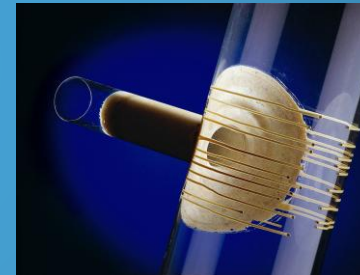
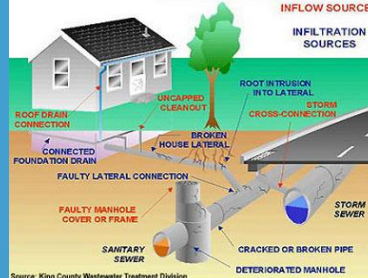
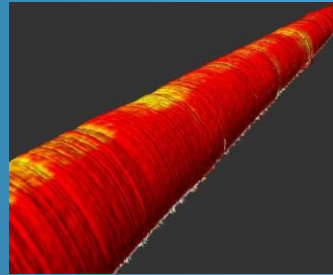




MULTI-SENSOR INSPECTIONS



National Plant Services, Inc., a Carylon Company

The Environmental Protection Specialists

Michelle Beason, PE
Regional Manager/Principal Engineer



CLEANING

- LARGE AND SMALL DIAMETER PIPE CLEANING
- ROOT REMOVAL
- WWTP CLEANING SERVICES

INSPECTION

- LATERAL AND MAINLINE CCTV INSPECTION
- MULTI-SENSOR INSPECTIONS
- MANHOLE INSPECTIONS
- LIVE WATER MAIN INSPECTIONS

REPAIR

- LATERAL LINING
- CENTRIFUGALLY CAST STRUCTURAL COATINGS
- GROUTING
- CIPP POINT REPAIRS

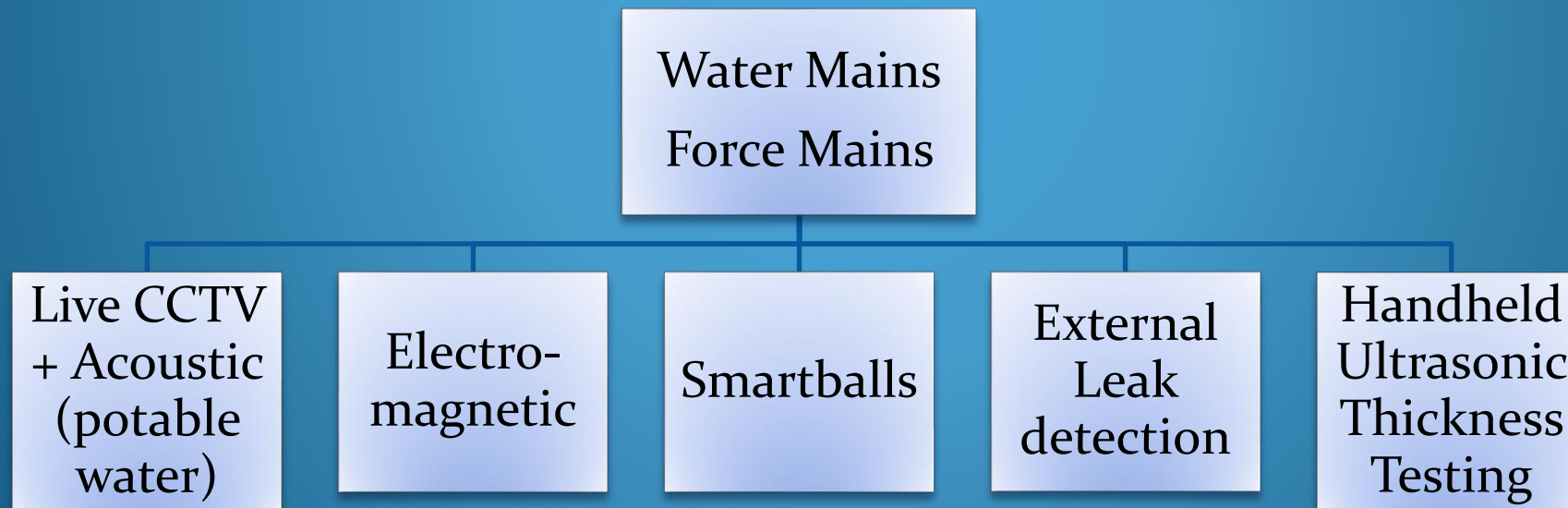
PRESENTATION TOPICS

- WATER MAIN/FORCE MAIN TECHNOLOGIES
 - Live CCTV and Acoustic
 - Electromagnetic
- SEWER/STORM MULTI-SENSOR INSPECTIONS
 - HDCCTV
 - Laser
 - Lidar
 - Ring Lasers
 - Sonar

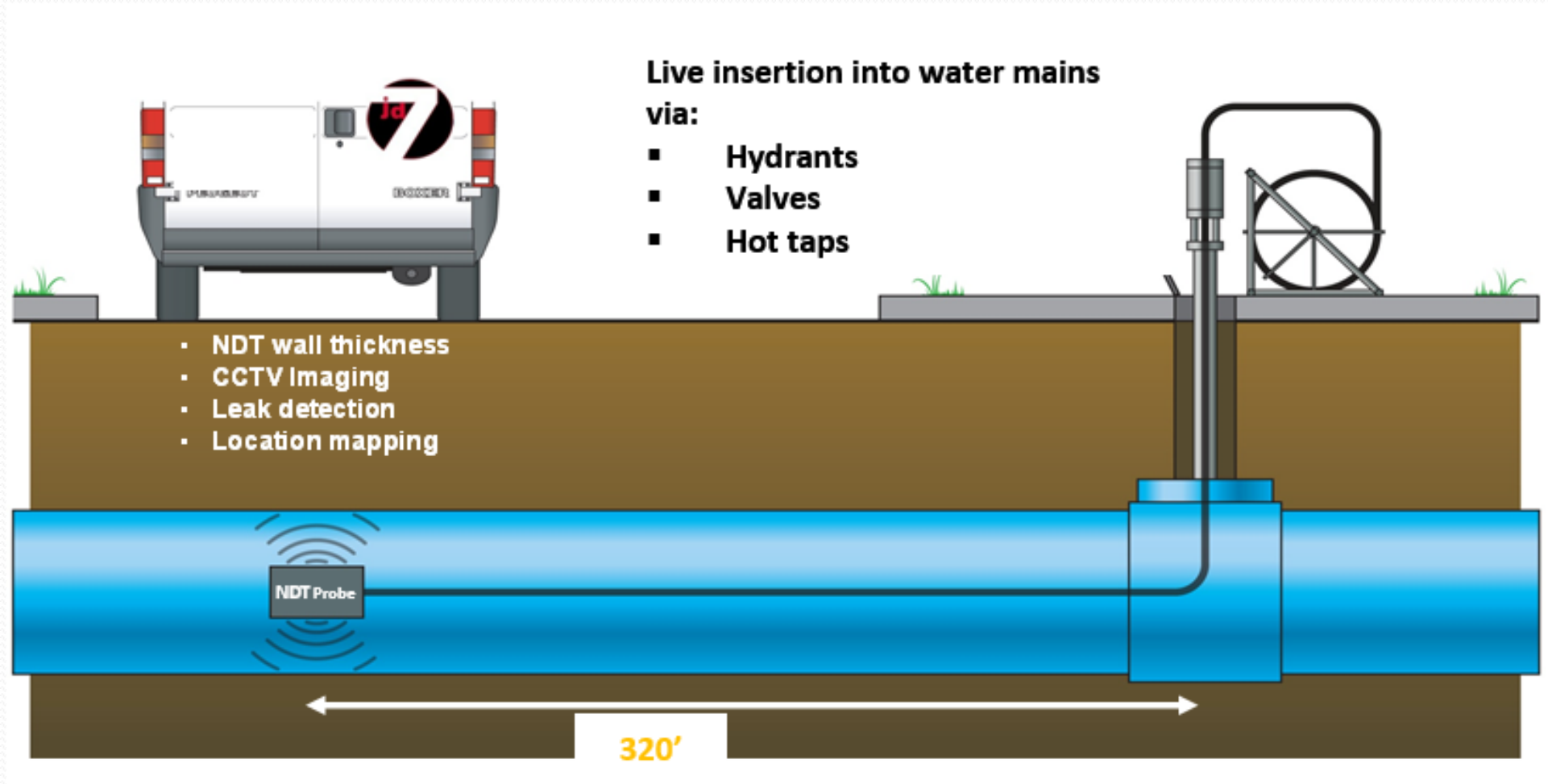


***GOOD OLD FASHIONED PIPE
WALKS WORK AS WELL! MICHELLE
WALKING A 84" COMBINED SEWER***

FORCE MAIN/WATER MAIN INVESTIGATIONS



LIVE CCTV AND ACOUSTIC LEAK DETECTION



NASSCO PACP Standardized Code List

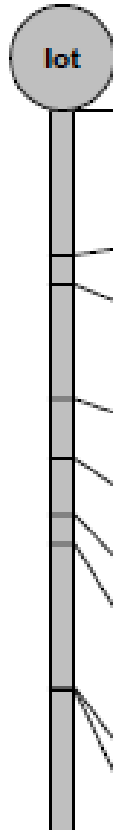
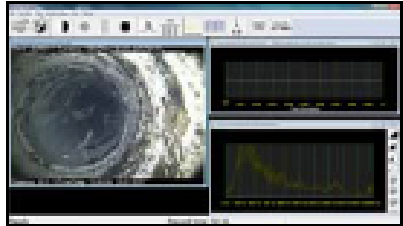
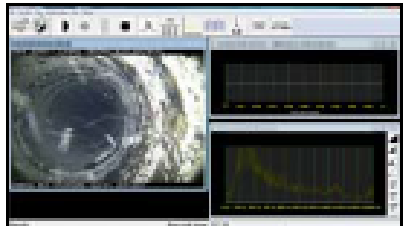
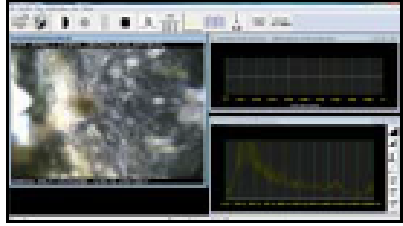
NASSCO'S PIPELINE ASSESSMENT CERTIFICATION PROGRAM® (PACP®)

Section 4 — Structural Defect Coding

C CRACK 4-3 CL Longitudinal CC Circumferential CM Multiple CS Spiral CH Hinge (2, 3, 4)	F FRACTURE 4-9 FL Longitudinal FC Circumferential FM Multiple FS Spiral FH Hinge (2, 3, 4)	B BROKEN 4-17 BSV Soil Visible BVV Void Visible	H HOLE 4-21 HSV Soil Visible HVV Void Visible	D DEFORMED 4-25 (Rigid) DR Deformed Rigid No modifiers used.	D DEFORMED 4-25 (Flexible) DFBR Bulging Round DFBI Bulging Inv.Curv. DFC Creasing DFE Elliptical	D DEFORMED 4-25 (Brick) DTBR Bulging Round DTBI Bulging Inv.Curv.
X COLLAPSE 4-37 X Collapse No descriptors and no modifiers used.	J JOINT 4-43 JOS Offset Small JOM Offset Medium JOL Offset Large	J JOINT 4-43 JOSD Offset Small Defect JOMD Offset Medium Defect JOLD Offset Large Defect	J JOINT 4-43 JSS Separation Small JSM Separation Med. JSL Separation Large	J JOINT 4-43 JAS Angular Small JAM Angular Medium JAL Angular Large	S SURFACE DAMAGE 4-51 SRI Roughness Increased SAV Aggregate Visible SAP Aggregate Projecting SAM Aggregate Missing	S SURFACE DAMAGE 4-51 SRV Reinforcement Visible SRP Reinforcement Projecting SRC Reinforcement Corroded SMW Missing Wall
S SURFACE DAMAGE 4-51 SSS Surface Spalling SSC Surface Spalling Coating SCP Chemical Attack SZ Other	LF LINING FEATURES 4-67 LFAC Abdr'd Connection LFAS Annular Space LFB Blistered Lining LFCS Service Cut Shifted	LF LINING FEATURES 4-67 LFD Detached LFDC Discoloration LFDE Defective End LFDL Delamination	LF LINING FEATURES 4-67 LFOC Overcut Service LFRS Resin Slug LFUC Undercut Service LFW Wrinkled LFZ Other	WF WELD FAILURE 4-85 WFC Circumferential WFL Longitudinal WFM Multiple WFS Spiral WFZ Other	RP POINT REPAIR 4-89 RPL Liner RPLD Liner Defective RPP Patch RPPD Patch Defective	RP POINT REPAIR 4-89 RPR Replacement RPRD Replmt. Defective RPZ Other RPZD Other Defective
BRICKWORK 4-97 DB Displaced MB Missing DI Dropped Invert	BRICKWORK 4-97 MMS Mortar Missing Small MMM Mortar Missing Med. MML Mortar Missing Large					

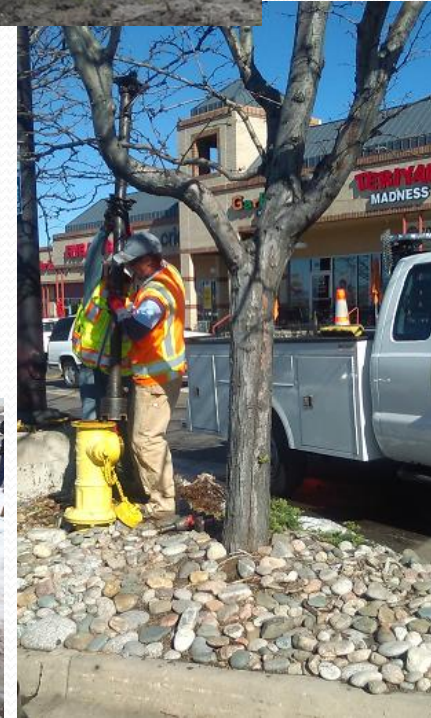
**NASSCO HAS
DEVELOPED NEW
PRESSURE PIPE
CODES FOR
PRESSURIZED
SEWERS, AND
POTABLE WATER
INSPECTIONS.**

**AVAILABLE IN
PACP VERSION 8!**

Inspection Report					
Date 2/13/2017	Job No. JUP001-1	Weather Dry	Operator EDGAR BORGES	Purpose of Survey Maintenance Related	Section No. 1
Certificate No. U-0908-7492	Length 2,566.00 ft	System Owner JUPITER	Date Cleaned	Pre-Cleaning No Pre-Cleaning	Tape/Media No.
Purpose of Survey Shape	Maintenance Related Circular	Joint Length Dia./Height 12 inch			
1:1100	Position	Code	Observation	Grade	
	0.00	AMH	Downstream Manhole, Survey End / WATERMAIN	 60.3 FT	
	50.00	DAZ	Deposits Attached Other, 5 %of cross sectional area, from 12 to 12 o'clock, within 8 inches of joint: NO / MINERAL DEPOSITS	M 2	
	60.30	MGO	General Observation / Joint, possible large amount of buildup at joint or misalignment	 60.3 FT	
	100.00	DAZ	Deposits Attached Other, 5 %of cross sectional area, from 12 to 12 o'clock, within 8 inches of joint: NO / MINERAL DEPOSITS	M 2	
	120.00	DSZ	Deposits Settled Other, 5 %of cross sectional area, from 12 to 12 o'clock, within 8 inches of joint: NO / Example of accumulation of organic m	M 2	
	140.20	DSZ	Deposits Settled Other, 5 %of cross sectional area, from 12 to 12 o'clock, within 8 inches of joint: NO / Example of accumulation of organic m	M 2	
	150.00	DAZ	Deposits Attached Other, 5 %of cross sectional area, from 12 to 12 o'clock, within 8 inches of joint: NO / MINERAL DEPOSITS	 639.9 FT	

JD7 Investigator®

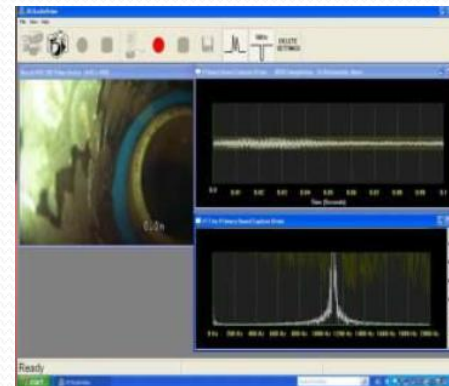
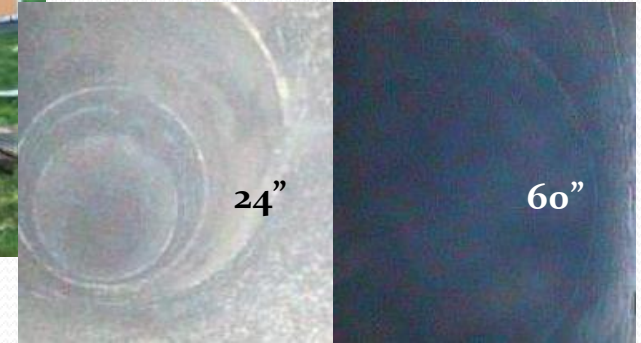
- 2" to 12" pipe diameter (all pipe materials)
- Access: dry- and wet-barrel hydrants, valves, hot taps
- **HD quality CCTV and footage**
- **Acoustic leak detection**
- **Sonde for locating**
- **320' in a single deployment (bi-directional)**
- Up to 250 psi. Real-time observations in the field





JD7 LDS 1000[©]

- 12" and greater pipe diameter (all pipe materials)
- Access: ARV, hot tap, gate valve, pigging wye
- **HD quality CCTV and footage**
- **Acoustic leak detection**
- **Sonde for locating**
- **3,300' in a single deployment (neutral buoyant cable)**
- Up to 250 psi
- Real-time observations in the field

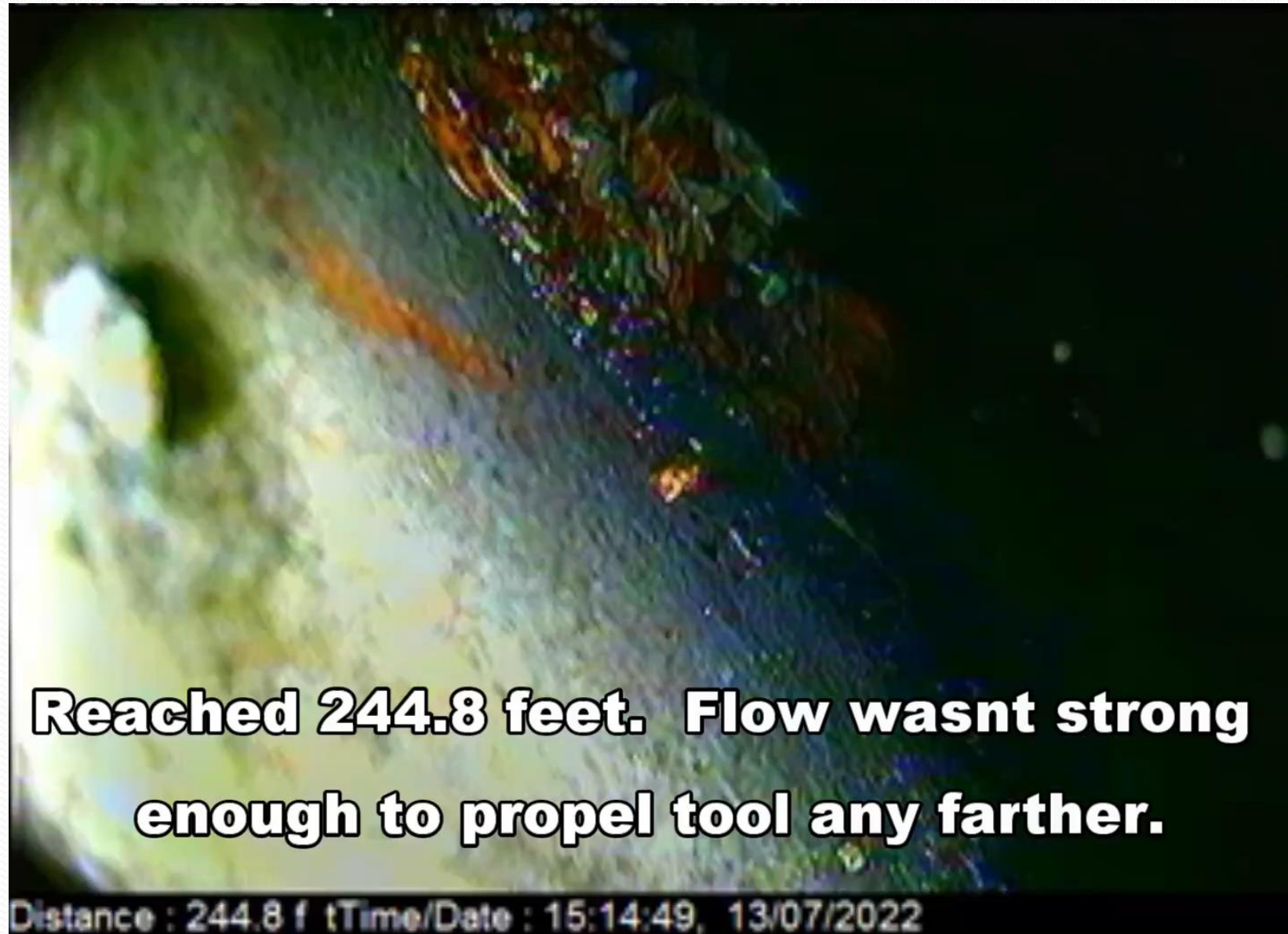




Music: Landras Dream

Musician: music by audionautix.com

License: <https://creativecommons.org/licenses/by/4.0/legalcode>



**Reached 244.8 feet. Flow wasn't strong
enough to propel tool any farther.**

Distance : 244.8 f tTime/Date : 15:14:49, 13/07/2022

**ELECTROMAGNETIC
PRESSURE PIPE TOOLS
FOR METALLIC PIPE INSPECTION**

SUPPLIERS: PICA AND PURE

ELECTROMAGNETIC TOOLS TO MEASURE METAL LOSS

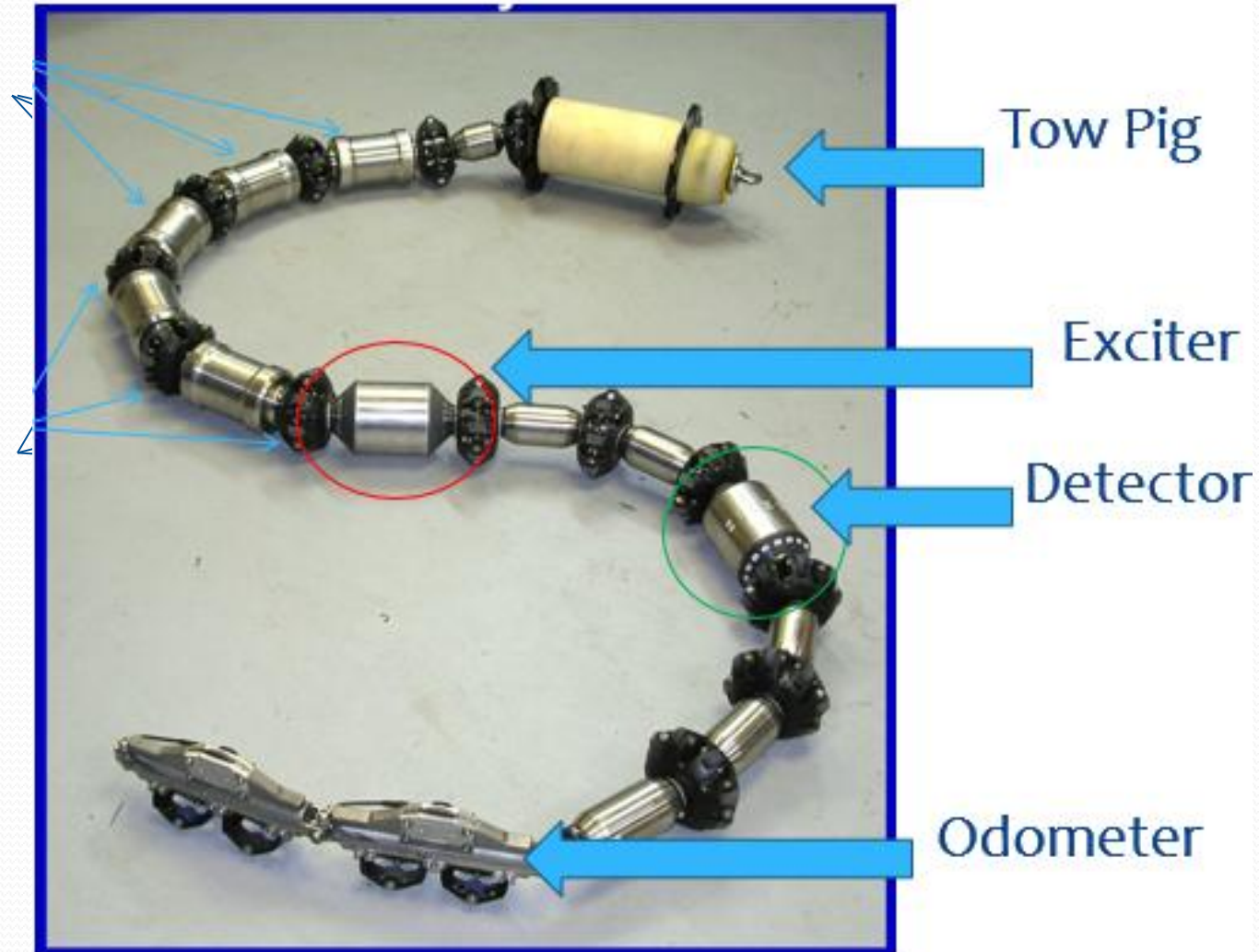
- 💧 Relies on time varying Electromagnetic (EM) fields.
- 💧 Suitable for metallic cylinder pipe and bar wrapped pipe.
- 💧 Will quantify amount (depth) of missing metal.
- 💧 Can see through internal liners & deposits.
- 💧 Equally sensitive to external or internal corrosion.
- 💧 Inspections per ASTM Standard Practice E-2096-00

PICA's RFT In-Line Inspection Tool

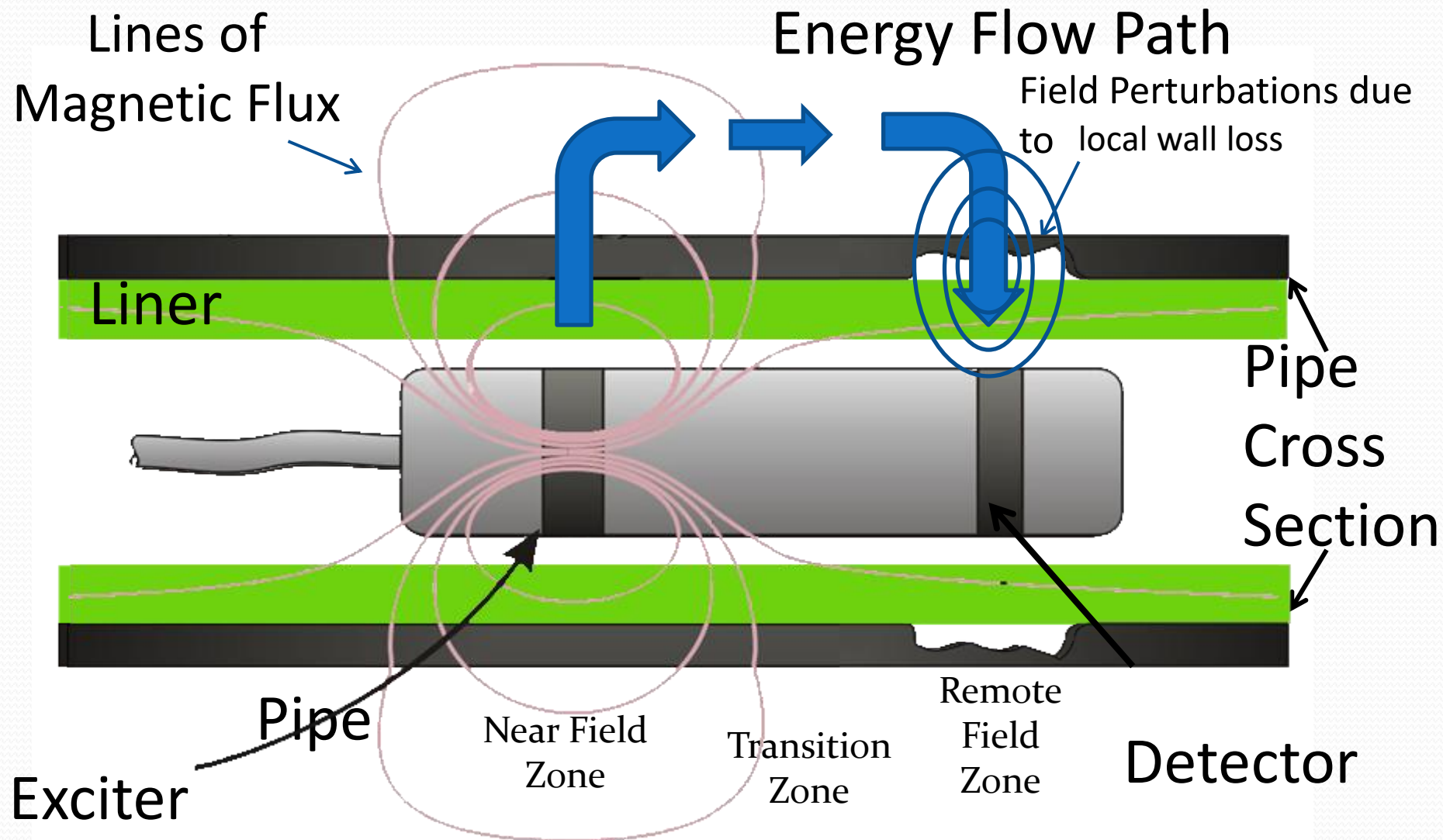
**REQUIRES FULL
BORE ACCESS TO
THE PIPE**

**CAN PASS
THROUGH BENDS**

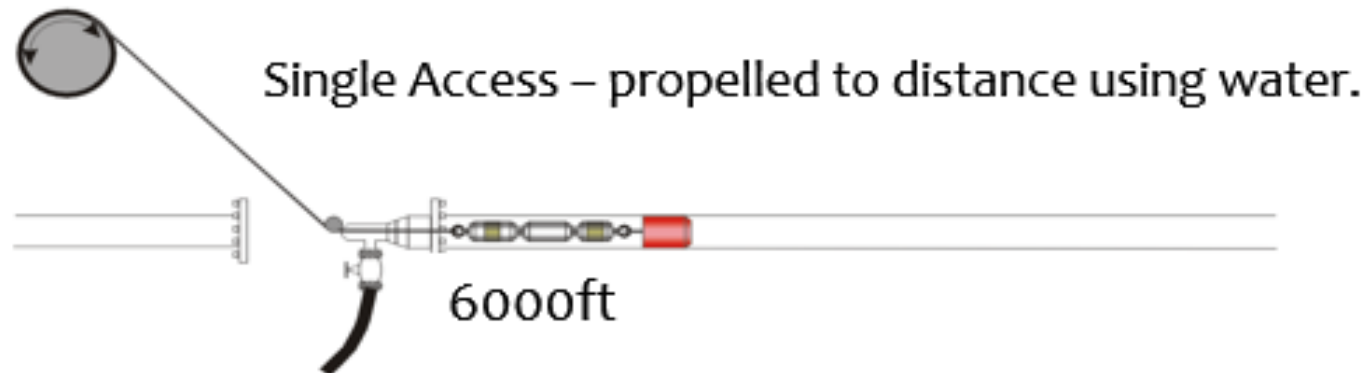
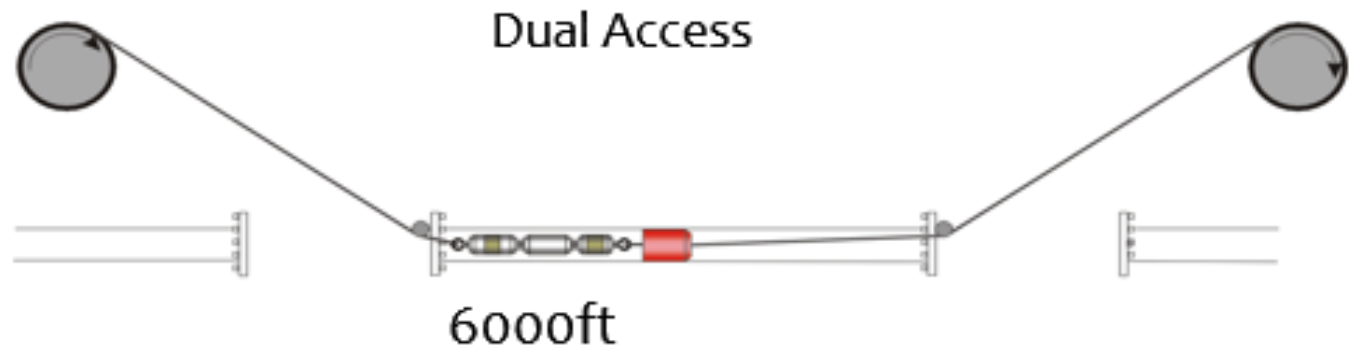
**CANNOT PASS
THROUGH
BUTTERFLY
VALVES**



RFT Graphically:

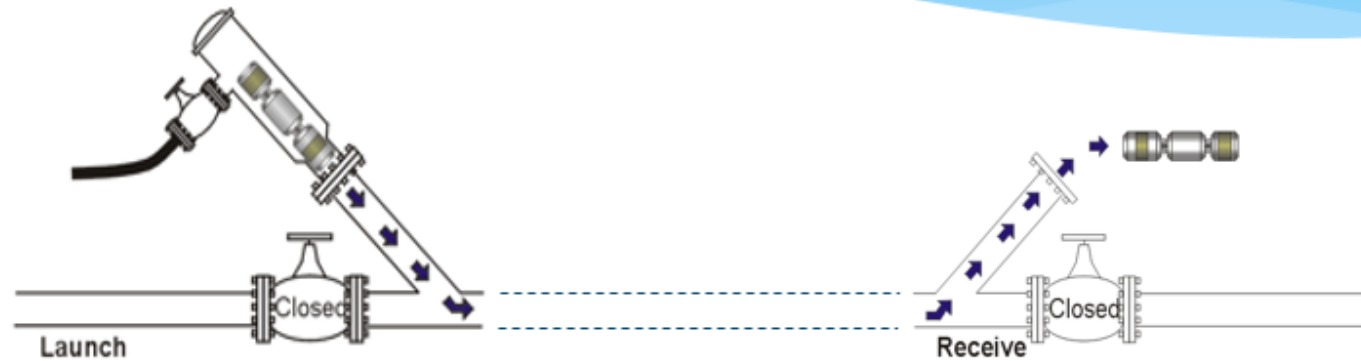


Tethered Tool Deployment

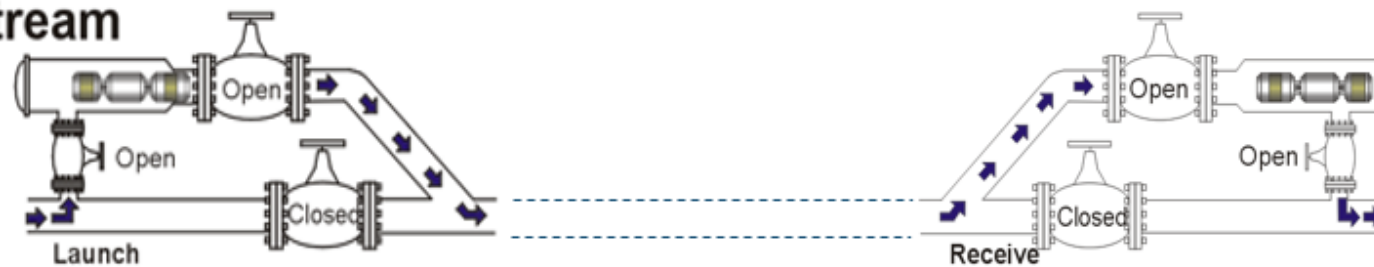


Untethered or Free Swim Options

WYE



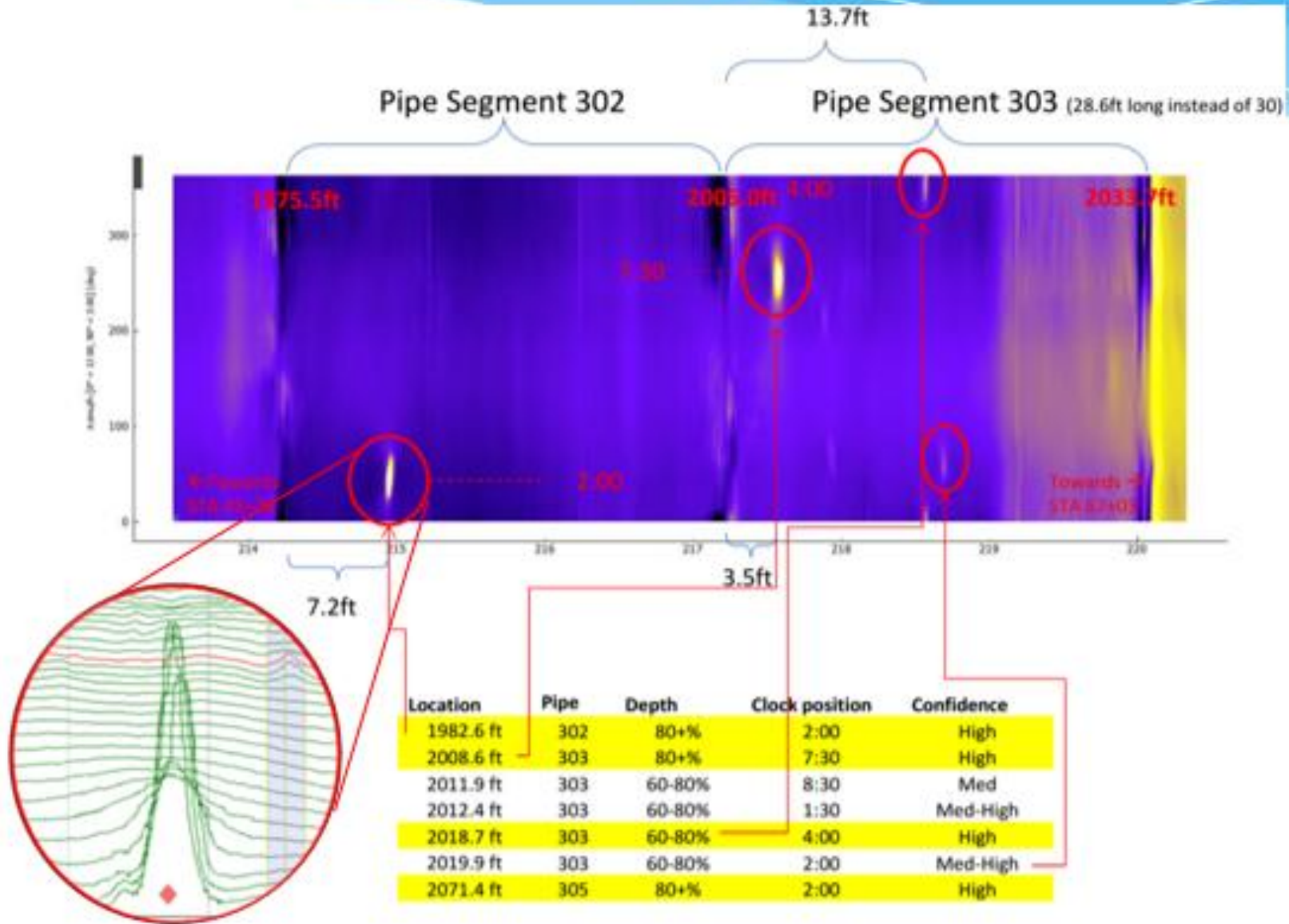
On Stream

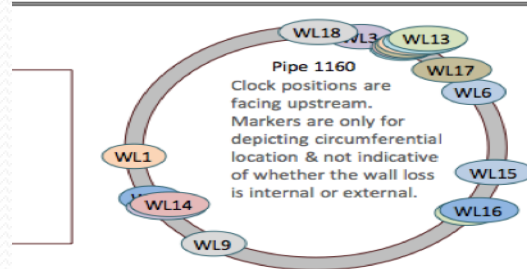
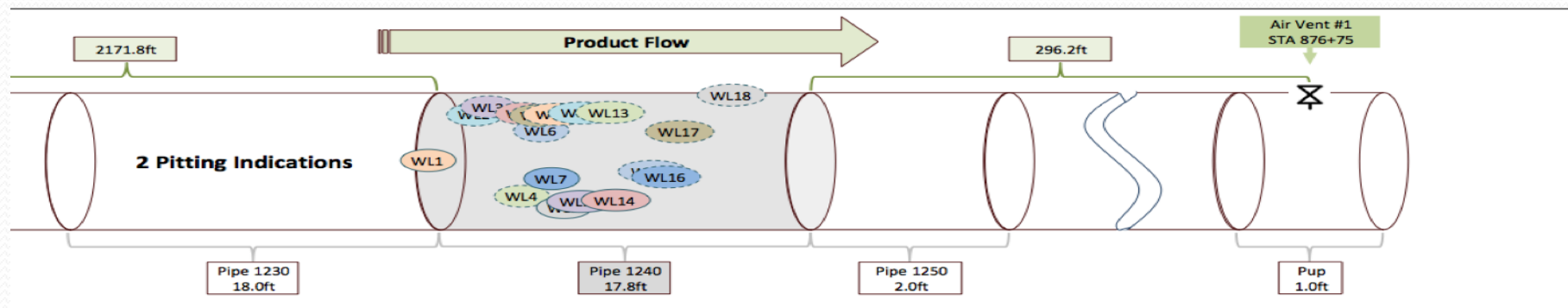


Spool piece



Raw Data for Segments 302 & 303 in Section 3.





Area of Interest	Wall Loss (Remaining Wall)	Circumferential Position	US B&S distance (ft)	DS B&S distance (ft)	US Marker distance (ft)	DS Marker distance (ft)
WL1	72%	9:00	0.6	17.2	2172.4	313.4
WL2	0%	1:00	1.5	16.3	2173.3	312.5
WL3	30%	12:30	3.3	14.5	2175.1	310.7
WL4	3%	4:00	4.2	13.6	2176.0	309.8
WL5	52%	1:00	4.7	13.1	2176.5	309.3
WL6	9%	2:30	5.2	12.6	2177.0	308.8
WL7	61%	8:30	6.1	11.7	2177.9	307.9
WL8	42%	1:00	6.2	11.6	2178.0	307.8
WL9	62%	7:00	6.4	11.4	2178.2	307.6
WL10	0%	1:00	6.8	11.0	2178.6	307.2
WL11	33%	1:00	7.2	10.6	2179.0	306.8
WL12	24%	8:00	8.1	9.7	2179.9	305.9
WL13*	0%	1:00	8.9	8.9	2180.7	305.1
WL14	15%	8:00	9.0	8.8	2180.8	305.0
WL15	10%	3:30	10.5	7.3	2182.3	303.5
WL16*	0%	4:00	11.6	6.2	2183.4	302.4
WL17*	0%	2:00	13.0	4.8	2184.8	301.0
WL18	65%	12:00	15.0	2.8	2186.8	299.0



Reported: 3% Remaining
Actual: 0% Remaining

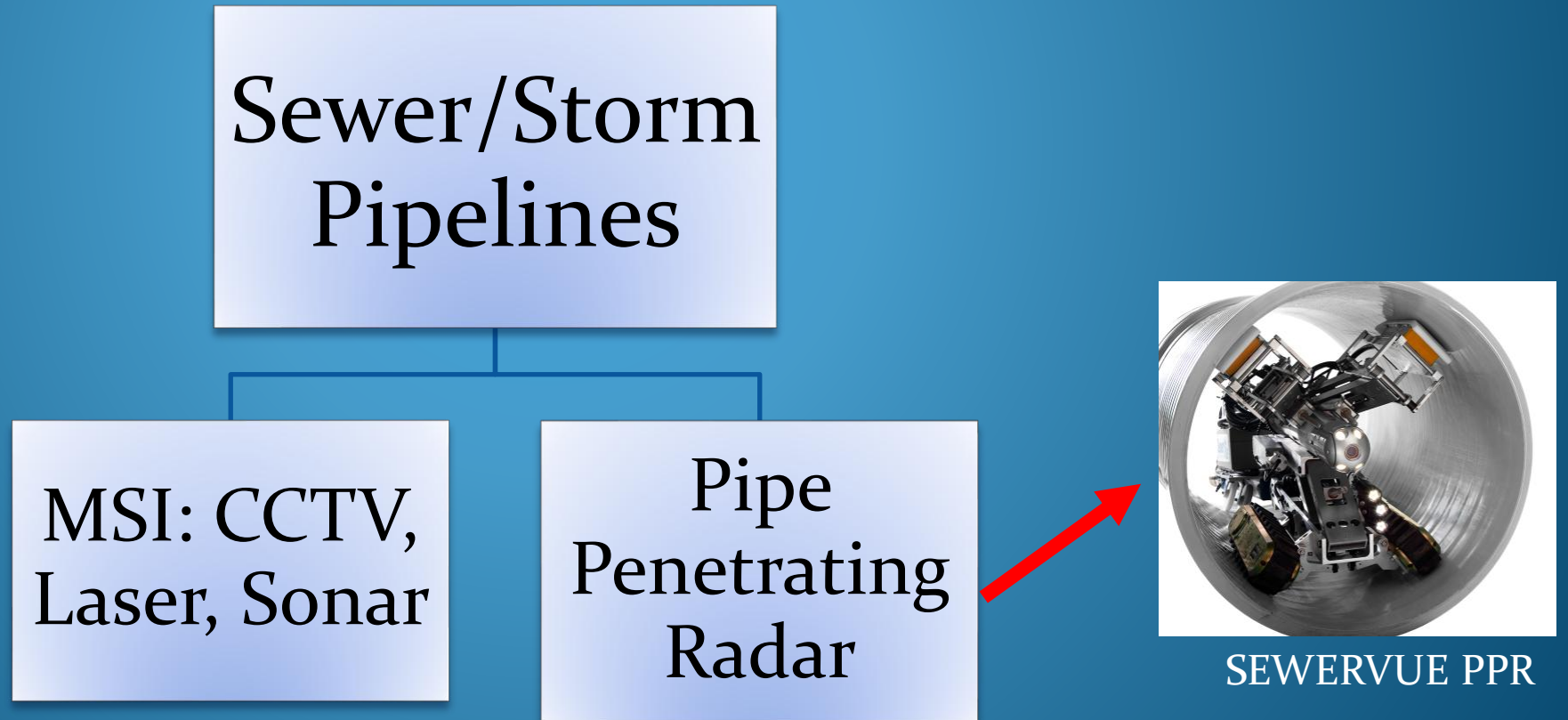


Reported: 0% Remaining
Actual: 0% Remaining



Reported: 0% and 10% Remaining
Actual: 0% and ~10% Remaining

Sewer/Stormwater Multi-Sensor Inspections (MSI)



MULTI-SENSOR INSPECTIONS

ALL RIDING ON ONE PLATFORM AND DURING ONE
INSPECTION PASS

1. CCTV, HD VIDEO, AND LASER ABOVE THE
WATER LINE
2. SONAR BELOW THE WATER LINE
3. OPTIONAL GAS LOGGER

Why Laser and Sonar

- LASER

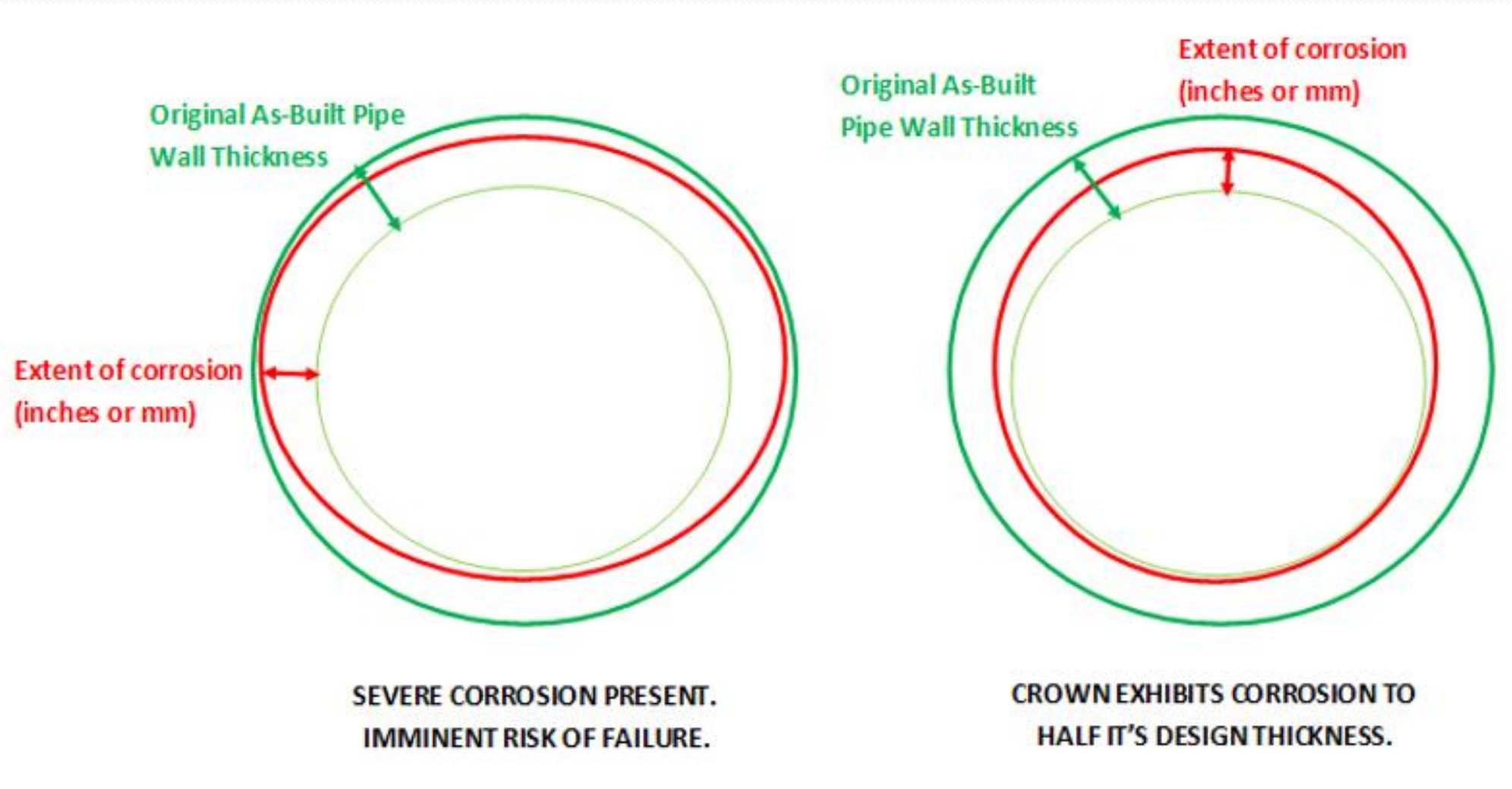
- Measure Ovality
- Measure Corrosion
- Measure large defects/cracks
- Determine Remaining Useful Life
- Help design rehab projects – size of lining needed, etc

- SONAR

- Determine large defects in the pipe under water
- Determine if Pipe Cleaning is necessary/methodology
- Define exact debris quantities/disposal costs



CCTV vs. Laser Profiling – Measuring Corrosion and Ovality



TYPES OF LASER INSPECTIONS

- LIDAR/3D LASER – XYZ POINT CLOUD OF MEASUREMENTS
- DIODE LASERS – 2 PRECISE LASERS THAT SPIN TO CREATE A SPIRAL SCAN.
- RING LASER – RING OF LIGHT PROJECTED ON THE PIPE WALL, CAMERA RECORDS LIGHT RING, THEN A MEASUREMENT GRID IS USED TO COMPUTE PIPE DIMENSIONS.

NATIONAL PLANT SERVICES, INC.

MSI SERVICE OPTIONS: LIDAR AND RING LASER

CARYLON 3D: CCTV/LIDAR/SONAR

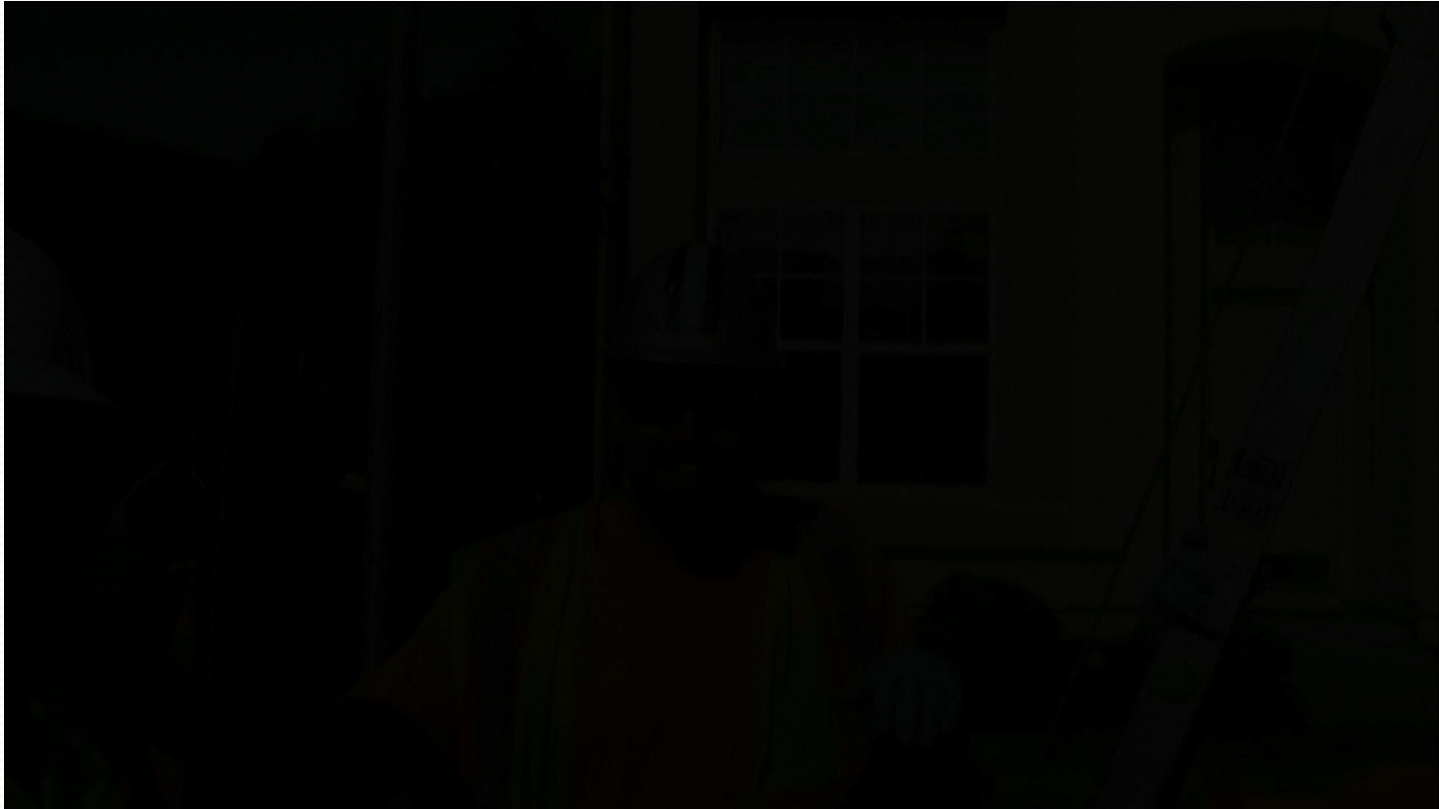
- INSPECTION IS LIMITED TO 2400 LF
- CRAWLER OR FLOAT
- CAN INSPECT + 30 FEET DIAMETER!
- LIVE FEED CCTV + GO PRO
- LIDAR SCANNER MEASURES THE PIPE
- DATA DISRUPTIONS CAN BE CAUSED BY:
 - STEAM
 - WATER OR DEBRIS ON THE LASER GLASS

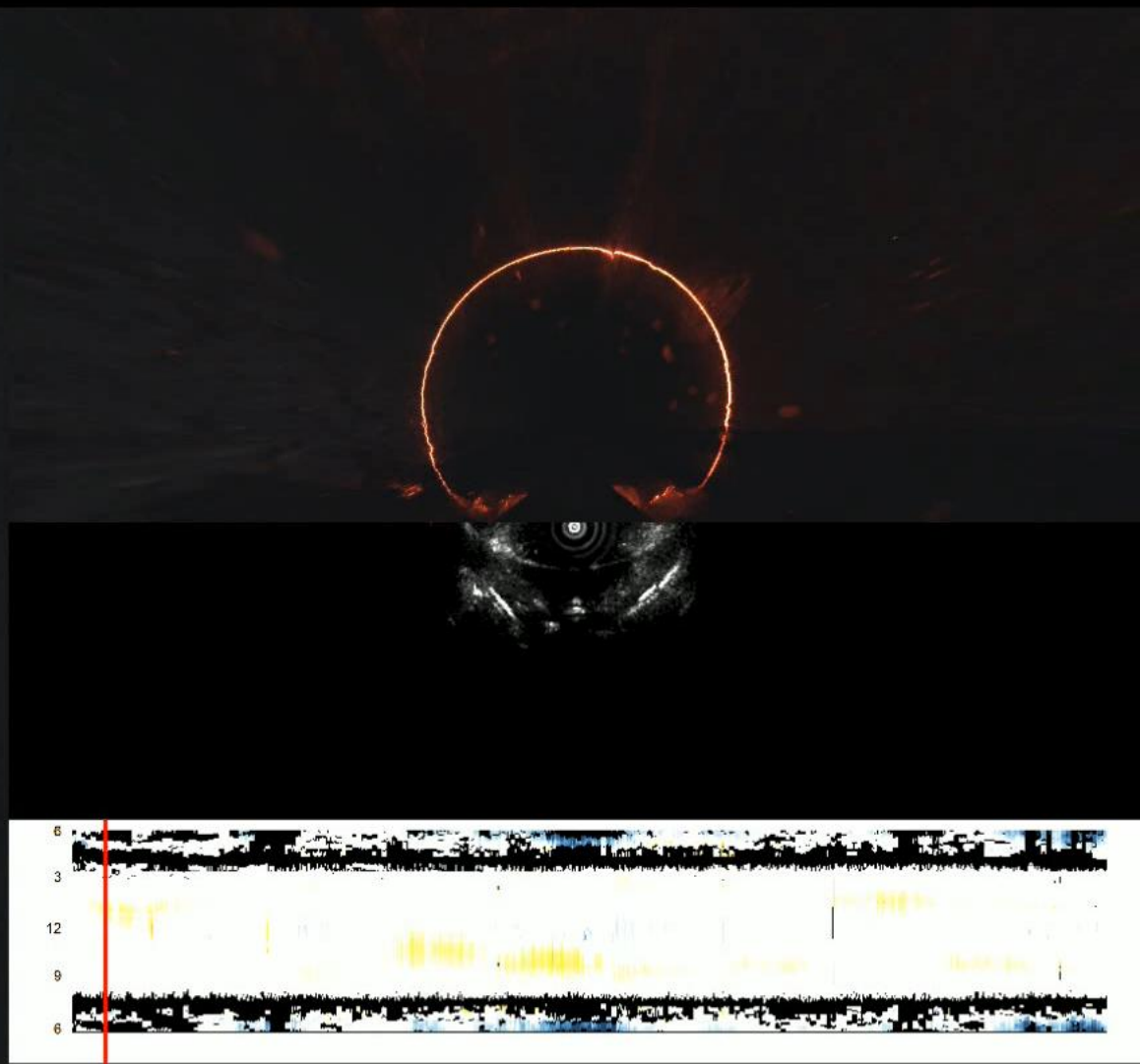
FLY EYE FLOAT: 180 FISH EYE/RING LASER/SONAR

- CAN INSPECT 8,000+ LF IN ONE DEPLOYMENT
- MAXIMUM DIAMETER 108"
- BATTERY OPERATED
- CCTV IS A SERIES OF 180 DEGREE FISH EYE SNAPSHOTS
- A RING OF LIGHT IS PROJECTED ON THE PIPE WALLS, THEN PUT OVER A GRID TO OBTAIN DIMENSIONS
- GOOD FOR LONG INSPECTION LENGTHS, TURBULENT SEWERS, STEAM

RING LASERS

- Ring of light is projected against the inside of the pipe. Camera is used to determine inside dimensions and changes in pipe shape and size.
- Inspects pipelines from 18" to 108" diameter.





WWMH04355
1 July 2024

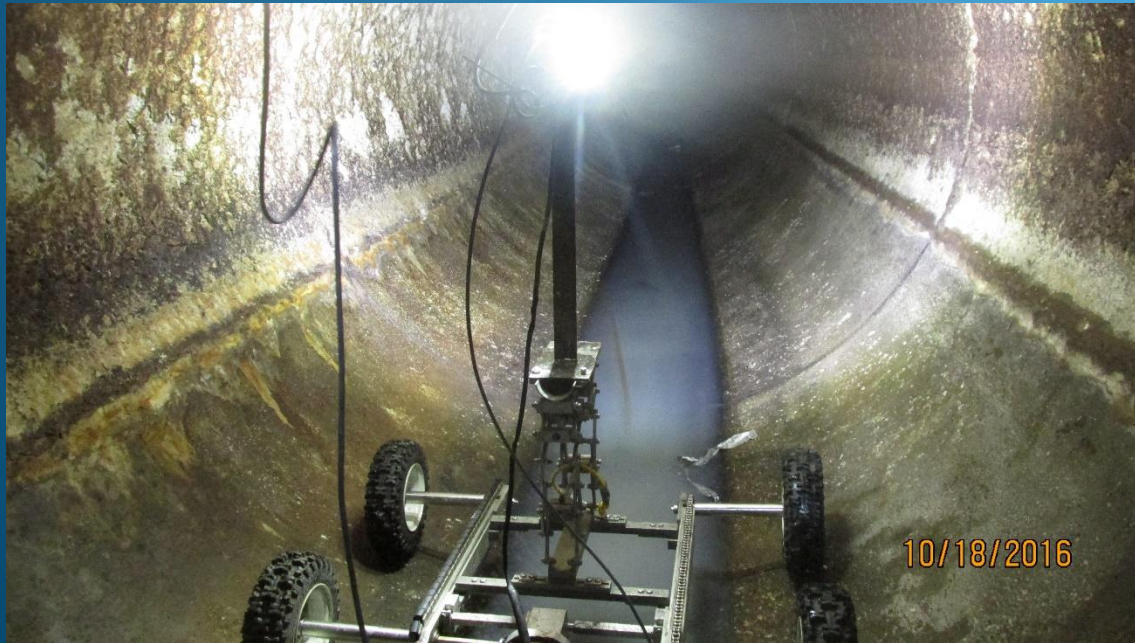
Downstream
12:38:46

WWMH04350
23.5 in

Polyvinyl Chloride
6.2ft

CARYLON 3D MSI SYSTEM

HDCCTV, LIDAR, SONAR IN ONE INSPECTION PASS



CARYLON 3D MSI SYSTEM

HDCCTV/LIDAR/SONAR + GAS LOGGER



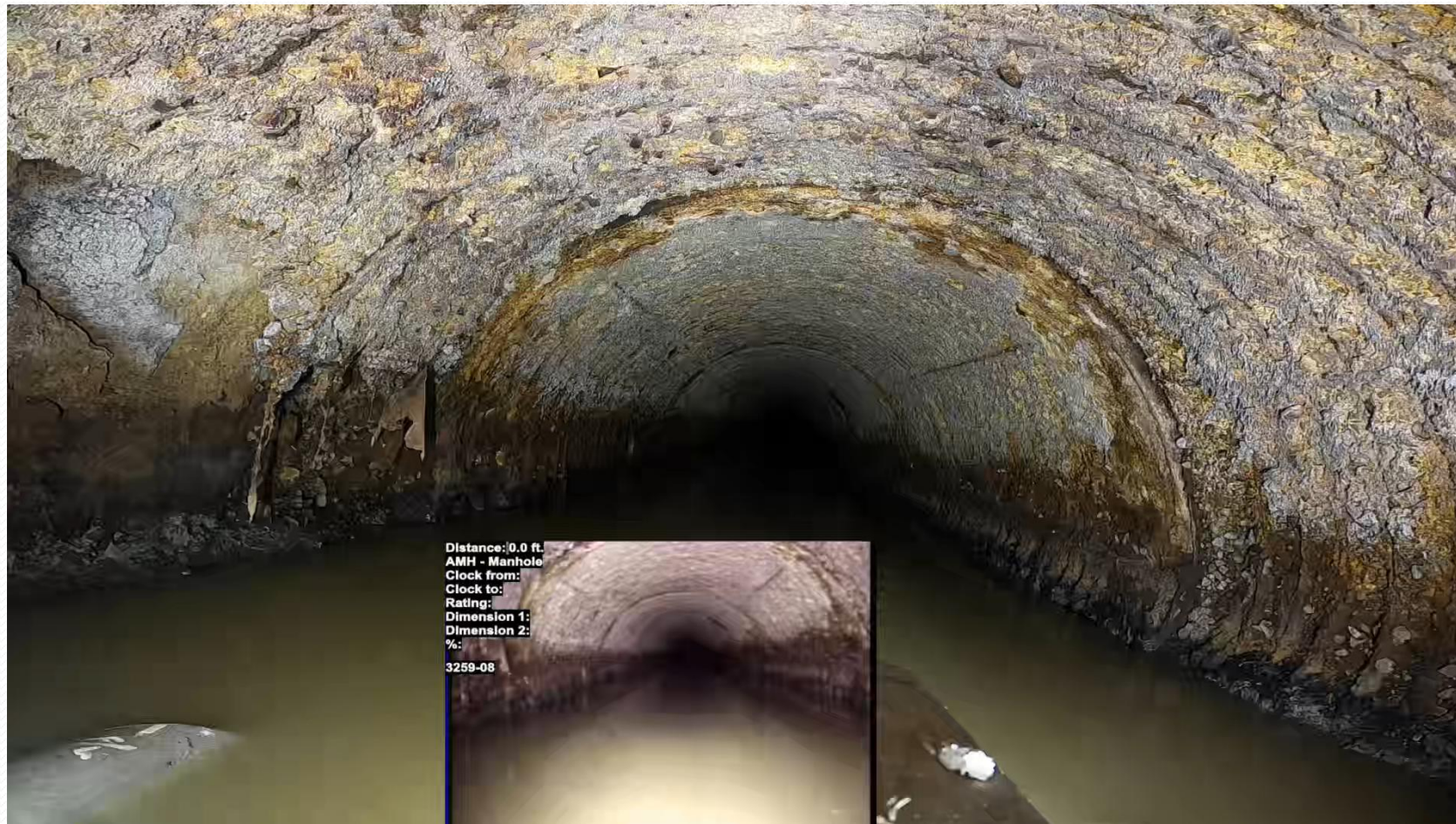
CCTV

INDUSTRY-WIDE HD CAMERA LIMITATIONS

- Cable length limitations
- Diameter limitations
- Have to purchase camera manufacturers truck, use their transports
- Lack of sufficient lighting



DEVELOPED THE USE OF GO PROS ON OUR MSI PLATFORM TO OBTAIN HIGH DEF CCTV



The high-definition video files are LARGE.

Files are over 39 gigs at full resolution, and now 4-7 gigs at the final merged video



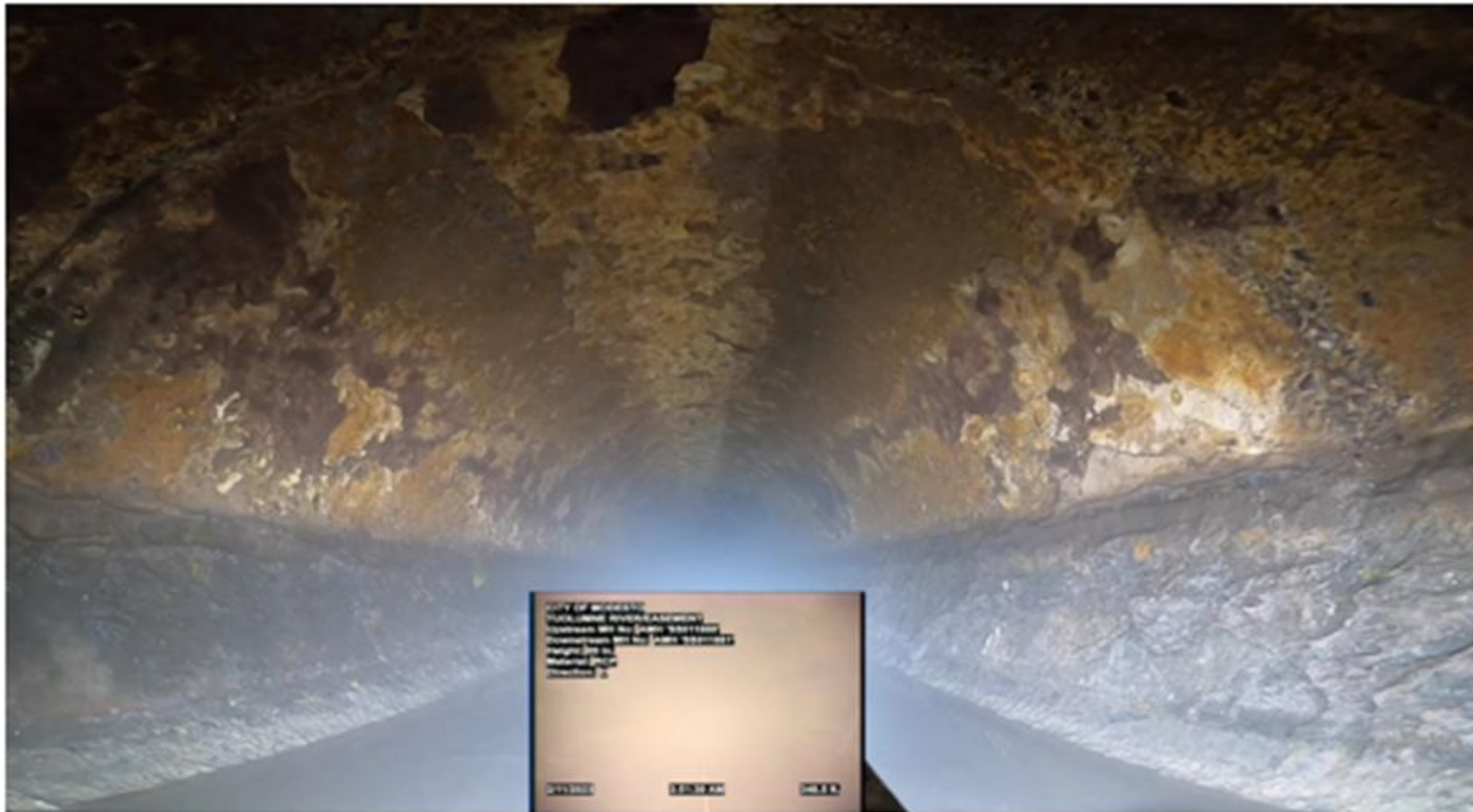
Upstream MH No: [AMH '3263-01']
Downstream MH No: [AMH '3262-02']

6/1/2023

1:46:50 PM

22.2 ft.

GO PROS HAVE LESS IMPACTS FROM STEAM AND SPLASHING



SONAR

ONLY WORKS UNDER WATER!

USED TO INSPECT UNDER THE
WATER LINE IN SIPHONS AND
INTERCEPTORS

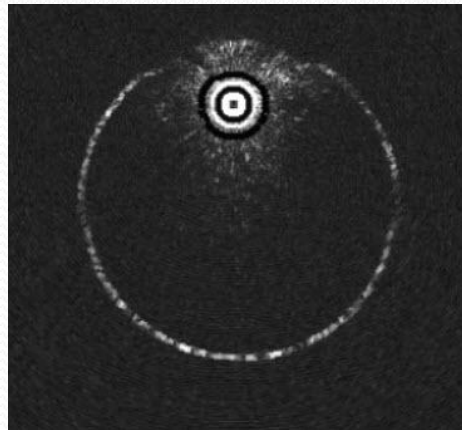
Sonar

- Continuous Acoustic scanning
- 360 degrees per second.
- Used to determine inside dimensions and changes in pipe shape and size, and to quantify the amount of debris in the pipe.
- Accuracy from $\frac{1}{4}$ " to $\frac{1}{2}$ "
- Inspects pipelines from 8" to 108" diameter.

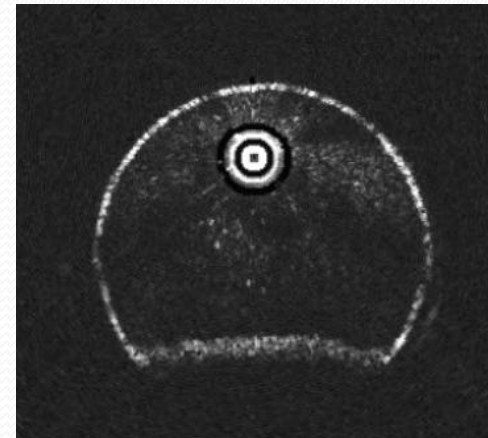


ACTUAL SONAR SCAN MPEG

RELATIVELY CLEAN SIPHON

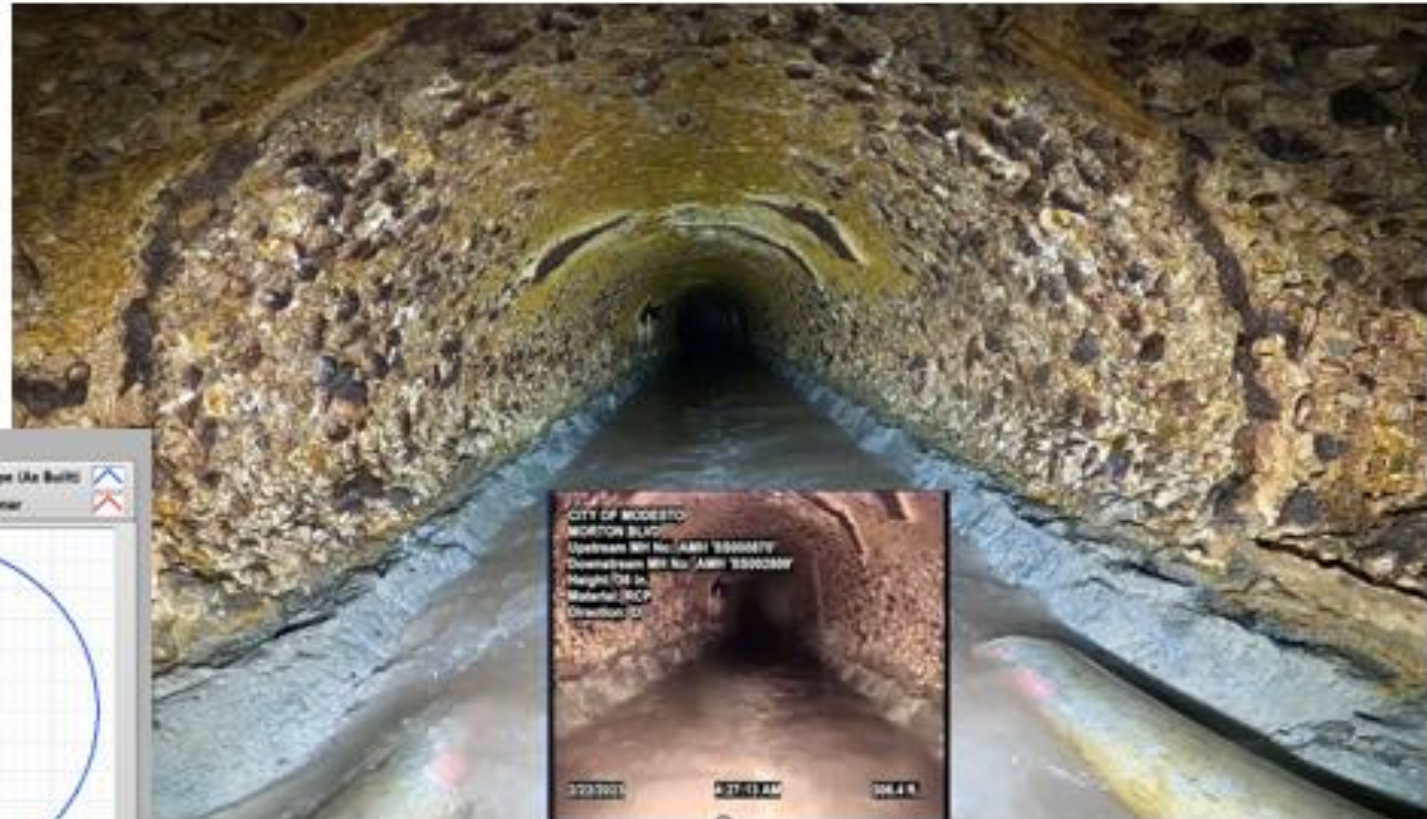
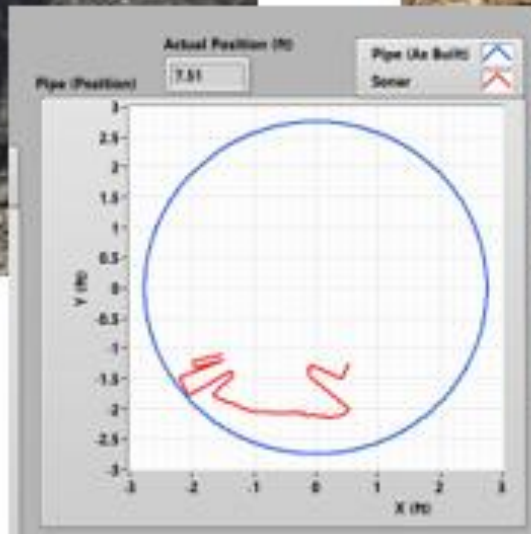


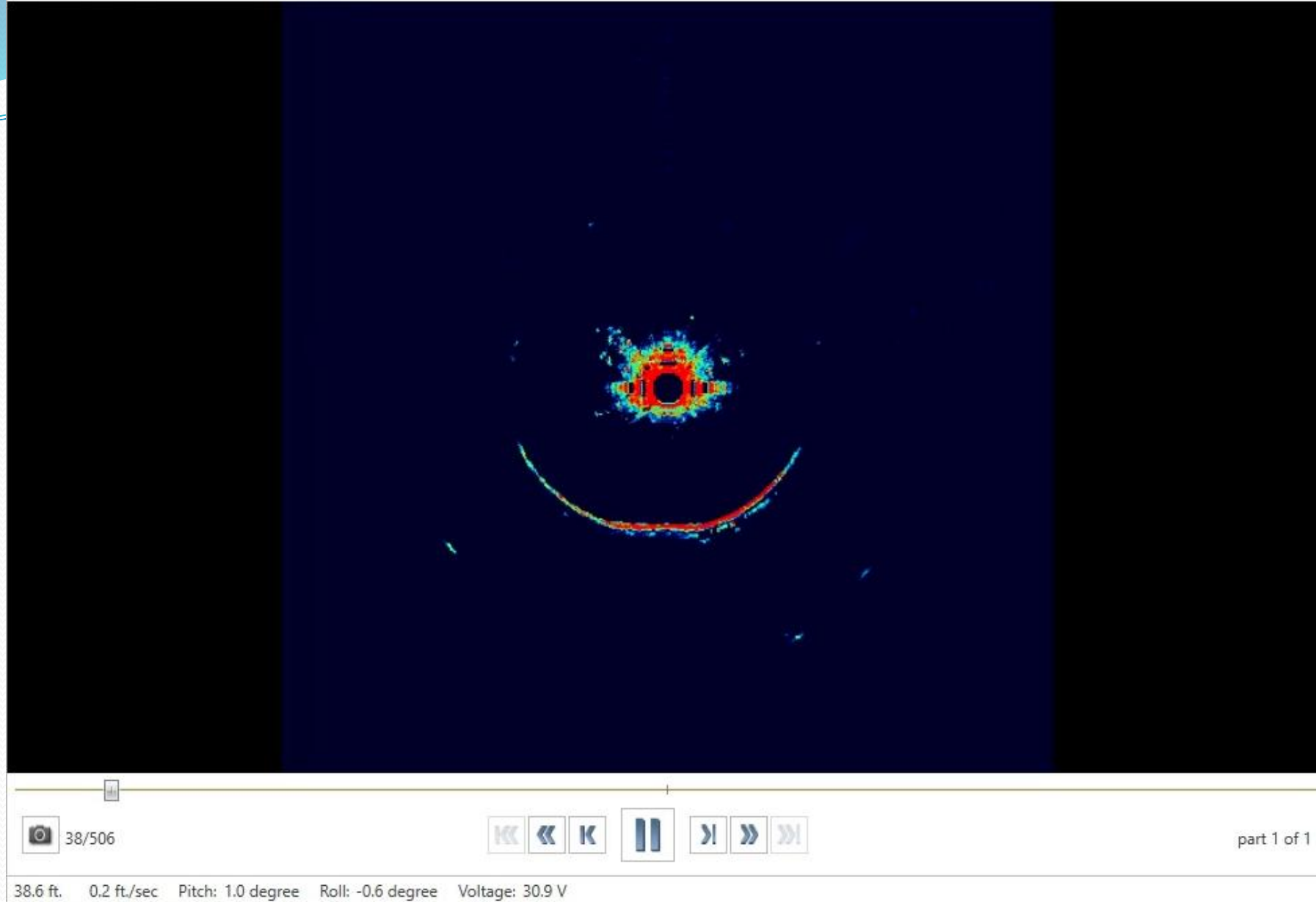
**SIPHON WITH SIGNIFICANT
DEBRIS**



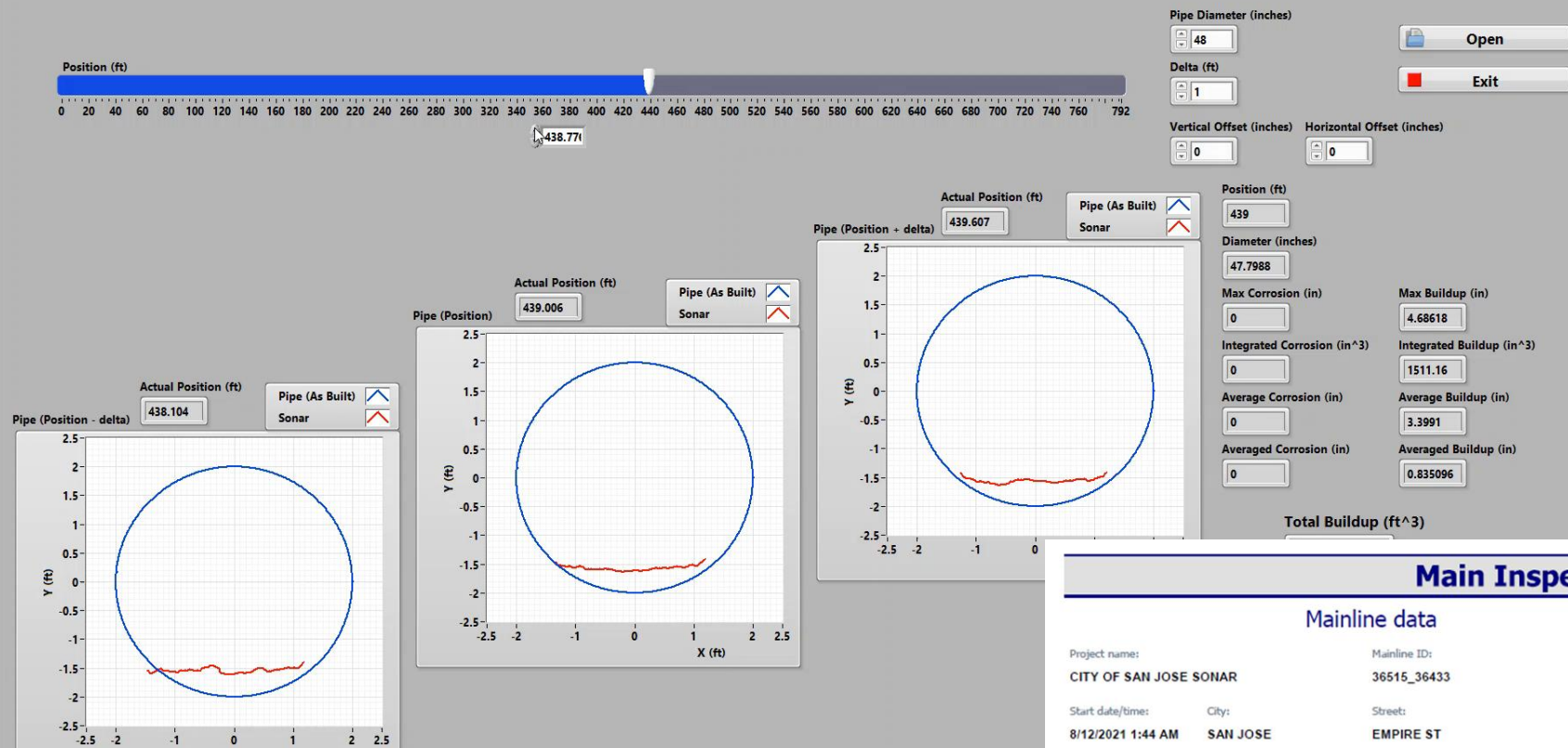
We process this sonar data and provide debris quantities at each location. MPEG sonar movies are also provided for import into your asset management system.

Sonar only works under the water line, and it has to be submerged under water with space between the sonar head and pipe bottom or debris. Turbulent flow, dragging in debris, or ragging will also prevent delivery of sonar scans.





WITH SONAR WE OBTAIN 1-3 PROFILE IMAGES PER FOOT



**THERE MUST BE WATER IN
BETWEEN THE SONAR SENSOR,
AND BOTTOM OF THE
PIPE/DEBRIS**

Main Inspections Sonar Sediment

Mainline data

Project name:		Mainline ID:	
CITY OF SAN JOSE SONAR		36515_36433	
Start date/time:	City:	Street:	
8/12/2021 1:44 AM	SAN JOSE	EMPIRE ST	
Width:	Height:	Shape:	Material:
	48 in.	C	ZZZ
			Location code:
			B

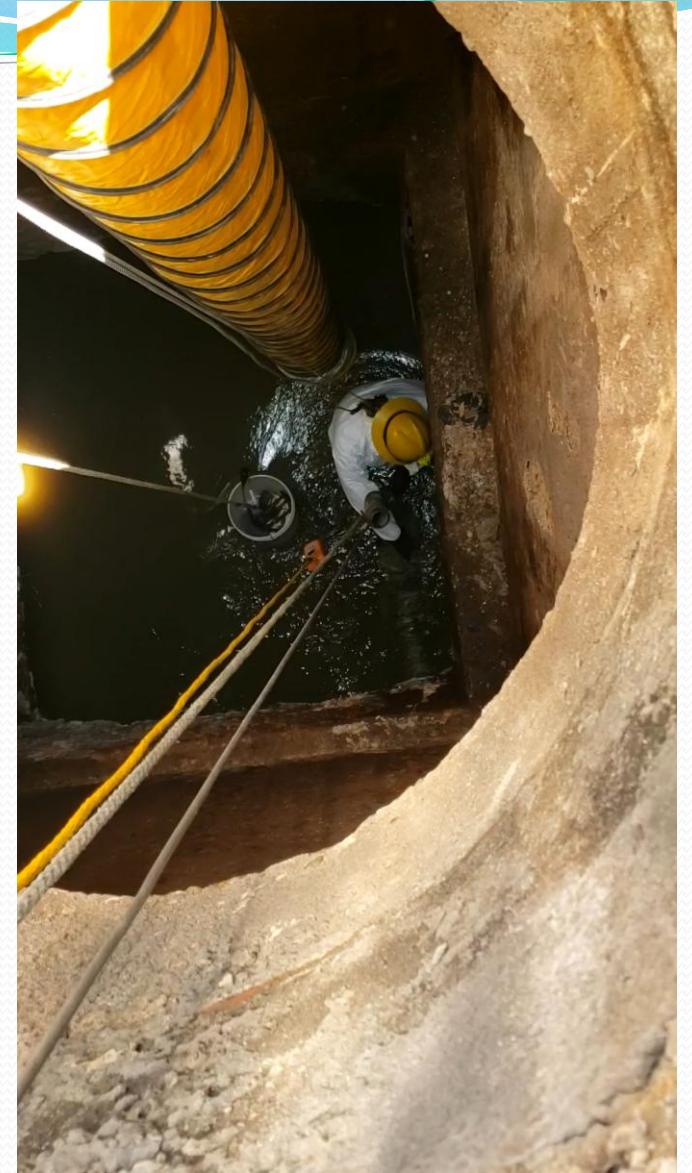
Sediment data

Max grease on top:	Avg. Sediments on top:	Est. Sediments Vol. on top:	Blockage % on top:
0.0 in.	0.0 in.	0.00 cu ft	0.0 %
Max debris on bottom:	Avg. Sediments on bottom:	Est. Sediments Vol. on bottom:	Blockage % on bottom:
9.1 in.	3.7 in.	77.51 cu ft	1.7 %
Max debris sum:	Avg. Sediments sum:	Est. Sediment Vol. sum:	Total blockage %:
9.1 in.	3.7 in.	77.51 cu ft	1.7 %

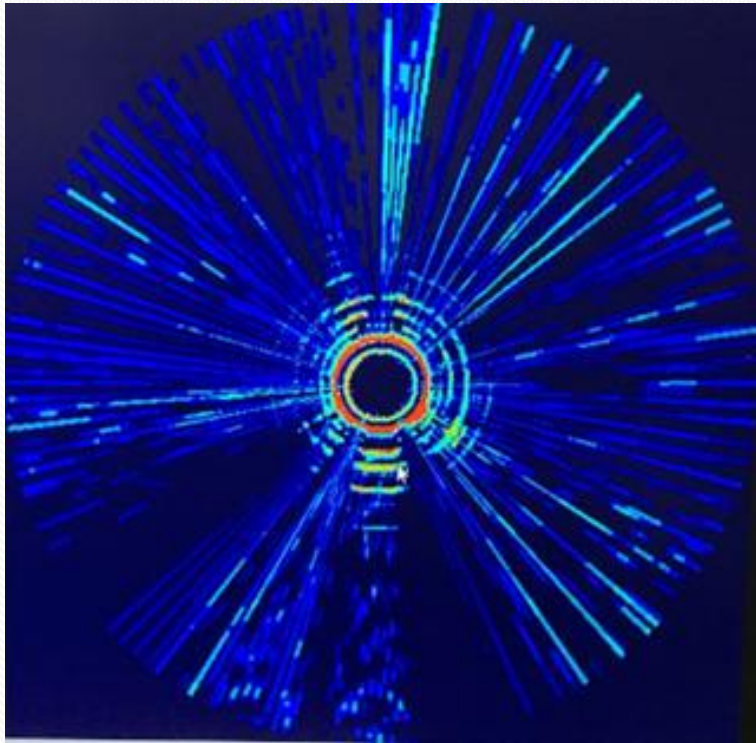
Sediment in pipe

Important Considerations for Sonar of Siphons:

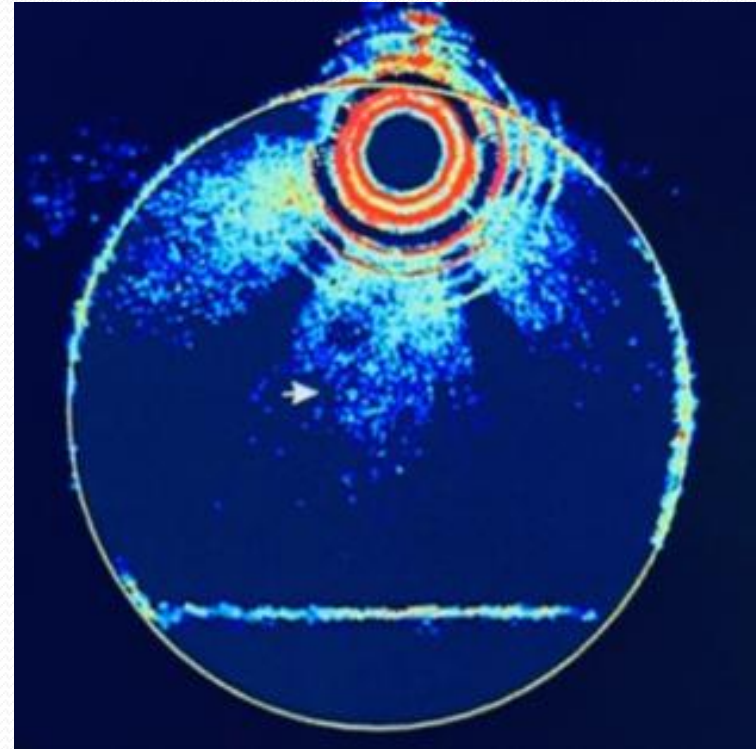
If you are going to sonar inspect a siphon, it is necessary to flush the lines to remove rags that tend to gather in siphons.



Benefits of In-Service Flushing of Siphons Prior to Sonar



Before Flushing



After 2 Days of Flushing

Otherwise, rags will cover the sonar and you will get no data, and it will be a wasted effort!



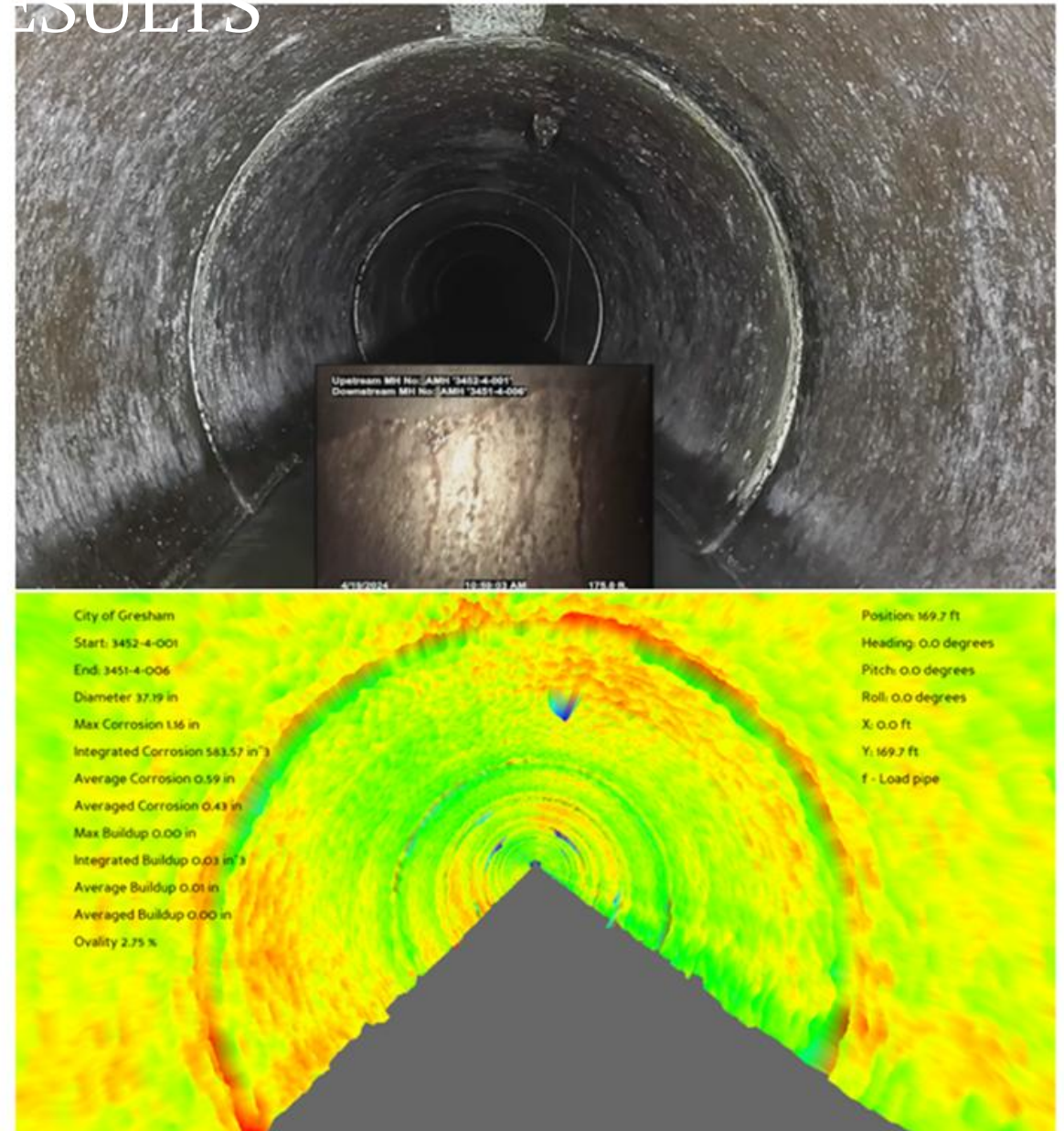
LIDAR

HOW TO READ LIDAR:

The color ramp adjusts automatically based on comparison to the as-built dimension:

- Green indicates as-built pipe size/condition
- Yellow indicates minor corrosion
- Orange indicates more corrosion
- Red indicates the highest corrosion observed
- Blue indicates buildup, or where pipe is inside as-built measurements.

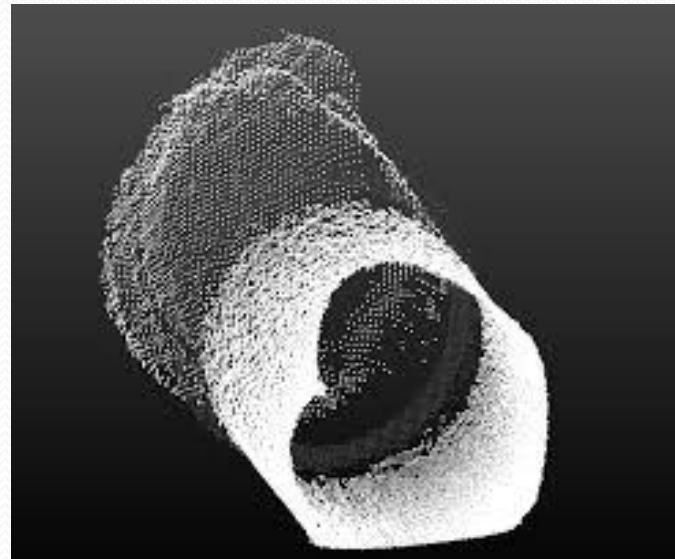
RESULTS



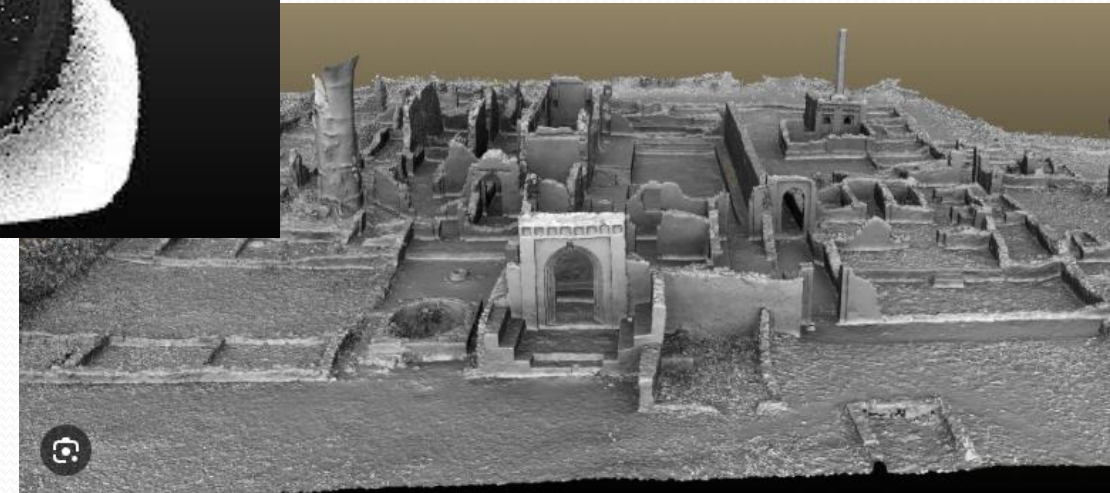
LIDAR (Light Detection and Ranging)

- The lidar sensor emits pulsed light waves.
- These pulses bounce off surrounding objects and return to the sensor.
- The sensor uses the time it takes for each pulse to return to the sensor to calculate the distance it traveled
- A 3D map of the pipe, otherwise known as a “point cloud”, is generated

SOURCE: SEMANTIC SCHOLAR



LASER MAPPING IS USED FOR ABOVE GROUND INFRASTRUCTURE TOO, INCLUDING ANCIENT SITES LIKE THIS!



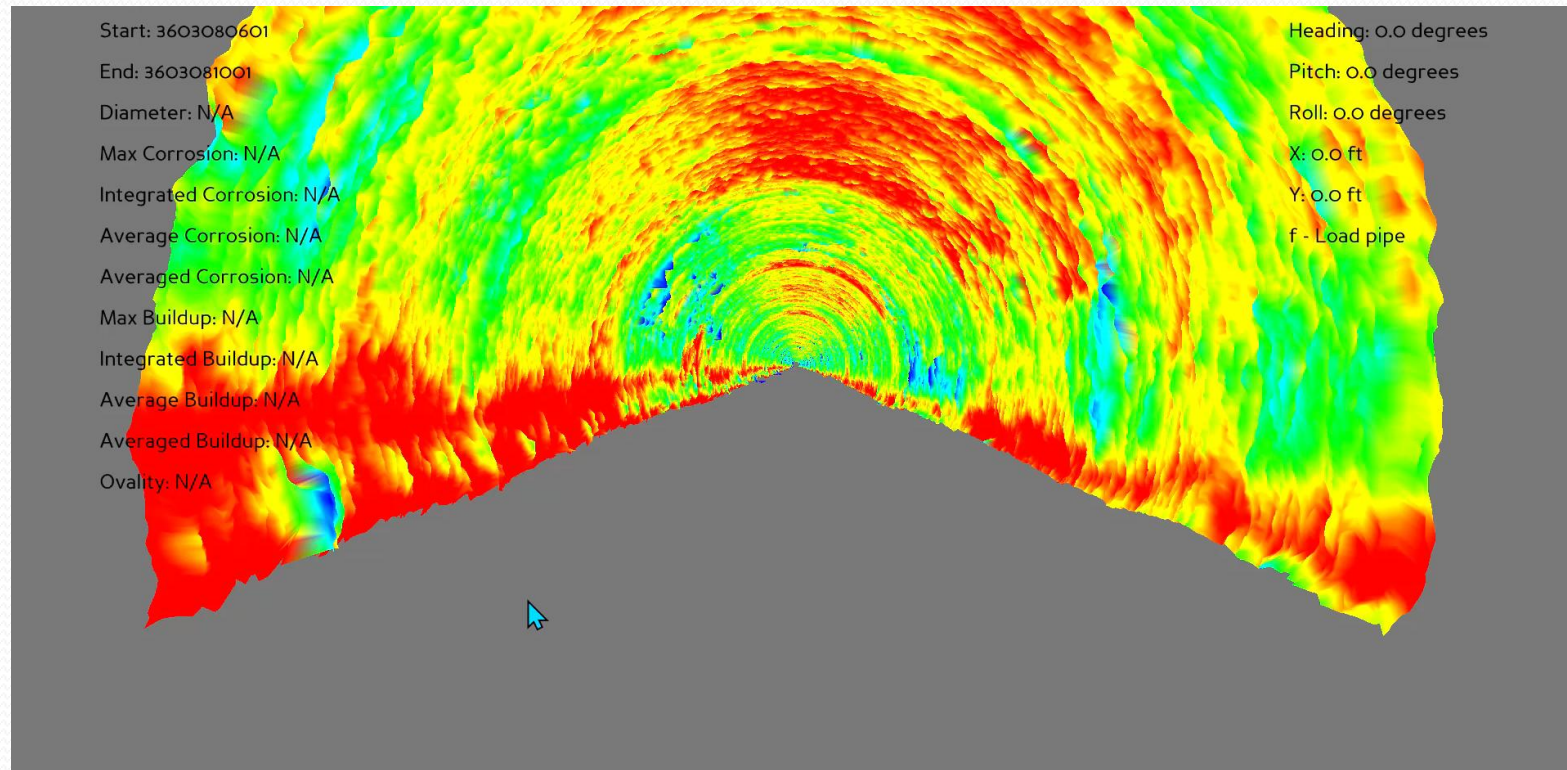
The Zamani Project - Heritage Documentation Beyond the Point Cloud - LiDAR News

Images may be subject to copyright. [Learn More](#)

[Visit >](#)

LIDAR DRIVE THROUGH MODEL

OUR IN-HOUSE
SOFTWARE
DISPLAYS THE
POINT CLOUD
AGAINST THE
AS-BUILT
DIMENSIONS

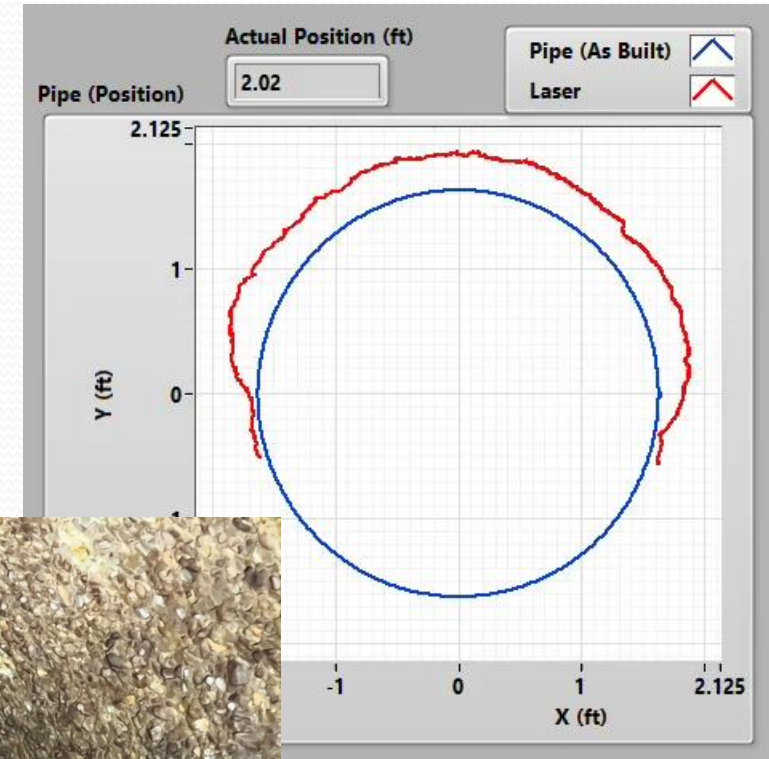
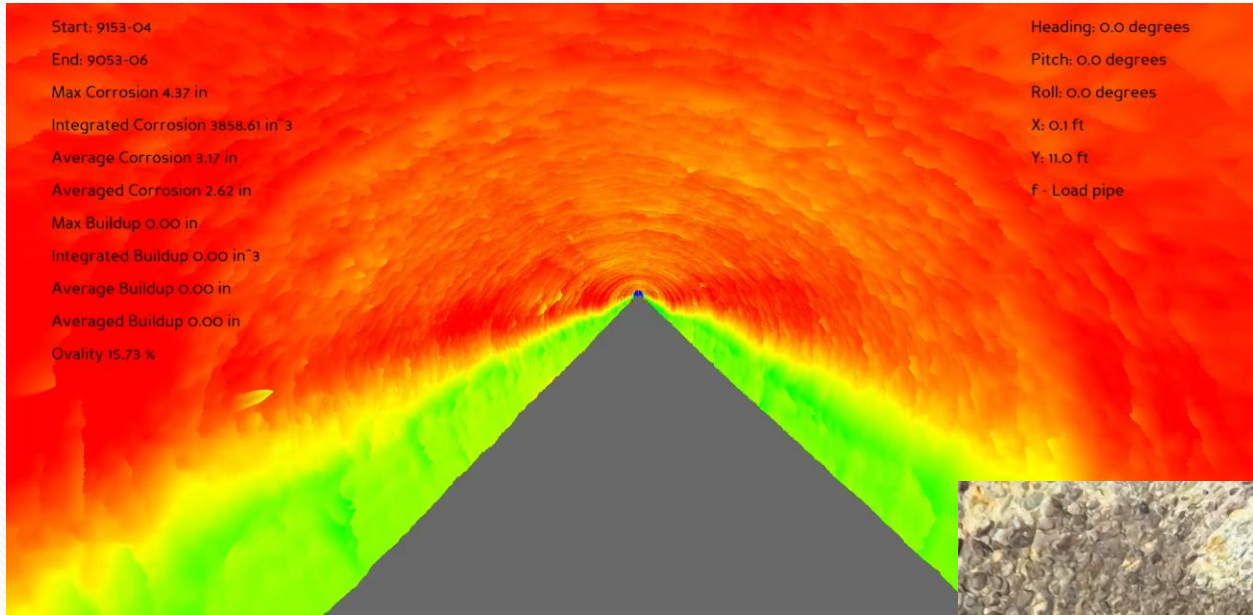


54" RCP
Start: 3603080601
End: 3603081001
Max Corrosion 1.70 in
Integrated Corrosion 156.35 in³
Average Corrosion 0.26 in
Averaged Corrosion 0.08 in
Max Buildup 0.95 in
Integrated Buildup 250.37 in³
Average Buildup 0.15 in
Averaged Buildup 0.12 in
Ovality 3.16 %

Position: 891.2 ft
Heading: 0.0 degrees
Pitch: 0.0 degrees
Roll: 0.0 degrees
X: -0.1 ft
Y: 891.2 ft
f - Load pipe

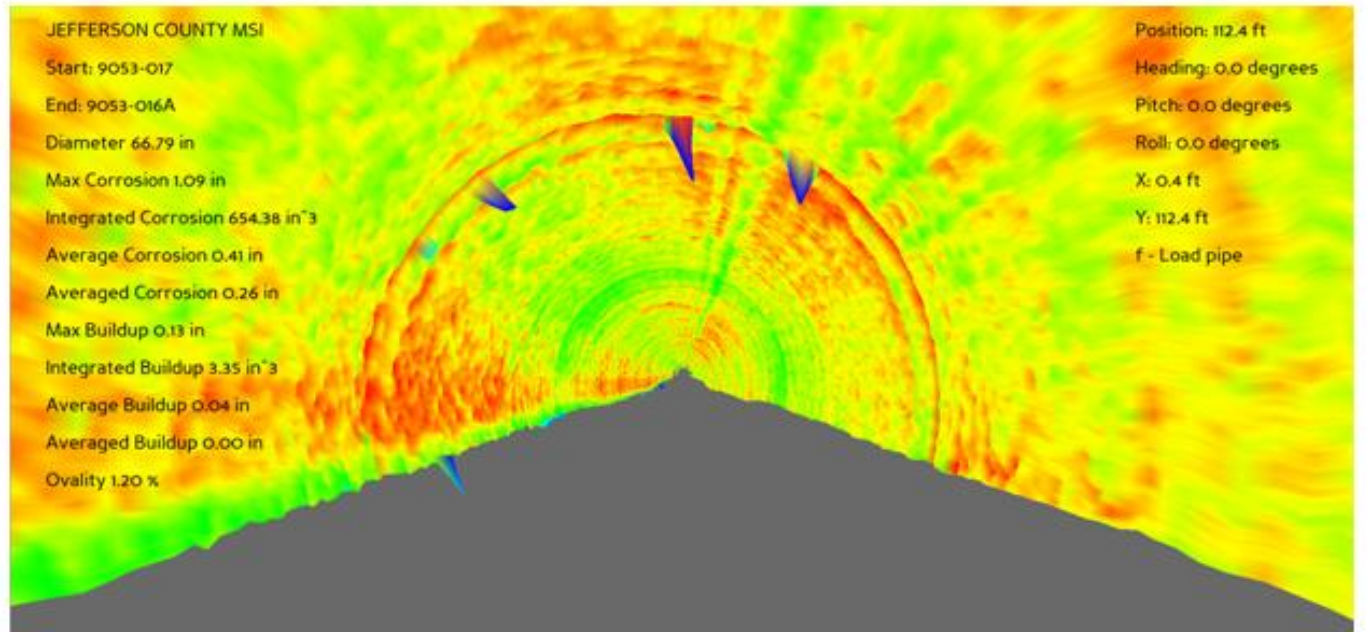


The normal adjustable color ramp can be boring!

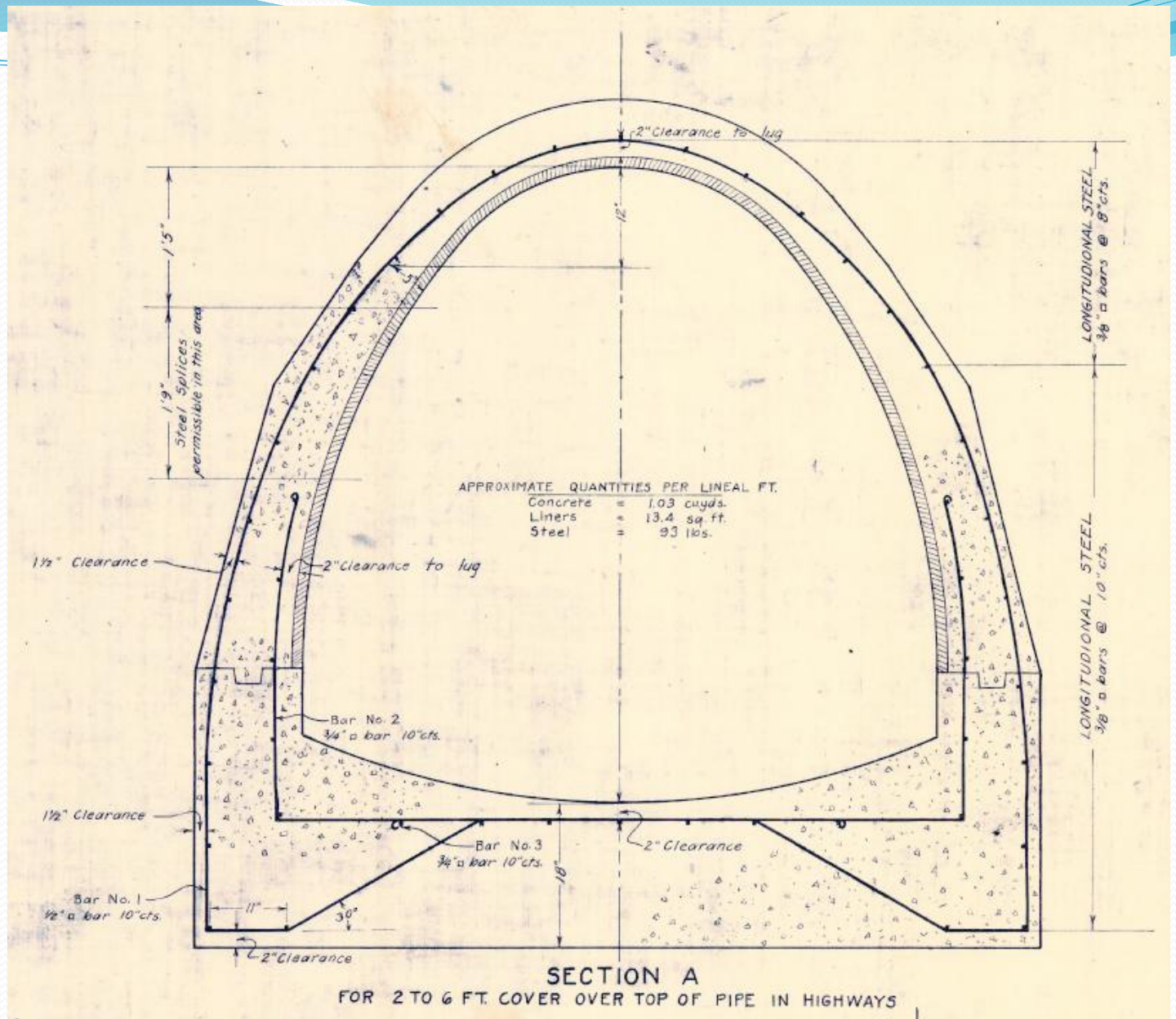


Wider Color Ramp Improves Definition

**THE WAFFLE
PATTERN OF THE
REBAR IS CLEARLY
VISIBLE**



We need the as-
built for more
custom pipe
shapes



Semi-Elliptical Pipe, Installed 1927

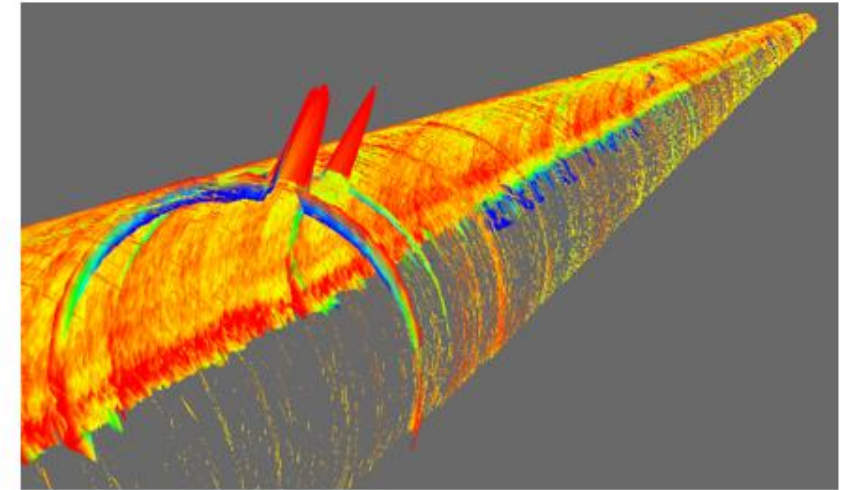
Predict Remaining Useful Life

[illegible]

Laser shooting up Laterals

Laser readings indicate corrosion OR measurements outside reference circle.

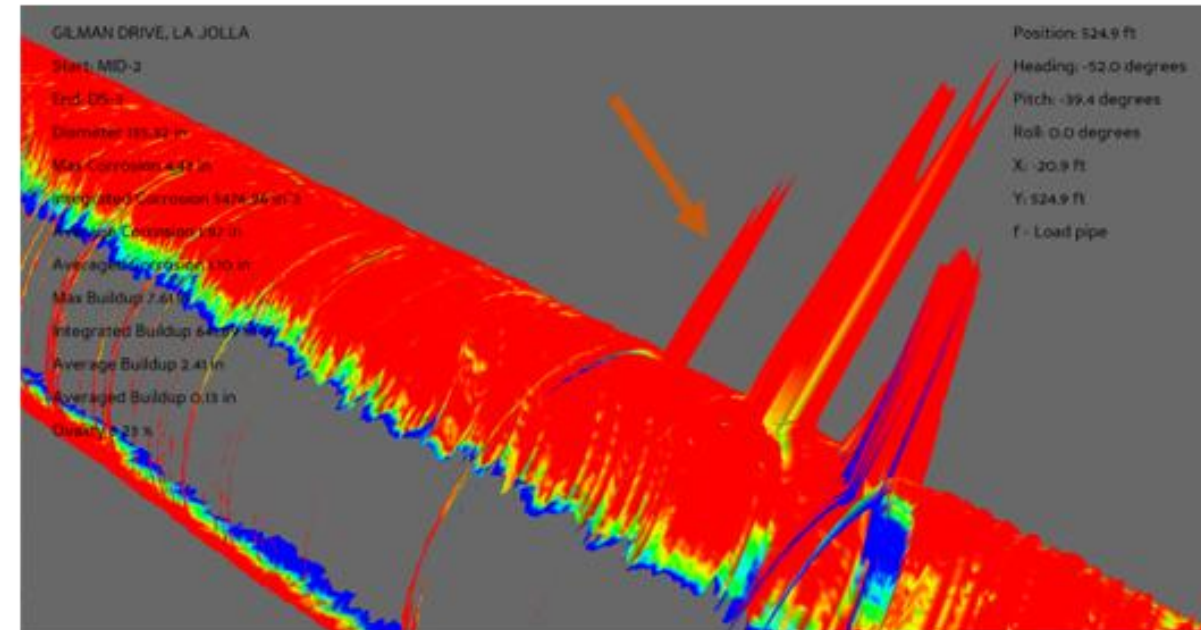
Will shoot up tap connections



SCANS 157 AND 160 WERE DELETED FROM AVERAGES ABOVE DUE TO HIGH VALUES CAUSED BY INCOMING TAP/LATERALS.					
Position (ft)	Circular Radius (in)	Circular Normalized Residual Range	Maximum Corrosion (in)	Average Corrosion (in)	Integrated Corrosion (in3)
157	33.892383	0.548472	19.608312	1.625808	1429.634187
160	33.992811	0.553221	19.919952	1.196335	1135.810791

THE LASER CAN FIND HOLES TOO!

CMP Storm Drain CCTV/Lidar Inspection



LIDAR IS USEFUL IN CMP TOO!

132" to 180" Storm Culvert Southern California



NATIONAL PLANT SERVICES
A Carylton Company

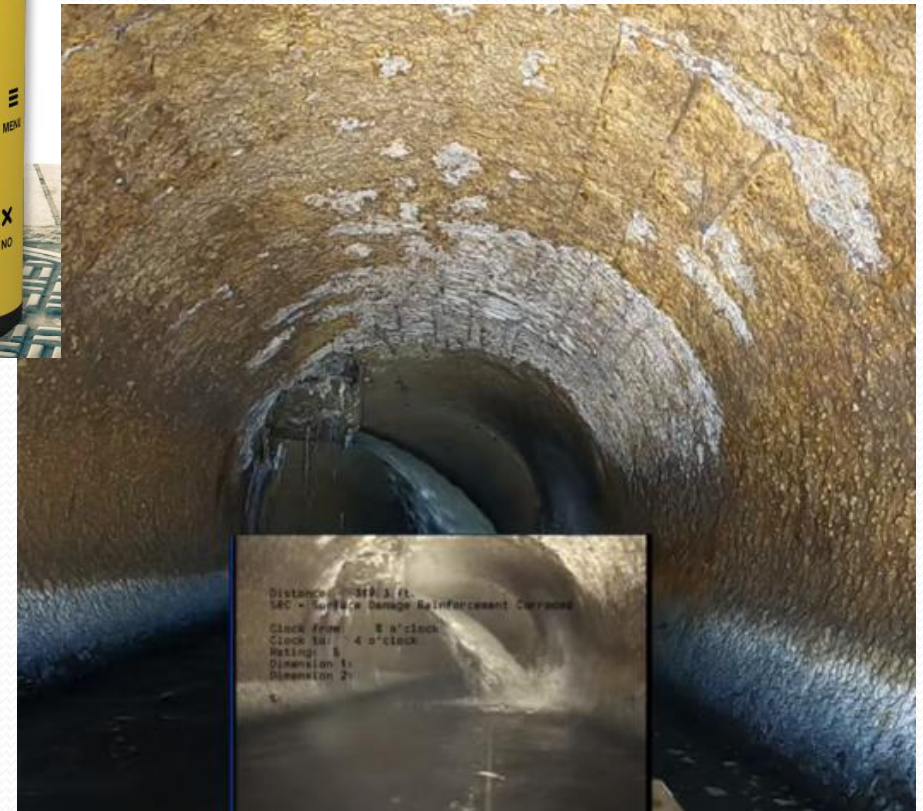
<u>Start (ft)</u>	<u>End (ft)</u>	<u>Ovality (%)</u>
3	11	<10
12	192	10-20
193	206	20-30
207	250	30-40
257	268	20-30
269	410	10-20
411	447	<10
448	1685	10-20
1686	1796	20-30
1797	1883	10-20
1884	1931	<10
1932	1966	10-20
1967	2039	20-30
2040	2060	30-35
2061	END	20-30
AVERAGE		16.19
MAXIMUM		38.26

VCP PIPE CAN CORRODE TOO!



GAS LOGGERS

Date	O2(2)		CO(3)	H2S(4)	°C
	Min	Max	Peak	Peak	
START OF 1ST PASS - 8:54AM					
8/25/2023 8:24:00 AM	20.8	20.8	0	0	25
8/25/2023 8:27:00 AM	21.2	21.4	0	0	25
8/25/2023 8:30:00 AM	21.3	21.4	0	0	25
8/25/2023 8:33:00 AM	21.3	21.4	0	0	25
8/25/2023 8:36:00 AM	21.3	21.4	0	6	25
8/25/2023 8:39:00 AM	21.3	21.4	0	6	26
8/25/2023 8:42:00 AM	21.3	21.4	0	2	26
8/25/2023 8:45:00 AM	21.3	21.4	0	2	26
8/25/2023 8:48:00 AM	21.3	21.4	0	7	26
8/25/2023 8:51:00 AM	21.1	21.3	0	55	26
8/25/2023 8:54:00 AM	21.2	21.2	0	48	28
8/25/2023 8:57:00 AM	21.2	21.2	0	26	28
8/25/2023 9:00:00 AM	21.2	21.2	0	25	28
8/25/2023 9:03:00 AM	21.2	21.2	0	19	28
8/25/2023 9:06:00 AM	21.2	21.2	0	20	28
8/25/2023 9:09:00 AM	20.8	21.2	0	31	29
8/25/2023 9:12:00 AM	20.8	20.8	0	71	29
8/25/2023 9:15:00 AM	20.8	21.2	0	63	29
8/25/2023 9:18:00 AM	20.8	21.2	0	35	29
1ST PASS REACHES DSMH - 9:20 AM					
8/25/2023 9:21:00 AM	20.8	21.2	0	116	29
8/25/2023 9:24:00 AM	20.8	20.8	0	171	30
8/25/2023 9:27:00 AM	20.8	20.8	0	133	30



**HIGHEST H₂S READINGS
WERE AT JUNCTION TO
THE FORCE MAIN**

PLANNING FOR MSI PROJECTS

- Maximum length between access points?
- What is the diurnal flow? Should we perform day or night inspections?
- What sensors? CCTV, Lidar/Laser, and sonar?
- **Site Reconnaissance visits are IMPORTANT**
- What traffic control do we need?
- Where should we set up to start inspections?
- What manholes should we avoid?

CONDITIONS TO WATCH FOR DURING PLANNING/SITE RECON:

- Bends in the pipe alignment can stop an inspection
- Obstructions in manholes/pipes
- High pressure/high flow tie-ins that may stop an inspection
- High traffic areas that can slow production and increase TC costs
- Select continuous pipe runs to maximize daily footage production
- Is flow too turbulent for Lidar?



ENGINEERED FINAL REPORTS

- NPS staff prepares all deliverables.
- Reports for EACH line segment are prepared which summarize all data streams.
- A technical engineering report/memorandum is prepared for each project.
- Repair recommendations can be provided.



NATIONAL PLANT SERVICES, INC.

CCTV/3D LASER/SONAR DELIVERABLES

CCTV

PACP DATABASE

CCTV VIDEO/HD

DEFECT SNAPSHOTS

PACP SCORING REPORT
IN PDF

PACP SUMMARY
REPORT IN PDF

SONAR

2D SONAR/LASER
PROFILE VIEWER

2D SONAR
PROFILE
MOVIE

SONAR DEBRIS
GRAPH

LASER

3D LASER VIEWING
SOFTWARE AND FILES

3D LASER MODEL
MOVIE

2D SONAR/LASER
PROFILE VIEWER; 2D
LASER RESULTS MOVIE

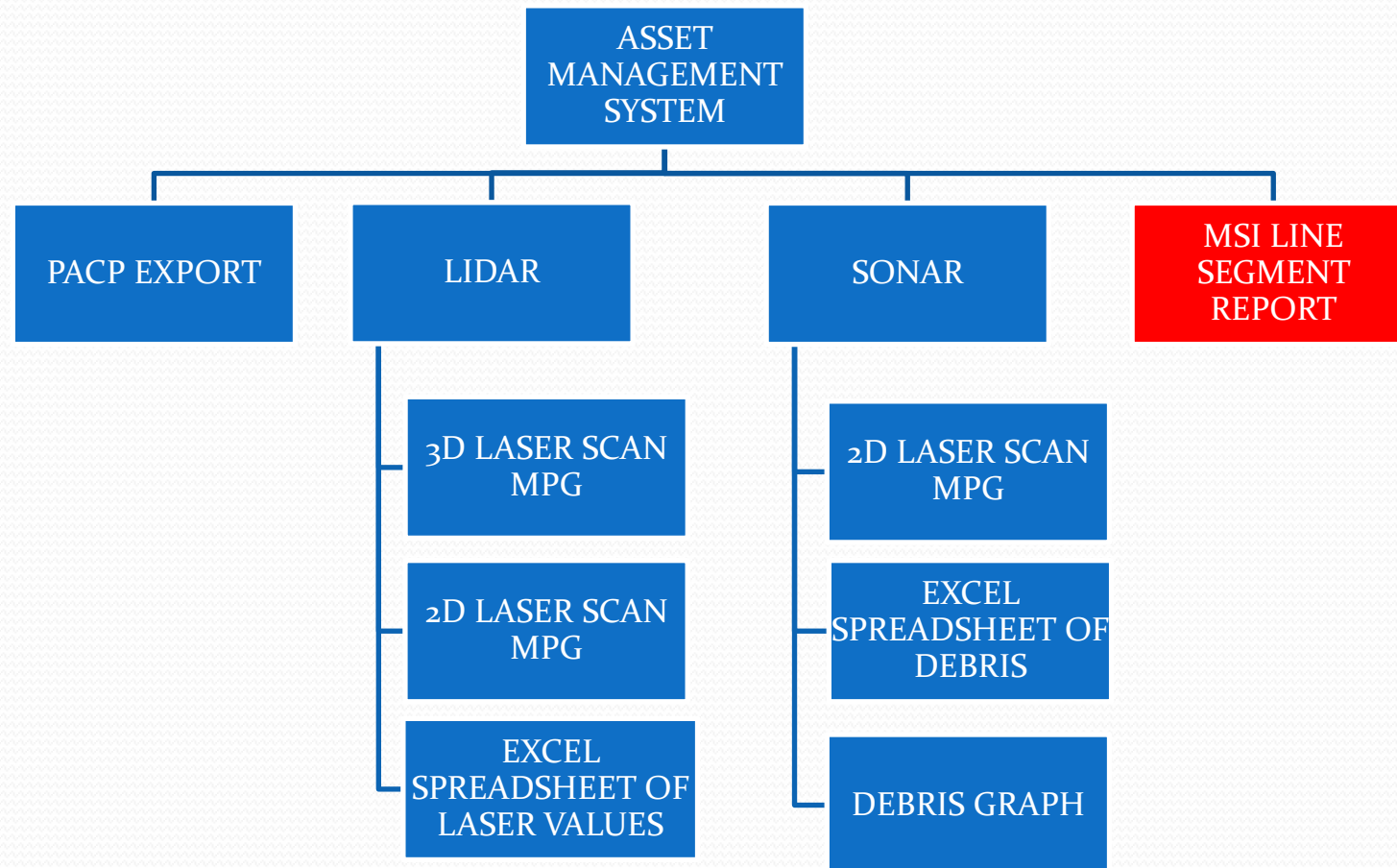
CORROSION, BUILDUP,
OVALITY, EXCEL
SPREADSHEET



MSI LINE SEGMENT
REPORTS

PROJECT SUMMARY
REPORT WITH REPAIR
RECOMMENDATIONS

IMPORT RESULTS INTO ANY ASSET MANAGEMENT SYSTEM



NPS' CUSTOM MSI LINE SEGMENT REPORTS

1

ANY CITY
MULTI-SENSOR INSPECTION
PREPARED BY: NATIONAL PLANT SERVICES, INC



MULTI-SENSOR INSPECTION SUMMARY REPORT FOR:
MH 9053-017 to 9053-016A, 66" RCP, 925.1 LF INSPECTED
LENGTH

INSPECTION PROCEEDED DOWNSTREAM FROM MH 9053-017 TO MH 9053-016A. THE FLOATING PONTOON WAS USED FOR THIS INSPECTION. THE WATER LEVEL WAS AT 35% DURING THIS DAYTIME INSPECTION.

HEAVY STEAM PRESENT AT START OF INSPECTION. STEAM CAN DISRUPT LASER READINGS AND VALUES MAY SHOW AS LESS THAN THEY REALLY ARE.

SURFACE REINFORCEMENT VISIBLE AND CORRODED THROUGHOUT.

INTRUDING SEALING MATERIAL IS SEEN AT MANY JOINTS, SOME ARE HANGING.

AVERAGE CORROSION OVER ENTIRE LENGTH OF PIPE IS 0.75 INCHES. MAXIMUM CORROSION IS 2.63 INCHES, WHICH IS AT A JOINT.

SONAR REVEALED MINIMAL DEBRIS (0.17 CF).

GAS DETECTOR UTILIZED. MAXIMUM H2S READING WAS 46 ppm.

Measurement	Measurement From Pipe Center (Inches)
Average Corrosion/Outside Reference Circle	0.75
Maximum Average Corrosion/Outside Reference Circle	1.23
Maximum Corrosion/Outside Reference Circle	2.63

Average Corrosion/
Outside Reference Circle

Maximum Corrosion/
Outside Reference Circle

2

ANY CITY
MULTI-SENSOR INSPECTION
PREPARED BY: NATIONAL PLANT SERVICES, INC



PACP SCORING REPORT



CUES, Inc.
3000 Rio Vista Avenue
Orlando, FL 32805
Phone: 407-849-0190
Fax: 407-425-1569

PACP v7.0 Inspections and Scoring

General Information:

Surveyed by: F MORENO/NPS	Certificate number: U-913-19012	Reviewed by:	Reviewer certificate no.:	Owner:	Customer:
PJO number:	Work order no.:	Media label:	Project name: 2022 AMP06 SVT REINSPECTION	Start date/time: 20230824 09:42	
Sheet number:	Weather:	Pre-cleaning: N	Date cleaned:	Flow control: N	Purpose: F
Direction: D	Technology used:	Inspection status: CI	Consequence of failure:	Pressure value:	

Location:

Drainage area:	Pipe segment ref.: GP009053-367527	Street: HILLTOP RD/EASEMENT
City: BESSEMER	Location code: D	Location details:

Pipe:

Pipe use: SS	Height: 66 in.	Width:	Shape: C	Material: RCP	Lining method:
Coating method:	Pipe joint length:	Total length:	Length surveyed: 925.066 ft.	Year constructed:	Year renewed:

Measurements:

Upstream MH No: 9053-017	Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:	Elevation:
Downstream MH No: 9053-016A	Rim to invert:	Rim to grade:	Grade to invert:	Northing:	Easting:	Elevation:
MH coordinate system:	MH vertical datum:	GPS accuracy:				

Additional Information:

Pipe Ratings

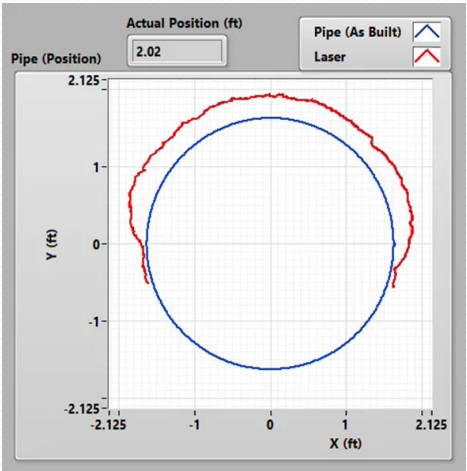
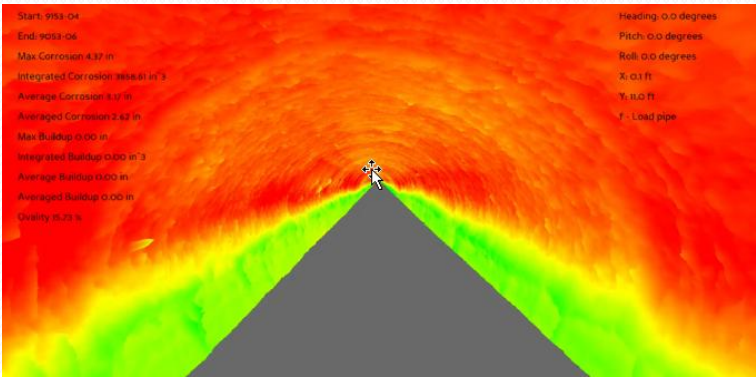
Grade	Amount of Defects	Segment Grade	Structural Pipe Rating	Quick Rating	Pipe Rating Index	Amount of Defects	Segment Grade	Structural Pipe Rating	Quick Rating	Pipe Rating Index	Pipe Rating	Pipe Rating Index	Overall: Lof	Risk
1	0	0				0	0							
2	0	0				72	144							
3	182	546	1,413	5243	4.0	1	3	147	312M	2.0	1,560	3.6	6.0	
4	3	12				0	0							
5	171	855				0	0							

Observations

Distance	Video Ref.	PACP Code	Continuous	Value Inches (mm)	%	Joint	Circumferential Location At/From	Rating	Image Ref.	Remarks
0.0 ft.		AMH								9053-017
0.0 ft.		MWL			35					2022 AMP06 SVT REINSPECTION - MMH

WHAT DO WE DO NOW?

1. COMPARE TV
AND PACP
SCORES AGAINST
LASER DATA



2. HOW DOES
THIS COMPARE
TO THE AS-BUILT?

Dia	Class	Wall Type	Circumferential Reinforcement	Elliptical Reinforcement	Pipe Wall Profile (inches)																	
					0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50
42	III	B	Two Lines	Y																		

YEP, BETTER
FIX THIS ONE
ASAP!

3. DETERMINE YEARS TO INNER OR OUTER REBAR TO DETERMINE RUL. (BEST IF MORE THAN ONE DATA SET)

PACP Structural Quick Rating	PACP O&M Quick Rating	PACP Quick Rating	Average Corrosion (in)	Maximum Corrosion (in)	Install Year	Max Annual Corrosion Rate (in/yr)	Depth to Inner Steel (in)	Years to Failure (inner steel)	Years to Failure (mid-point)	Depth to Outer Steel (in)
5E3T	5141	3.4	0.48	1.55	1915	0.015	-0.6	-36	>100	3.5
3B11	2A00	2.5	CCTV Only	CCTV Only	1958	-	-	-	-	-
513L	512B	2.4	0.12	0.29	1908	0.003	0.7	>100	>100	3.8
3G2D	4100	2.6	0.12	0.30	1942	0.004	0.7	>100	>100	3.0
3J2C	4131	2.8	0.10	0.56	1953	0.009	0.4	50	>100	5.7

4. ASSIGN TO A
CIP SCHEDULE
AND START
DESIGN!



Questions?



Michelle Beason, PE

925-262-7366

mbeason@nationalplant.com

YouTube @michelledbeason