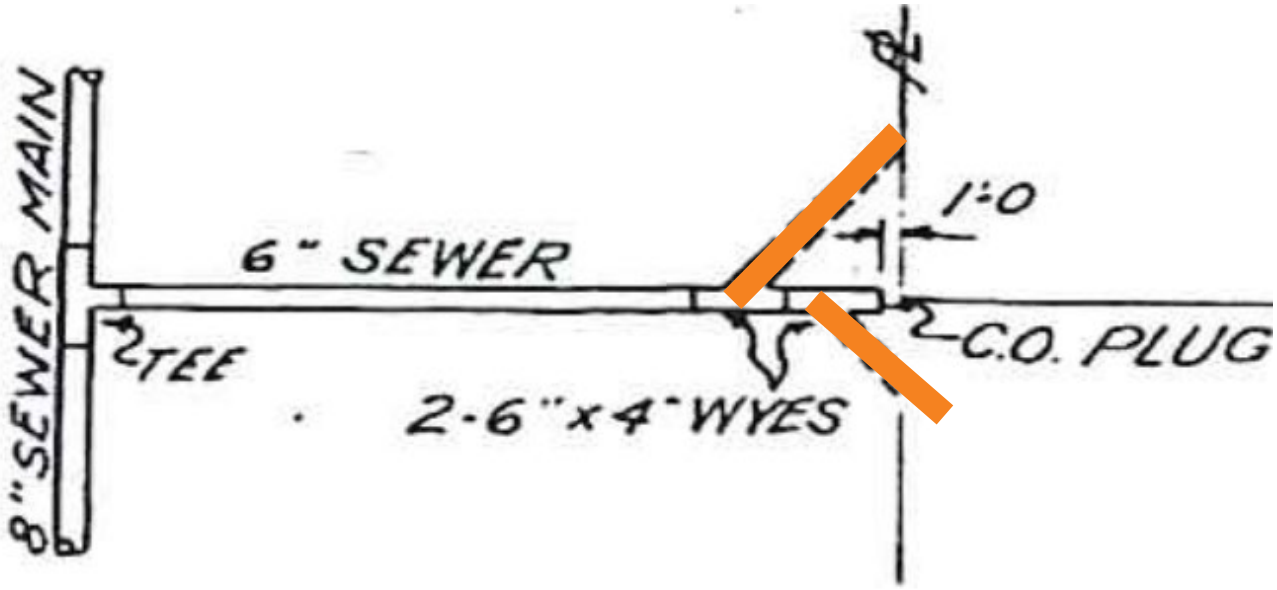
Mainline Lining

- UV Lining Process:
  - Side sewer locations measured
  - Line jetted
  - Flows plugged/diverted
  - Sleeved liner pulled through
  - Light train pulled through to opposite end
  - “Safety Caps” installed
  - Pipe pressurized to specifications
  - Light train pulled back according to specified rate and pressure
  - Side sewers reinstated
- Construction Issues
  - **None occurred**

Reinstated Sewer Line

Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process



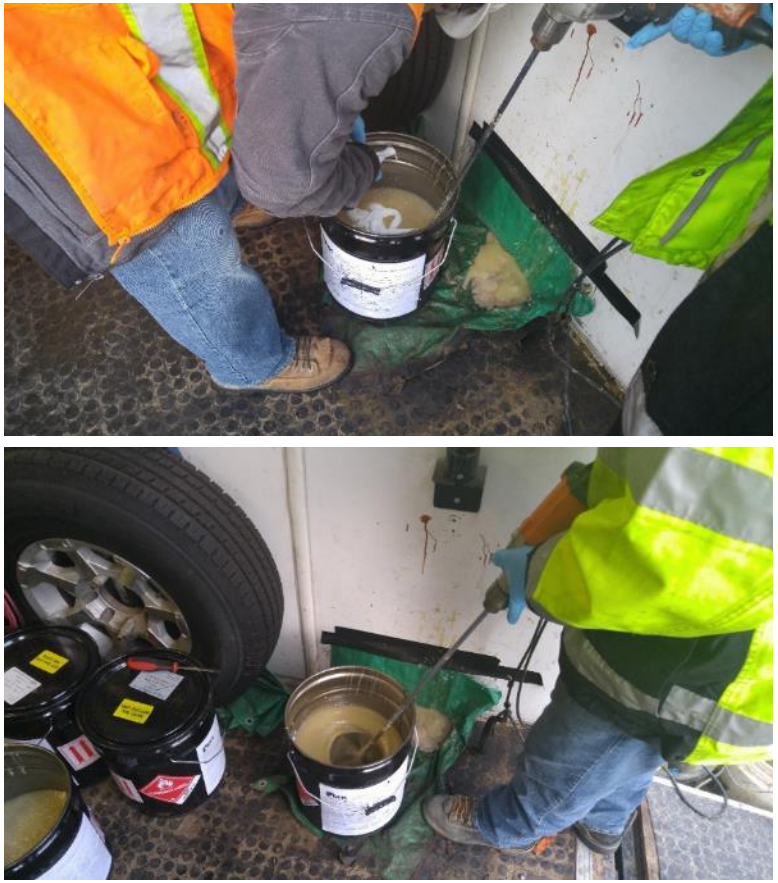
Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Pre-cut or cut on site

Liner preparation

Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Pre-cut or cut on site
    - Resin mixed



Mixing Resin

Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Pre-cut or cut on site
    - Resin mixed
    - **Liner wetted out**

Liner wet-out

Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Pre-cut or cut on site
    - Resin mixed
    - Liner wetted out
    - Inserted into inversion tank

Inserting into inversion tank

Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Pre-cut or cut on site
    - Resin mixed
    - Liner wetted out
    - Inserted into inversion tank
  - **Liner transported to cleanout in inversion tank**
  - **Liner inserted into cleanout**

Inserting into cleanout

Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Pre-cut or cut on site
    - Resin mixed
    - Liner wetted out
    - Inserted into inversion tank
  - Liner transported to cleanout in inversion tank
  - Liner inserted into cleanout
    - **Pressure cap installed or inversion tank remains connected**
  - **Liner resin cures under pressure for 2 hours**

Pressure cap

Upper Lateral Lining

- Ambient cured lining of 4-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Pre-cut or cut on site
    - Resin mixed
    - Liner wetted out
    - Inserted into inversion tank
  - Liner transported to cleanout in inversion tank
  - Liner inserted into cleanout
    - Pressure cap installed or inversion tank remains connected
  - Liner resin cures under pressure for 2 hours
  - **Bladder removed, cleanout capped**

Bladder removal

Reinstated upper lateral

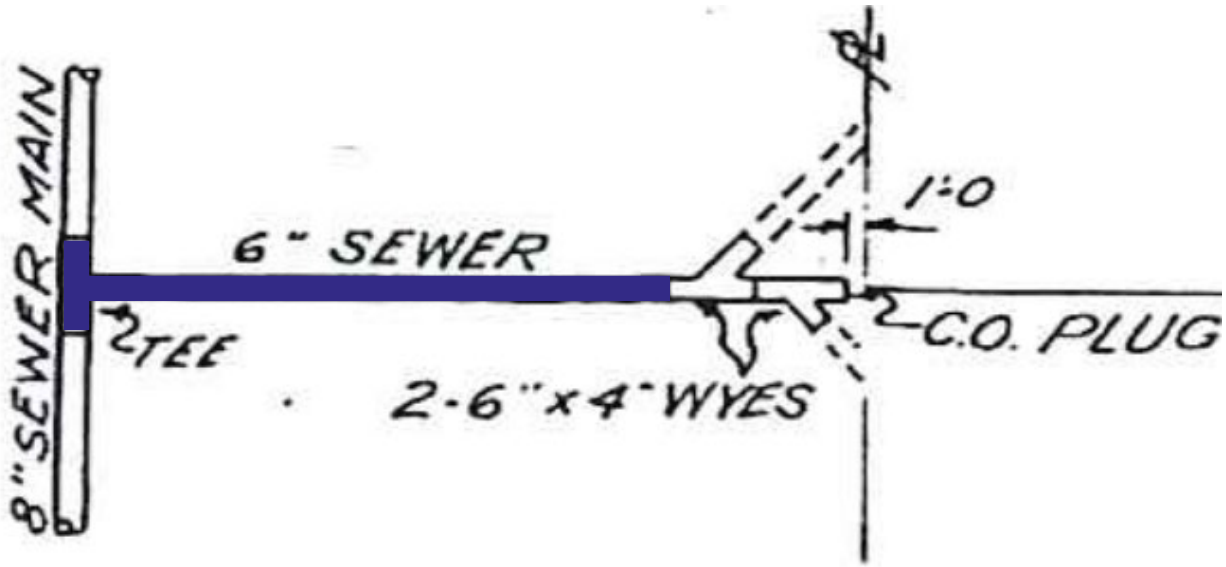
Upper Lateral Lining

- Construction issues
  - Improper curing
  - Issues with pressure caps malfunctioning
  - Bladder failure causing pressure loss
  - Resin/BPO ratios

Improperly cured liner portion

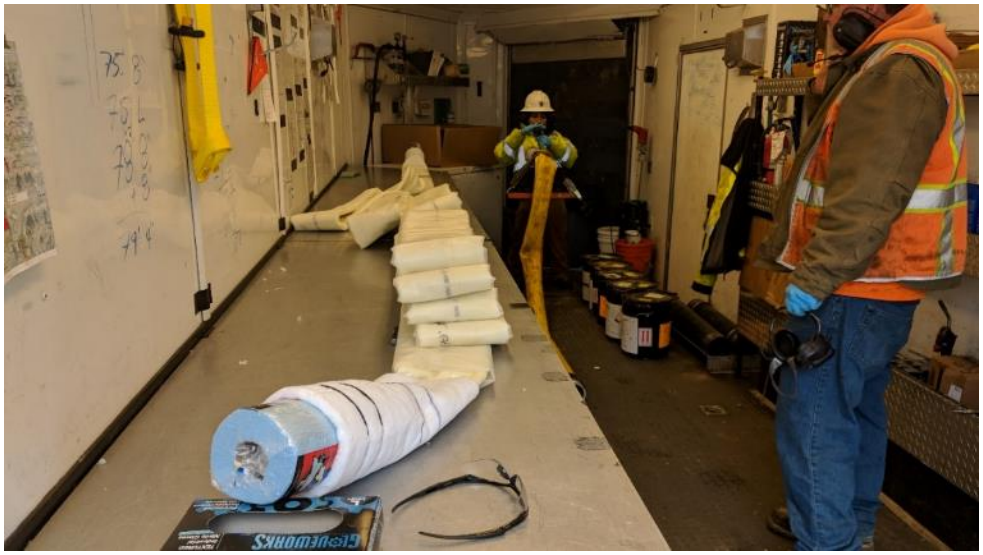
Lower Lateral Lining

- Steam cured lining and T-lining of 6-inch-diameter side sewer process



Lower Lateral Lining

- Steam cured lining and T-lining of 6-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Hydrophilic gaskets installed



Lateral liner preparation

Lower Lateral Lining

- Steam cured lining and T-lining of 6-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Hydrophilic gaskets installed
    - **Mixing and wetting out resin**
    - **Inserted into steam cure bladder and launcher**

T-liner set-up

Lower Lateral Lining

- Steam cured lining and T-lining of 6-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Hydrophilic gaskets installe
    - Mixing and wetting out resin
    - Inserted into steam cure bladder and launcher
    - **Transported to manhole**

Work near manhole

Lower Lateral Lining

- Steam cured lining and T-lining of 6-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Hydrophilic gaskets installed
    - Mixing and wetting out resin
    - Inserted into steam cure bladder and launcher
    - Transported to manhole
  - **Camera inserted into cleanout**
  - **T-liner pulled through and lined up with side sewer**
  - **Inverted into side sewer**

Camera view of inversion

Lower Lateral Lining

- Steam cured lining and T-lining of 6-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Hydrophilic gaskets installed
    - Mixing and wetting out resin
    - Inserted into steam cure bladder and launcher
    - Transported to manhole
  - Camera inserted into cleanout
  - T-liner pulled through and lined up with side sewer
  - Inverted into side sewer
  - **Steam cured for 30 minutes**

Steam Truck

Support Trucks

Lower Lateral Lining

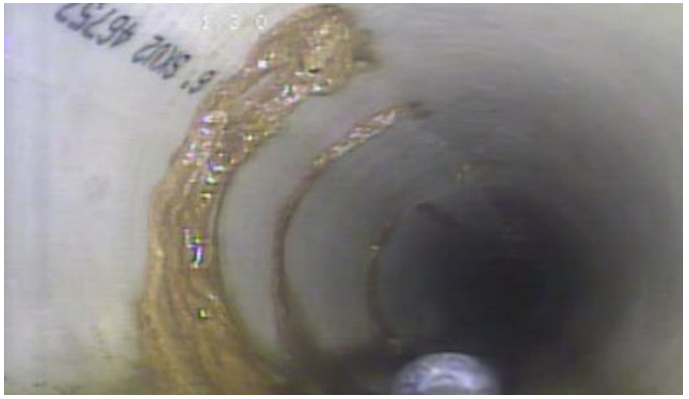
- Steam cured lining and T-lining of 6-inch-diameter side sewer process
  - Line inspected, repairs made to remove roots etc.
  - Liner prepared in trailer
    - Hydrophilic gaskets installed
    - Mixing and wetting out resin
    - Inserted into steam cure bladder and launcher
    - Transported to manhole
  - Camera inserted into cleanout
  - T-liner pulled through and lined up with side sewer
  - Inverted into side sewer
  - Steam cured for 30 minutes

Reinstated lower lateral

Lower Lateral Lining

- Construction Issues
  - Blind shot from MH without cleanout.
    - Liner hung-up in pipe and did not invert
    - Portion of pipe vactored and repaired
  - T-liner seam seal
  - Lined over side sewer caused home backup
  - Steam truck ran out of gas during a cure

Repair pit for un-inverted liner portion



Infiltration at T-liner seam

Post-Lining Process

- Completion CCTV/Review of final results
- Emergency repairs made
  - Side sewer lined over
- Final repairs of remaining issues
  - Seam with infiltration
  - Cleanup of rough transitions

Final Construction Statistics and Cost

84 out of 86 houses participated

73 Vac-A-Tee clean outs installed

44 T-Liners installed

3,890 feet of 8-inch mainline UV liner

4,725 feet of side sewer:

- 1,170 feet of 6-inch side sewer
- 3,015 feet of 4-inch side sewer

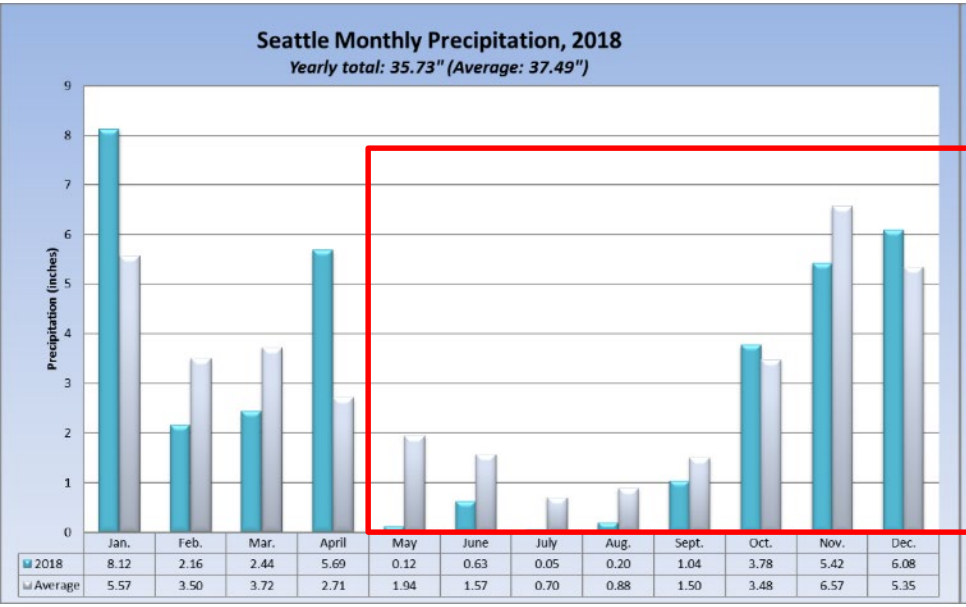
$1,141,084 total construction value (before tax)

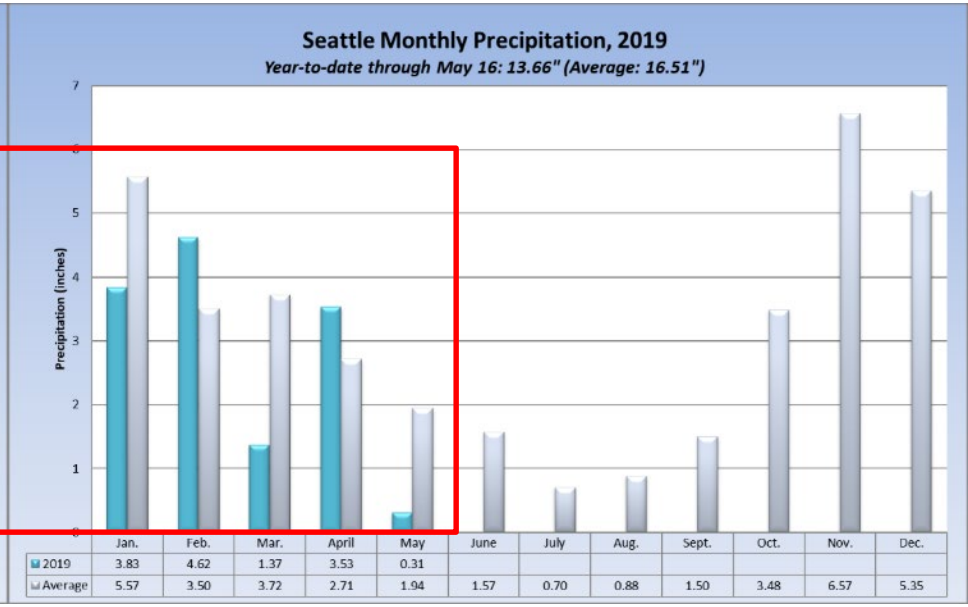
- $155/ft for side sewers with cleanouts, $125/ft without cleanouts
- $105/ft for mainlines

5 months of construction

Post Construction Monitoring

- Meter reinstalled 5/1/2018





- Average rain over time period: 37.8 inches
- Received rain over time period: 30.9 inches

Post Construction Monitoring

- Meter reinstalled 5/1/2018
  - Estimated flow reduction:

Post Construction Monitoring

- Meter reinstalled 5/1/2018
  - Estimated flow reduction:

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Post Construction Monitoring

- Meter reinstalled 5/1/2018
  - Estimated flow reduction:

  - Suspect post metering data
  - Completing Pilot Project 2 (mainlines only)
  - Will continue to monitor through the 2019/20 wet weather season

Thoughts on Private Property Work

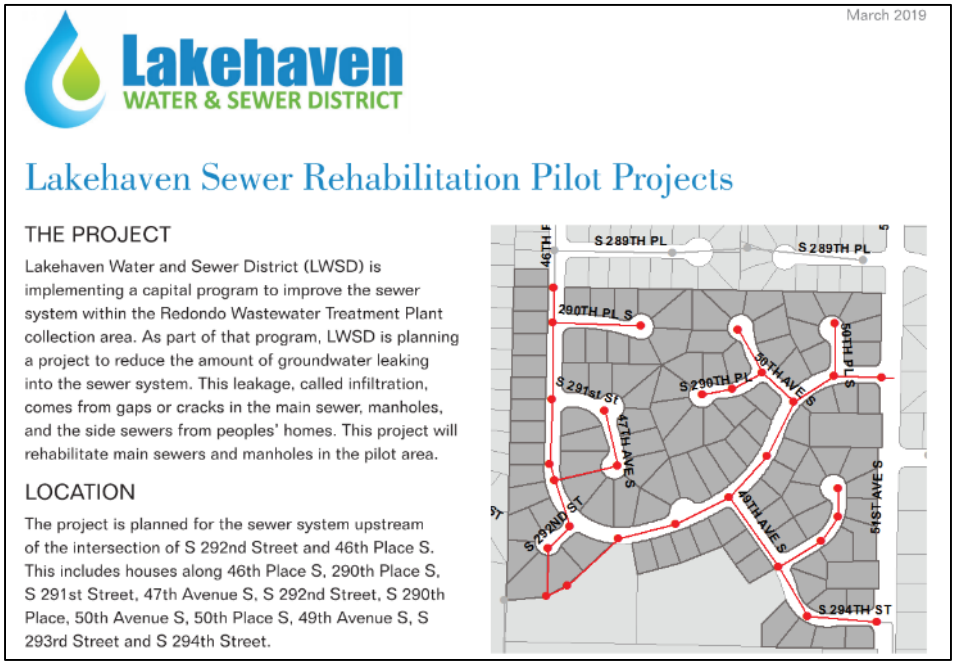
- Needs planning and upfront communication
- Don’t over promise
- Not scary
- Construction crews need to be willing to talk to private property owners
- Law is on your side
- Does Owner Contribute any $$$

AGO 2009 No. 5:

- *Municipal sewer districts have statutory authority to use public funds to repair or replace side sewers located on private property if doing so will increase sewer capacity by reducing infiltration and inflow. Use of public funds to do so does not constitute an unconstitutional gift or loan of public funds if the district acts without donative intent and can demonstrate that the action will result in significant benefit to the public.*

Phase 2

- Completing Phase 2 today!
  - Mainlines, connections at the main, and MH's
  - CIPP lining of 6,130' of 8" and 10" pipe
  - 73 connections with the main (3' T-Liners)
  - Coating of 34 MH's
  - $950,000 w/tax



March 2019

Lakehaven WATER & SEWER DISTRICT

Lakehaven Sewer Rehabilitation Pilot Projects

THE PROJECT

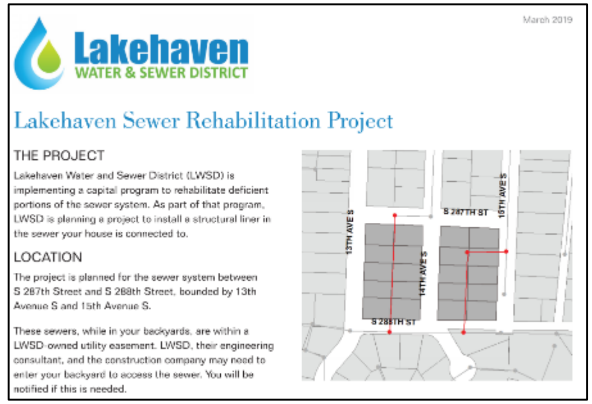
Lakehaven Water and Sewer District (LWSD) is implementing a capital program to improve the sewer system within the Redondo Wastewater Treatment Plant collection area. As part of that program, LWSD is planning a project to reduce the amount of groundwater leaking into the sewer system. This leakage, called infiltration, comes from gaps or cracks in the main sewer, manholes, and the side sewers from peoples' homes. This project will rehabilitate main sewers and manholes in the pilot area.

LOCATION

The project is planned for the sewer system upstream of the intersection of S 292nd Street and 46th Place S. This includes houses along 46th Place S, 290th Place S, S 291st Street, 47th Avenue S, S 292nd Street, S 290th Place, 50th Avenue S, 50th Place S, 49th Avenue S, S 293rd Street and S 294th Street.

CIPP Lining – Not Just for I/I

- District has leveraged larger I/I projects to get commodity pricing for smaller structural repairs


March 2019

Lakehaven WATER & SEWER DISTRICT

Lakehaven Sewer Rehabilitation Project

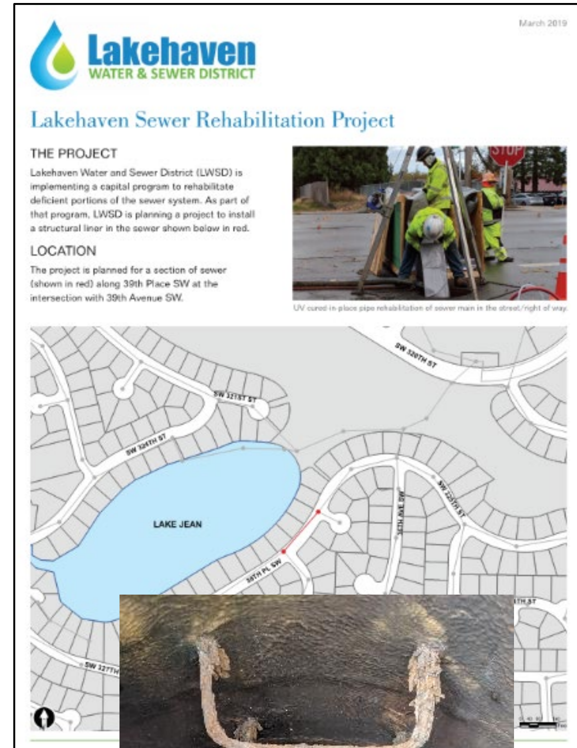
THE PROJECT

Lakehaven Water and Sewer District (LWSD) is implementing a capital program to rehabilitate deficient portions of the sewer system. As part of that program, LWSD is planning a project to install a structural liner in the sewer your house is connected to.

LOCATION

The project is planned for the sewer system between S 287th Street and S 288th Street, bounded by 13th Avenue S and 15th Avenue S.

These sewers, while in your backyards, are within a LWSD-owned utility easement. LWSD, their engineering consultant, and the construction company may need to enter your backyard to access the sewer. You will be notified if this is needed.


March 2019

Lakehaven WATER & SEWER DISTRICT

Lakehaven Sewer Rehabilitation Project

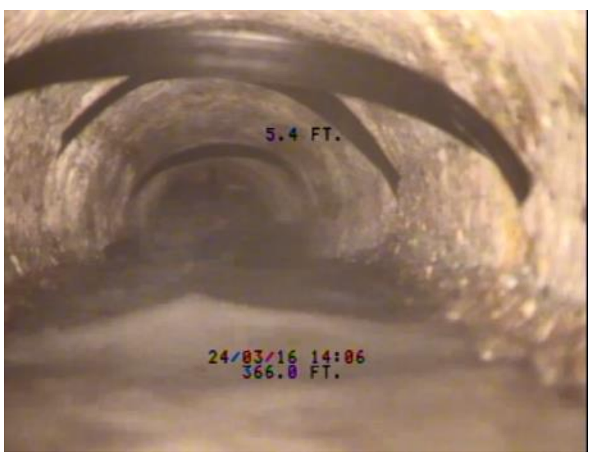
THE PROJECT

Lakehaven Water and Sewer District (LWSD) is implementing a capital program to rehabilitate deficient portions of the sewer system. As part of that program, LWSD is planning a project to install a structural liner in the sewer shown below in red.

LOCATION

The project is planned for a section of sewer (shown in red) along 39th Place SW at the intersection with 39th Avenue SW.

UV cured in-place pipe rehabilitation of sewer main in the street/right of way.



Thank you.

Questions?

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Brown AND Caldwell

Lakehaven WATER & SEWER DISTRICT