

Hydromax USA Identifies Potential Underground Water Pipeline Issues for Aurora Water in Colorado

PROJECT OVERVIEW

UTILITY:

Aurora Water partnering with CH2M



PIPELINE FOR ASSESSMENT:

- 30-inch steel water main installed in 1966 – on N Havana Street
- 27-inch steel water main installed in 1956 – on S Peoria Street

PIPELINE SPECIFICATION:

- **Wall thickness: 0.1875-inch** (in accordance with client's request and Ultrasonic Test results)
- **Cement mortar lining of 3/8-inch** (in accordance with client's request).

TECHNOLOGY USED:

p-CAT™ (pipe condition assessment technology)

p-CAT™ is a non-invasive and non-destructive technology suitable for pressurized metallic and asbestos cement pipelines and is applicable for potable water pipelines, raw water and waste water pipelines.



THE PROBLEM

Familiar with invasive condition assessment technologies in the market and the associated costs, CH2M and the Aurora Water set out to identifying a cost effective non-invasive pipe condition assessment tool that could be utilized to determine the health of their water infrastructure as well as identify potential problem locations.

After carefully researching available technologies on the market to include deployment methods, resulting data as well as pricing, CH2M and the Aurora Water selected Hydromax USA and p-CAT technology.

THE SOLUTION

p-CAT™ is a non-invasive pipeline condition assessment tool that utilizes inverse transient pressure wave analysis to determine pipe wall degradation and identify anomalies. Developed over 10 years ago by Dr. Young-il Kim from the University of Adelaide Australia. p-CAT is designed to test long stretches of pipe efficiently and effectively while giving the utility detailed analysis capable of change detection down to 30 ft. sub-sections. In addition to wall degradation, p-CAT identifies anomalies which may include, pockets of air, pipe material changes, blockages and valve closure.

CASE STUDY

ASSESSMENT PERFORMED

Working with CH2M and the Aurora Water, Hydromax USA collected all available data on the two pipelines including as-builts, GIS, pressure data, and repair history. Hydromax team performed a detailed analysis and feasibility review to ensure p-CAT was a proper fit for the proposed pipeline.

From that review it was determined the pipeline was an ideal candidates for p-CAT. Hydromax team then performed a site visit to locate, identify and inspect available assets needed for a successful deployment of p-CAT. Further review and final test planning were taken on at the completion of the successful site visit. Field Teams returned to Virginia Beach and successfully performed p-CAT testing on over 2 miles of pipe in 2 days' time using the existing air release valves and hydrants. Close boundary test was performed in this project.

Existing appurtenances like ARVs, hydrants etc. were used as both transient generation stations and measuring station.

The data was sent to the analysis team for detailed review and report generation. Utilizing pipeline specification provided by the Client, the analysis team performed a sub-sectional analysis to identify problem areas down to 30 ft. resolution.



Sample Visual Summary of Sub-Section Analysis Report

RESULTS

N HAVANA STREET | 30 INCH WATER MAIN:

- 32% of pipeline tested was **HIGHLY DETERIORATED**
- 4% of pipeline tested was in **MODERATE CONDITION**
- 64% of pipeline tested had 82–95% remaining wall thickness.
- 16 anomalies were identified including valves that were not fully sealed, pipe material change and entrapped air.

S PEORIA STREET | 27 INCH WATER MAIN:

- 44% of pipeline tested was **HIGHLY DETERIORATED**
- 35% of pipeline tested was in **MODERATE CONDITION**
- 20% of pipeline tested had 81–91% remaining wall thickness.
- 5 anomalies were identified including entrapped air and valve seal positions.

Series Identifier	Approx. Chantage (ft)		Sub-section Location on Pipeline	Assumed Pipe	Approx. Length (ft)	Theoretical Thickness (Inch)		Remaining Total Equivalent Wall Thickness ⁽¹⁾ (Difference between initial wall or current mortar lining from the nominal theoretical value)						Sub-Sectional Average Wave Speed (ft/s)
	Start	End				Wall	Lining	Assumed Internal Corrosion ⁽²⁾			Assumed External Corrosion ⁽²⁾			
								Wall (in)	Lining (in)	% remaining ⁽³⁾	Wall (in)	Lining (in)	% remaining ⁽³⁾	
51	7330	7359	ARV as located on site to the pipe material type transition (Anomaly B)	Unknown	130	Unable to provide pipe wall condition as the pipe specification is unknown						4178		
52	7369	7445	Starts at the transition (Anomaly D)	12" DCL	186	0.34	0.06	0.25 (-0.08)	0.00 (-0.06)	73%	0.24 (-0.1)	0.06 (0.00)	71%	3943
53	7545	7701	as per chantage	12" DCL	156	0.34	0.06	0.26 (-0.08)	0.00 (-0.06)	74%	0.24 (-0.1)	0.06 (0.00)	72%	3953
54	7701	7806	as per chantage	12" DCL	105	0.34	0.06	0.25 (-0.08)	0.00 (-0.06)	73%	0.24 (-0.1)	0.06 (0.00)	71%	3940
55	7806	7902	as per chantage	12" DCL	96	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	77%	0.25 (-0.09)	0.06 (0.00)	76%	3983
56	7902	8111	as per chantage	12" DCL	119	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	76%	0.25 (-0.09)	0.06 (0.00)	75%	3973
57	8111	8282	as per chantage	12" DCL	171	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	77%	0.25 (-0.09)	0.06 (0.00)	75%	3980
58	8282	8425	as per chantage	12" DCL	143	0.34	0.06	0.27 (-0.07)	0.00 (-0.06)	77%	0.25 (-0.1)	0.06 (0.00)	75%	3976
59	8425	8624	Ends at Anomaly C	12" DCL	199	0.34	0.06	0.25 (-0.09)	0.00 (-0.06)	73%	0.24 (-0.1)	0.06 (0.00)	71%	3940
60	8624	8951	Starts at Anomaly C	12" DCL	328	0.34	0.06	0.24 (-0.09)	0.00 (-0.06)	68%	0.22 (-0.1)	0.06 (0.00)	68%	3913
61	8951	9102	Ends at Anomaly D	12" DCL	149	0.34	0.06	0.24 (-0.1)	0.00 (-0.06)	68%	0.22 (-0.1)	0.06 (0.00)	68%	3911
62	9102	9234	Starts at Anomaly D	12" DCL	131	0.34	0.06	0.24 (-0.1)	0.00 (-0.06)	70%	0.22 (-0.1)	0.06 (0.00)	68%	3911
63	9234	9476	as per chantage	12" DCL	243	0.34	0.06	0.23 (-0.1)	0.00 (-0.06)	68%	0.22 (-0.1)	0.06 (0.00)	66%	3885
64	9476	9579	as per chantage	12" DCL	102	0.34	0.06	0.25 (-0.09)	0.00 (-0.06)	72%	0.24 (-0.1)	0.06 (0.00)	70%	3934
65	9579	9724	as per chantage	12" DCL	146	0.34	0.06	0.23 (-0.1)	0.00 (-0.06)	68%	0.22 (-0.1)	0.06 (0.00)	66%	3885
66	9724	9857	Ends at Anomaly E	12" DCL	133	0.34	0.06	0.24 (-0.09)	0.00 (-0.06)	70%	0.24 (-0.1)	0.06 (0.00)	68%	3934
67	9857	10017	Between Anomaly E and F	12" DCL	162	0.34	0.06	0.24 (-0.1)	0.00 (-0.06)	69%	0.22 (-0.1)	0.06 (0.00)	67%	3896

Sample Sub-Sectional Analysis Report