PICA
Pipeline Inspection and Condition Analysis Corporation

Sample CCTV & Laser Report

Laser Profilometry Assessment

Project: XXXXX

Xxxxxxx
Xxxxxxx
Xxxxxxxx

Inspection Dates:
Report Submission:
Revision:
Operators:
Analysis & Reporting:
Reviewers:

PICA
Pipeline Inspection and Condition Analysis Corporation

Table of Contents

Project Summary 3
Slick Line #1 & #2 Requested Scope of Work 4
Slick Line Characteristics: 5
Overview of Inspection Area 6
Inspection Preparation 6
Slick Line Access Points: 8
CCTV & Laser Imaging Pipe Orientation 9
CCTV Findings: Slick Line #1 – Southside of Slick Line Building 10
CCTV Summary: 10
CCTV Observations: 10
CCTV Findings: Slick Line #2 –Northside of Slick Line Building 13
CCTV Observations: 13
Laser Profilometry Findings Summary: Slick Line #1 15
Slick Line #1 Laser Data – Maximum Diameter Findings 16
Slick Line #1 – High Resolution Flat Profiles 17
Laser Profilometry Findings Summary: Slick Line #2 20
Appendix 3: Laser Profilometry Reports – Slick Lines #1 & #2 21
Slick Line #1 Unfolded Snapshot Profile 22
Slick Line #1 Median & Max Diameter Summary Reports 23
Slick Line #2 Unfolded Snapshot Profile 24
Slick Line #2 Median & Max Diameter Summary Reports 25
Appendix 4: Laser Profilometry Background 26
Laser Profilometry Technique 26
Method 26

PICA
Pipeline Inspection and Condition Analysis Corporation

Project Summary

The total length on each of Slick Lines #1 and #2 for CCTV visual and laser profilometry was approximately 530 meters. PICA Corp Inc. design team built a unique prototype downhole inspection tool for the Slick Lines. The inspection tool is completely battery operated and is equipped with a 4K camera and single head laser. The inspection unit was tether deployed using 3100 ft. of Amsteel rope and an electric winch system. Russell technicians completed calibrations on both the winch line and laser tool for the inspection.

Pipe eccentricity (out of roundness) measurements were performed during the Tool deployment. The single head laser plotted 1080 points on the pipe wall surface, which appears on the CCTV image as a red circle. Any ovality changes and deflections of the circle are measurable with an accuracy of +/- 0.5% (1mm). Features such as dents, ERW welds, girth welds and ovality are easily seen, recorded and measurable in real-time or off-line.

The travel speed of the inspection tool was set to 6 meters per minute, which is an ideal speed to measure the pipe I.D. cross-section dimension, ovality and deformation using the projected laser method. Distance within each Slick Line has been reported from a master odometer which measured off the trailing tether attached to the laser tool. At the beginning of the inspection, the odometer was offset 1.6 meters. with the forward-facing camera and laser unit being below the Slick Line top flange. Distances shown in the laser imaging provided in this report correspond to the feature's location in the Slick Line.

The laser profilometer reported total scanned distances will always be shorter than the reported length of the pipeline section. Since the laser profilometer is offset from the camera by approximately 5.625-inches, distances reported for laser findings have been adjusted to coincide with the master odometer measurements.

The following results are based on the information collected from both the CCTV and laser profilometry inspection and analyzed off site after the field work was completed.

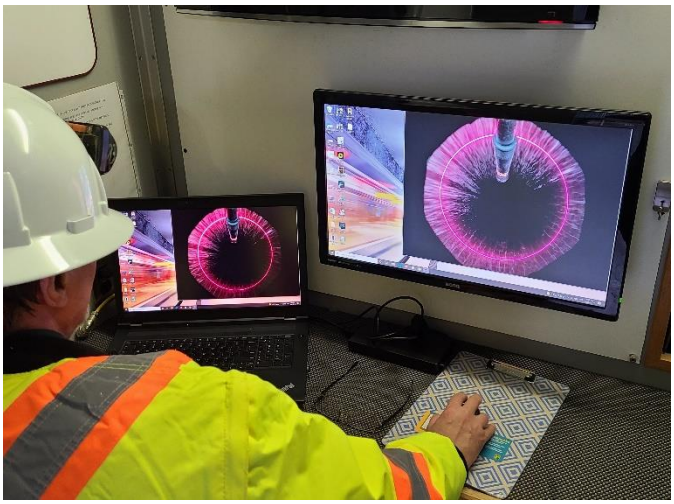


Figure 1. PICA technician verifying visual and laser data after calibration run

Figure 2. Typical setup on Slick Line using a winch and rollers to guide inspection tool down the pipe

Slick Line #1 & #2 Requested Scope of Work

The plant area consists of an underground Uranium ore mine and above ground processing facilities. As part of the activity underground, the plant sends mixed concrete from surface to the mine through two pipelines called, Slick Lines. The Slick Lines are referred to as Slick Line #1 & Slick Line #2.
In 2010 Slick Line #2 was installed with a hard facing liner (boron carbide) on the inner wall of the pipe to mitigate erosion of the carbon steel pipe. Slick Line #2 was inspected in 2013 to verify the thickness and the remaining carbide liner.
In 2014 Slick Line #1 piping was reinstalled with a hard facing liner (nano boron carbide). Since then, it has been in service but has not been inspected.
Client wants to perform thickness checks for both Slick Lines #1 & #2. Client past historical inspection findings on both (un-coated) Slick Lines were found to have erosion wear from concrete aggregate when piped to the bottom of the mine.

Figure 3. Both Slick Lines #1 and #2 internal hard-facing liner shows that the original weld caps have been worn smooth leaving a crazing effect. The crazing effects of the carbide liner are common to see as minor stress relief cracking during the post weld cooling process.

PICA
Pipeline Inspection and Condition Analysis Corporation

Slick Line Characteristics:

MR-22-237 Slick Line #1					
Location:		**Installation Date:**	2009	**Inspection Equipment:**	Laser Profilometer & Visual Inspection ASTM F3080-17a
Asset Identification:	Slick Line #1	**Material:**	Carbon Steel	**Equipment Propulsion:**	Singe tethered
Product:	Mixed Concrete	**Pipe Specifications:**	API 5CT	**Inspection Speed:**	6-9 m/min (20-30 ft/min)
Line Size:	**OD:** 244.5 mm (9.625”) **ID:** 216.8 mm (8.535”)	**Nominal Wall:**	L80 13.8 mm (0.545”)	**Tool Settings:**	TBD
Length:	530 m	**Liner:**	7 mm (0.276”) NWT Trimay TWP 71W Nano-Boro-carbide	**Estimated Run Duration:**	1-1.5 hrs one way
Underground/ Exposed:	Buried – vertical (2.5-deg deviation)	**Ext Coating:**	349.3 mm (13.75”) OD Casing	**Total bends:**	None
Failure History:	None	**Line Features:**	6 m pipe lengths	**Burial Depth:**	vertical
Planned Inspection Date(s):	May 16 – 19, 2022	**Joint Type:**	Seal-Lock Boss threaded couplings	**Elevation Difference:**	530 m

MR-22-237 Slick Line #2					
Location:		**Installation Date:**	2009	**Inspection Equipment:**	Laser Profilometer & Visual Inspection ASTM F3080-17a
Asset Identification:	Slick Line #2	**Material:**	Carbon Steel	**Equipment Propulsion:**	Singe tethered
Product:	Mixed Concrete	**Pipe Specifications:**	API 5CT	**Inspection Speed:**	6-9 m/min (20-30 ft/min)
Line Size:	**OD:** 244.5 mm (9.625”) **ID:** 216.8 mm (8.535”)	**Nominal Wall:**	L80 13.8 mm (0.545”)	**Tool Settings:**	TBD
Length:	530 m	**Liner:**	7 mm (0.276”) NWT Trimay TWP 71W Nano-Boro-carbide	**Estimated Run Duration:**	1-1.5 hrs one way
Underground/ Exposed:	Buried – vertical (2.5-deg deviation)	**Ext Coating:**	349.3 mm (13.75”) OD Casing	**Total bends:**	None
Failure History:	None	**Line Features:**	6 m pipe lengths	**Burial Depth:**	vertical
Planned Inspection Date(s):	May 16 – 19, 2022	**Joint Type:**	Seal-Lock Boss threaded couplings	**Elevation Difference:**	530 m

Overview of Inspection Area

The inspection area in the Slick Line Building is located on the East side of the plant site near Shaft #2. The slick lines inspected are 202.875mm in diameter with an internal hard-face welded liner. The slick lines extend from the surface within the Slick Line Building going down vertically (with an average offset of 2.5-degrees from vertical) and exiting 550 meters into the mine near shaft #2 (Figure 4.).

Figure 4. Google Earth Map – Slick Line Building Location

Inspection Preparation

Both slick lines #1 and #2 were pig-cleaned by the client prior to Russell's arrival. The cleaning pig sizes that were sent down the pipe ranged from 4-inch to 10-inch. No obstructions were noted by client during cleaning of the lines.

Both Slick Lines #1 and #2 were gauged prior to the inspection runs to ensure no obstructions would cause the inspection tool to hang up in the pipe. Russell NDE's custom gauge assembly is shown in Figure 5.

Figure 5. Gauge tool assembly used on Slick Lines #1 and #2 prior to the main inspection

Slick Line Access Points:

The access points to the slick lines were covered by blind flanges which were removed for the inspection work. (Figure 6 and Figure7).

Figure 6. Slick Line 1 access with bolted flange

Figure 7. The Slick Line flanges and pipe walls were marked up to help reference the clock positions for when the laser inspection tool was inserted

CCTV & Laser Imaging Pipe Orientation

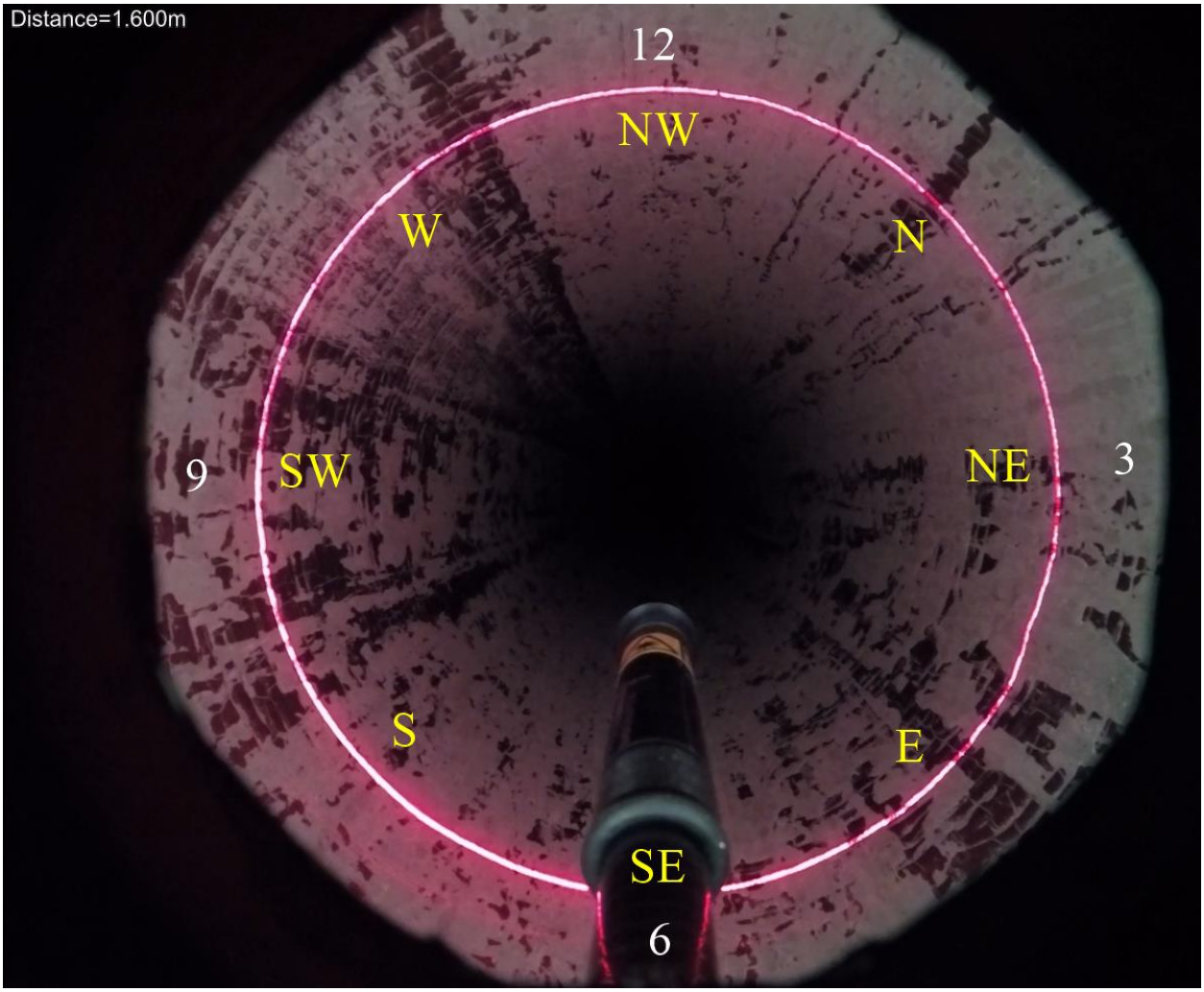


Figure 8. The deployment of the inspection tool going down into Slick Lines #1 & #2 were orientated where the tip of laser tip was facing the SE side wall of the pipe. The inspection length coverage showed no evidence of rotation of the tool during the video review.

CCTV Findings: Slick Line #1 – Southside of Slick Line Building

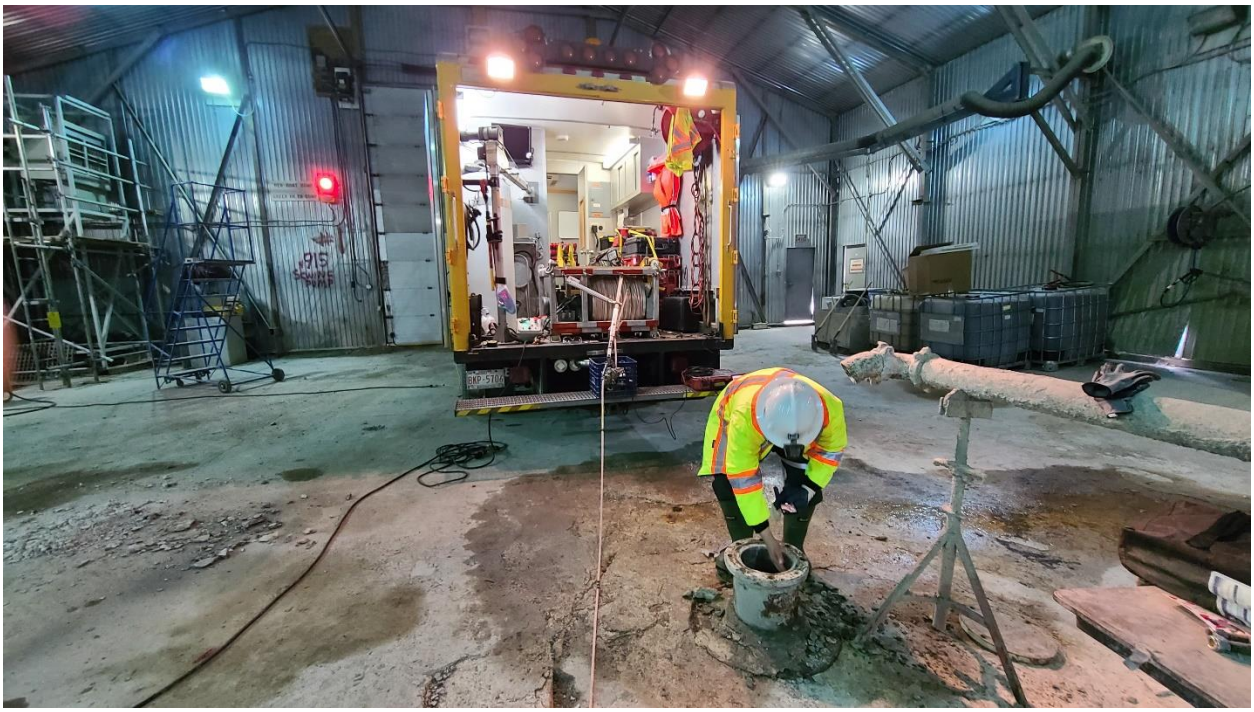


Figure 9. PICA technician performing visual and markup on Slick Line#1 before equipment setup

CCTV Summary:

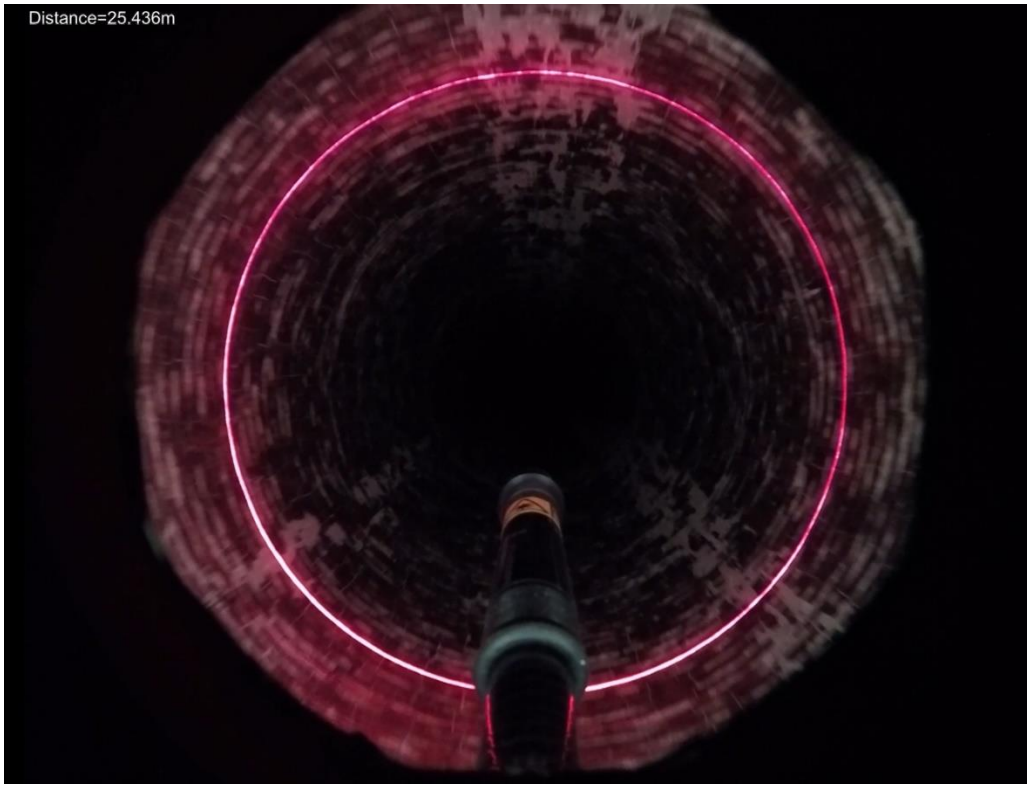
At full illumination setting it was found that the forward view camera LED lighting did obscure the laser projected ring on the pipe wall surface for gathering visual information on the Slick Line wall. The lighting system voltage was reduced until it illuminated just a 4-inch-long area without impacting the projected laser ring.

We suggest on the next scheduled inspection using the laser profiler, the LED lights will be turned off on the run going down the Slick Lines. Once the inspection tool exits at the bottom inside the mine the lighting system would be turned to maximum for the return run to acquire enhanced visual information of the pipe wall.

CCTV Observations:

- Traces of carried over dried cement were noted at the pipe wall surface near the top opening of the Slick Line which stopped around 15 meters down.
- The hard-facing material crazing effect is easily seen through the video footage throughout the length of the Slick Line.
- Pipe internal features such as couplings and joints were also easily seen.

NOTE: The hard-facing carbide liner on Slick Line #1 is noticeably thinning based on the CCTV footage from 450 meters to the bottom extent of the pipe that exits into the mine at 530 meters.



Top Image: Hard-facing material on the pipe wall is clearly present with light concrete in adhered between the convoluted weld caps
Bottom Image: Hard-facing material appears to be eroded between the 6 to 10 position S.E to W of the pipe wall. Indications at the wall may suggest the path of the mixed concrete when poured into the pipe from the surface

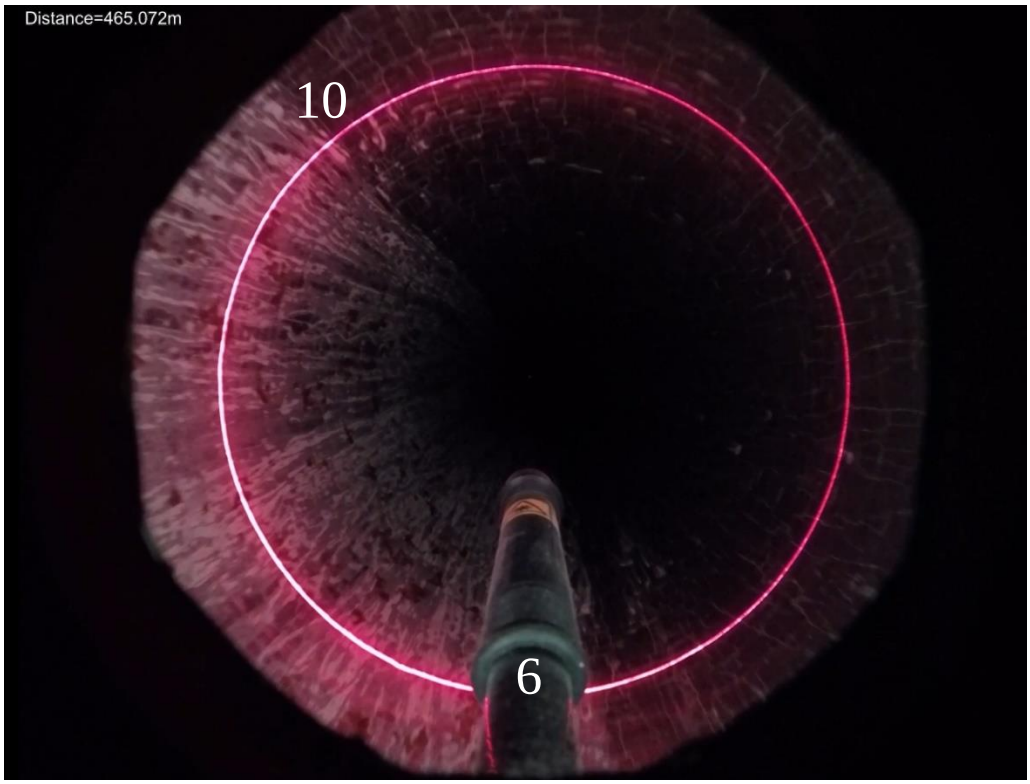


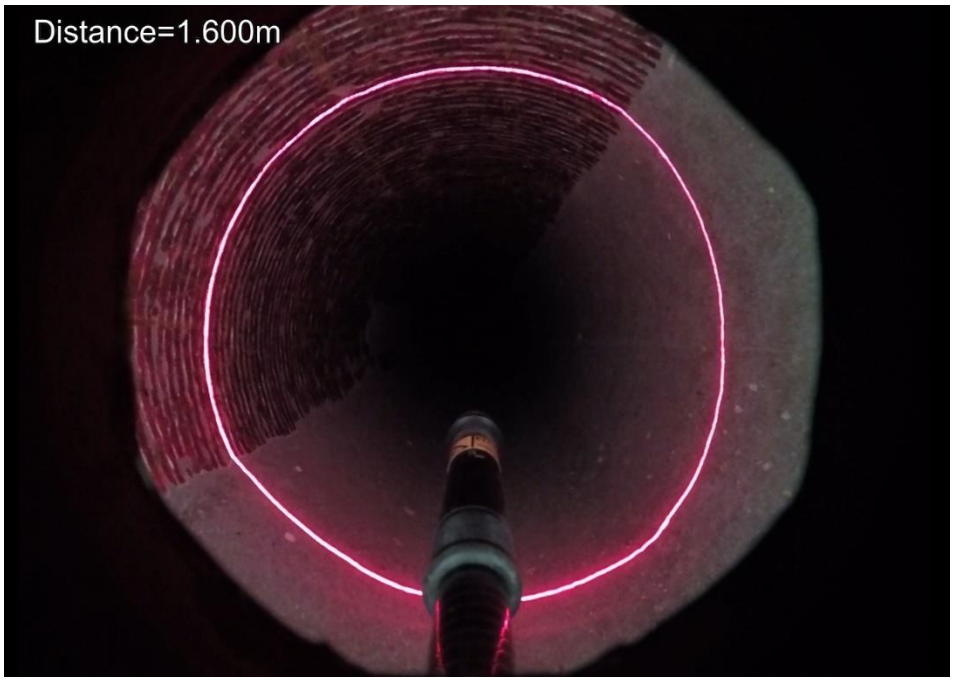
Figure 10. Laser tool exiting at 530 meters below inside mine corridor

CCTV Findings: Slick Line #2 –Northside of Slick Line Building

Figure 11. Inspection run setup on Slick Line

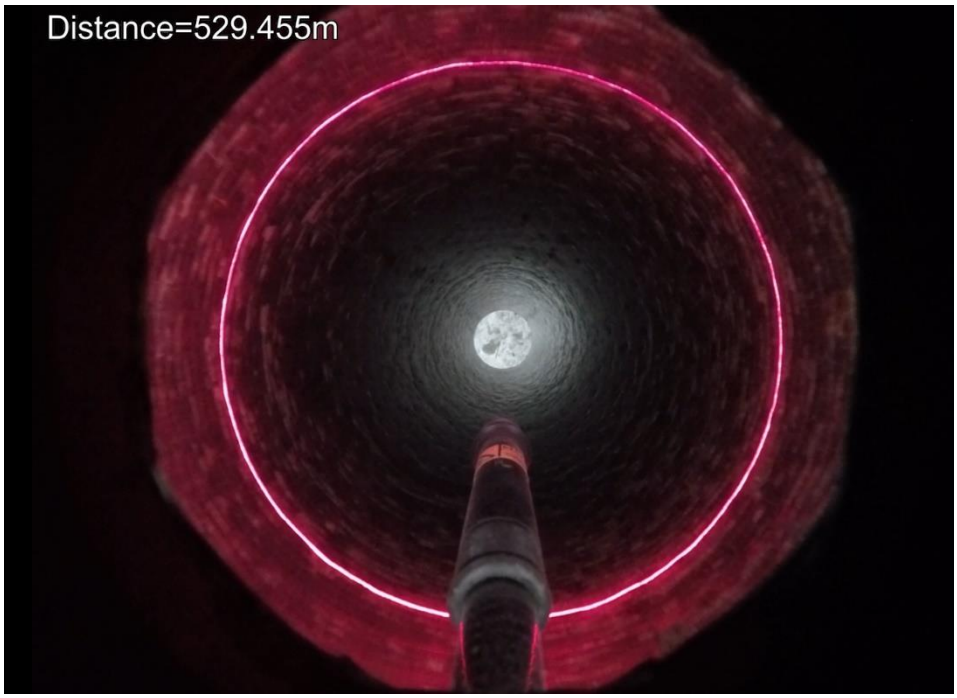
CCTV Observations:

- Distance 0 meters to 15 meters shows hardened concrete film on the pipe wall after pigging.
- The hard facing liner weld nodules and spatter have generally been eroded-off.
- The crazing effect (surface cracking) from the hard face liner can be seen when looking down from the surface top flange and is visible in the CCTV image for the full length.
- Pipe segment joints and couplings were seen throughout the CCTV footage.



Top Image: The inspection start location at 1.6 meters shows light concrete film over the hard-facing liner on Slick Line #2

Bottom Image: The hard-facing liner is easily seen before exiting at the bottom at the mine



PICA
Pipeline Inspection and Condition Analysis Corporation

Laser Profilometry Findings Summary: Slick Line #1

The laser profiler scanned a total distance from the surface opening past the flange to the bottom extent of the slick inside the mine corridor at 528.4 meters

The over-all average of the pipe internal diameter with the carbide liner when analyzed through the laser software ranged from 209.2mm to 211.3.mm compared to the baseline ID input of 202.875mm. The erosion pattern that is occurring within the pipe from the transportation of concrete shows the erosion signature is more circumferential with wear than isolated linear indications of wear.

The following chart outlines the more severe erosion areas noted, recording the start and end points for each of these sections. The profiled cross-sectional measurements of the pipe internal diameter with liner, including estimated remaining liner wall thickness, are reported.

Scan Start Point (m)	Scan End Point (m)	Scan Distance (m)	Max ID (mm)	Wall Loss (mm)	Total Estimated Remaining Wall (mm)	Estimated Remaining Liner (mm)	% Rem Liner	% Liner Wall Loss	Wall Loss Orientation
3.9	4.9	1	207	2.06	18.82	4.95	70.58%	29.42%	NW
38.2	39.9	1.7	205.8	1.46	19.42	5.55	79.14%	20.86%	Circumferential
41.3	47.1	5.8	206.4	1.76	19.12	5.25	74.86%	25.14%	NW / W
69.9	78.7	8.8	205.6	1.36	19.52	5.65	80.56%	19.44%	W
117.2	123.3	6.1	206	1.56	19.32	5.45	77.71%	22.29%	E
174	180.1	6.1	206.4	1.76	19.12	5.25	74.86%	25.14%	E / NE / NW
186.4	192.8	6.4	206.3	1.71	19.17	5.30	75.57%	24.43%	NE / N / NW
216.3	222.3	6	206.7	1.91	18.97	5.10	72.72%	27.28%	NE / N / W
227.8	239.7	11.9	206.9	2.01	18.87	5.00	71.29%	28.71%	NW
245.5	252	6.5	207.1	2.11	18.77	4.90	69.87%	30.13%	NE / NW / W
254.5	270.8	16.3	207.1	2.11	18.77	4.90	69.87%	30.13%	NE / N / S
291.5	306.7	15.2	206.8	1.96	18.92	5.05	72.01%	27.99%	Circumferential
317.4	329.4	12	207.1	2.11	18.77	4.90	69.87%	30.13%	NE / N / NW / SW
380.3	387.1	6.8	207	2.06	18.82	4.95	70.58%	29.42%	Circumferential
431	438.5	7.5	206.9	2.01	18.87	5.00	71.29%	28.71%	NE / NW / SW
458.2	458.4	0.2	208.7	2.91	17.97	4.10	58.45%	41.55%	Circumferential
461	478.5	17.5	207.1	2.11	18.77	4.90	69.87%	30.13%	NE / NW
487.2	503.2	16	206.3	1.71	19.17	5.30	75.57%	24.43%	NW / SE
503.4	503.7	0.3	210.6	3.86	17.02	3.15	44.90%	55.10%	Circumferential
510.5	517.8	7.3	207.1	2.11	18.77	4.90	69.87%	30.13%	NE / NW / SW

*Table has been revised to reflect liner wall loss and remaining liner wall thicknesses

The area with the largest reported percentage of wall loss (30.62% at 503.4 m) is shown in Figure 12 on the following page.

The laser profilometry data reports which include both Excel CSV files and the inter-active laser software portion are provided separately from the main report due to file size.

The CCTV video footage is also included as part of the main report for the client's reference and evaluation. Russell NDE has provided Cameco representatives a Google Drive link to download the larger content folders.

CLICK HERE FOR REPORTS

Slick Line #1 Laser Data – Maximum Diameter Findings

The maximum diameter profile report below shows an area located at 503.3 meters with circumferential erosion on a segment joint.

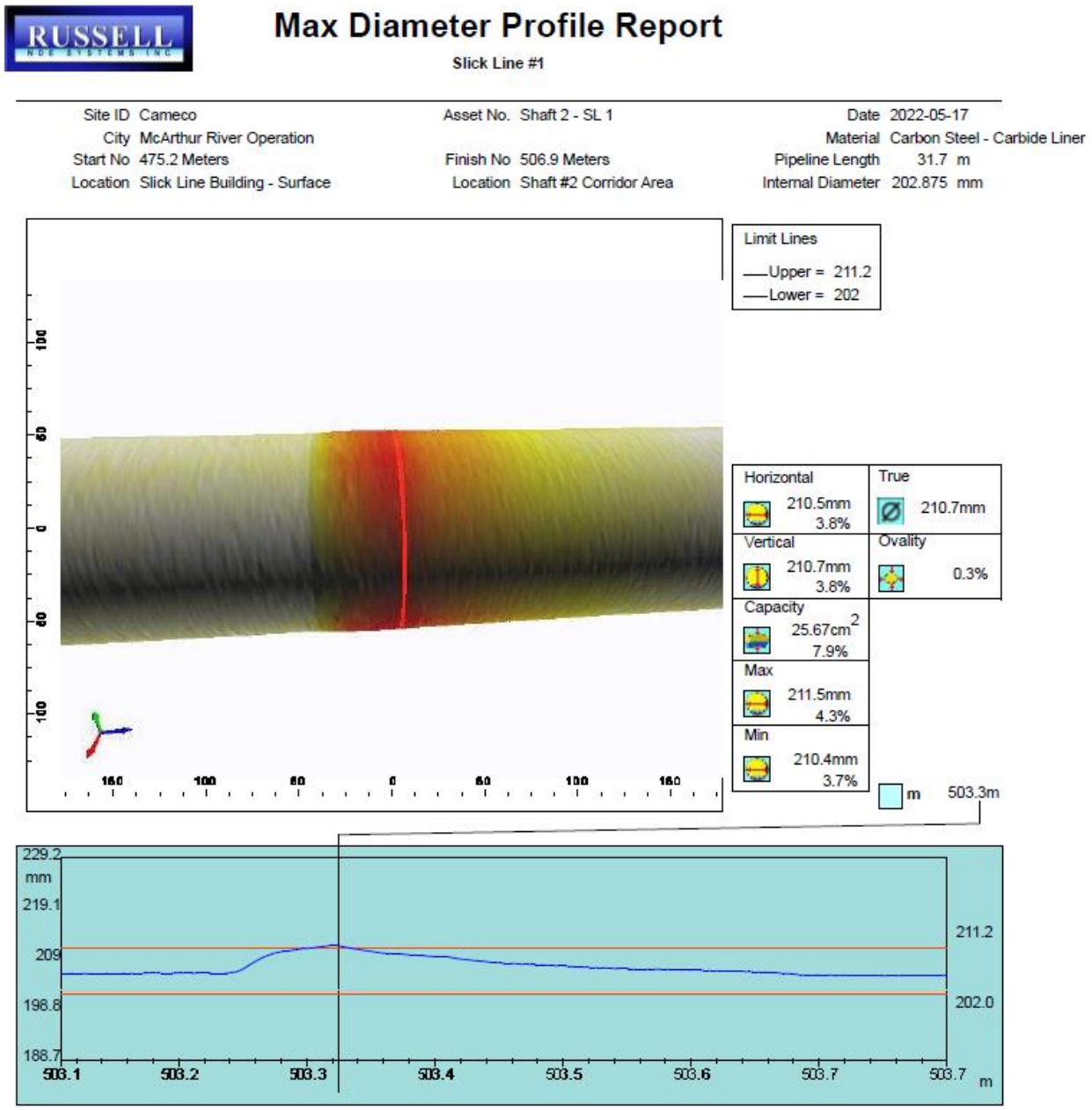
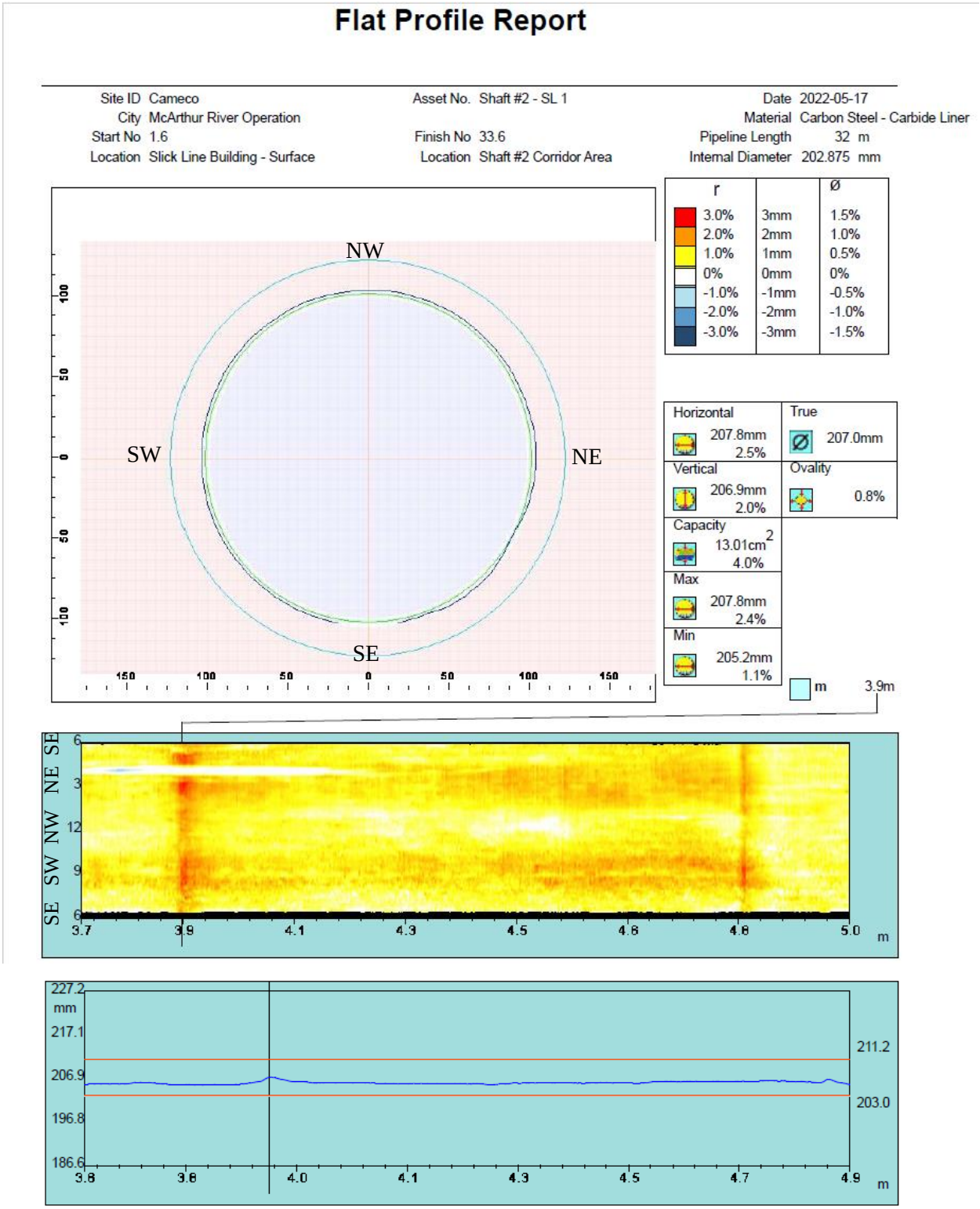
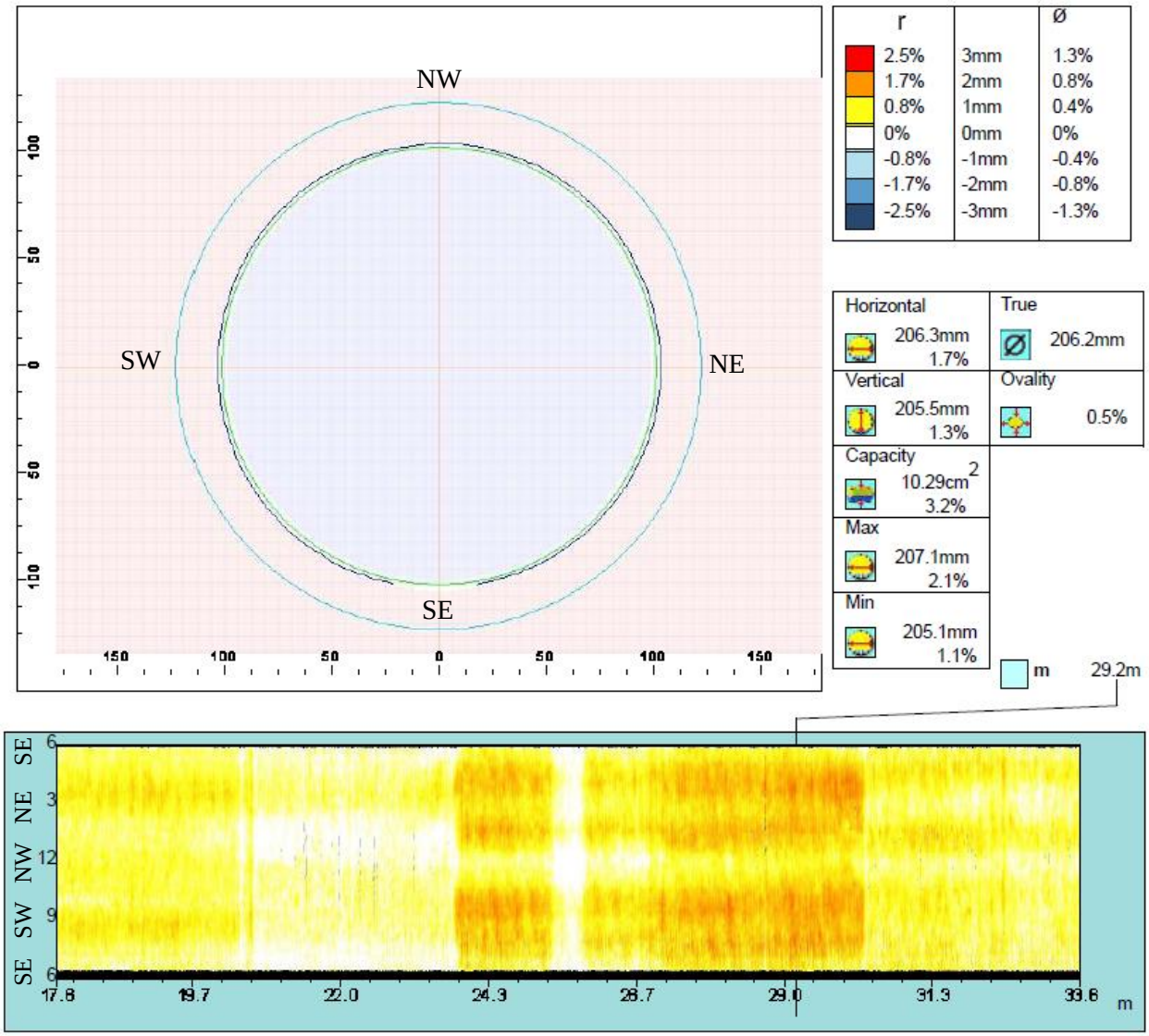


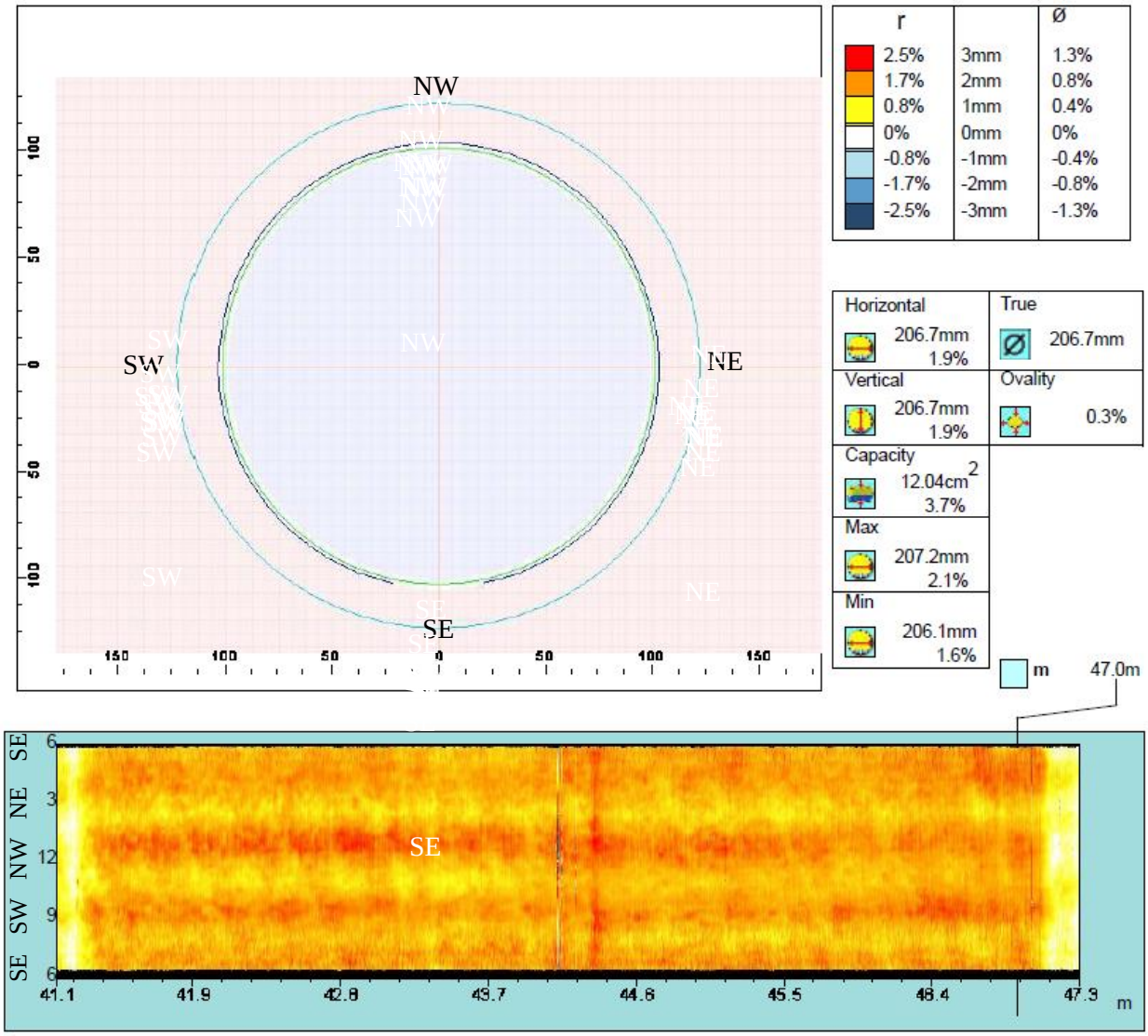
Figure 12. Profile report on the maximum internal diameter captured at 503.3 meters

Slick Line #1 – High Resolution Flat Profiles

The following captured flat profile graphs outline paths of the abrasion and erosion on the hard face carbide liner.




NW
SW
NE
SE
100
50
0
50
100
150 100 50 0 50 100 150
r
Ø
2.5% 3mm 1.3%
1.7% 2mm 0.8%
0.8% 1mm 0.4%
0% 0mm 0%
-0.8% -1mm -0.4%
-1.7% -2mm -0.8%
-2.5% -3mm -1.3%
Horizontal
206.3mm
1.7%
True
206.2mm
Vertical
205.5mm
1.3%
Ovality
0.5%
Capacity
10.29cm2
3.2%
Max
207.1mm
2.1%
Min
205.1mm
1.1%
m
29.2m
SE
NE
NW
SW
SE
6
3
12
9
6
17.8 19.7 22.0 24.3 26.7 29.0 31.3 33.6
m


NW
SW
NE
SE
100
50
0
50
100
150
100
50
0
50
100
150
r
Ø
2.5%
1.7%
0.8%
0%
-0.8%
-1.7%
-2.5%
3mm
2mm
1mm
0mm
-1mm
-2mm
-3mm
1.3%
0.8%
0.4%
0%
-0.4%
-0.8%
-1.3%
Horizontal
206.7mm
1.9%
True
206.7mm
Vertical
206.7mm
1.9%
Ovality
0.3%
Capacity
12.04cm2
3.7%
Max
207.2mm
2.1%
Min
206.1mm
1.6%
m
47.0m
SE
NE
NW
SW
SE
6
3
12
9
6
SE
41.1
41.9
42.8
43.7
44.6
45.5
46.4
47.3
m

PICA
Pipeline Inspection and Condition Analysis Corporation

Laser Profilometry Findings Summary: Slick Line #2

The laser profiler scanned a total distance from the surface opening past the flange to the bottom extent of the slick inside the mine corridor at 528.4 meters

The over-all average of the pipe internal diameter with the carbide liner when analyzed through the laser software ranged from 205.4mm to 208.1mm compared to the baseline ID input of 202.875mm. The erosion pattern that is occurring within the pipe from the transportation of concrete shows the erosion signature is more circumferential with wear than isolated linear indications of wear.

The following chart outlines the more severe erosion areas noted, recording the start and end points for each of these sections. The profiled cross-sectional measurements of the pipe internal diameter with liner, including estimated remaining liner wall thickness, are reported.

Scan Start Point (m)	Scan End Point (m)	Scan Distance (m)	Max ID (mm)	Wall Loss (mm)	Total Estimated Remaining Wall (mm)	Estimated Remaining Liner (mm)	% Rem Liner	% Liner Wall Loss	Wall Loss Orientation
33.4	50.7	17.3	206.3	1.71	19.17	5.30	75.57%	24.43%	SW / NW / E
56.2	83.4	27.2	206.2	1.66	19.22	5.35	76.29%	23.71%	W / NW / NE
107.1	109.8	2.7	206.6	1.86	19.02	5.15	73.43%	26.57%	SW / NE
124.5	141.6	17.1	206.4	1.76	19.12	5.25	74.86%	25.14%	W / NE
147.8	153.7	5.9	206.5	1.81	19.07	5.20	74.15%	25.85%	S / NW / E
171.2	182.9	11.7	206.8	1.96	18.92	5.05	72.01%	27.99%	Circumferential
225.9	256.1	30.2	206.2	1.66	19.22	5.35	76.29%	23.71%	S / N
262.5	268.8	6.3	206.4	1.76	19.12	5.25	74.86%	25.14%	SW / NE
275.4	281.5	6.1	207	2.06	18.82	4.95	70.58%	29.42%	SW / NE
301.1	307	5.9	206.4	1.76	19.12	5.25	74.86%	25.14%	SW / NE
331.7	344.1	12.4	206.9	2.01	18.87	5.00	71.29%	28.71%	E / S
363.7	391.6	27.9	206.6	1.86	19.02	5.15	73.43%	26.57%	SW / NE
431.3	437.8	6.5	206.3	1.71	19.17	5.30	75.57%	24.43%	NW / E / SW
452	459	7	206.7	1.91	18.97	5.10	72.72%	27.28%	Circumferential
520.3	527.6	7.3	207.4	2.26	18.62	4.75	67.73%	32.27%	NE / SW

*Table has been revised to reflect liner wall loss and remaining liner wall thicknesses

The laser profilometry data reports which includes both Excel CSV files and the inter-active laser software portion are provided separately from the main report due to file size.

The CCTV video footage is also included as part of the main report for the client's reference and evaluation.

Russell NDE has provided client representatives a Google Drive link to download the larger content folders.

PICA
Pipeline Inspection and Condition Analysis Corporation

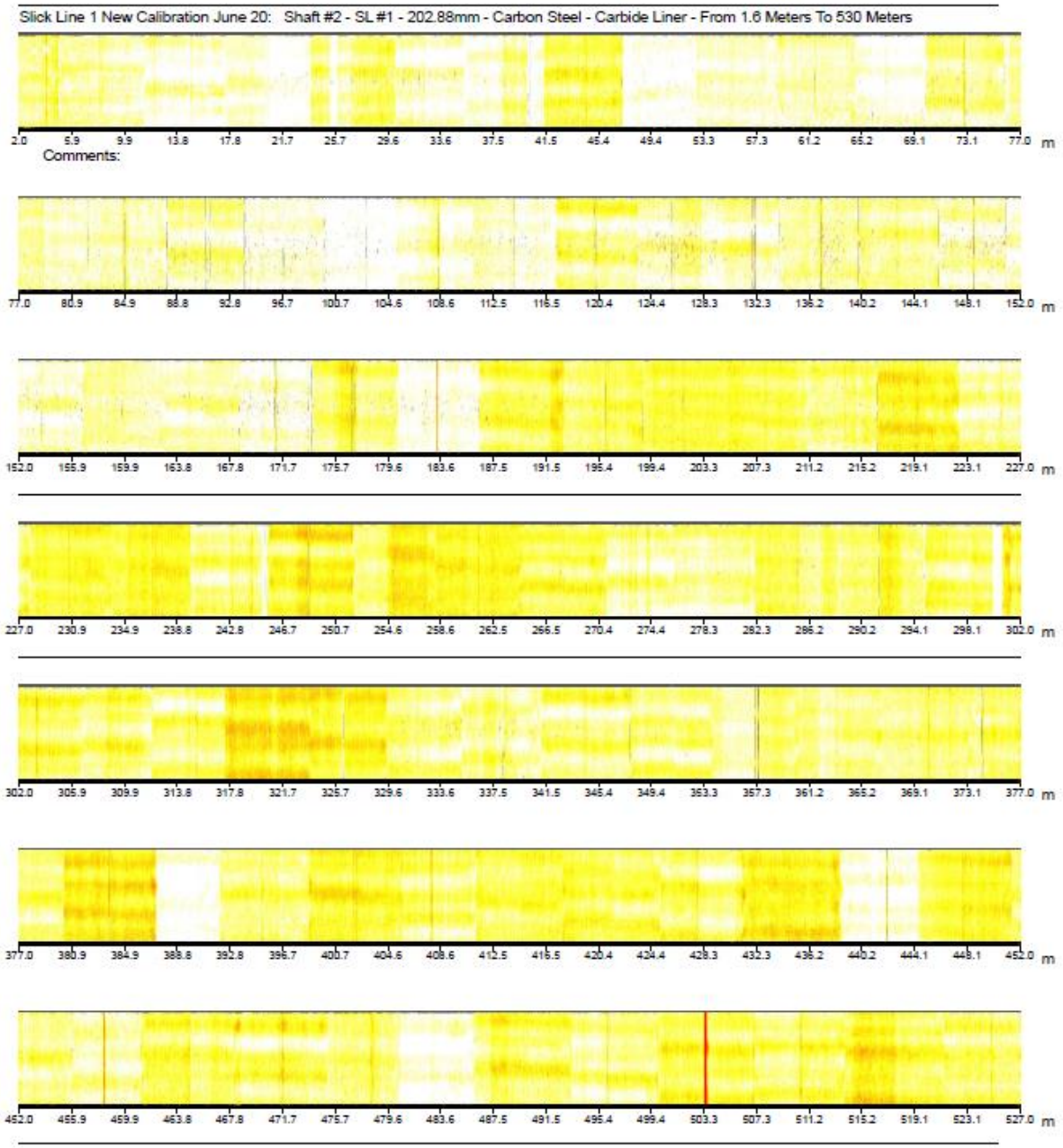
Appendix 3: Laser Profilometry Reports – Slick Lines #1 & #2

Contents

Laser Profilometry 530 Meter Project Overview Snapshot – Slick Line #1
Slick Line #1 Maximum Diameter Summary Report
Slick Line #1 Median Diameter Summary Report

Laser Profilometry 530 Meter Project Overview Snapshot – Slick Line #2
Slick Line #2 Maximum Diameter Summary Report
Slick Line #2 Median Diameter Summary Report

Slick Line #1 Unfolded Snapshot Profile



Light to darker shades (yellow → orange → red) represent increase of the pipe internal diameter with the hard facing liner

Slick Line #1 Median & Max Diameter Summary Reports

RUSSELL NDE SYSTEMS INC

Median Diameter Summary Report

Slick Line #1

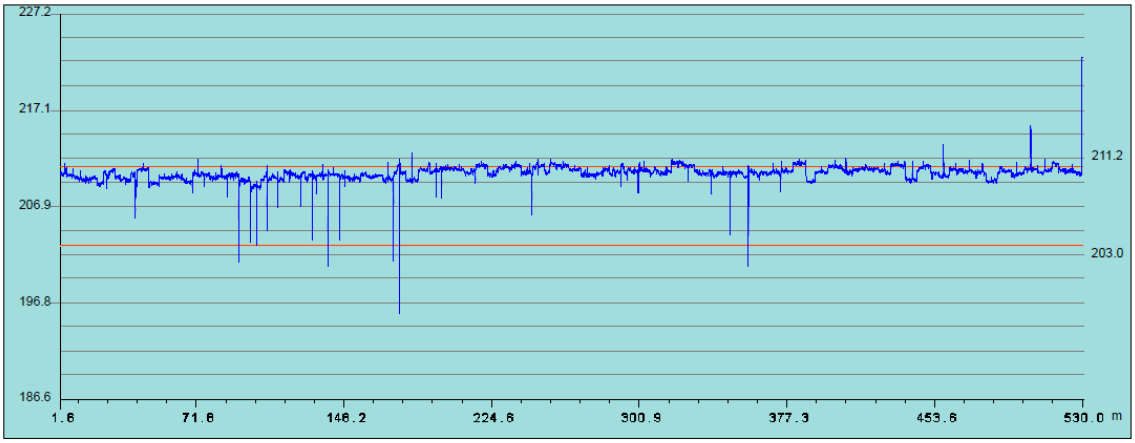
Site ID	Cameco	Asset No.	Shaft 2 - SL 1	Date	2022-05-17
City	McArthur River Operation			Material	Carbon Steel - Carbide Liner
Start No	1.6 Meters	Finish No	530 Meters	Pipeline Length	528.5 m
Location	Slick Line Building - Surface	Location	Shaft #2 Area	Internal Diameter	202.875 mm

Comments

Summary length - True Internal Diameter Output

Limit Lines
Upper limit = 211.2
Lower Limit= 203

mm 90% - Fractile: 211.3mm, Exceeded limits: 13.6%



PROFILER Russell NDE Systems Inc. Copyright 2019 Page 1/1

RUSSELL NDE SYSTEMS INC

Max Diameter Summary Report

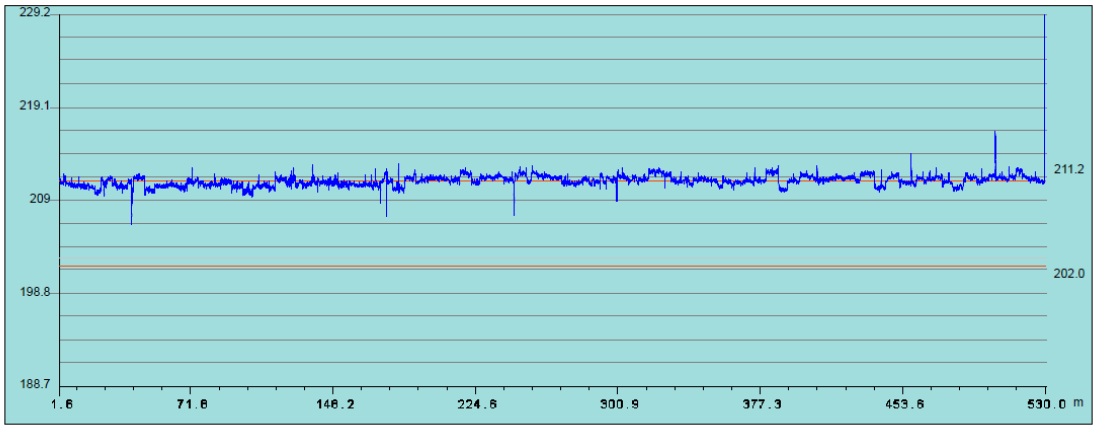
Site ID	Cameco	Asset No.	Shaft 2 - SL 1	Date	2022-05-17
City	McArthur River Operation			Material	Carbon Steel - Carbide Liner
Start No	1.6 Meters	Finish No	530 Meters	Pipeline Length	528.5 m
Location	Slick Line Building - Surface	Location	Shaft #2 Area	Internal Diameter	202.875 mm

Comments

Summary length - Maximum Diameter Output

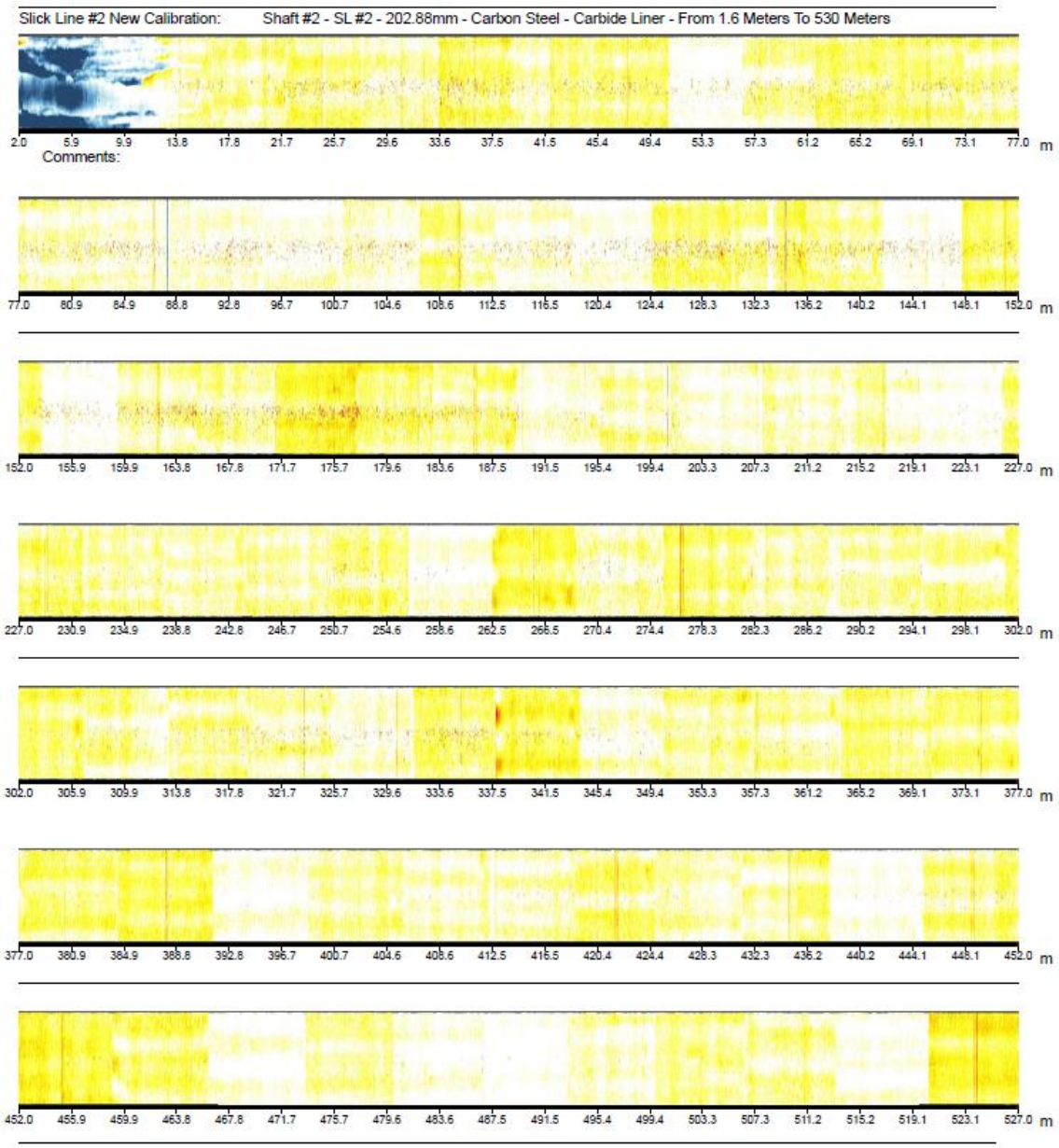
Limit Lines
Upper limit = 211.2
Lower Limit= 202

mm 90% - Fractile: 211.9mm, Exceeded limits: 50.9%



PROFILER Russell NDE Systems Inc. Ph:(780) 468-6800 Copyright 2019 Page 1/1 Printed: 2022-06-01

Slick Line #2 Unfolded Snapshot Profile



Light to darker shades (yellow → orange → red) represent increase of the pipe internal diameter with the hard facing liner

Slick Line #2 Median & Max Diameter Summary Reports

RUSSELL NDE SYSTEMS INC

Median Diameter Summary Report

Slick Line #2

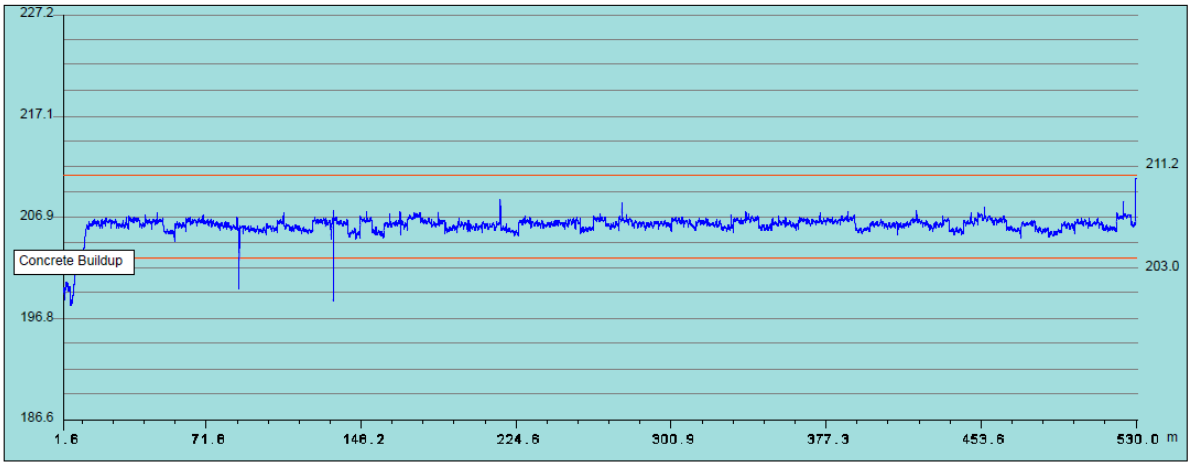
Site ID	Cameco	Asset No.	Shaft 2 SL 2	Date	2022-05-18
City	McArthur River Operation			Material	Carbon Steel - Carbide Liner
Start No	1.6 Meters	Finish No	530 Meters	Pipeline Length	528.4 m
Location	Slick LIne Building	Location	Mine Shaft 2 Area	Internal Diameter	202.875 mm

Comments

0-15 meters = Concrete remaining on pipe wall after pigging

Limit Lines
Upper limit = 211.2
Lower Limit= 203

mm 90% - Fractile: 206.9mm, Exceeded limits: 1.6%



RUSSELL NDE SYSTEMS INC

Max Diameter Summary Report

Slick Line #2

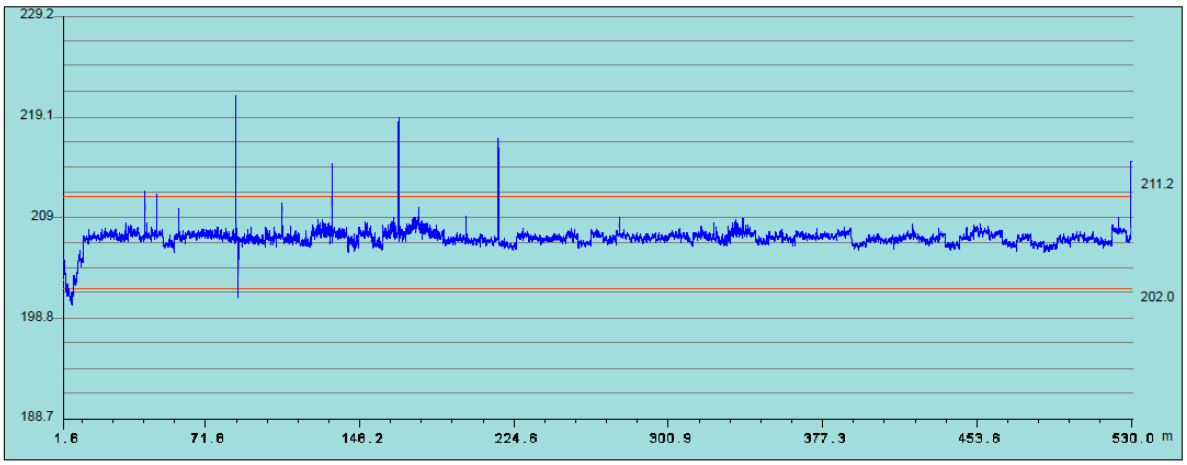
Site ID	Cameco	Asset No.	Shaft 2 SL 2	Date	2022-05-18
City	McArthur River Operation			Material	Carbon Steel - Carbide Liner
Start No	1.6 Meters	Finish No	530 Meters	Pipeline Length	528.4 m
Location	Slick LIne Building	Location	Mine Shaft 2 Area	Internal Diameter	202.875 mm

Comments

0-15 meters = Concrete remaining on pipe wall after pigging

Limit Lines
Upper limit = 211.2
Lower Limit= 202

mm 90% - Fractile: 207.7mm, Exceeded limits: 0.8%



PROFILER

Russell NDE Systems Inc.
Ph:(780) 468-6800

Page 1/1
Printed: 2022-06-01

PICA
Pipeline Inspection and Condition Analysis Corporation

Appendix 4: Laser Profilometry Background

Laser Profilometry Technique

Standard practice in accordance with ASTM F3080-17a cross-sectional measurements.

When used with a delivery system (down-hole tool), the camera and laser projection shall be advanced at a speed of no more than 30 ft. per minute. The camera and laser are set centered in the pipe with the lights turned off and the laser ring line projected on the pipe wall surface.

The laser ring while viewed on the monitor shall take up no less than 60% and no greater than 80% of the viewing screen.

The distance counter of the down-hole laser tool winch system is set to 1.6 meters and digital recording begins.

Upon completion of inspection, a measuring calibration tool is fixed to the end of the laser wand and recorded in 5 second intervals viewing the horizontal and vertical plane of the calibration tool set measurement distances. This procedure calibrates the laser for accuracy.

The laser software acquires time-stamped media files from the laser inspection. A unique camera lens FEC (fisheye correction) file is recorded to display the type of camera used which calculates the camera lens Field of View (FoV) / Field Depth (FoD), two points of two sized measurements with distances from the lens and a lens correction chart. The FEC file is what provides precision along with the calibration tool to provide linear measurements to within 0.04-inch (1 mm) accuracy.

Method

Camera Type:	Modified GoPro Hero Black Session - GP-FEC
Profiler Type:	Redzone LAS50 single laser head configuration
Format:	MPG4 /H264
Digital Recording:	180 circumferential points per frame, 1 frame per 0.314-inches (49,482 frames for 528.4 meters.)
Work Duration:	2 Days
Lens distortion software correction:	GPFEC applied.
Profiling Method:	Camera lights on (recorded for visual analysis) – forward. Camera lights off (recorded for automated laser analysis) - back.
Ovality formula:	Ovality % (q) = 100 x Maximum Internal Diameter minus Mean Internal Diameter divided by Mean Internal Diameter

Note:

The ovality from milled pipe rolled out from manufacturing always have a low percentage of out-of-roundness /ovality. Typically, the percentage of out-of-roundness on pipe from the mill range from 0.2% - 0.5%.