Eugene Water & Electric Board

Transmission Main Condition Assessment

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PNWS AWWA, 2017




Presentation Overview

- **EWEB water system background.**
- **Condition Assessment:**
- Prioritizing and determining activities.
- EWEB's process for activities.
- Field work photos.
- Results.
- Next steps.
- **Questions and comments.**

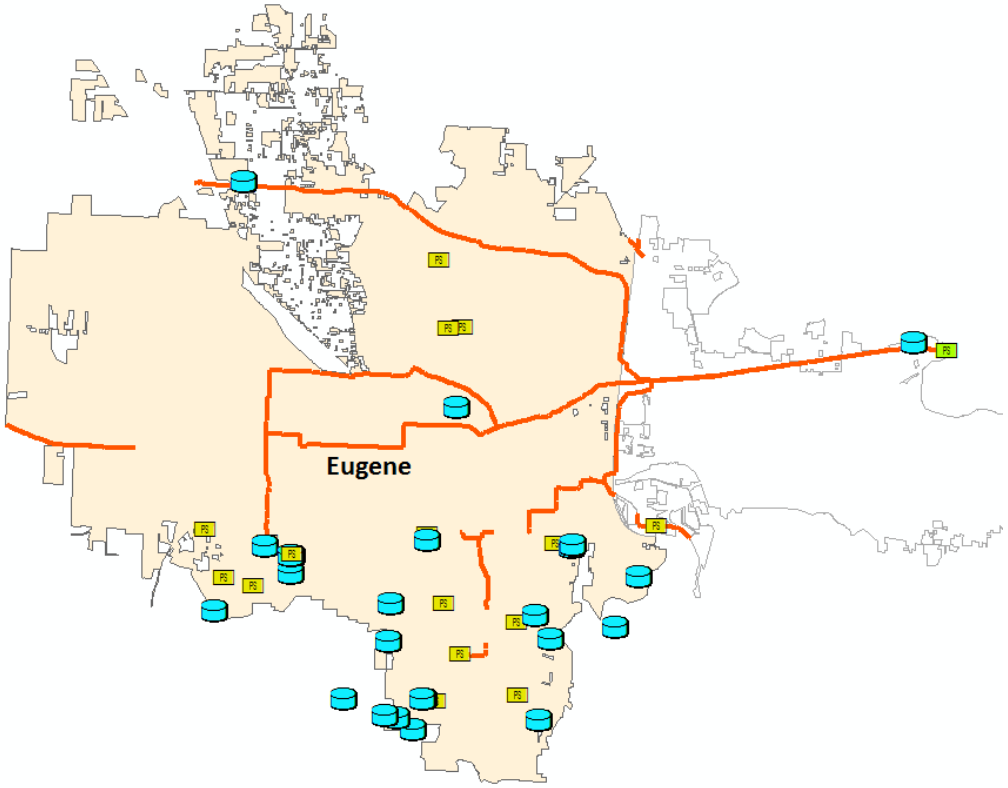
EWEB Water System

- **1 water treatment plant.**
- **23 covered reservoirs.**
- **28 pump stations.**
- **804 miles of water main.**

Hayden Bridge Water Treatment Plant

Transmission System

- **36.21 miles of Transmission pipeline ≥ 24-Inch DIA.**



Transmission Pipeline Leaks

- On April 11, 2016 a leak was discovered on EWEB's 45-inch transmission line near the Treatment Plant.
- The welder made multiple patch repairs where pitting was evident and the crew noticed coating separating from the main on the bottom of the pipe.

68 year old 45-inch Steel Pipe – localized corrosion failure

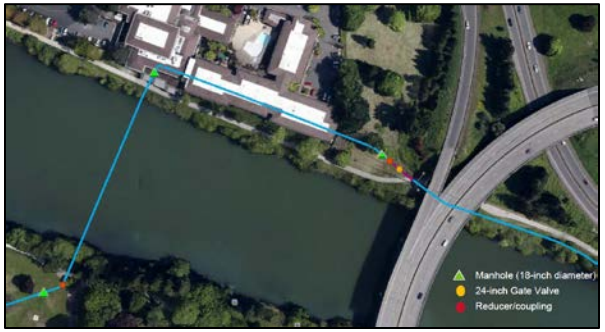
Prioritizing Condition Assessment Work

1. 45-Inch Transmission Main – 5.7 Miles.

- Large Diameter.
- Recently leaked.
- Interstate-5 undercrossing.
- River under-crossing.
- Critical pipeline from treatment plant to system.

2. 30-Inch Transmission Main – 0.5 Miles.

- Hotel built above transmission main.
- River undercrossing.



Prioritizing Condition Assessment Work

- **45-Inch characteristics:**

- Installed in 1948.
- 3/8” thick Steel pipe; welded joints inside and out.
- Coal tar enamel lining and coating.
- Native backfill.

- **30-Inch characteristics:**

- Installed in 1958.
- 1/4” thick Steel pipe; dresser type mechanical joints; cadwelded jumper cables.
- Coal tar enamel lining and coating.
- Screened native material backfill.

Prioritizing Condition Assessment Work

- **45-Inch general concerns:**

- Pipe is a valuable, critical asset that needs to be maintained, without shutdowns, during the peak demand seasons.

- **30-Inch general concerns:**

- Inspection report describes numerous issues with coating damage from shipping and handling; damage from cadwelds and poor backfill/ compaction.

Determining Condition Assessment Activities

- **Contracted HDR Engineering for Recommendations:**
- Phase condition assessment activities balancing cost, risk, and operational constraints for more effective results.

- **45-Inch recommendations:**
- Phase 1: Corrosion Survey (leverage 2008 Corrpro study).
- Phase 2: Leak Detection Survey (PURE: Smartball).
- Phase 3: Dry, In-pipe inspection (PICA: See Snake).
- Phase 4: Excavation and direct assessment at leak and corrosion areas.

- **30-Inch recommendations:**
- Phase 1: Leak Detection Survey (PURE: Smartball).
- Phase 2: Dry, In-pipe inspection (PICA: See Snake).
- Phase 3: Man-entry inspection and repairs.

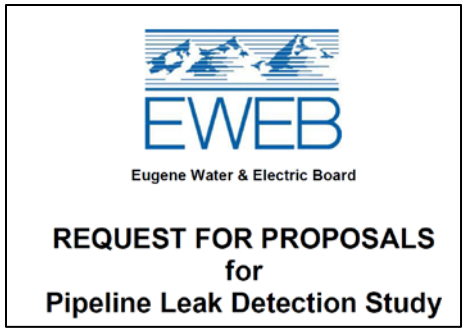
Condition Assessment Process

Step 1 - Request for proposals (RFP):

- Formal solicitation process
- A team of EWEB staff evaluated five (5) proposals.

Proposals evaluated based on the following Criteria:

1. **Qualifications & References.**
2. **General Plan and Sequence of Work.**
3. **Pricing Proposals.**



Condition Assessment Process

Step 2 - Vendor selection process (PURE):

- Many example projects were relevant to large diameter steel pipe and located in the U.S. and the West Coast.
- Smartball is accurate to 0.028 gal/min and pinpoints leaks to within one pipe diameter away.
- Demonstrated knowledge of the EWEB transmission System.

December 9, 2016

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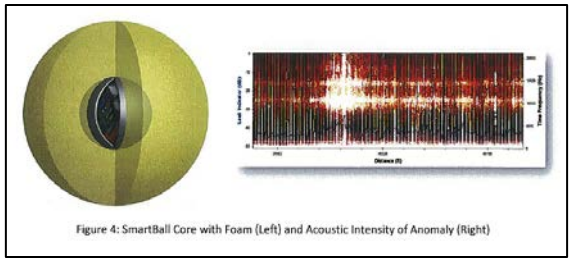


Figure 4: SmartBall Core with Foam (Left) and Acoustic Intensity of Anomaly (Right)

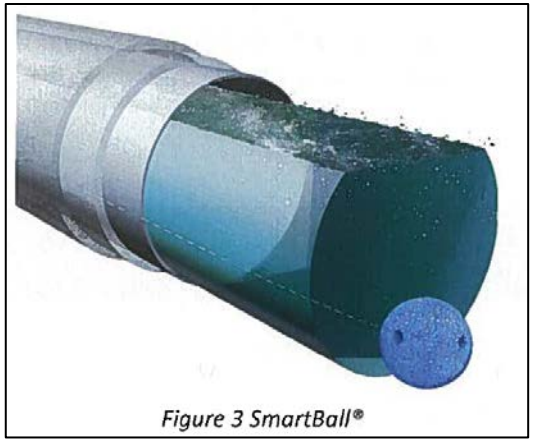
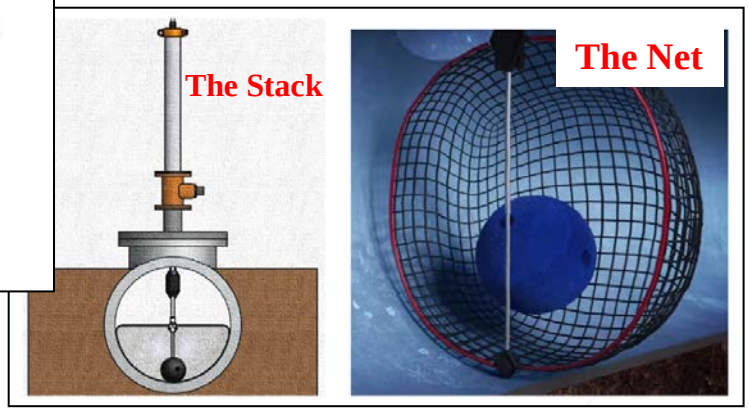


Figure 3 SmartBall®

Condition Assessment Process

Step 3 - Kickoff Meeting & Smartball Overview:

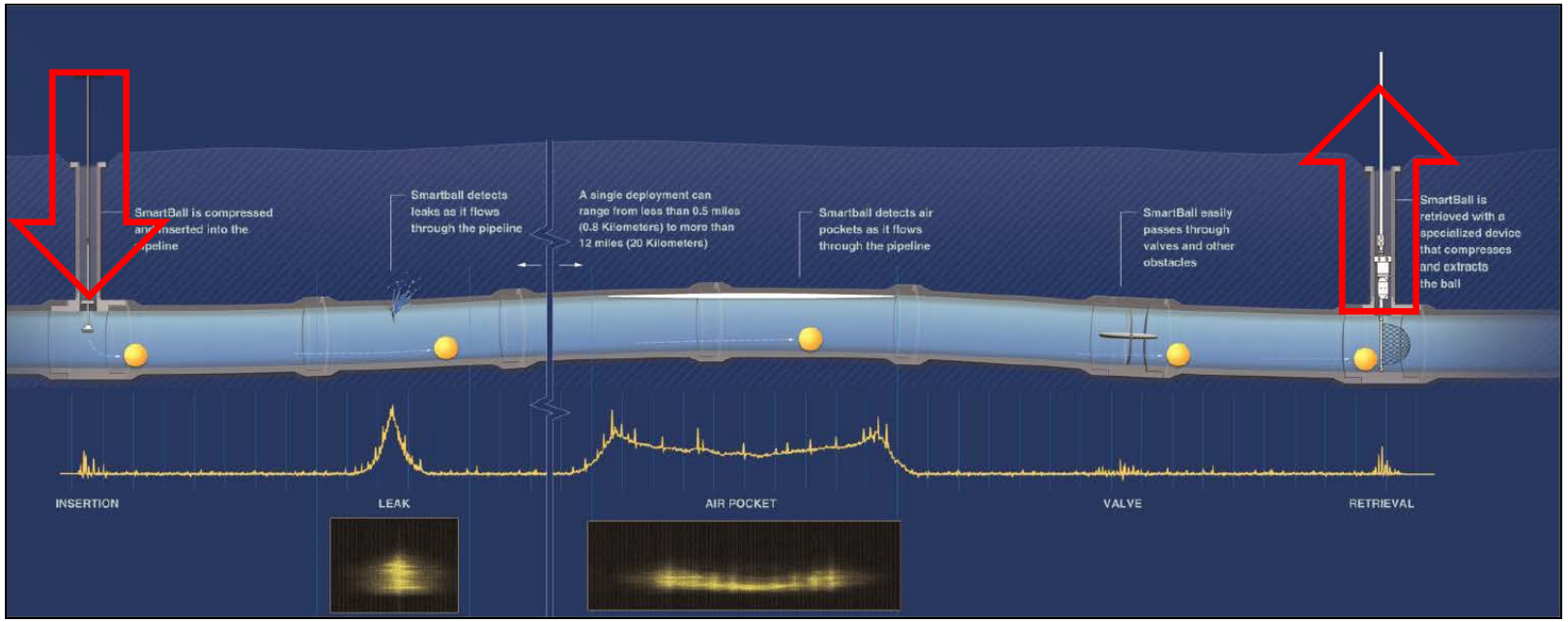
- Free swimming tool that travels with flow.
- Records acoustic data created by leaks and air pockets.
- Able to inspect long stretches in a single deployment without disruption to an in-service pipeline.



Condition Assessment Process

Step 4 – PURE's Smartball Requirements:

- A 4, 6, or 8-inch gate valve, with flange face oriented vertically.
- Extraction requires the pipe outlet to be centered over the pipe.
- Required velocity 1 to 2.5 ft/s and a pressure greater than 15-psi.



Condition Assessment Process

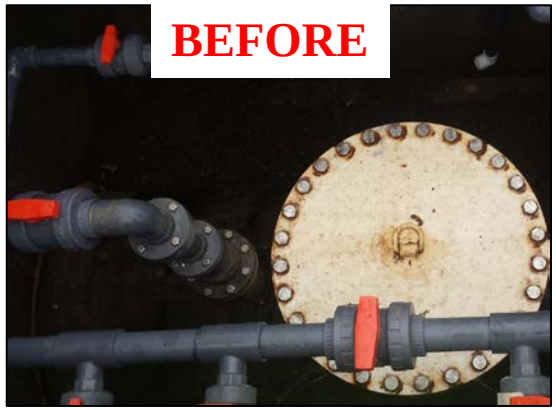
Step 4 Cont. - Fitting installation on the 30-Inch.

30-inch – Insert Location

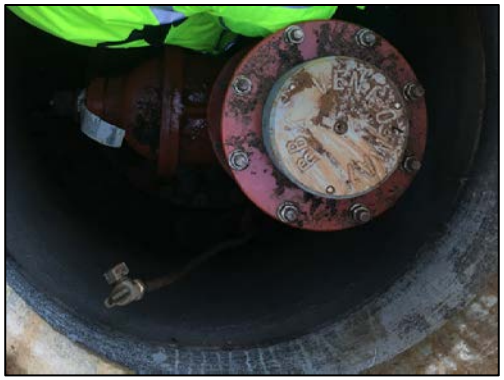
30-inch – Extract Location

Condition Assessment Process

Step 4 Cont. - Fitting installation on the 45-Inch.



45-inch – Insert Location



45-inch – Extract Location

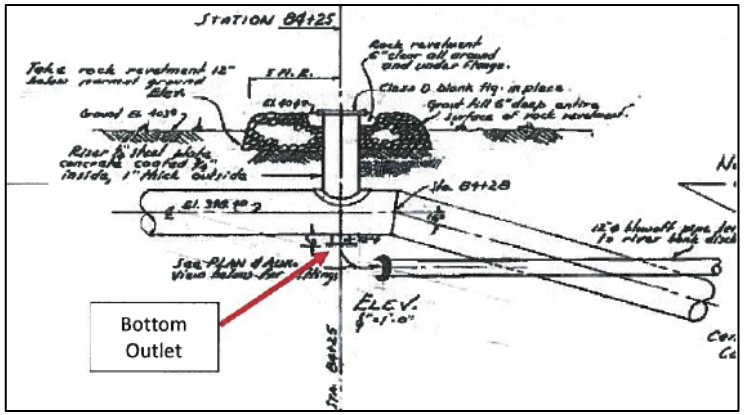
Condition Assessment Process

Step 5 - Modeling the 30-Inch for 1.3 ft/s.

- Treatment Plant target flow rate of 20 MGD.
- Model results; the 30-inch velocity was 1.27 ft./s with two fire flows at hydrants.
- Performed field flows at both hydrants to get actual values.
- Model results; the 30-inch velocity was 1.34 ft./s with actual field flows.

30-inch – Fire Hydrants

30-inch – Under the Inn

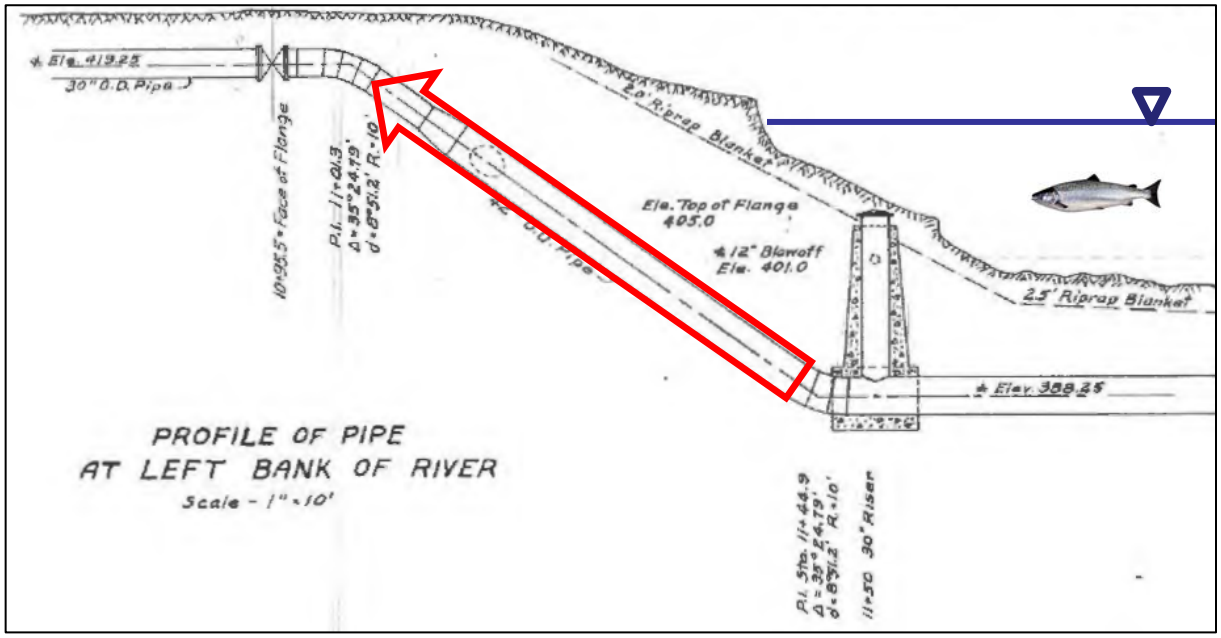


30-inch – Bottom Outlet (Under Building)

Condition Assessment Process

Step 5 Cont. - Modeling the 45-Inch for 1 ft/s.

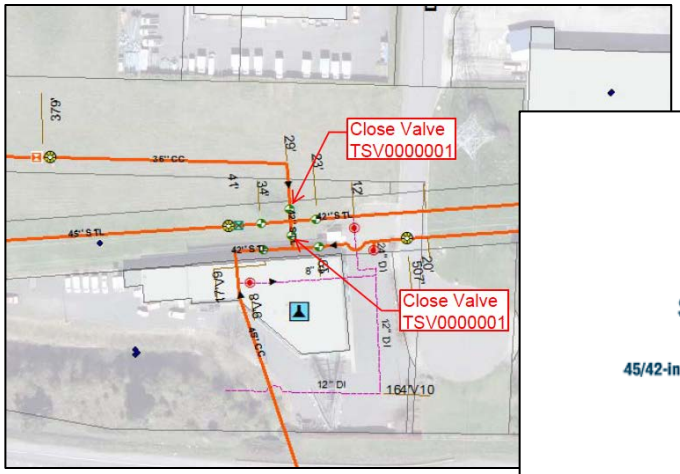
- Treatment Plant target flow rate of 15 MGD.
- Isolate all lateral connections along the 45-inch.
- Model results: the 45-inch velocity was 2.1 ft./s



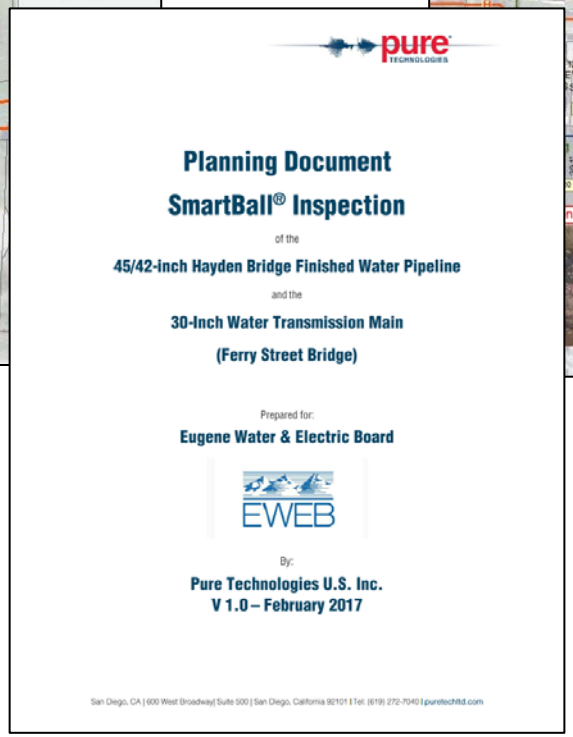
45-inch – River Bank Slope at River Crossing

Condition Assessment Process

Step 6 – Field work operational plans.



45-inch – Valve Isolation Plan



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Planning Document

SmartBall® Inspection

of the

45/42-inch Hayden Bridge Finished Water Pipeline

and the

30-Inch Water Transmission Main

(Ferry Street Bridge)

Prepared for:

Eugene Water & Electric Board

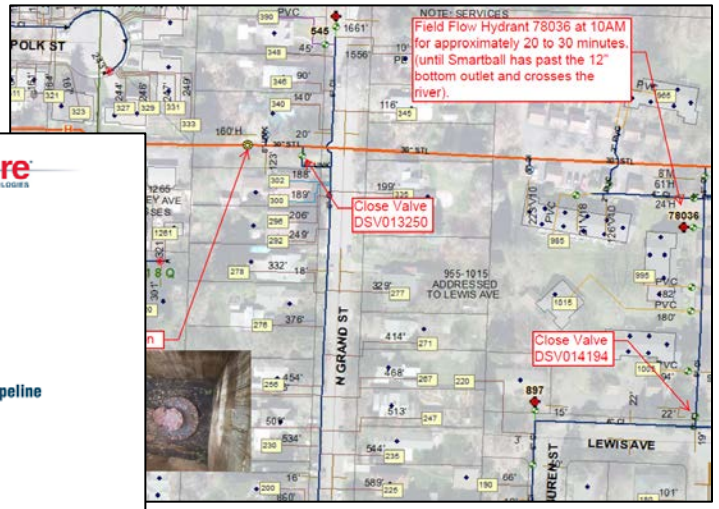
EWEB

By:

Pure Technologies U.S. Inc.
V 1.0 – February 2017

San Diego, CA | 600 West Broadway| Suite 500 | San Diego, California 92101 | Tel: (619) 272-7040 | puretechltd.com

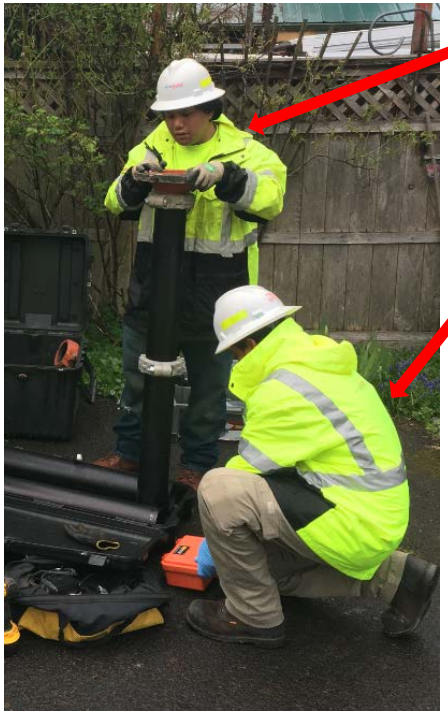
PURE's Plan



30-inch – Valve Isolation Plan

Condition Assessment Work

- **Step 7 – PURE's team on site completing field work.**



Condition Assessment Work

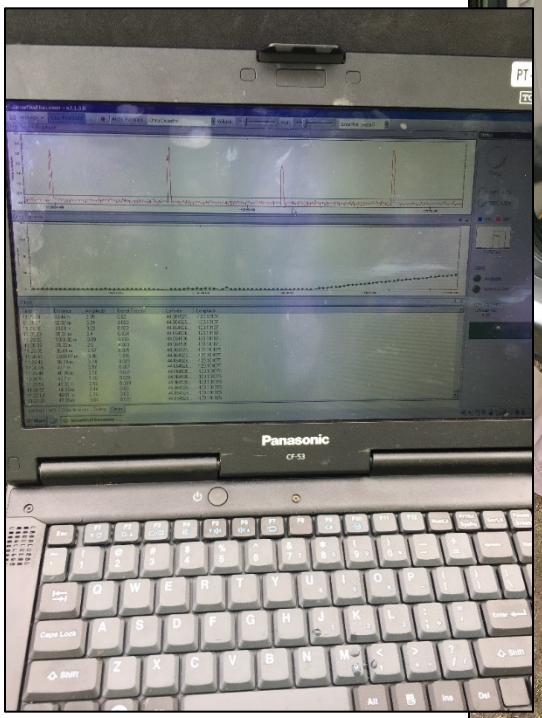
- **30-inch: Starting at the extraction site.**

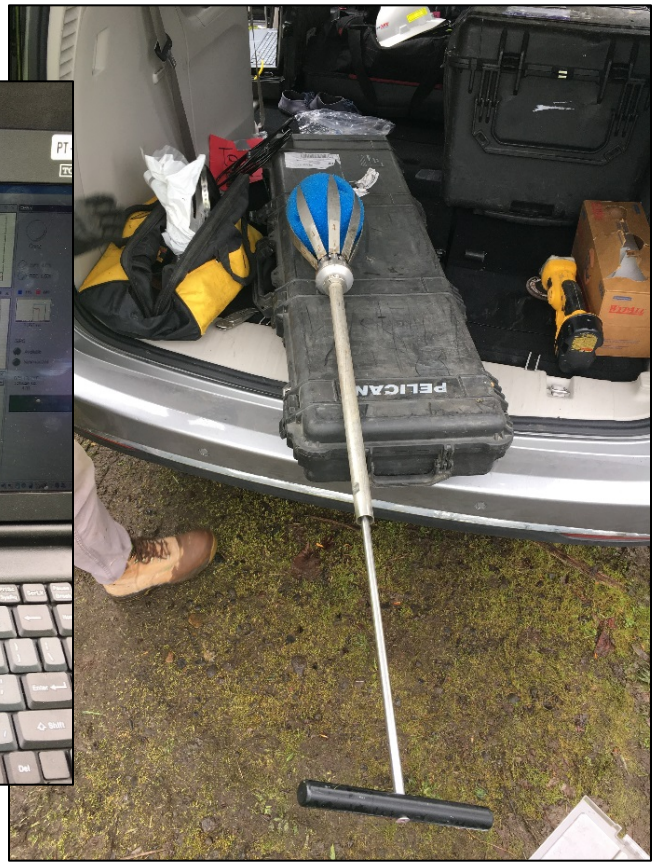
Condition Assessment Work

- **30-inch: Insertion site and velocity check (25 MGD).**

Condition Assessment work

- **30-inch: Smartball insertion.**





Condition Assessment work

- **30-inch: Smartball extraction.**

Condition Assessment Work

- **45-inch: Starting at the extraction site.**

Condition Assessment Work

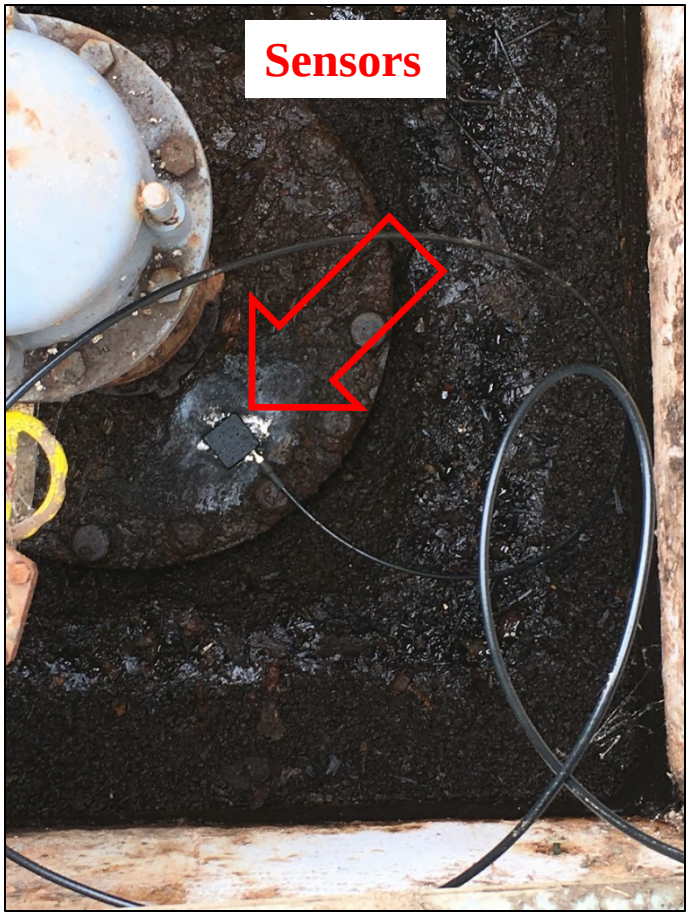
- **45-inch: Smartball insertion.**

Condition Assessment Work

- **45-inch: Smartball insertion.**

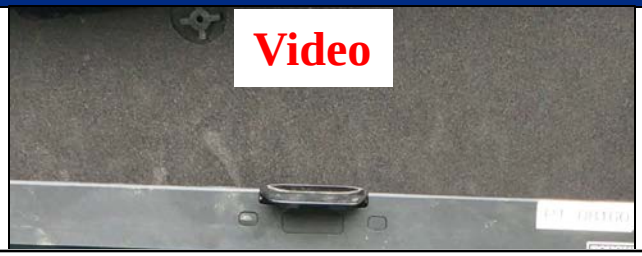
Condition Assessment Work

- **45-inch: Smartball tracking with acoustic sensors.**



Condition Assessment Work

- **45-inch: Smartball extraction.**



Leak Detection Results

- **Step – 8**

45-INCH : Leak #1	
Leak Distance from Nearest Tracking Location	1 feet after SBR 7 (12-inch Gate Valve at Station 102+39, from drawing D-1124)
Leak Distance from Nearest Tracking Location	2197.1 feet before SBR 8 (exposed pipe ~135 feet downstream of University Commons Road)
Leak Size	Small (~1.36 gal/min)
Leak Details	Suspected Feature – Related Leak
Leak Location Description	Leak location lines up with SBR 7 on North Garden Way. Possibility that feature was left open during inspection. Mechanical noise heard. No visible cause observed.
Location Confidence Comments	High confidence location due to the proximity to SBR 7.
Approximate Location of Leak	

45-INCH : Leak #2	
Leak Distance from Nearest Tracking Location	978.3 feet after SBR 8 (exposed pipe ~135 feet downstream of University Commons Road)
Leak Distance from Nearest Tracking Location	1295.6 feet before SBR 9 (next to Autzen Stadium)
Leak Size	Small (~0.04 gal/min)
Leak Details	Suspected Feature – Related Leak
Leak Location Description	Leak is located ~978 feet downstream of SBR 8 and is suspected to be related to a feature right next to Martin Luther King Jr Boulevard.
Location Confidence Comments	Medium confidence location since the leak is within SBR 8 tracking range.
Approximate Location of Leak	

Leak Detection Results

- **Step 8 – Cont.**

	30-INCH Leak #1
Leak Distance from Nearest Upstream Tracking Location	1233.6 feet after SBR 2 (2-inch Valve Air Bleed and Intake at Station 89+95, from drawing D-5335-9)
Leak Distance from Nearest Downstream Tracking Location	602.9 feet before Extraction (6-inch Flange Outlet and Valve at Station 107+45, from drawing D-5335-10)
Leak Size	Small (~0.85 gal/min)
Leak Details	Suspected Feature-Related Leak. Event lines up with a 6-inch cast iron lateral connection. This feature could have been open during the inspection
Leak Location Description	The leak is located ~603 feet upstream of Extraction and lines up with a 6-inch cast iron lateral connection.
Location Confidence Comments	High confidence location due to proximity to Extraction.
Approximate Location of Leak	

Leak Detection Results

- Overall, both the 45-inch and the 30-inch transmission mains show indications of being in good condition.
- The acoustic anomalies detected were correlated with water system features (valves).
- EWEB intends to inspect each valve to assure that there are no leaks.

Next Steps

- Finalize post condition assessment report with HDR.
- Plan future phases for condition assessment activities.
- Prioritize limited resources for known transmission main improvements.

Questions & Comments?

Thank you for your time!

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