

City and County of Honolulu Large Diameter Pipe Condition Assessment



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Presentation Summary

- Basis of Inspections
- Prioritization
- Technologies
- Approach
- Summary

Background

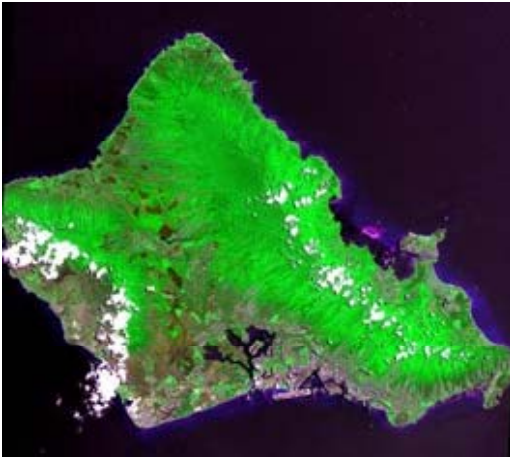


- 1995 EPA Consent Decree to reduce sanitary sewer overflows (SSOs)

- Large Sewer Structural Condition Assessment performed from 1992 to 1999

- I/I Program identified 5 supplemental programs
 - Private I/I Reduction
 - Wet Weather SSO Mitigation
 - Wet Weather I/I Assessment
 - **Critical Sewer Structural Condition Assessment**
 - Small Diameter Sewer Rehabilitation

Project Scope

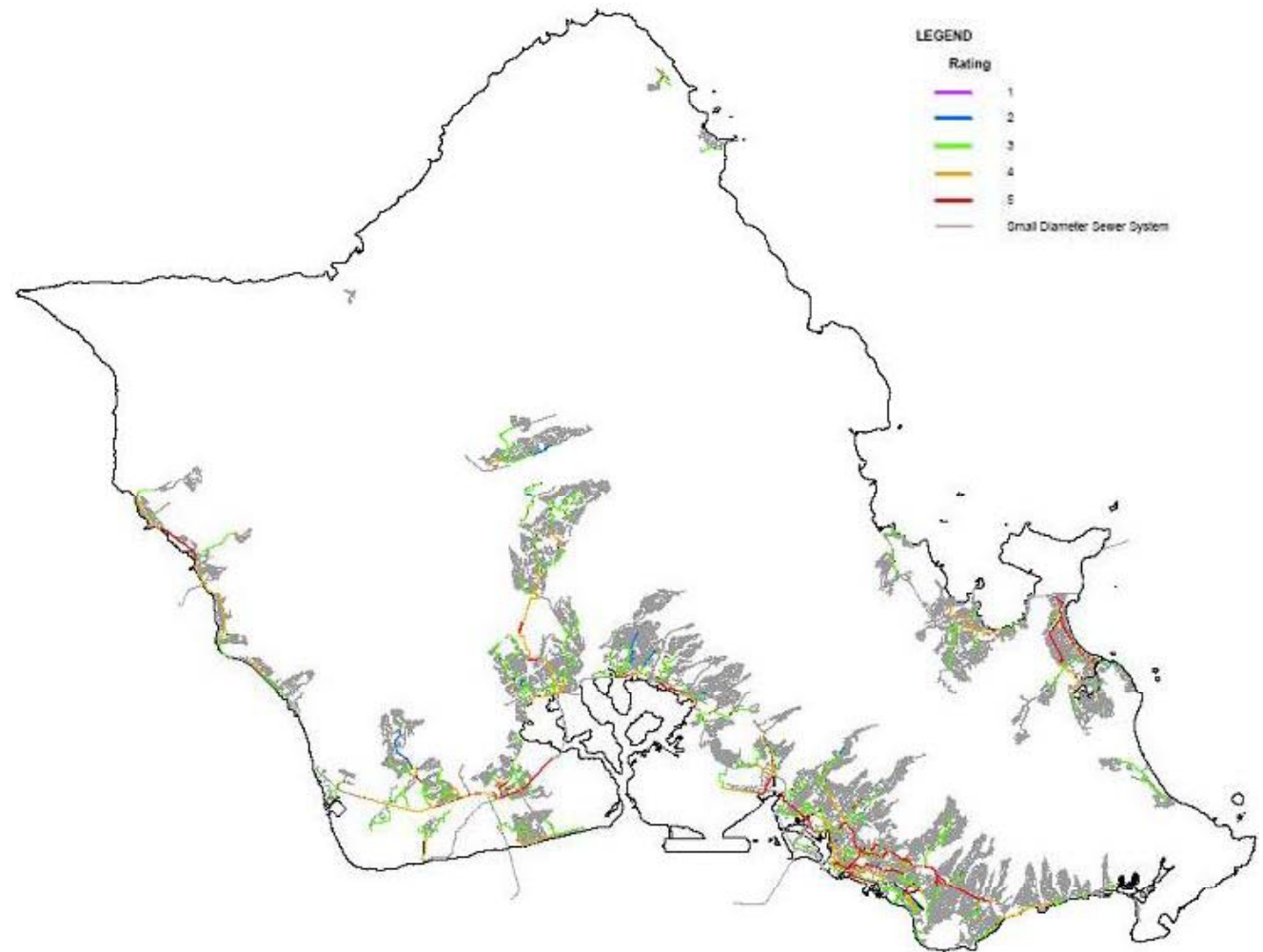


- Large diameter sewers
- Siphons, and sewers immediately adjacent
- Pipes downstream of force mains
- Sewers not in planning or rehabilitation projects

- Approximately 150 miles
 - 4,000 Manholes and pipe reaches
- Pipe Materials
- Pipe Diameters up to 84 inches

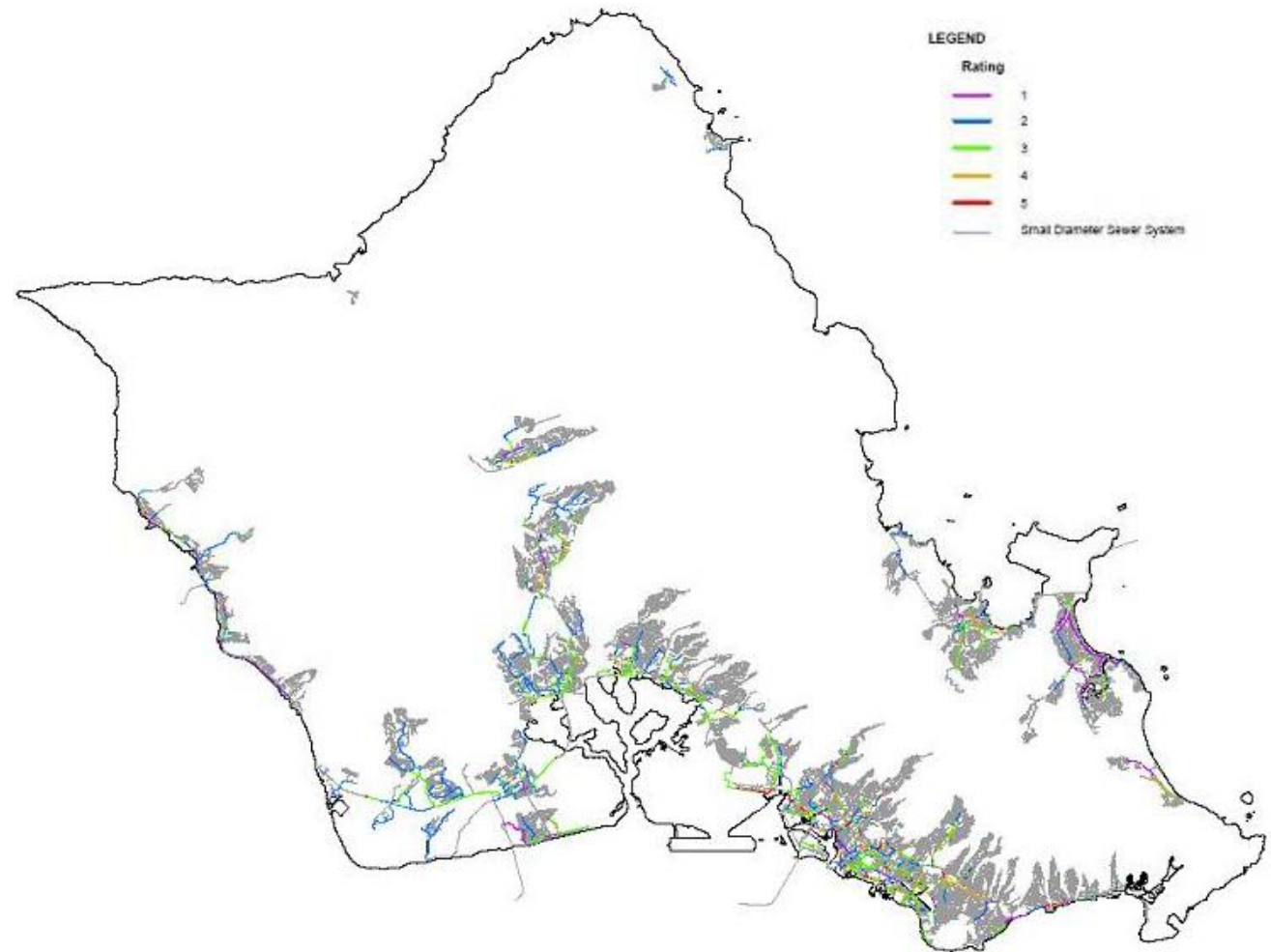
Inspection Prioritization

- Consequence of Failure
 - Environment
 - Public
 - Community
- Rating: 1 – 5



Inspection Prioritization

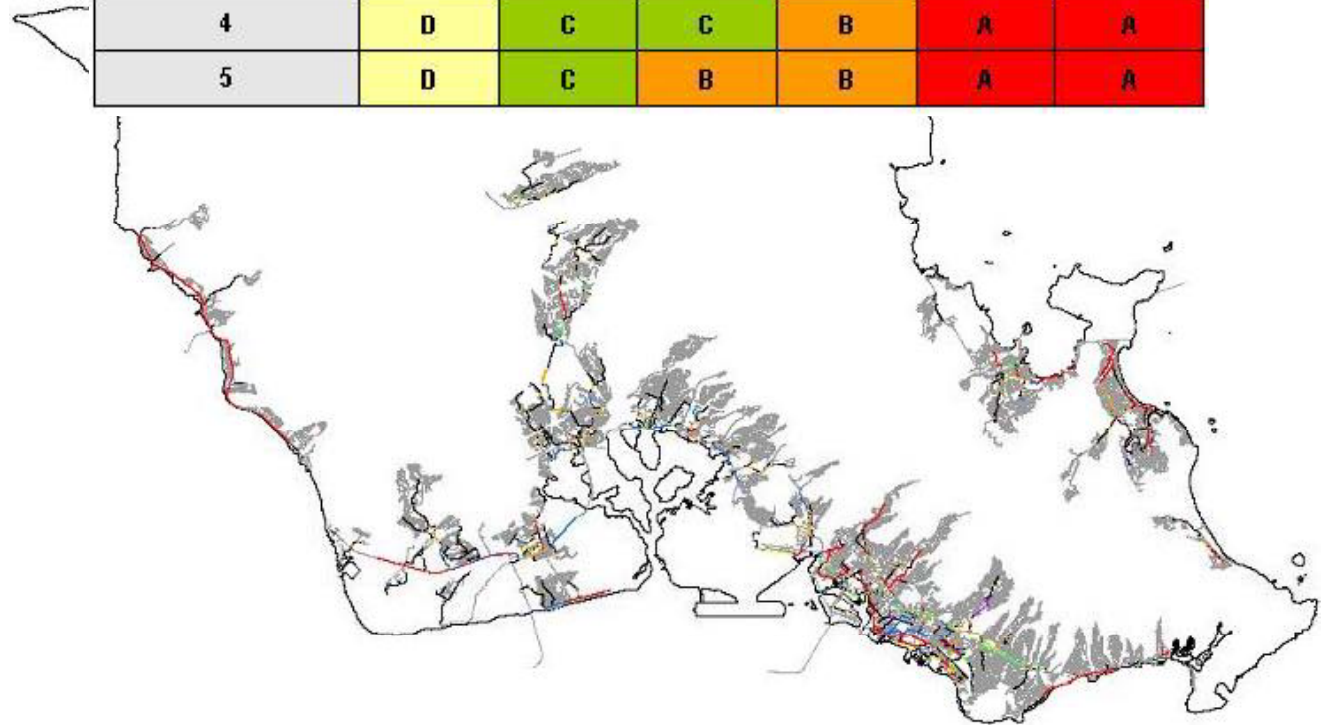
- Likelihood of Failure
 - Existing structural condition
 - Maintenance frequency information
- Rating: 1-5



Inspection Prioritization

- Prioritize inspections using a risk assessment

Risk Assessment Prioritization						
Consequence Rating	Maximum Pipe or Manhole Likelihood Rating					
	0	1	2	3	4	5
1	D	D	D	D	C	B
2	D	D	D	D	C	B
3	D	D	D	C	B	B
4	D	C	C	B	A	A
5	D	C	B	B	A	A



Field Inspection

- NASSCO
 - PACP
 - MACP
- Field Inspection Form
 - Structural Condition

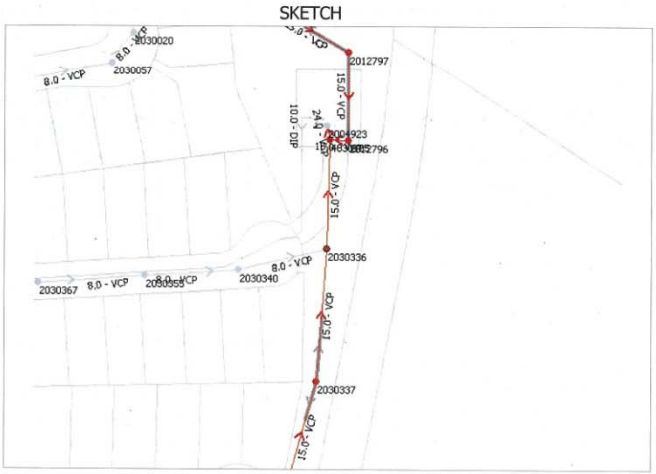


MANHOLE INSPECTION FORM

Data Entry

Manhole Number (12) 2030336	Surveyor's Name (1) JK / DY / RT	Certificate No. (1a) 03-2389 / 04-7075 / 04-7072	Survey Customer (3) Brown and Caldwell	Date (8) (MM/DD) / / 2009	Time (9) (military) :
P.O. No. (6) SC-ENV-070010	Sheet No. (5) 1	System owner (2) CITY/Other: _____	Drainage Area (4) HK / HN / KH / KK / LA / SI / WH / WM / WN	User of Sewer (20) SS / Other: _____	Pre-Cleaning (36) J / H / N / Z
Location (Street) (10) _____	Locality/City (10a) Honolulu	Location Details (11) (if any) _____	Location Code (38) A / B / C / D / E / F / G / H / I / J / K / L / M / Y / Z	Elevation (45) N/A	Weather (37) (1-7) _____
Northing (43) _____	Easting (44) _____	Coordinate Syst. (46) UTM _ NAD 83	Accuracy of GPS (47) M / N / L	Video Name (51) N/A	Tape/Media No. (33) N/A
Rim to Grade (15) _____	MH Surface Type (40) AS / CO / CC / GD / GR / ZZ	Inspection Status (48) SI / DI / RI / NF / NO / SD / NI / NA / BM	H2S (in ppm) _____	Location Photo ID _____	Internal Photo ID _____

Stream Crossing None / Buried / Aerial	Chamber Floor Depth from Cover _____	MANHOLE COMPONENT OBSERVATIONS
Cover Shape C / Z: _____	Cover Size 24" / 30" / Z: _____	Cover Material CAS / ZZ: _____
Cover Condition Sound / Cracked / Broken / Missing / Corroded / BoltsMssng	Frame Material CAS / ZZ: _____	Frame Condition Sound / Cracked / Loose / Offset
Frame Offset Distance _____ inches	Chimney Material 1 BR / RCP / ZZ: _____	Chimney Material 2 BR / RCP / ZZ: _____
Int. Chim. Coating/Liner NC / C / E / P / PL / R / CP / F / B / ZZ	Cone Material BR / RCP / ZZ: _____	Int. Cone Coating/Liner NC / C / E / P / PL / R / CP / F / B / ZZ
Wall Material BR / RCP / ZZ: _____	Int. Wall Coating/Liner NC / C / E / P / PL / R / CP / F / B / ZZ	Bench Present? Yes / No
Bench Coating/Liner NC / C / E / P / PL / R / CP / F / B / ZZ	Bench Material BR / RCP / ZZ: _____	Channel Material BR / RCP / ZZ: _____
Additional Info: <div style="border: 1px solid black; height: 30px; width: 100%;"></div>		



Inspection Technologies

- Visual Condition Inspection
 - Pole Zoom Camera
 - CCTV Camera
- Physical Condition Inspection
 - Laser Profiling and Scanning
 - Sonar Profiling

Pole Mounted Digital Video Zoom Camera

- CCTV camera head
- 24 foot carbon fiber pole (6 foot extension)
- Controls on Control Unit



Envirosight
SPECIALISTS IN PIPELINE INSPECTION



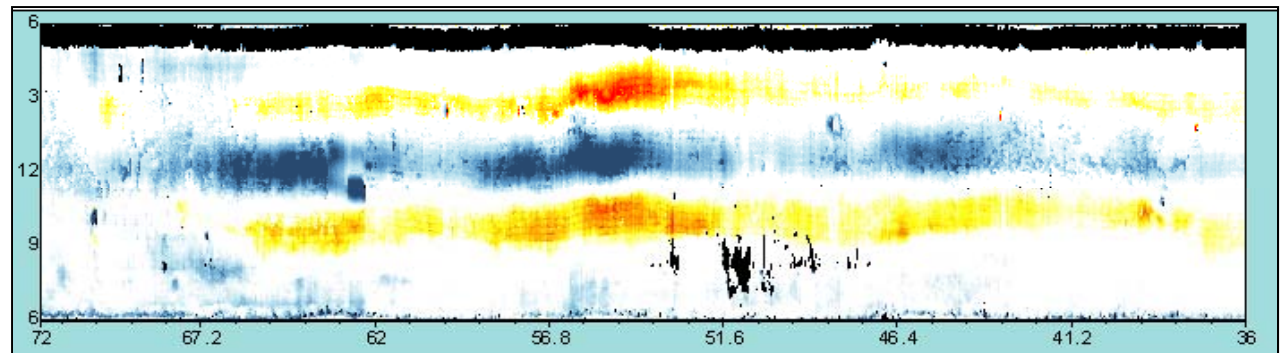
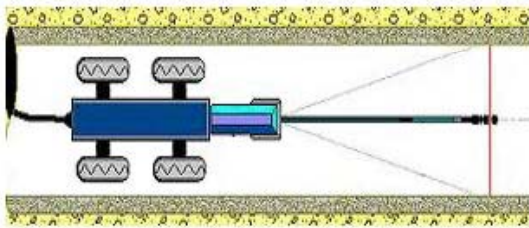
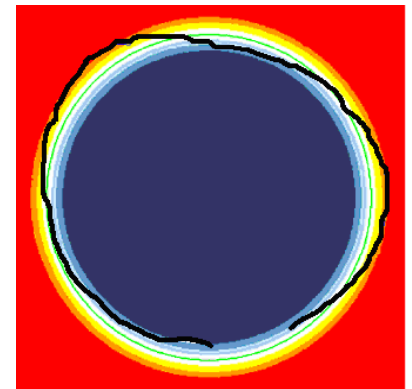
Pole Mounted Digital Video Zoom Camera

- Non-entry inspection for manholes and pipelines
- Screening Tool



2-D Laser Profiling

- Ring laser
- Combined with CCTV
- Retro-fit to CCTV Camera Screening Tool



3-D Laser Scanning

- Independent of CCTV Inspection
- 3-D pipeline models
- Minimum 36 inch diameter



3-D Laser Scanning

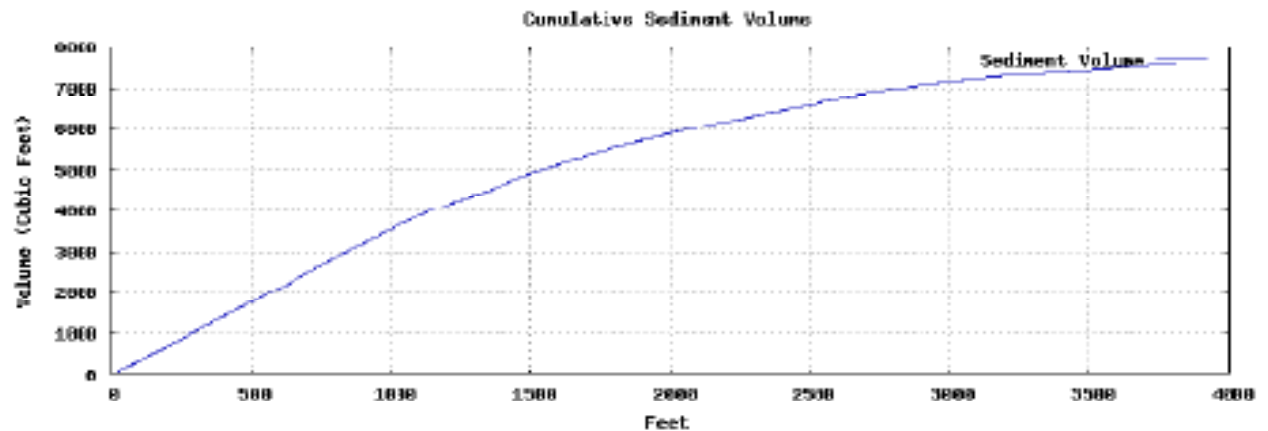
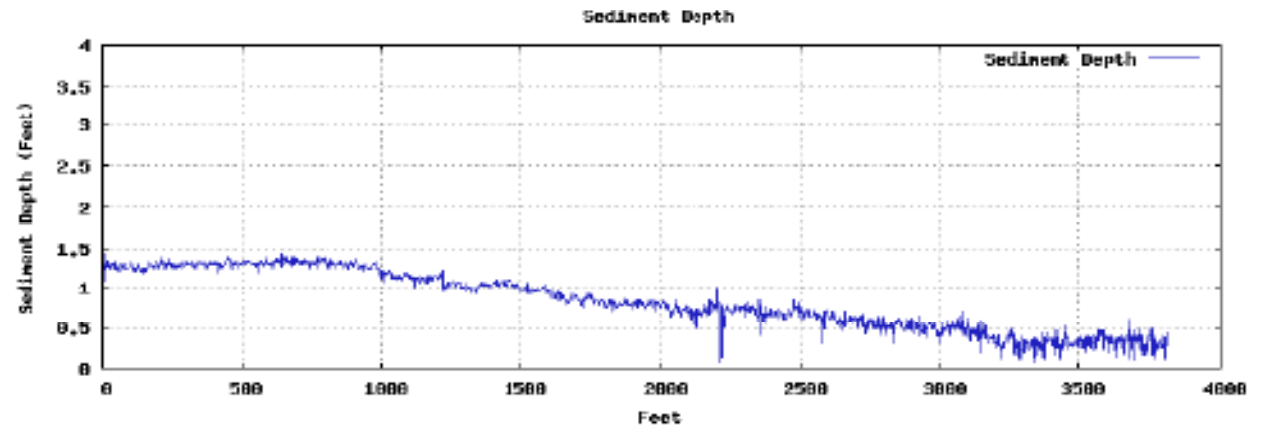
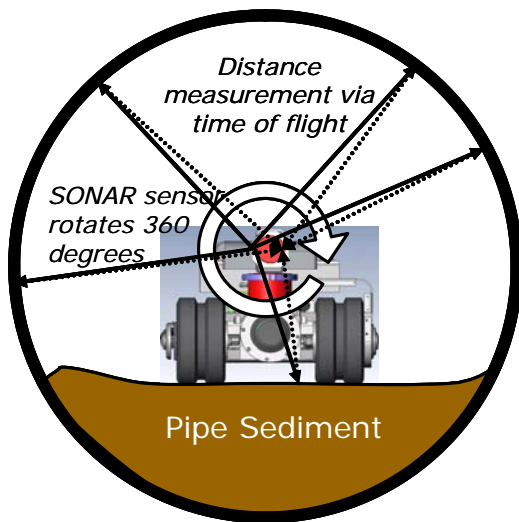
- Multi-inspection
 - 3-D laser scanning
 - Sonar profiling
 - CCTV
 - H₂S and temperature measurement
- 650 pounds
- 3.5 hp hydraulic



RedZone
ROBOTICS

Sonar Profiling

- Inspect below water surface
- Sediment by Footage
- Cumulative Sediment



Inspection Approach

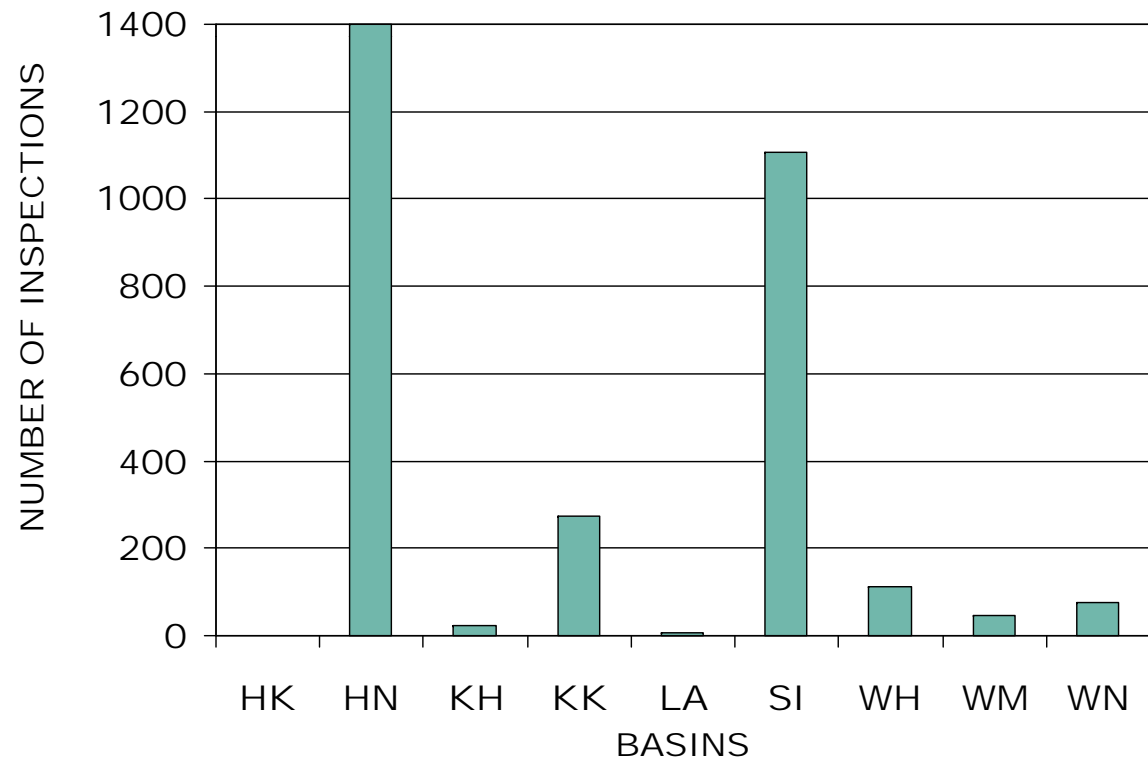


- Inspect entire large diameter system
- Pole zoom camera: primary inspection method
- Use CCTV, laser and sonar inspections where most effective

Manhole Inspection Statistics



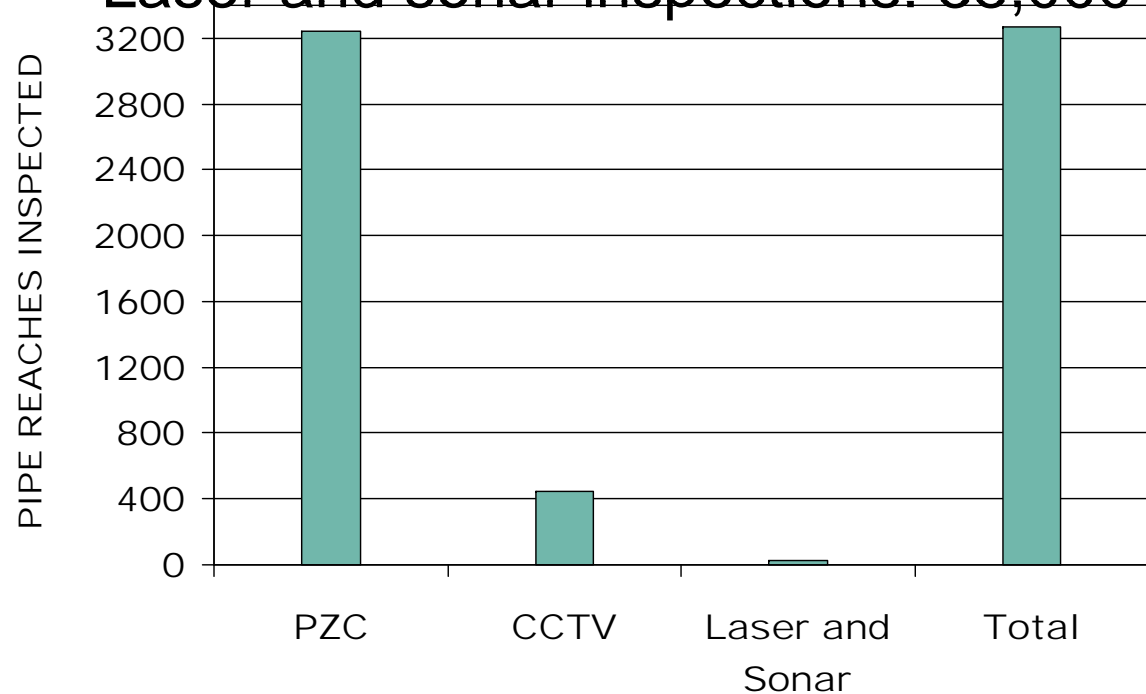
- 3,000 Non-entry inspections using Pole Zoom Camera
- 100 CSE inspections provided physical information



Pipeline Inspection Statistics



- 3,200 Pole zoom camera inspections
 - Approximately 80% of large diameter system
- CCTV inspections: 61,000 LF
- Laser and sonar inspections: 38,000 LF



Summary

- Inspect entire large diameter system
- Pole zoom camera was primary inspection method
- Supplemented with CCTV, laser and sonar inspections
- Inspection data update structural condition rating