

HYDROMAX USA

Advanced Water, Wastewater and Gas Data Collection

CASE STUDY

Hydromax USA Aids the City of Virginia Beach, VA with Pipeline Replacement & Rehab Project

PROJECT OVERVIEW

UTILITY:

City of Virginia Beach, VA
partnering with Hazen



PIPELINE FOR ASSESSMENT:

- 20-inch cast iron water main installed in 1967

PIPELINE SPECIFICATION:

- **Outer Diameter: 21.6-inches**
(USAS A21.1-1967 (AWWA H1 – 67))
- **Wall Thickness: 0.72-inches**
(USAS A21.1-1967 (AWWA H1 – 67))
- **Manufacturers Tolerance: +0.08 in.**
(USAS A21.1-1967 (AWWA H1 – 67))
- **No cement mortar lining**

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

Preparing plans to replace a section of pipeline, the City of Virginia Beach along with Hazen & Sawyer set out to identify a cost effective technology to perform pipe condition assessment on the a stretch a pipe adjacent to the pipeline scheduled to be replaced. This effort would help the City of Virginia Beach and Hazen determine if the whole pipeline required replacement or only a short section.

After carefully researching available technologies on the market to include deployment methods, resulting data as well as pricing, CH2M and 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 Hazen and the City of Virginia Beach, 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 the 1 miles of pipe in a day's time using the existing air release valves and hydrants.

Series Number	Appex. Chainage (ft)		Sub-section Location on Pipeline	Assumed Pipe Length (ft)	Theoretical Thickness (in)		Remaining Total Equivalent Wall Thickness (%) ⁽¹⁾ (Difference between metal wall or cement 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 ⁽³⁾					
							Wall (in)	Lining (in)	% Remaining ⁽⁴⁾	Wall (in)		Lining (in)	% Remaining ⁽⁵⁾	
S1	7200	7350	As-Built as located on site to the pipe material/line transition (Anomaly B)	Unknown	130	Unable to provide pipe wall condition as the pipe specification is unknown				43.78				
S2	7350	7545	Starts at the transition (Anomaly B)	12" DCL	186	0.34	0.06	0.26	0.00	73%	0.24	0.06	71%	3843
S3	7545	7702	as per change	12" DCL	156	0.34	0.06	0.26	0.00	74%	0.24	0.06	72%	3813
S4	7702	7856	as per change	12" DCL	195	0.34	0.06	0.26	0.00	73%	0.24	0.06	71%	3840
S5	7856	7992	as per change	12" DCL	96	0.34	0.06	0.27	0.00	77%	0.25	0.06	76%	3883
S6	7992	8113	as per change	12" DCL	119	0.34	0.06	0.27	0.00	76%	0.25	0.06	75%	3873
S7	8113	8282	as per change	12" DCL	171	0.34	0.06	0.27	0.00	77%	0.25	0.06	75%	3880
S8	8282	8425	as per change	12" DCL	143	0.34	0.06	0.27	0.00	77%	0.25	0.06	75%	3876
S9	8425	8624	Ends at Anomaly C	12" DCL	199	0.34	0.06	0.28	0.00	73%	0.24	0.06	71%	3840
S10	8624	8953	Starts at Anomaly C	12" DCL	328	0.34	0.06	0.28	0.00	70%	0.23	0.06	68%	3813
S11	8953	9322	Ends at Anomaly D	12" DCL	369	0.34	0.06	0.24	0.00	68%	0.22	0.06	66%	3816
S12	9322	9234	Starts at Anomaly D	12" DCL	131	0.34	0.06	0.24	0.00	70%	0.23	0.06	68%	3811
S13	9234	9476	as per change	12" DCL	243	0.34	0.06	0.23	0.00	68%	0.22	0.06	66%	3885
S14	9476	9570	as per change	12" DCL	102	0.34	0.06	0.25	0.00	72%	0.24	0.06	70%	3834
S15	9570	9724	as per change	12" DCL	146	0.34	0.06	0.23	0.00	68%	0.22	0.06	66%	3885
S16	9724	9827	Ends at Anomaly E	12" DCL	133	0.34	0.06	0.24	0.00	70%	0.23	0.06	68%	3814
S17	9827	10017	Between Anomaly E and F	12" DCL	192	0.34	0.06	0.24	0.00	69%	0.22	0.06	67%	3836

The data was sent to the analysis team for detailed review and report generation. Utilizing assumed originally installed pipeline schedule and class, the analysis team performed a sub-sectional analysis to identify problem areas down to 30 ft. resolution.

RESULTS

- 32% of pipeline tested was **HIGHLY DETERIORATED**
- 65% of pipeline tested was **MODERATELY DETERIORATED**
- 2 HIGH PRIORITY and 11 MEDIUM PRIORITY anomalies were identified which included valves that were not fully sealed, pipe material change and entrapped air.



Sample Visual Summary of Sub-Section Analysis Report

