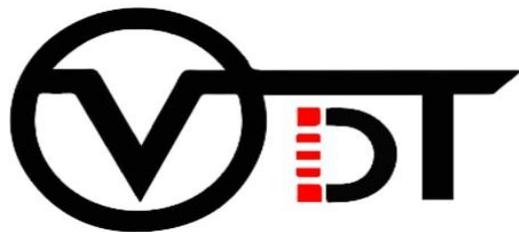


Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
Pipeline Name- 14" RT - RD, Water Injection Pipeline  
Pipeline Length- 10.64 Km



**VEDANTA LIMITED**  
**FINAL INSPECTION REPORT**  
**FOR**  
**THE IN-LINE INSPECTION OF THE**  
**14" RT TO RD, WATER INJECTION PIPELINE , 10.64 km**





Revision	Date	Description
0	29.03.2025	Initial Release

Item	Name	Title	Signatures	Date
Prepared by	Abhinav Singh	Data Analyst		29.03.2025
Reviewed by	Fazal Khan	Manager (DA)		29.03.2025
Approved by	Rakesh Kant	Project Manager		29.03.2025

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## Section 1. Introduction

This report gives a summary of the EGP and MFL tool inspection of the 14 inch RT to RD, 10.64 km, Water Injection Pipeline. Which was conducted by VDT Pipeline Integrity Solutions Private Limited for VEDANTA LIMITED. The EGP inspection was performed on 14.11.2024 and MFL inspection run #2 was performed on 02.03.2025.

Prior to the inline inspection runs, the pipeline was cleaned using the Cup pig cleaning tool. The amount of debris recovered from the pipeline after the last cleaning run was negligible, so it was acceptable to proceed with further pigging programs.

A total of **1022** metal loss anomalies, were detected and recorded during the inspection.

For all metal loss anomalies, the ASME B31G anomaly interaction criteria have been applied.

Mill/manufacturing anomalies have been present in the pipeline since it was commissioned. Consequently, it is to be noted that the sizing accuracy specified is not applicable to these anomalies.

**Section 1** of this final inspection report identifies the details of the subject pipeline and provides the summary and assessment of the inspection findings.

**Section 2** provides information on the inspection operation, giving details of all inspection runs performed and the key personnel involved in the survey

**Section 3** provides detailed analysis and reporting on the severe features identified according to the feature selection rules.

**Section 4** provides an overview of the pipeline condition, presenting graphical information designed to summarize the detected metal loss features.

**Section 5** contains geometric anomaly report, reference point marker list, pipeline feature list, and comprehensive pipeline tally.

VDT would hereby like to thank Vedanta Private Limited for their assistance and cooperation during the course of the project.

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## 1.1 PIPELINE DATA

This information is based on the pipeline questionnaire supplied by Vedanta Limited prior to the inspection operation. These values have been used for defect assessment in this final report.

<b>Pipeline name</b>	14" RT - RD, Water Injection Pipeline
<b>Launcher</b>	Ravva Terminal (RT)
<b>Receiver</b>	Ravva Despatch (RD)
<b>Diameter</b>	14 inch
<b>Length</b>	10.64 km
<b>Steel grade</b>	API 5L X60
<b>Nominal Wall Thickness</b>	14.7 mm
<b>Design Pressure</b>	84.5 kg/cm <sup>2</sup>
<b>MAOP</b>	84.5 kg/cm <sup>2</sup>
<b>Product</b>	Water
<b>Year of Commission</b>	1996

Where a wall thickness differs from the supplied questionnaire information, its values is estimated from the magnetic field strength, to the nearest API value.

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## 1.2 Summary and statistical data

This section provides a summary of the inspection operation conducted for Vedanta limited in 14" Ravva Terminal (RT) to Ravva Despatch (RD), 10.64 km Water Injection pipeline.

The inspection survey consisted of gauging, cleaning and inspection runs of the pipeline. The results presented in this report are compiled from the following inspection run:

### EGP Inspection run details:

Run number	1
Launched	10:08 HRS, 14 November 2024
Received	13:15 HRS, 14 November 2024
Data Received at Head office	15 November 2024

### EGP Tool Condition after Inspection run:

Disc/Cup Wear	Negligible
Quantity of recovered debris	2 Minutes black water
Type of recovered debris	Black Water
Tool damage	No Damage

### EGP Tool Condition after Inspection run

Start of Data Recording	Reducer at RT
End of Data Recording	Reducer at RD
Total Recorded length	10.610 Km
Average Speed	0.9 m/s

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### MFL Inspection run details:

Run number	1
Launched	08:24 HRS, 12 November 2024
Received	11:04 HRS, 12 November 2024
Data Received at Head office	15 November 2024

### MFL Tool Condition after Inspection run:

Disc/Cup Wear	Negligible
Quantity of recovered debris	3 Minutes black water
Type of recovered debris	Black Water
Tool damage	No Damage

**NOTE:** The run has failed because the data could not be retrieved from the SD card. A re-run was recommended after checking the issue.

---

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### MFL Inspection run details:

Run Number	2
Launching Details	12:41 HRS, 02 MARCH 2025
Receiving Details	16:23 HRS, 02 MARCH 2025
Data Received at Head office	03 MARCH 2025

### MFL Tool Condition after Inspection run:

Disc/Cup Wear	Negligible
Quantity of recovered debris	2 Minutes black water
Type of recovered debris	Black Water
Tool damage	No Damage

### MFL Tool Condition after Inspection run

Start of Data Recording	Reducer at RT
End of Data Recording	Reducer at RD
Total Recorded length	10.610 Km
Average Speed	0.8 m/s
Magnetization Level	Acceptable

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Detection thresholds applied in accordance with pipe manufacturing standards. Values of detection and reporting thresholds for metal loss anomalies and geometric anomalies are given in the table below.

Anomaly description	Detection threshold	Reporting threshold
Metal loss anomalies	Length $\geq$ 6 mm Width $\geq$ 6 mm Depth $\geq$ 6% WT	Depth $\geq$ 10% WT

The following table summarizes all the detected anomalies by depth and surface location and depth exceeding a threshold of 10% of the reference wall thickness:

Depth	Internal anomalies	External anomalies
70% $\leq$ metal loss < 80%	--	--
60% $\leq$ metal loss < 70%	--	--
50% $\leq$ metal loss < 60%	--	--
40% $\leq$ metal loss < 50%	--	--
30% < metal loss < 40%	-	--
20% < metal loss < 30%	02	01
10% < metal loss < 20%	672	08
metal loss < 10%	317	22
<b>Total Number of Anomalies</b>	<b>991</b>	<b>31</b>

The significance of each corrosion metal loss anomaly has been assessed using the pressure sentencing formulae based on ASME B31G. As per the standard, anomalies with a peak depth of <10% and  $\geq$  80% have been omitted from the calculation.

The following table summarizes the anomalies in the ERF threshold groups:

ERF	ASME B31G	
	Internal anomalies	External anomalies
ERF $\leq$ 0.4	991	31
0.4 $\leq$ ERF < 0.6	--	--
0.6 $\leq$ ERF < 0.8	--	--
0.8 $\leq$ ERF < 1.0	--	--
ERF $\geq$ 1.0	--	--
<b>Total</b>	<b>991</b>	<b>31</b>

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The following page contains a comprehensive statistical breakdown of all features identified in the inspection survey.

Total number of metal loss anomalies	1022
Total number of internal metal loss anomalies	991
Number of corrosion anomalies	117
Number of manufacturing anomalies	874
Total number of external metal loss anomalies	31
Number of corrosion anomalies	0
Number of manufacturing anomalies	31
Total number of general anomalies	330
Total number of pitting	92
Total number of pinhole	--
Total number of grooves (axial and circumferential)	533
Total number of slots (axial and circumferential)	67
Total number of laminations	--
Total number of dents	--
Total number of buckles	--
Total number of Ovalities	--
Total number of girth weld anomalies	--
Total number of longitudinal welds anomalies	--
Total number of spiral weld anomalies	--
Total number of pipe mill anomalies	--
Total number of magnetic markers	03
Total number of bends	16
Total number of attachments	07
Total number of CPP	--
Total number of casings	--
Total number of reference points	06
Total number of valves	03
Total number of debris	--
Total number of off takes	--
Number of taps	--
Number of flow tees	02
Total number of sleeves	--
Total number of flanges	10
Total number of supports	14

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### 1.3 Assessment of inspection results

The pipeline condition can be summarized as follows:

1. The 14" Ravva Terminal (RT) to Ravva Despatch (RD), 10.64 km pipeline is seamless pipe (WT 14.7 mm, steel grade API 5L X60), the Design pressure and the MAOP is 84.5 kg/cm<sup>2</sup>.
2. The inspection operation was completed by VDT on 02.03.2025, using the MFL tool.
3. The total number of **1022** metal loss anomalies with max depth **28%** was reported.
4. There are **No** metal loss features reported with a peak depth of  $\geq 80\%$  and **No** metal loss features with an ERF  $\geq 1.0$ .
5. It is recommended that the future condition of the pipeline be monitored by further inspection schedules, taking into account the operational conditions of the pipeline and relevant company codes of practice or national regulatory direction.

This qualitative assessment is based on, and limited to, our IPS results only, and does not include any numerical parameters (corrosion growth rates, anodic potential, etc.) other than the IPS results such as input design and operational parameters provided by Vedanta Limited.

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## Section 2. Operational data

The In-line inspection (ILI) of the 14" Ravva Terminal (RT) to Ravva Despatch (RD), 10.64 km pipeline included the following activities:

- Tool preparation at VDT central facility, Noida sec-57;
- Mobilization to the site;
- Pipeline gauging with VDT Gauge tool;
- Pipeline cleaning with VDT cleaning tool;
- Pipeline inspection with the VDT MFL tool;
- Preparation and submission of a preliminary inspection report;
- Preparation and submission of final inspection report.

The inspection tool was calibrated and configured to suit the operating parameters of the pipeline.

The key personnel in this survey were:

- Abhinav Singh, Data Analyst;
- Fazal Khan, Manager (DA);
- Rakesh Kant, Project Manager.

The ILI consisted of one 1 Gauge Pig, 5 cleaning Pig, 1 EGP and 2 MFL individual run details are presented in the following subsections.

## 2.1 Gauge tool run

A tool with one gauge plate was run to ensure there were no internal diameter (ID) reductions or other obstructions in the pipeline which could impede the inspection activities. The gauge plates are designed to pass smoothly through heavy wall sections (bends/valves, etc.) without touching the pipe wall, to indicate ID reductions above acceptable limits only.

The gauge tool is designed to perform three functions:

1. Verification of bend radius;
2. Identification of dents/obstructions;
3. Verification of wall thickness changes/ID reductions.

The details of the gauge tool run are summarized in the table given below:

Run no.	Average tool speed	Launched		Received		Tool condition		Debris
		Date	Time	Date	Time	Gauge plate	Bend plate	Product
01	1.06 m/s	27.08.24	09:29	27.08.24	12:15	300 mm	No Damage	05 MINUTES BLACK WATER BEFORE TOOL RECIEVING

**Note-**The gauge tool speed is not measured on board, but calculated based on the time taken to complete the run.

A copy of the gauge completion certificate and gauge run report are contained in Appendix A of this report.



## 2.2 Cleaning program

The cleaning program utilized a Cup pigs, Bi-Di pigs and magnetic brush cleaning tool (MBCT). The program was completed on 29<sup>th</sup> August 2024. Details of the cleaning run are summarized in the following table:

RUN DATA									
Run no.	Pig type	PU OD (Before Run)			Launched		Received		Debris
		Cup	GD	SD	Date	Time	Date	Time	Product
1	Cup Pig	356	N/A	N/A	27.08.24	15:27	27.08.24	18:10	02 MINUTES BLACK WATER BEFORE TOOL RECIEVING
2	Bi-Di with two Brush and Magnet Pig	N/A	310	356	28.08.24	09:27	28.08.24	12:10	02 MINUTES BLACK WATER BEFORE TOOL RECIEVING
3	Cup Pig with two Brush and Magnet	356	N/A	N/A	28.08.24	14:31	28.08.24	17:15	02 MINUTES BLACK WATER BEFORE TOOL RECIEVING
4	Bi-Di Pig with two Brush	N/A	310	356	29.08.24	07:42	29.08.24	10:35	02 MINUTES BLACK WATER BEFORE TOOL RECIEVING

The pipeline was satisfactorily cleaned and approved to conduct the MFL inspection. A copy of the cleaning report is contained in Appendix A of this report.

The cleaning program utilized a Cup pig. The program was completed on 02<sup>th</sup> March 2025. Details of the cleaning run are summarized in the following table:

RUN DATA									
Run no.	Pig type	PU OD (Before Run)			Launched		Received		Debris
		Cup	GD	SD	Date	Time	Date	Time	Amount Product
1	Cup Pig	355	N/A	N/A	02.03.2025	07:20	02.03.2025	10:40	07 MINUTES BLACK WATER BEFORE TOOL RECIEVING

The pipeline was satisfactorily cleaned and approved to conduct the MFL inspection. A copy of the cleaning report is contained in Appendix A of this report.

## 2.3 EGP tool pigging survey

Details of the EGP tool inspection run are summarized in the table below:

Run no.	Average tool speed	Launched		Received		Tool condition		Debris
		Date	Time	Date	Time	Cups & discs	Sensors	Product
1	0.9 m/s	14.11.24	10:08	14.11.24	13:15	No Damage	No Damage	02 MINUTES BLACK WATER BEFORE TOOL RECEIVING

All EGP inspection operational specifications were met during the run.

The following operational conditions were observed during the inspection run:

<b>Average speed</b>	0.9 m/s
<b>Maximum speed</b>	1.0 m/s
<b>Minimum speed</b>	0.75 m/s
<b>Maximum pressure</b>	70.3 kg/cm <sup>2</sup>
<b>Temperature</b>	38 °C
<b>Run duration</b>	03 hour 07 minutes
<b>Recorded distance</b>	10.610 km

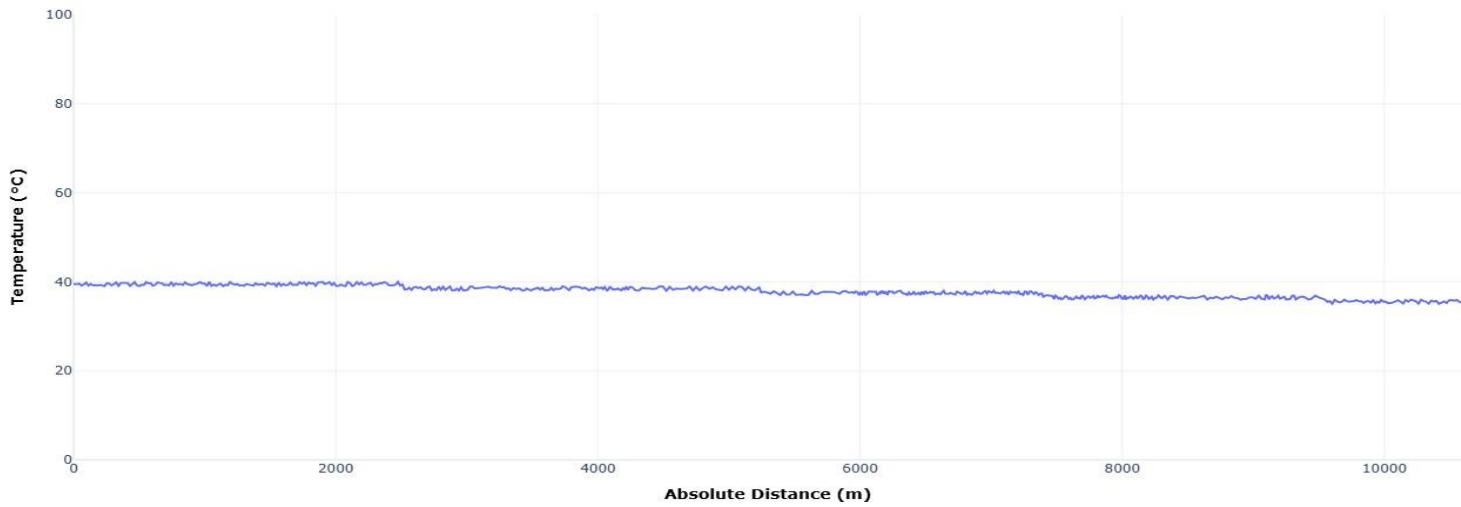
The run inspection data quality was checked on site and was found to meet VDT run acceptance criteria.

A copy of the EGP run report is contained in Appendix A of this report.

The temperature and sensor loss profiles are presented overleaf.

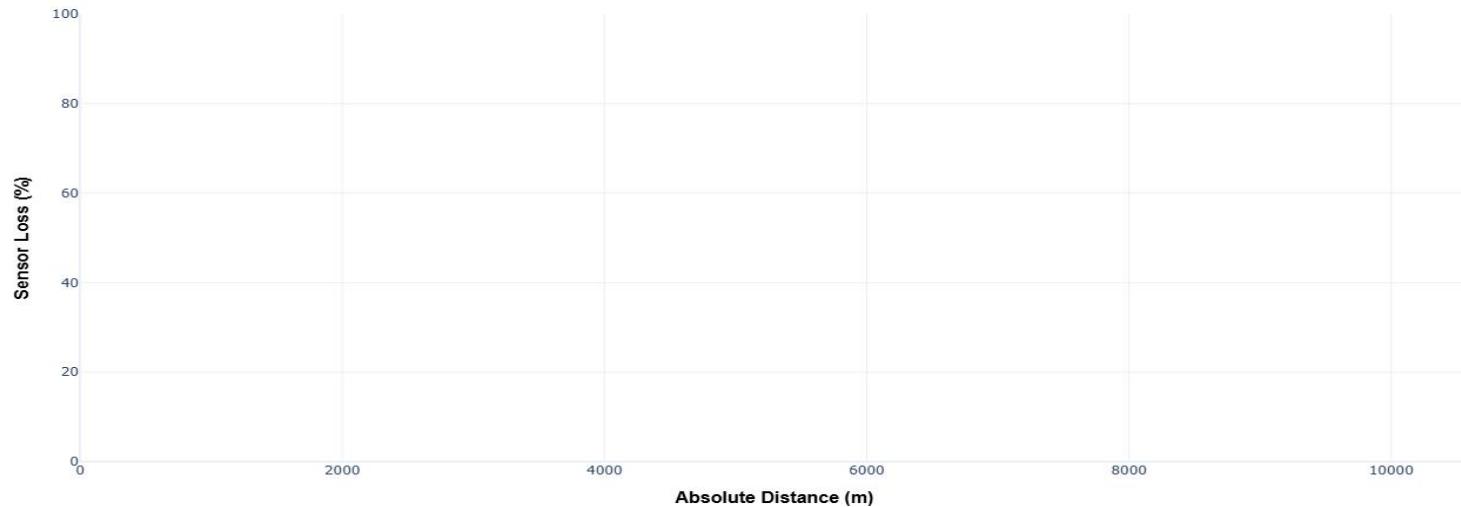
### 2.3.1 Temperature profile EGP Tool

**Temperature Level Profile**



### 2.3.2 Sensor Loss Profile EGP Tool

**Sensor Loss Profile**



## 2.4 MFL tool pigging survey

Details of the MFL tool inspection run are summarized in the table below:

Run no.	Average tool speed	Launched		Received		Tool condition		Debris
		Date	Time	Date	Time	Cups & discs	Sensors	Product
1	0.9 m/s	14.11.24	10:08	14.11.24	13:15	No Damage	No Damage	02 MINUTES BLACK WATER BEFORE TOOL RECEIVING

All MFL inspection operational specifications were met during the run.

The following operational conditions were observed during the inspection run:

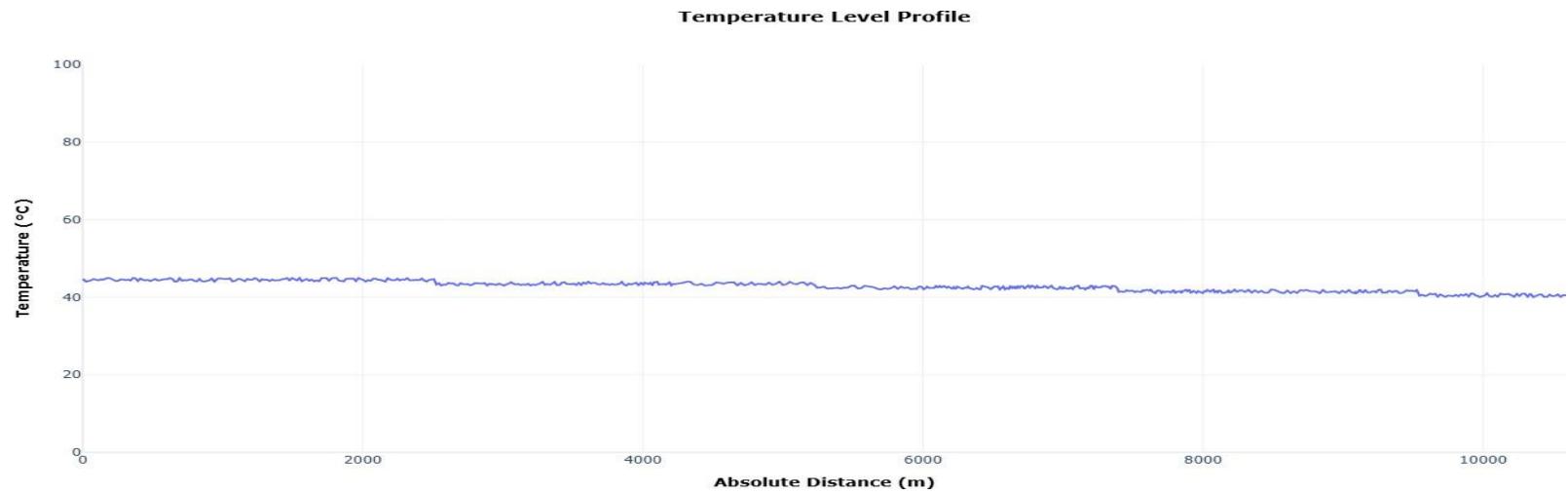
<b>Average speed</b>	0.8 m/s
<b>Maximum speed</b>	0.9 m/s
<b>Minimum speed</b>	0.65 m/s
<b>Maximum pressure</b>	70.2 kg/cm <sup>2</sup>
<b>Temperature</b>	42 °C
<b>Run duration</b>	03 hour 42 minutes
<b>Recorded distance</b>	10.610 km

The run inspection data quality was checked on site and was found to meet VDT run acceptance criteria.

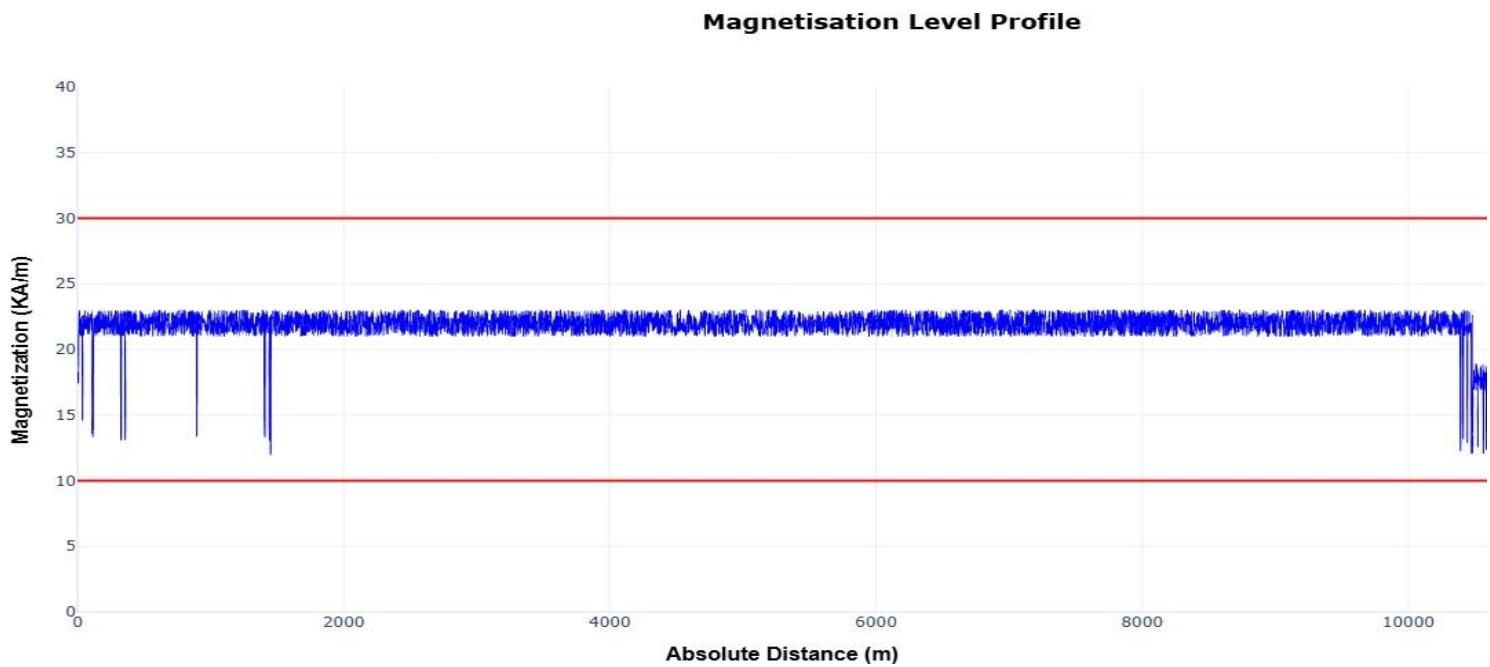
A copy of the MFL run report is contained in Appendix A of this report.

The temperature and sensor loss profiles are presented overleaf.

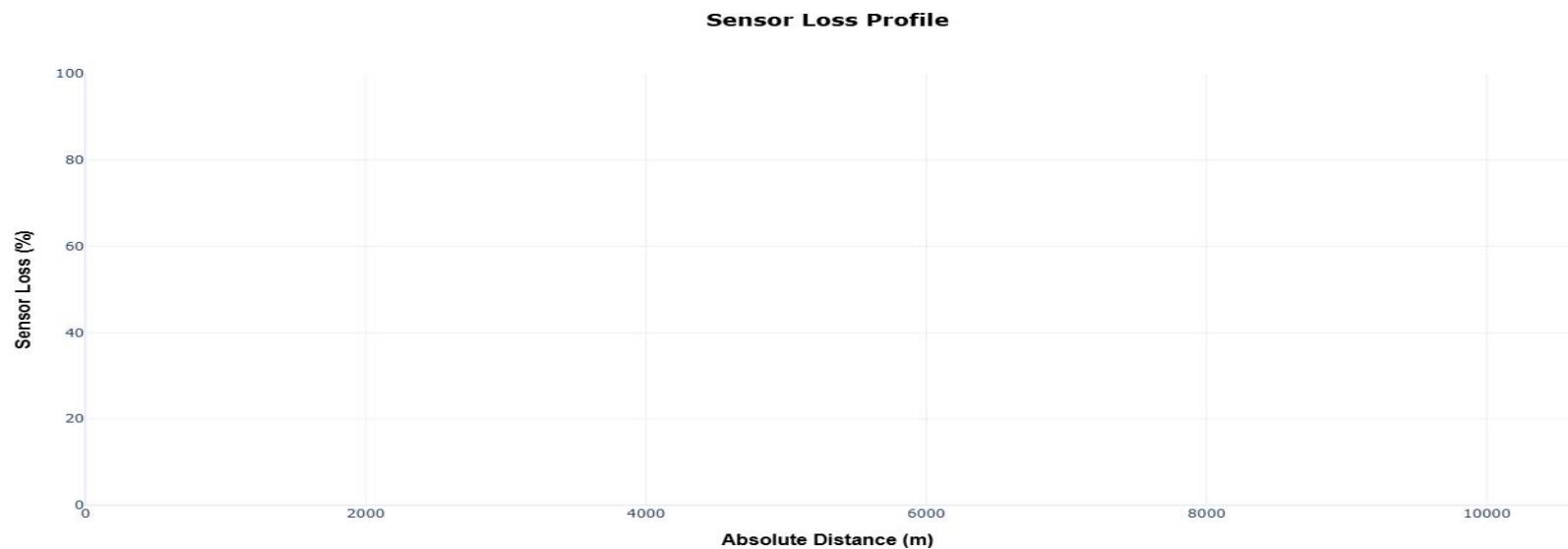
## 2.4.1 Temperature profile (MFL)



## 2.4.2 Magnetization level profile (MFL)



### 2.4.3 Sensor loss profile (MFL)



There is no sensor loss in MFL Tool.

## 2.5 Velocity profile:

The plot shows the velocity of the inspection tool during the inspection run.

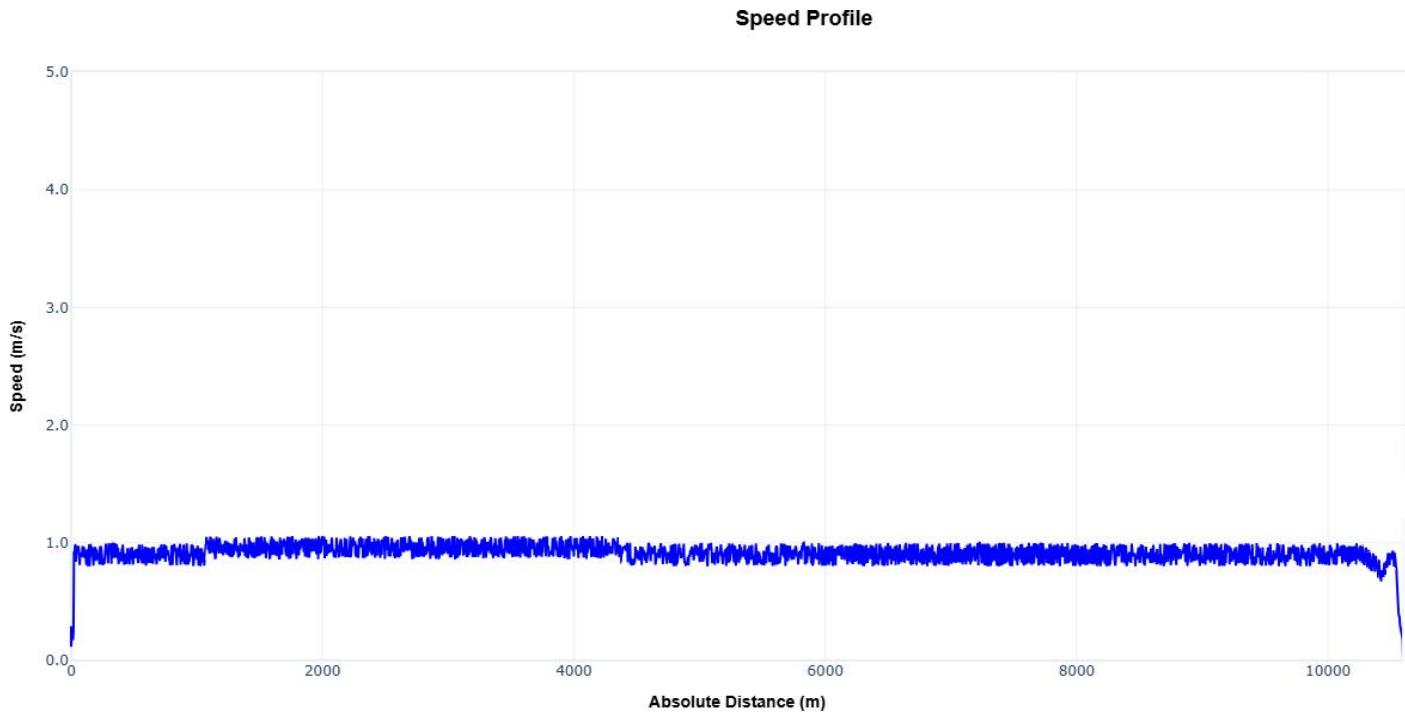
The acceptable velocity range for the EGP and MFL inspection tool is 0.3 – 3.0 m/s. If the tool specified maximum velocity then the exceeds the performance of the inspection can be degraded.

The average speed during the EGP inspection run was 0.9 m/s.

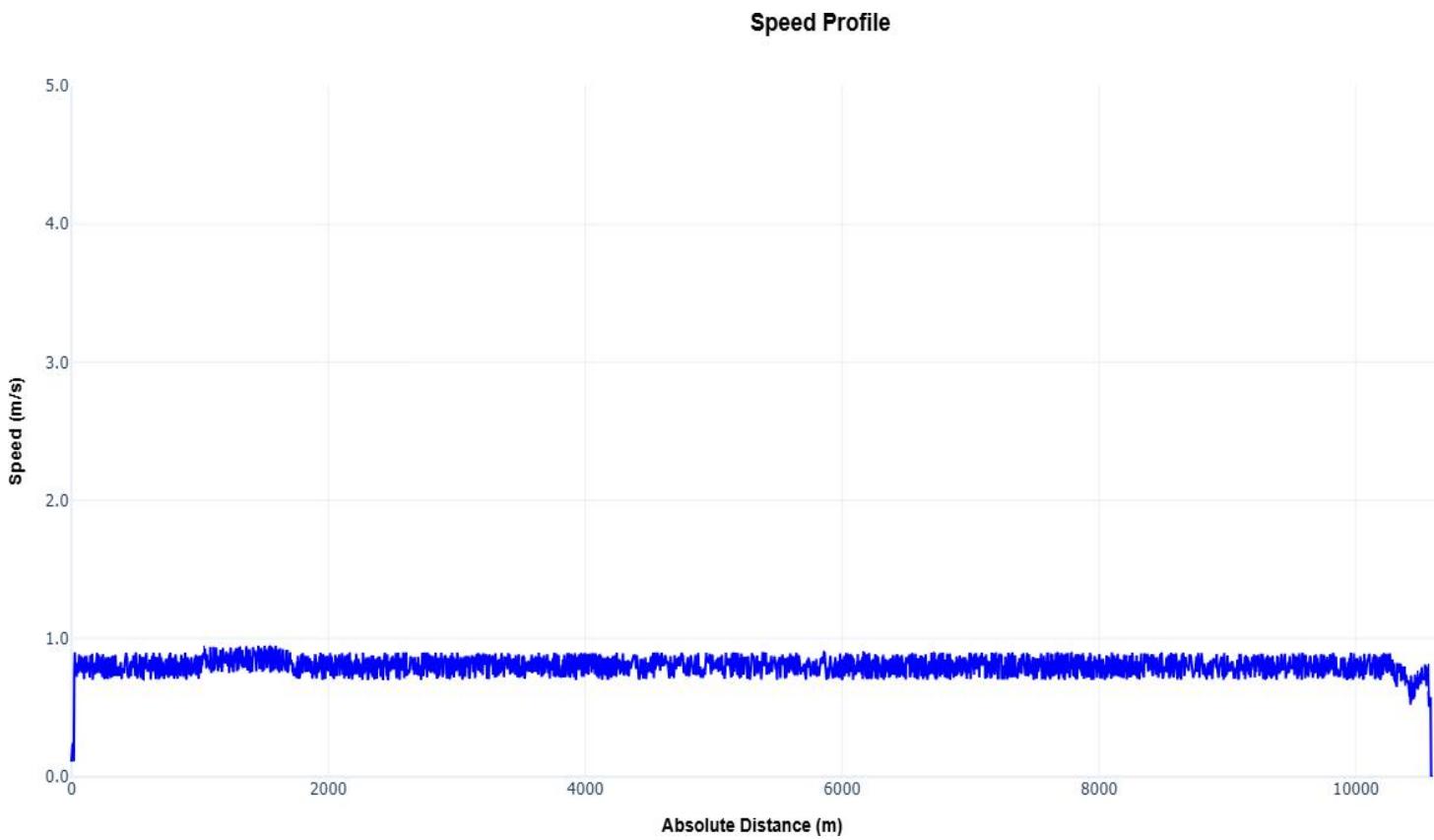
The average speed during the MFL inspection run was 0.8 m/s.

The velocity plots are provided overleaf.

### 2.5.1 EGP VELOCITY PROFILE



## 2.5.2 MFL VELOCITY PROFILE



### Section 3. Detailed feature report

The detailed feature report presents information on the **10** most severe metal loss anomalies that have been detected. These anomalies have been selected in accordance with the following feature selection rules:

**Rule 1** Features with ERF equals to or greater than 1.

**Rule 2** Features with peak depth equals to or greater than 80% wall loss.

**Rule 3** Features with ERF greater than 0.95 and less than 1.

**Rule 4** Features with peak depth  $\geq$  20% but less than 80% wall loss.

**Rule 5** Feature with axial length greater than 0.2 times of the diameter and with a peak Depth Greater than 0.1t.

Where a reported metal loss feature does not satisfy a specified priority rule, such features Will be identified with 'X' in the selection rule field.

The information is presented in two formats:

- Anomaly severity list
- Fully assessed feature sheets

### 3.1 Anomaly severity list

The anomaly severity list provides details of identified anomalies according to the feature selection rules.

The center line of the launch valve is taken as “zero” point of the pipeline log distance. The numbering of joints starts after the first launcher valve.

The anomaly severity list includes the following information:

- Feature number (S. No.)
- Absolute distance to start of reported anomaly from launch (m)
- Relative distance to the upstream girth weld to the start of the anomaly (m)
- Pipe ID
- Joint/Pipe length (m)
- Feature type per POF requirement
- Feature identification per POF requirement
- Dimension classification per POF requirement
- Orientation (o'clock)
- Axial length of reported anomaly (mm)
- Width of reported anomaly (mm)
- Peak depth of anomaly (%WT)
- Peak depth of anomaly (mm)
- Location on the pipe surface
- Calculated ERF value (ASME B31G)
- Calculated Psafe value (Bar) (ASME B31G)
- Latitude of anomaly
- Longitude of anomaly
- Comments if any concerning the anomaly

In accordance with ASME B31G standard, ERF values and the associated Psafe calculation have not been provided for those anomalies with a peak depth greater than 80% NWT or less than 10% NWT.

Details on anomaly descriptions and abbreviations possibly contained in this list can be found In Appendix C.

The anomaly severity list is presented overleaf.



### Anomaly Severity List

#### 14 inch RD to RT Water Injection Pipeline, 10.64 km

S L N O	Pipe Number	Abs. Distance (m)	Distance to U/S GW(m)	Pipe Length(m)	Feature Type	Feature Identification	Dimensions Classification	Orientatio n o' clock	WT (mm)	Length (mm)	Width (mm)	Depth (%) WT	Depth (mm)	severi ty	Location	ERF (ASME B31G)	Psafe (ASME B31G) kg/cm <sup>2</sup>	Comment
1	25	186.20	0.30	12.60	Metal Loss	MFG	CIGR	01:38	14.7	20	54	25	3.7	x	Internal	0.308	274.36	poss. Ext
2	61	603.29	11.67	12.60	Metal Loss	MFG	GENERAL	01:35	14.7	100	75	22	3.2	1	Internal	0.319	264.87	poss. Ext
3	76	781.21	0.98	12.60	Metal Loss	MFG	GENERAL	01:57	14.7	55	60	19	2.8	x	Internal	0.308	274.67	poss. Ext
4	136	1477.39	1.05	12.00	Metal Loss	MFG	PITTING	02:17	14.7	33	59	19	2.8	x	External	0.303	278.61	poss. Int
5	201	2277.37	0.84	12.10	Metal Loss	MFG	GENERAL	08:37	15.0	70	141	18	2.7	x	Internal	0.310	272.65	poss. Ext
6	333	3904.96	3.01	12.42	Metal Loss	MFG	GENERAL	03:39	15.2	75	63	28	4.3	1	External	0.314	269.01	poss. Int
7	333	3905.16	3.21	12.42	Metal Loss	MFG	PITTING	03:39	15.2	45	50	17	2.6	x	External	0.301	280.92	poss. Int
8	354	4160.64	0.02	12.50	Metal Loss	MFG	GENERAL	03:27	14.7	46	104	18	2.6	x	Internal	0.305	276.75	Adj. to GW
9	442	5253.00	10.93	12.10	Metal Loss	MFG	GENERAL	03:49	14.7	45	95	17	2.5	x	Internal	0.305	277.11	
10	732	8820.03	0.84	12.45	Metal Loss	MFG	CIGR	02:48	15.2	29	59	17	2.6	x	Internal	0.298	283.29	

### 3.2 Fully assessed feature sheets

A fully assessed feature sheet has been prepared for each anomaly contained in the anomaly severity list.

Each feature sheet provides details on the predicted axial length, width, peak depth and location details to the agreed accuracy in the contract.

Each fully assessed feature sheet provides information on the location and predicted dimensions of one metal loss feature. The fully assessed feature sheet provides information in four fields:

#### 1. Feature description

This section provides specific detail about the metal loss feature.

For the fully assessed feature sheet have been used calculation results (ERF and safe pressure) based on ASME B31G, as more conservative criterion.

#### 2. Feature location on pipe

This section is a schematic representation of the anomaly location relative to joint welds and orientation in direction of flow. The identified location relates to deepest point of the anomaly.

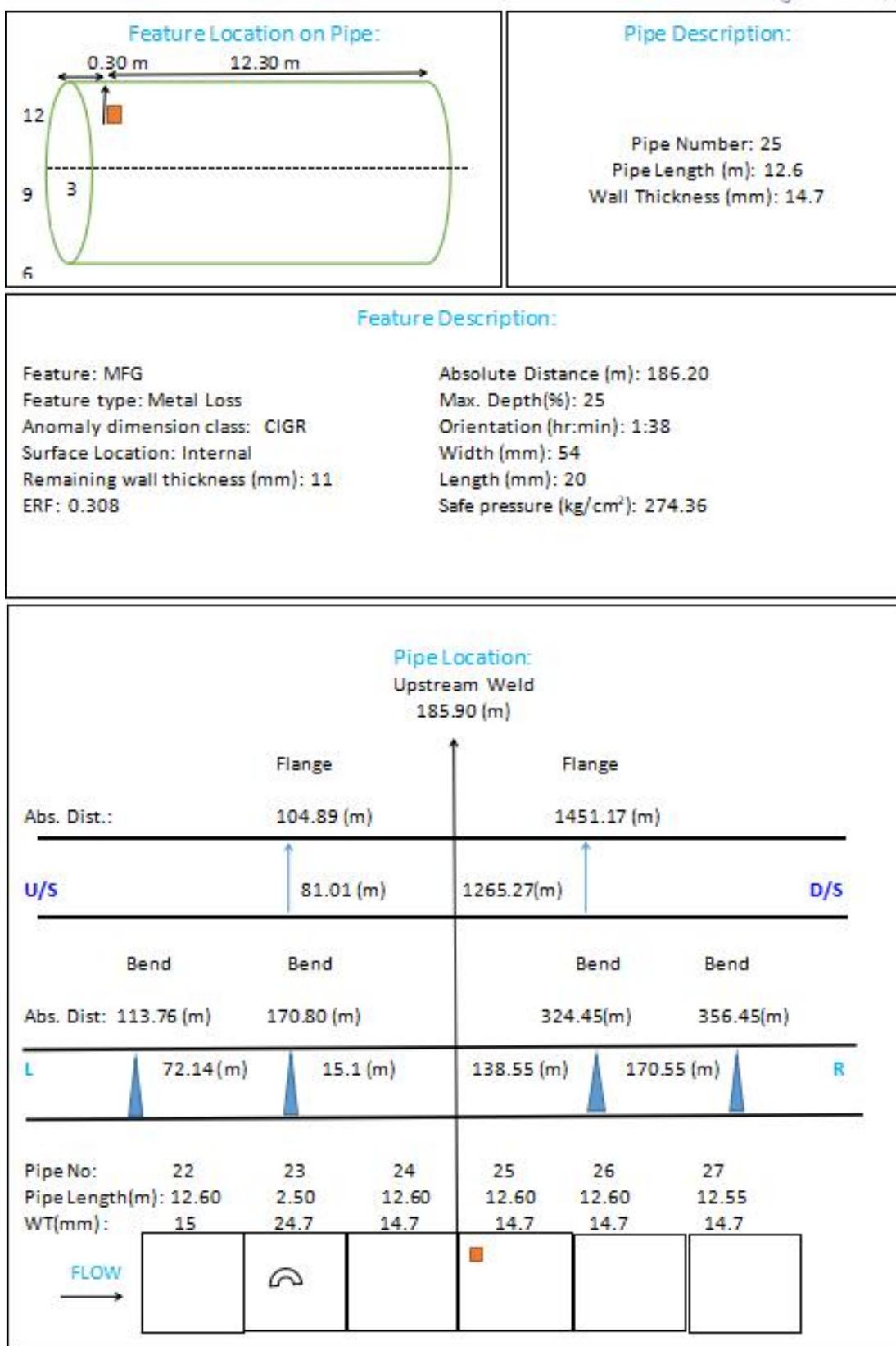
#### 3. Pipe description

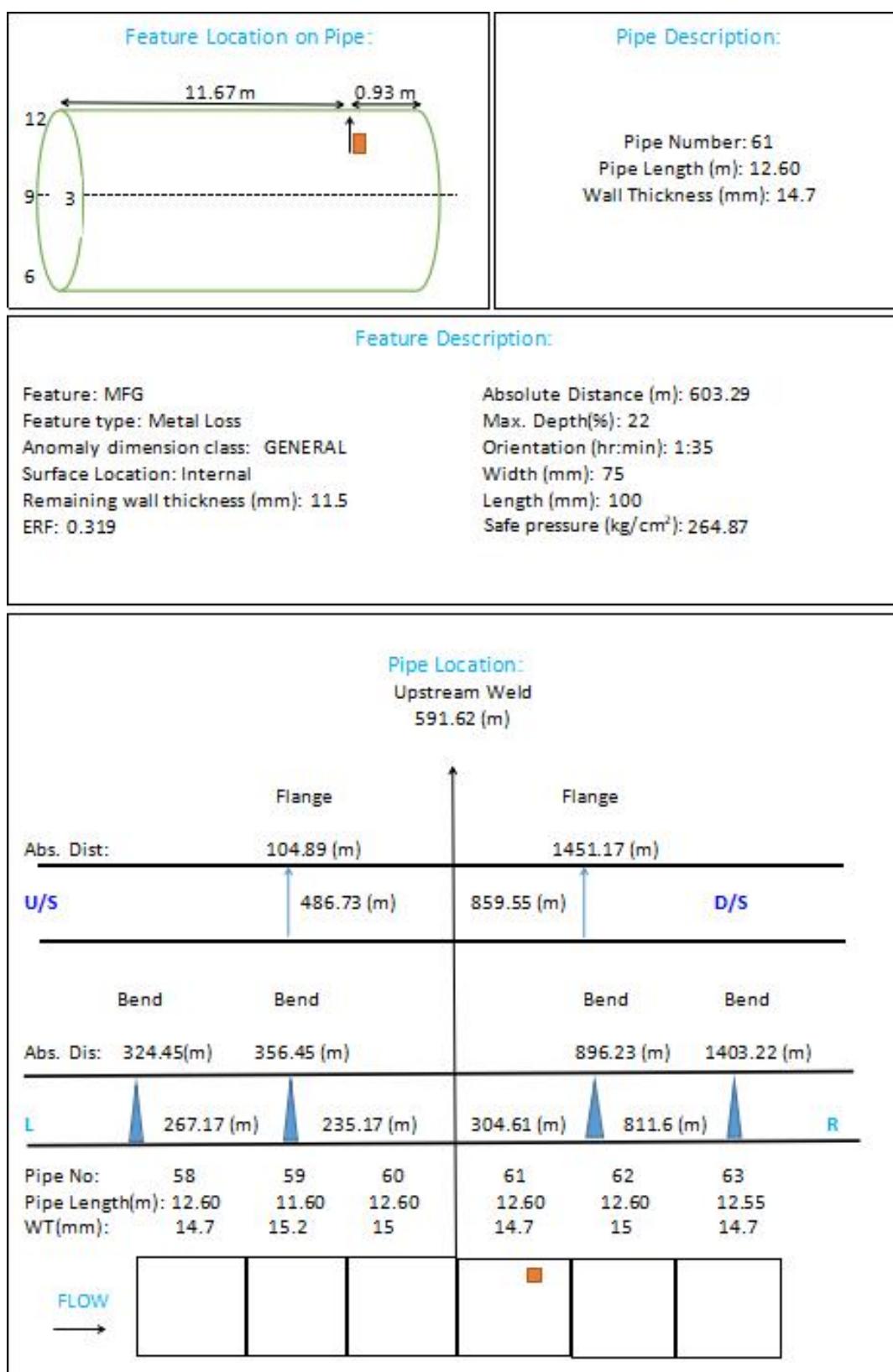
This is an optional field which may be populated to give other information on the anomaly or surrounding areas.

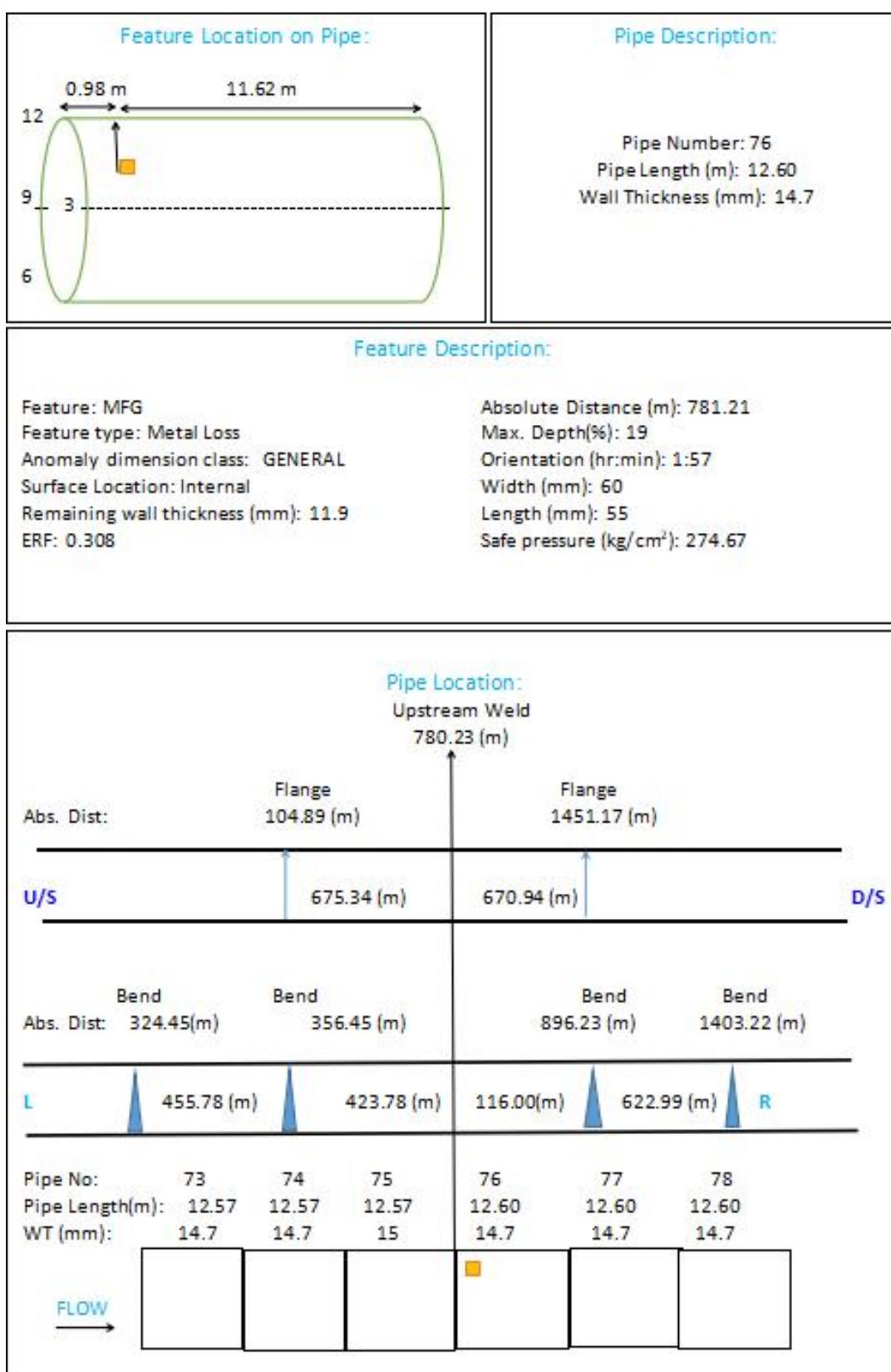
#### 4. Pipe location

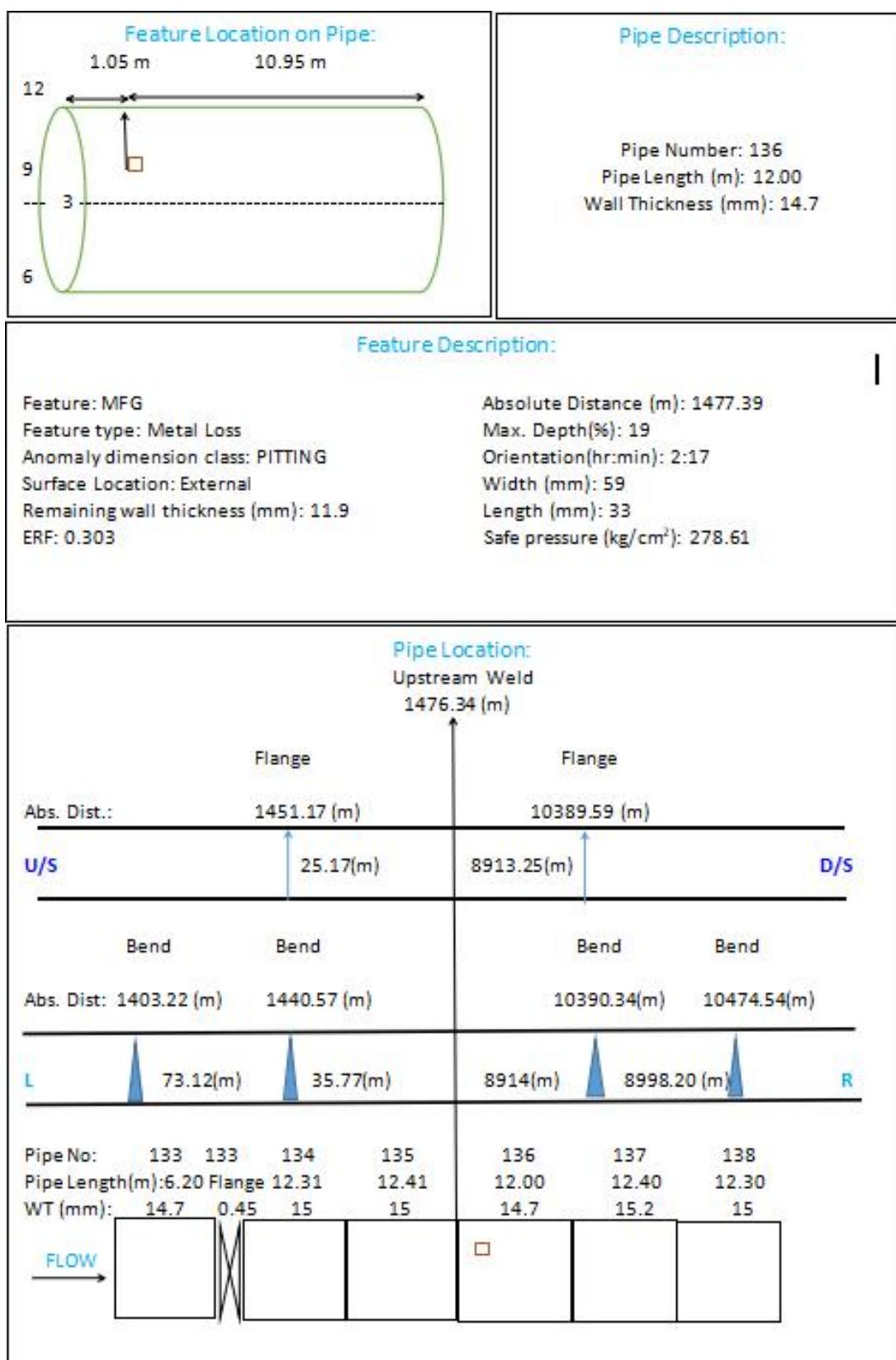
This section provides information that will enable the reference joint to be located for excavation. Wherever possible, the position of the metal loss feature is related to reference points that can easily be identified and located from the surface. There is a schematic diagram giving details of 3 pipe spools upstream and downstream of the reference joint.

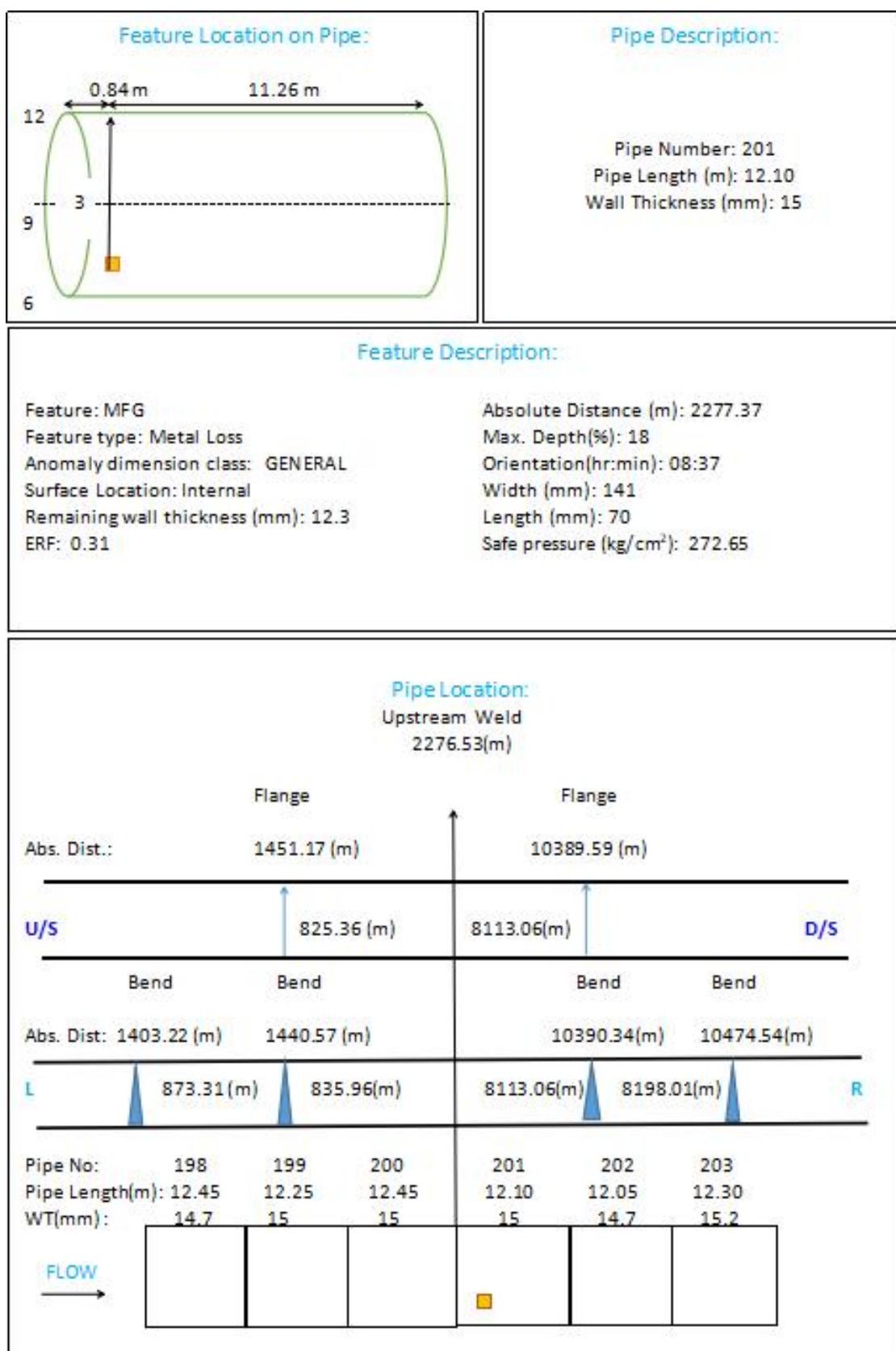
The fully assessed feature sheets are presented on the following pages.

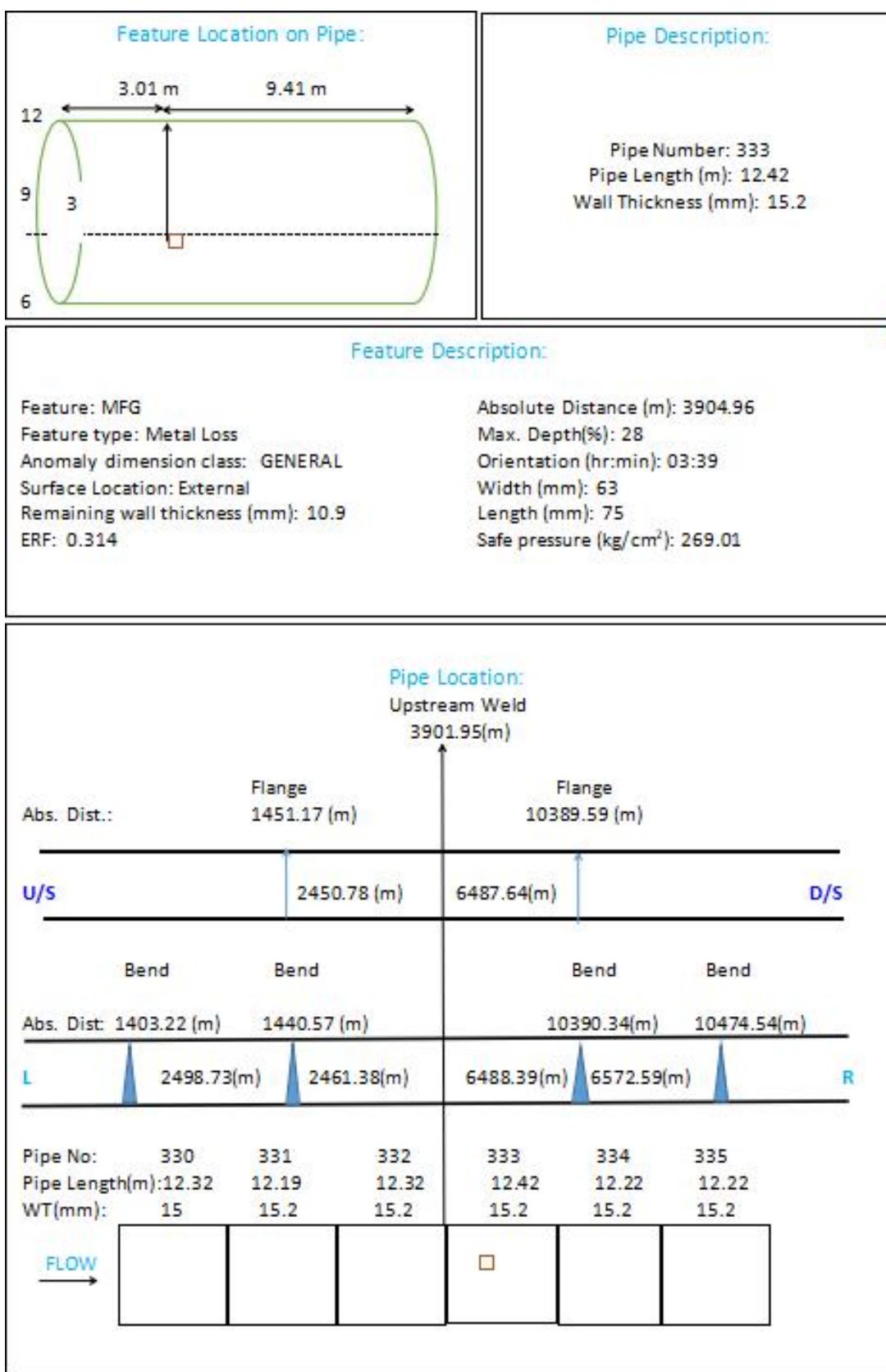


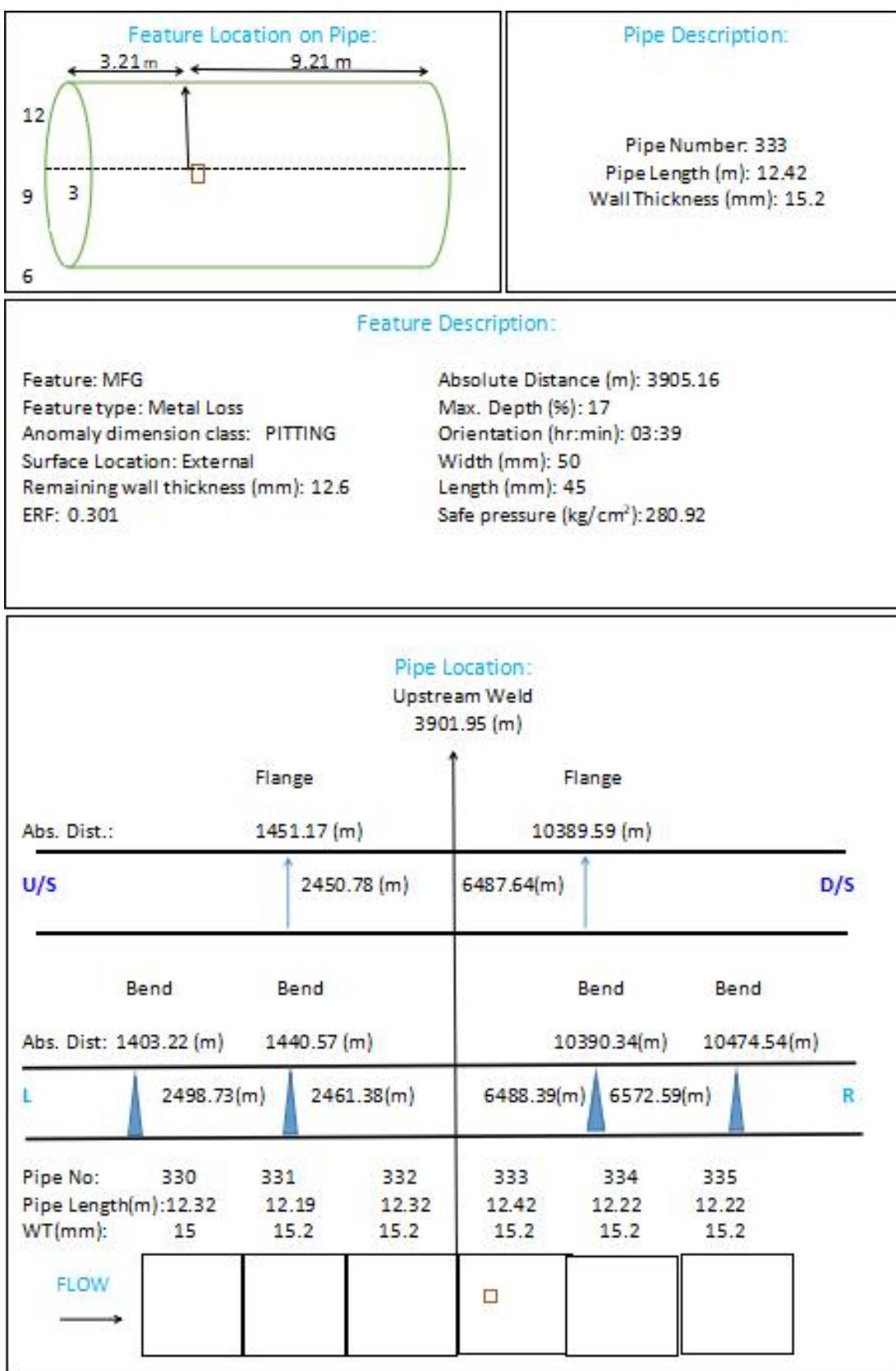




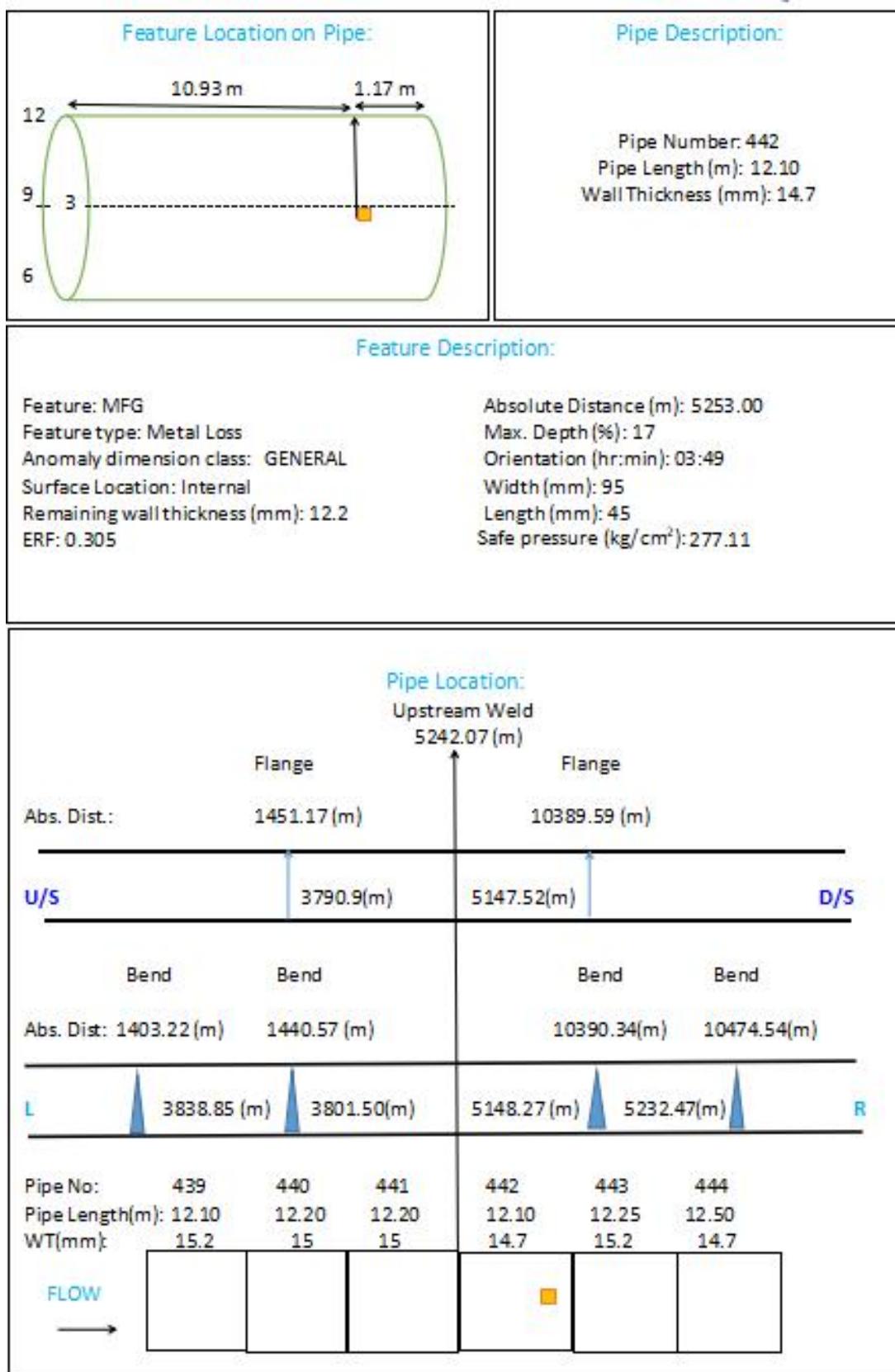


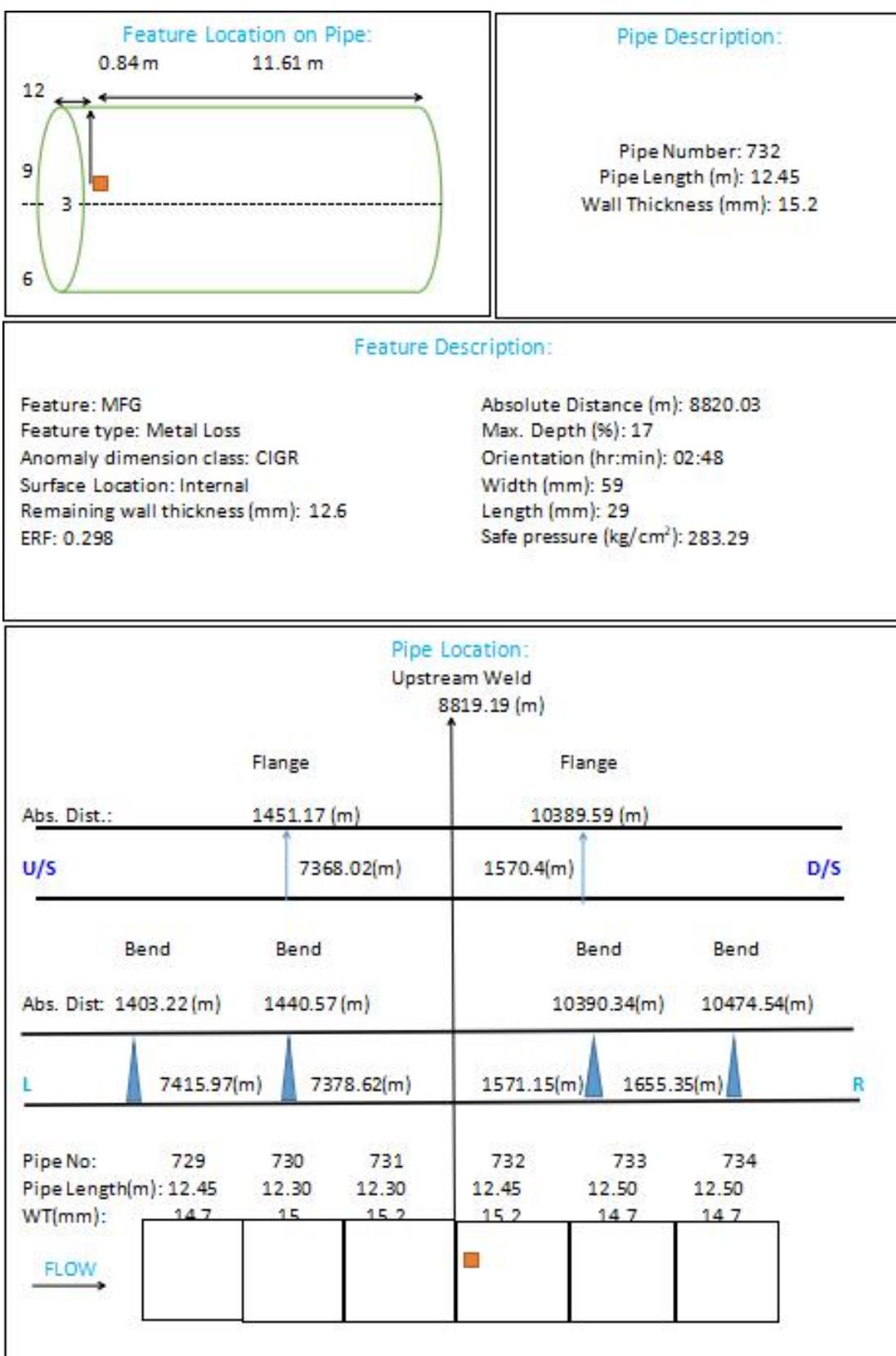






<b>Feature Location on Pipe:</b> <p>12.48 m 0.02m</p>	<b>Pipe Description:</b> <p>Pipe Number: 354          Pipe Length (m): 12.50          Wall Thickness (mm): 14.7</p>				
<b>Feature Description:</b>					
<p>Feature: MFG          Feature type: Metal Loss          Anomaly dimension class: GENERAL          Surface Location: Internal          Remaining wall thickness (mm): 12.1          ERF: 0.305</p>	<p>Absolute Distance (m): 4160.64          Max. Depth (%): 18          Orientation (hr:min): 03:27          Width (mm): 104          Length (mm): 46          Safe pressure (kg/cm<sup>2</sup>): 276.75</p>				
<b>Pipe Location:</b> Upstream Weld 4160.62(m)					
Flange  Abs. Dist.: 1451.17 (m)  <b>U/S</b>	Flange  10389.59 (m)  <b>D/S</b>				
Bend  Abs. Dist: 1403.22 (m)	Bend  1440.57 (m)	Bend  10390.34(m)	Bend  10474.54(m)		
<b>L</b> 2757.4 (m)	2720.05 (m)	6229.72(m)	<b>R</b> 6313.92(m)		
Pipe No: 351 Pipe Length(m): 12.45 WT(mm): 15	352 12.30 15	353 12.25 15	354 12.50 14.7	355 12.30 15	356 12.45 14.7
<b>FLOW</b> 					





#### 4. Metal loss summary report

The metal loss summary report provides an overview of the pipeline condition. Summaries of all metal loss features detected in the pipeline are presented in the following formats:

- Pressure-based histograms;
- Depth-based histograms;
- Distribution and orientation plots;
- Metal loss list.

## 4.1 Pressure-based histograms

The pressure based histograms show the distribution of the most significant features throughout the whole length of the pipeline.

For the pressure based histograms have been used calculation results based on ASME B31G, as more conservative criterion.

Each histogram shows the distribution along the pipeline of metal loss features with ERF values within chosen thresholds, with each kg/cm<sup>2</sup> of the histogram representing a 500m section of the pipeline.

Detailing and summarizing the pressure sentenced thresholds:

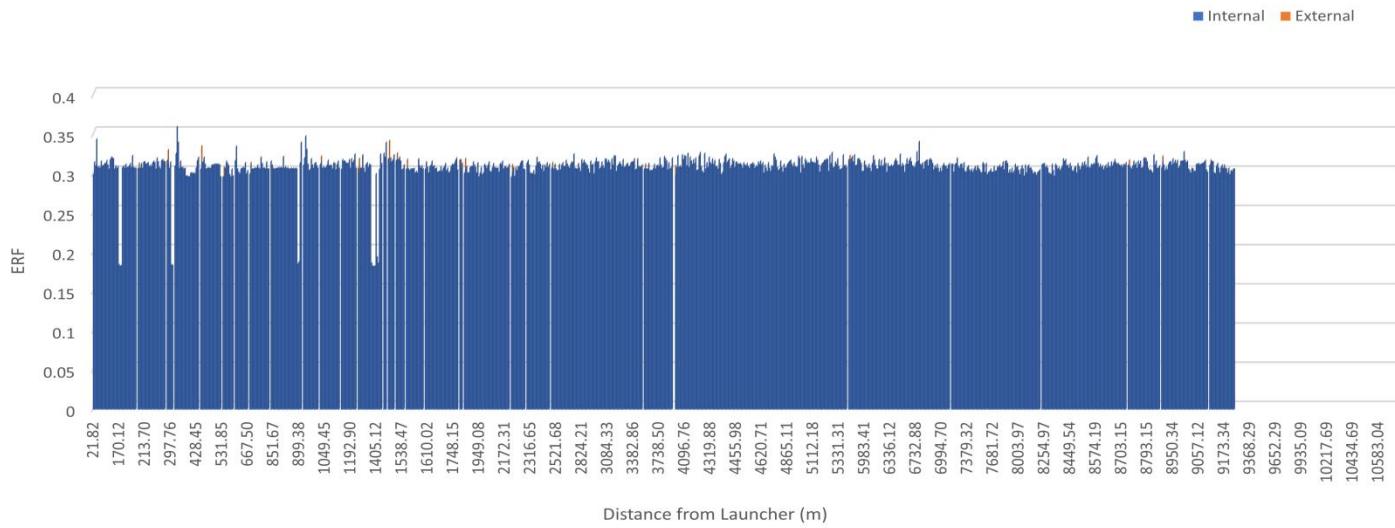
- **1022** metal loss features banded  $ERF \leq 0.4$ ;
- **0** metal loss features banded  $0.4 < ERF \leq 0.6$ ;
- **0** metal loss features banded  $0.6 < ERF \leq 0.8$ ;
- **0** metal loss features banded  $0.8 < ERF \leq 1.0$ ;
- **0** metal loss features banded  $ERF > 1.0$ .

Pressure-based histograms are presented to illustrate anomaly distribution on the pipe surface:

- Distribution of all metal loss anomalies based on ERF;
- Distribution of internal metal loss anomalies based on ERF;
- Distribution of external metal loss anomalies based on ERF.

The pressure-based histograms are presented overleaf.

## Distribution of all metal loss anomaly on ERF



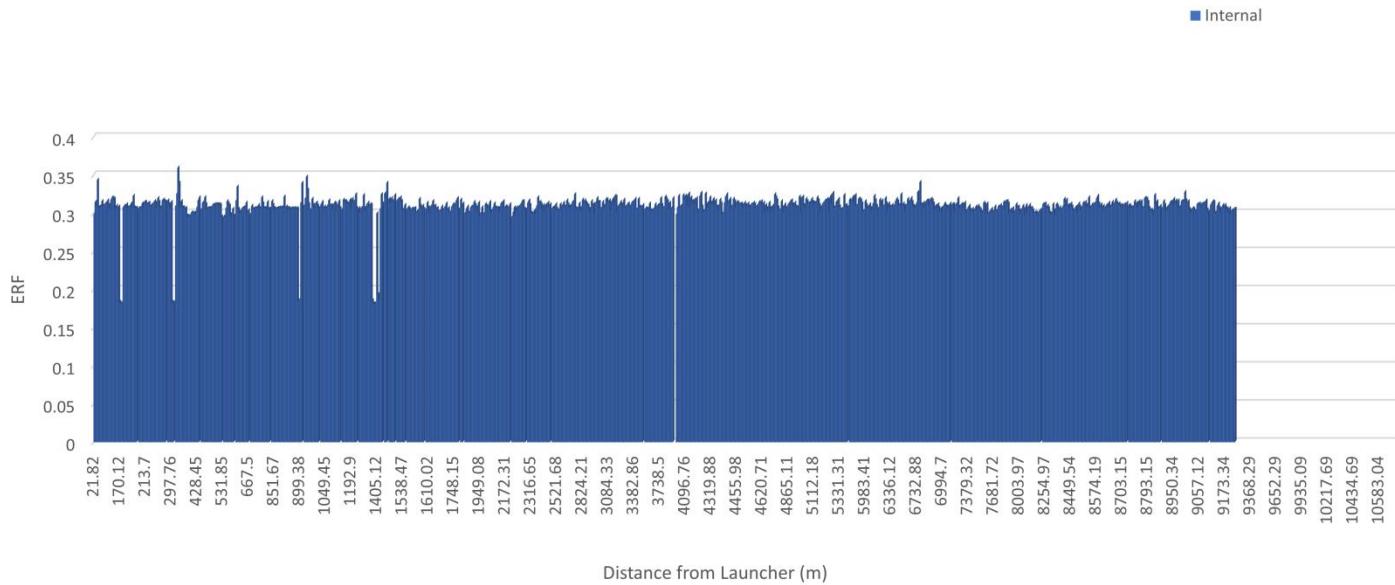
## Distribution of External metal loss anomaly on ERF



Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
Pipeline Name- 14" RT - RD, Water Injection Pipeline  
Pipeline Length- 10.64 Km



## Distribution of Internal metal loss anomaly on ERF





Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
Pipeline Name- 14" RT - RD, Water Injection Pipeline  
Pipeline Length- 10.64 Km

## 4.2 Depth-based histograms

The depth-based histograms show the distribution of all detected metal loss features throughout the whole length of the pipeline.

The metal loss features are banded into four thresholds, with each kg/cm<sup>2</sup> of the histogram representing a 500 m section of the pipeline.

Detailing and summarizing the depth thresholds:

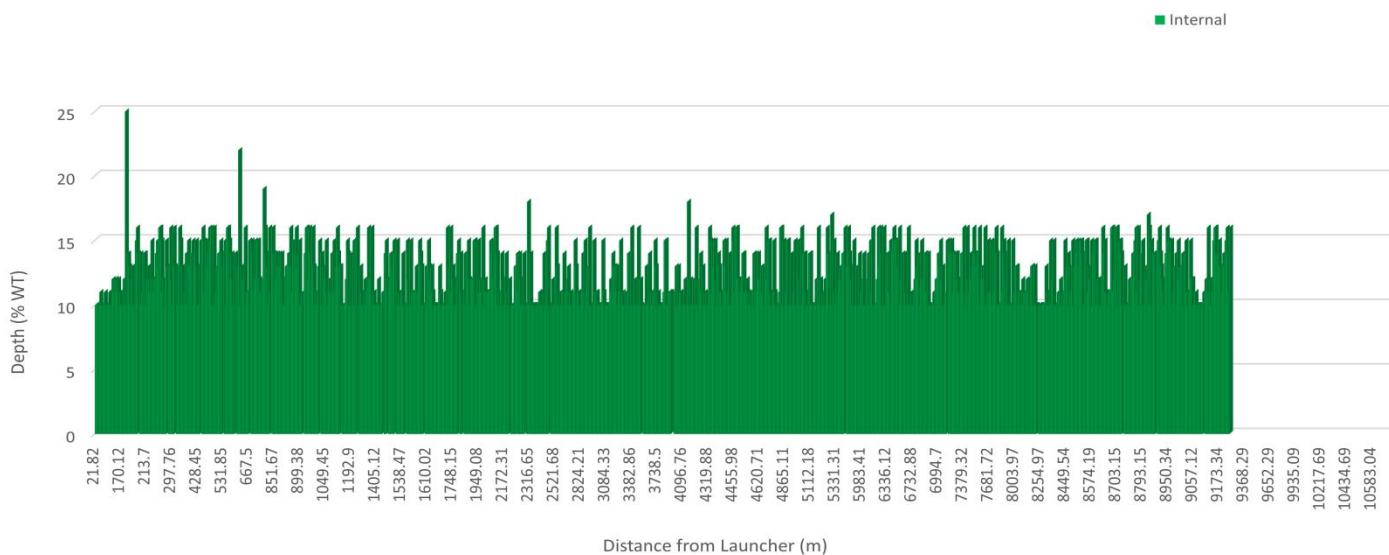
The metal loss features in the banded range are  $\leq 28\%$ .

Three depth-based histograms are presented to illustrate anomaly distribution on the pipe surface:

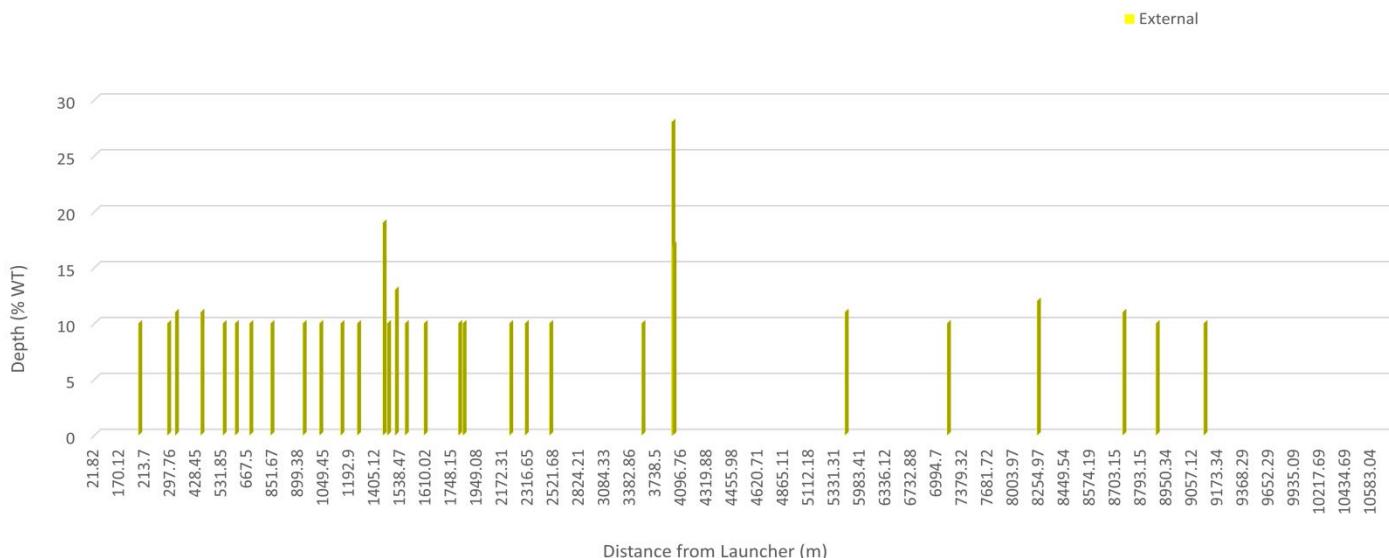
- Distribution of all metal loss anomalies based on depth;
- Distribution of internal metal loss anomalies based on depth;
- Distribution of external metal loss anomalies based on depth.

The depth-based histograms are presented overleaf.

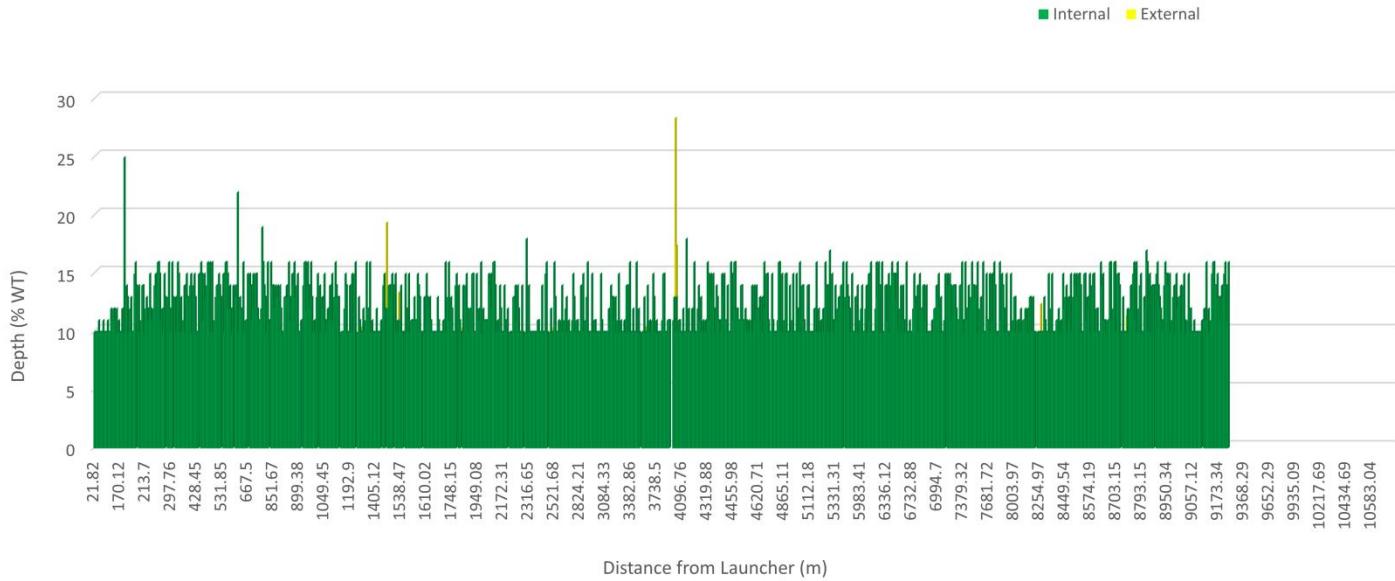
## Distribution of Internal metal loss anomalies base on depth



## Distribution of External metal loss anomalies base on depth



## Distribution of all metal loss anomalies base on depth



### 4.3 Distribution and orientation plots

Three orientation plots show the location of each selected metal loss feature plotted as absolute distance against orientation on the pipe surface, and one giving relative distance of the anomalies to the closest girth weld.

For each feature on the orientation plot, a box is drawn to represent the predicted axial/circumferential location along the pipe. The orientation is based upon a twelve-hour clock as viewed in the direction of the flow.

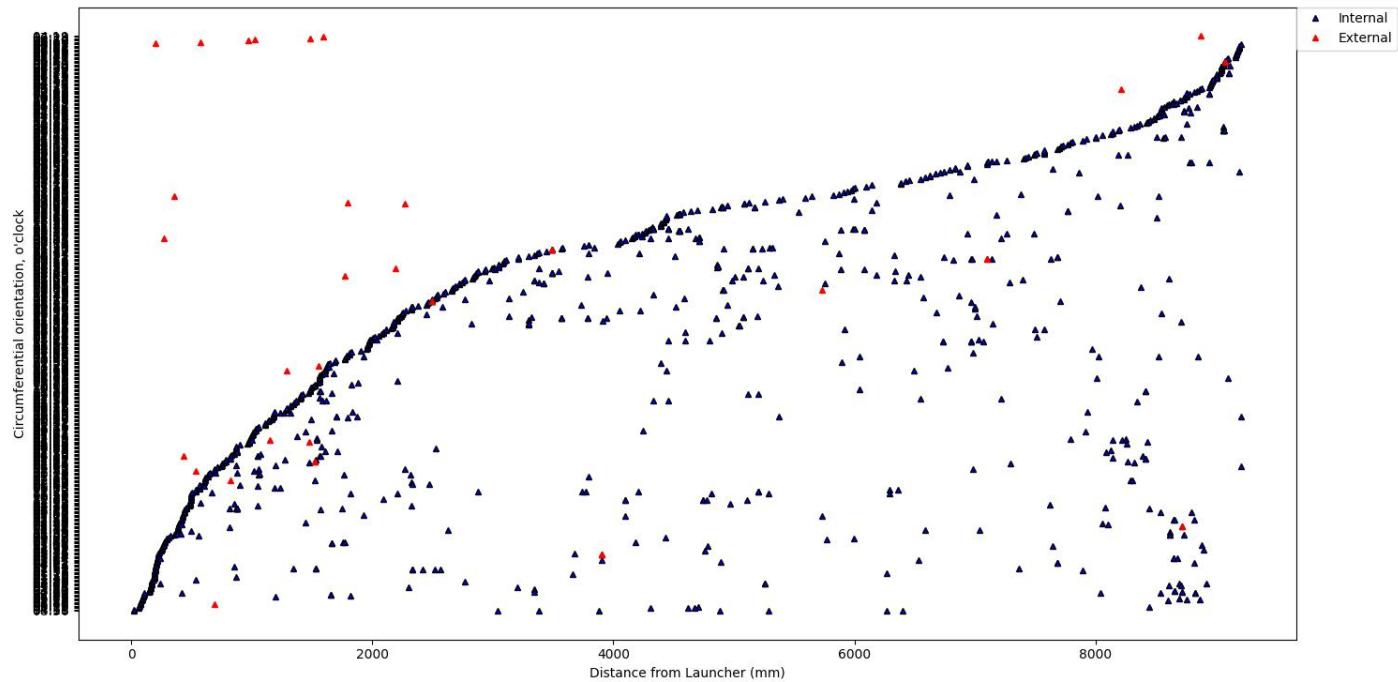
Three orientation plots are presented to illustrate anomaly

Distribution on the pipe surface:

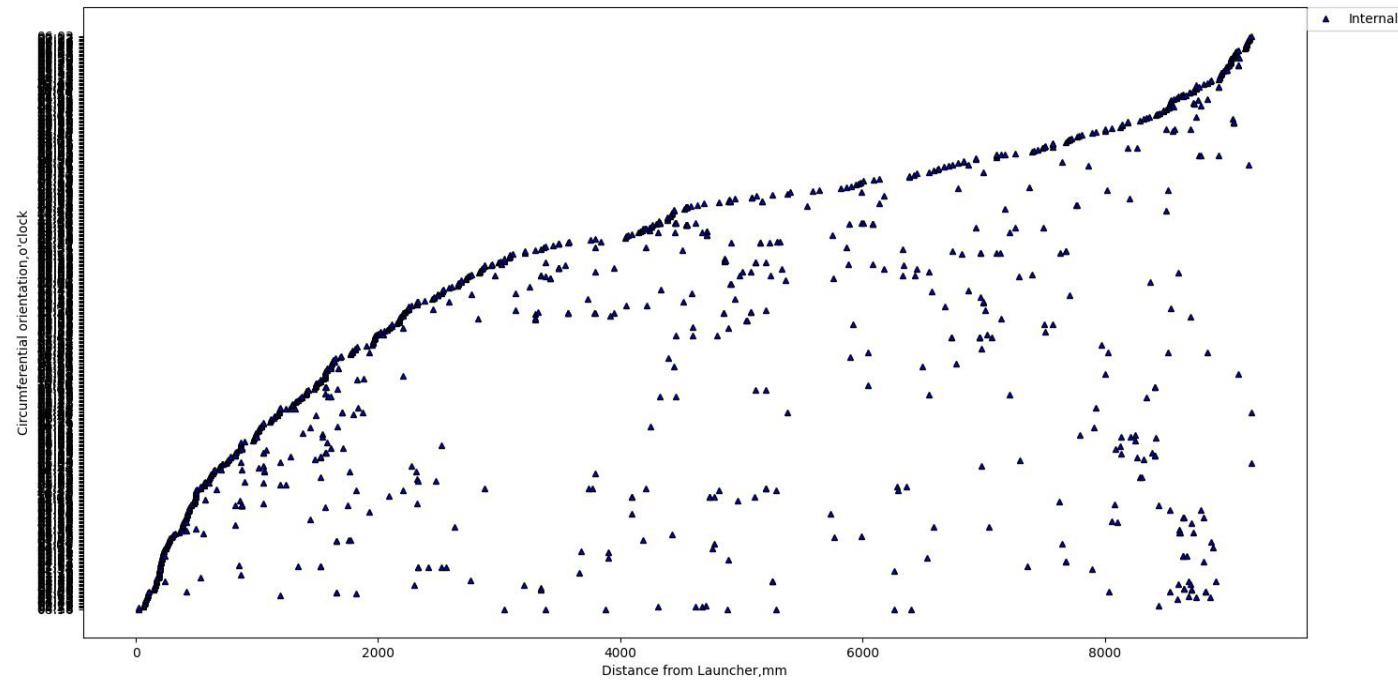
- Orientation plot of all metal loss anomalies over the full pipeline length;
- Orientation plot of all internal metal loss anomalies over the full pipeline length;
- Orientation plot of all external metal loss anomalies over the full pipeline length;

The distribution and orientation plots are presented overleaf.

### Orientation plot of all metal loss anomalies over the full pipeline length



### Orientation plot of all internal metal loss anomalies over the full pipeline length



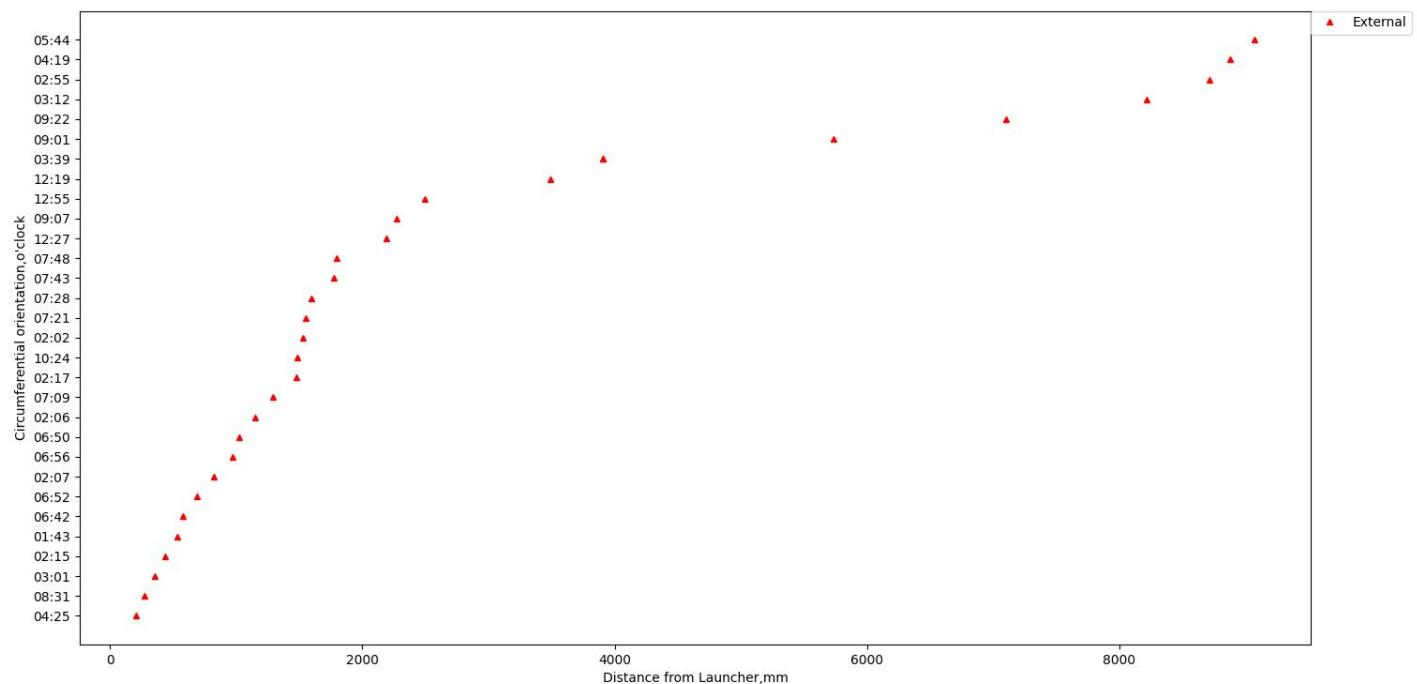
Client- Vedanta Limited

Subcontract No- PF-109943-R-24-189

Pipeline Name- 14" RT - RD, Water Injection Pipeline

Pipeline Length- 10.64 Km

## Orientation plot of all External metal loss anomalies over the full pipeline length



#### 4.4 Metal loss list

The metal loss list provides details of all metal loss features reported in the pipeline. The list is provided in severity order.

The metal loss list includes the following information:

Feature number;

- Absolute distance to start of the reported anomaly from launch (m);
- Upstream girth weld (joint) number;
- Relative distance to the upstream girth weld to the start of the anomaly (m);
- Joint length (m);
- Feature type per POF requirement;
- Feature identification per POF requirement;
- Dimension classification per POF requirement;
- Orientation (o'clock);
- Wall thickness for joint (mm);
- Axial length of the reported anomaly (mm);
- Width of the reported anomaly (mm);
- Peak depth of anomaly (%WT);
- Peak depth of anomaly (mm);
- Location on the pipe surface;
- Calculated ERF value (ASME B31G);
- Calculated Psafe value (Bar) (ASME B31G);
- Comments if any concerning the anomaly.

In accordance with ASME B31G standard, ERF values and the associated Psafe calculation have not been provided for those anomalies with a peak depth greater than 80% NWT or less than 10% NWT.

Details on anomaly descriptions and abbreviations possibly contained in this list can be found in Appendix C.

The Metal Loss list is presented in the following file: [14 RT to RD FR Pipetally Rev.0.xlsx](#)

## Section 5. Pipeline information

The pipeline information presents summaries of any pipeline anomalies, location reference points and a comprehensive pipeline tally. Information on the following is supplied:

- Geometric anomaly report;
- Reference point marker list;
- Pipeline Features;
- Pipeline tally.

## 5.1 Geometric anomaly report

The geometric anomaly report provides a list detailing the location of all dents and Ovalities detected along the pipeline. There are also, where applicable, orientation plots provided showing the distribution of dent indications and Ovalities indications over the whole pipeline length.

The following summarizes the geometric anomaly indications:

<b>Total number of dents</b>	<b>0</b>
<b>Total number of buckles</b>	<b>0</b>
<b>Total number of Ovalities</b>	<b>0</b>

**Note:** There are **No** geometric reductions found in the pipeline above 2% of the pipe OD

The geometric anomaly report includes the following information:

Feature number;

- Absolute distance to start of the reported anomaly from launch (m);
- Upstream girth weld (joint) number;
- Relative distance to the upstream girth weld to the start of the anomaly (m);
- Joint length (m);
- Feature type per POF requirement;
- Feature identification per POF requirement;
- Orientation (o'clock);
- Wall thickness for joint (mm);
- Axial length of the reported anomaly (mm);
- Width of the reported anomaly (mm);
- Peak depth of anomaly (% OD);
- Peak depth of anomaly (mm);
- Comments if any concerning the anomaly.

Details on anomaly descriptions and abbreviations possibly contained in this list can be found in Appendix C.

Two anomalies histograms are presented to illustrate anomalies distribution on the pipe surface:

- Distribution of all geometric anomalies over the full pipeline length
- Orientation plot of all geometric anomalies over the full pipeline length

There are no geometric anomaly present in the pipeline.

## 5.2 Weld anomaly report

The weld anomaly report provides a list detailing the location of all weld anomalies detected along the pipeline.

Weld anomalies, such as lack of fusion, lack of penetration, crack, etc. can be recorded in the inspection data. Where an anomaly type cannot be conclusively classified, the anomaly will be identified merely as “longitudinal/girth/spiral weld anomaly”.

The center line of the launch valve is taken as “zero” point of the pipeline log distance. The numbering of joints starts after the first launcher valve.

The weld anomaly report includes the following information:

- Feature number;
- Absolute distance to start of the reported anomaly from launch (m);
- Upstream girth weld (joint) number;
- Relative distance to the upstream girth weld to the start of the anomaly (m);
- Joint length (m);
- Feature type per POF requirement;
- Feature identification per POF requirement;
- Orientation (o'clock);
- Wall thickness for joint (mm);
- Axial length of the reported anomaly (mm);
- Width of the reported anomaly (mm);
- Peak depth of anomaly (%WT);
- Peak depth of anomaly (mm);
- Comments if any concerning the anomaly.

Details on anomaly descriptions and abbreviations possibly contained in this list can be found in Appendix C.

Two anomalies histograms are presented to illustrate anomalies distribution on the pipe surface:

- Distribution of all weld anomalies over the full pipeline length
- Orientation plot of all weld anomalies over the full pipeline length

There are no weld anomaly present in the pipeline.

### 5.3 Reference point marker list

The reference point marker list provides details of the location of all valves and magnets, where appropriate, that have been identified along the pipeline. These reference points can be used to locate anomalies and features along the pipeline.

The reference point marker list includes the following information:

- Absolute distance to start of the reported anomaly from launch (m);
- Upstream girth weld (joint) number;
- Relative distance to the upstream girth weld to the start of the anomaly (m);
- Joint length (m);
- Feature identification per POF requirement;
- Orientation (o'clock);
- Wall thickness for joint (mm);
- Axial length of the reported anomaly (mm);
- Width of the reported anomaly (mm);
- Location on the pipe surface;

Details on anomaly descriptions and abbreviations possibly used in this list can be found in Appendix C.

The reference point marker list is presented in the following file: [14 RT to RD FR Pipetally Rev.0.xlsx](#)

## 5.4 Pipeline tally

The pipeline tally presents a comprehensive listing of all girth welds, metal loss features, pipeline fixtures and fittings and pipeline anomalies detected and identified in the course of the inspection.

The center line of the launch valve is taken as “zero” point of the pipeline log distance. The numbering of joints starts after the first launcher valve.

All of the information contained on the listings previously presented in this report can also be found in the pipeline tally.

The pipeline tally includes the following information:

- Feature number;
- Absolute distance to start of the reported anomaly from launch (m);
- Upstream girth weld (joint) number;
- Relative distance to the upstream girth weld to the start of the anomaly (m);
- Joint length (m);
- Feature type per POF requirement;
- Feature identification per POF requirement;
- Dimension classification per POF requirement;
- Orientation (o'clock);
- Wall thickness for joint (mm);
- Axial length of the reported anomaly (mm);
- Width of the reported anomaly (mm);
- Peak depth of anomaly (%WT);
- Peak depth of anomaly (mm);
- Location on the pipe surface;
- Calculated ERF value (ASME B31G);
- Calculated Psafe value (Bar) (ASME B31G);
- Comments if any concerning the anomaly.

Further listing options can be obtained from the data disc accompanying this report. These lists can be found in the excel sheet or custom generated through the program.

Details on anomaly descriptions and abbreviations possibly contained in this list can be found in Appendix C.

The pipeline tally is presented in the following file:[14 RT to RD FR Pipetally Rev.0.xlsx](#).

## **Section 6. Appendices**

**Appendix A. Field reports**

**Appendix B. Tool data sheets**

**Appendix C. Definitions and terminology**

**Appendix D. Metal loss anomalies assessment**

**Appendix E. Disclaimer**

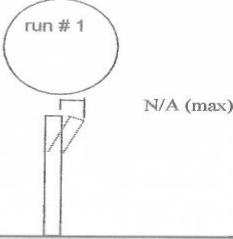
**Appendix F. Contact VDT**

Client- Vedanta Limited  
 Subcontract No- PF-109943-R-24-189  
 Pipeline Name- 14" RT - RD, Water Injection Pipeline  
 Pipeline Length- 10.64 Km



## Appendix A. Field reports

Copies of the gauge, cleaning and MFL tool inspection run reports and completion certificates are presented overleaf.

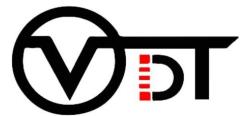
Client	VEDANTA LIMITED			 <small>ISO - 9001 : 2015 Certified Company</small>				
Subcontract No.	PF-109943-R-24-189							
Pipeline Name	14" RT-RD, Water Injection Pipeline							
Length	10.6 KM							
GAUGE REPORT								
RUN DATA								
Run	Launching		Receiving		Gauge Plate		Bend Plate	
	Date	Time	Date	Time	OD	damaged	OD	damaged
1	27.08.2024	09:29 HRS	27.08.2024	12:15 HRS	300	NO	N/A	N/A
RUN RESULT								
Run	Gauge Plate			Bend Plate			Debris	
	Min OD	Degrees	Type	Min OD	Degrees	Type	Product	
1	300	NO	NO	N/A	N/A	N/A	5 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
Min OD:	Smallest measured OD of the gauge/ bend plate							
Degrees:	How much of the circumference is damaged (90 means 1/4 of the circumference is damaged)							
Type:	Type of damage (scratch, bend )							
Product:	What type of debris is collected (sludge, powder, condensate, solid debris, metallic debris etc)							
								
CONCLUSION								
Gauge plate was intact and there was no damage on the Gauge Plate.								
Prepared by	Rakesh Kant	27.08.2024						
	Name	Date	Signature					
Submitted to Client	09.09.2024							
	Date							
Client approval	Mamidishetty Prathyusha	09.09.2024						
	Name	Date	Signature					

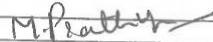
Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
Pipeline Name- 14" RT - RD, Water Injection  
Pipeline Pipeline Length- 10.64 Km



Client	VEDANTA LIMITED	
Subcontract No.	PF-109943-R-24-189	
Pipeline Name	14" RT-RD, Water Injection Pipeline	
Length	10.6 KM	
<b>GAUGE COMPLETION CERTIFICATE</b>		
<p>Hereby it is confirmed that VDT Pipeline Integrity Solutions Pvt Ltd had successfully completed the Gauge run for above mentioned pipeline with above mentioned Contract. The details of the Gauge run, are summarized under and confirmed to be acceptable by the Client.</p>		
<b>REMARKS</b>		
<p>14" Gauge Pig run was successfully completed and the Pipeline is accepted for further cleaning runs.</p>		
Prepared by	Rakesh kant Name	27.08.2024 Date <i>Rakesh</i> Signature
Submitted to Client	09.09.2024 Date	
Client approval	Mamidishetty Prathyusha Name	09.09.2024 Date <i>M. Prathyusha</i> Signature

Client- Vedanta Limited  
 Subcontract No- PF-109943-R-24-189  
 Pipeline Name- 14" RT - RD, Water Injection Pipeline  
 Pipeline Length- 10.64 Km



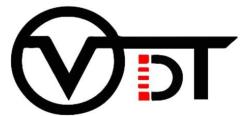
Client	VEDANTA LIMITED			 <small>VDT 2003 / 2018 Certified Company</small>				
Subcontract No.	PF-109943-R-24-189							
Pipeline Name	14" RT-RD, Water Injection Pipeline							
Length	10.6 KM							
CLEANING REPORT								
RUN DATA								
Run #	Pig Type	PU OD (before run)			Launching		Receiving	
		Cup	GD	SD	Date	Time	Date	Time
1	Cup Pig	356	N/A	N/A	27.08.2024	15:27 HRS	27.08.2024	18:10 HRS
2	Bidi Tool with two Brush and Magnet	N/A	310	356	28.08.2024	09:27 HRS	28.08.2024	12:10 HRS
3	Cup Pig with two Brush and Magnet	356	N/A	N/A	28.08.2024	14:31 HRS	28.08.2024	17:15 HRS
4	Bidi Tool with two Brush	N/A	310	356	29.08.2024	07:42 HRS	29.08.2024	10:35 HRS
RUN RESULT								
Run #	Cup		GD		SD		Debris Product	
	OD(m/m)	Damage	OD(m/m)	Damage	OD(m/m)	Damage		
1	354	No	N/A	N/A	N/A	N/A	02 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
2	N/A	N/A	308	No	353	No	02 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
3	354	No	N/A	N/A	N/A	N/A	02 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
4	N/A	N/A	307	No	354	No	02 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
SD	Sealing Disc							
GD	Girding Disc							
OD (min/max)	After run completion remove PU from tool body and measure the maximum and minimum diameter for the disc or cup worn most severely							
Product	What type of debris is collected (sludge, powder, condensate, solid debris, Metallic debris etc)							
CONCLUSION								
Pipeline is cleaned and ready for ILI run								
Prepared by	Rakesh Kant	29.08.2024		 Signature				
Submitted to Client	09.09.2024	Date						
Client approval	Mamidishetty Prathyusha	09.09.2024		 Signature				

Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
Pipeline Name- 14" RT - RD, Water Injection Pipeline  
Pipeline Length- 10.64 Km



Client	VEDANTA LIMITED	
Subcontract No.	PF-109943-R-24-189	
Pipeline Name	14" RT-RD, Water Injection Pipeline	
Length	10.6 KM	
<b>CLEANING COMPLETION CERTIFICATE</b>		
<p>Hereby it is confirmed that VDT Pipeline Integrity Solutions Pvt Ltd had successfully completed the Cleaning run(s) for above mentioned pipeline with the above mentioned Contract. The details of the Cleaning run(s), are summarized under and it is confirmed that the result of the last Cleaning run meet the requirements.</p>		
<b>REMARKS</b>		
All cleaning runs were completed and the Pipeline is ready for ILI runs.		
Prepared by	Rakesh Kant	29.08.2024
	Name	Date
Submitted to Client	09.09.2024	
	Date	
Client approval	Mamidishetty Prathyusha	09.09.2024
	Name	Date
		Signature

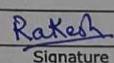
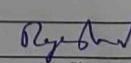
Client- Vedanta Limited  
 Subcontract No- PF-109943-R-24-189  
 Pipeline Name- 14" RT - RD, Water Injection  
 Pipeline Pipeline Length- 10.64 Km



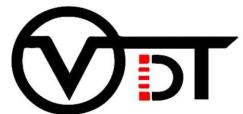
Client	VEDANTA LIMITED			 <small>ISO - 9001 : 2015 Certified Company</small>																																																							
Subcontract No.	PF-109943-R-24-189																																																										
Pipeline Name	14" RT - RD, Water Injection Pipeline																																																										
Length	10.64 KM																																																										
<b>CLEANING REPORT</b>																																																											
<b>RUN DATA</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Run #</th> <th rowspan="2">Pig Type</th> <th colspan="3">PU OD (before run)</th> <th colspan="2">Launching</th> <th colspan="2">Receiving</th> </tr> <tr> <th>Cup</th> <th>GD</th> <th>SD</th> <th>Date</th> <th>Time</th> <th>Date</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>14" Cup Pig</td> <td>355</td> <td>N/A</td> <td>N/A</td> <td>02.03.2025</td> <td>07:20 HRS</td> <td>02.03.2025</td> <td>10:40 HRS</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>								Run #	Pig Type	PU OD (before run)			Launching		Receiving		Cup	GD	SD	Date	Time	Date	Time	1	14" Cup Pig	355	N/A	N/A	02.03.2025	07:20 HRS	02.03.2025	10:40 HRS																											
Run #	Pig Type	PU OD (before run)			Launching		Receiving																																																				
		Cup	GD	SD	Date	Time	Date	Time																																																			
1	14" Cup Pig	355	N/A	N/A	02.03.2025	07:20 HRS	02.03.2025	10:40 HRS																																																			
<b>RUN RESULT</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Run #</th> <th colspan="2">Cup</th> <th colspan="2">GD</th> <th colspan="2">SD</th> <th>Debris</th> </tr> <tr> <th>OD(m/m)</th> <th>Damage</th> <th>OD(m/m)</th> <th>Damage</th> <th>OD(m/m)</th> <th>Damage</th> <th>Product</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>352</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> <td>7 MINUTES BLACK WATER BEFORE TOOL RECEIVING</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>								Run #	Cup		GD		SD		Debris	OD(m/m)	Damage	OD(m/m)	Damage	OD(m/m)	Damage	Product	1	352	N/A	N/A	N/A	N/A	N/A	7 MINUTES BLACK WATER BEFORE TOOL RECEIVING																													
Run #	Cup		GD		SD		Debris																																																				
	OD(m/m)	Damage	OD(m/m)	Damage	OD(m/m)	Damage	Product																																																				
1	352	N/A	N/A	N/A	N/A	N/A	7 MINUTES BLACK WATER BEFORE TOOL RECEIVING																																																				
SD	Sealing Disc																																																										
GD	Guiding Disc																																																										
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Product	What type of debris is collected (sludge, powder, condensate, solid debris, Metallic debris, Wax etc)																																																										
<b>CONCLUSION</b>																																																											
Pipeline is ready for MFL run																																																											
Prepared by	Rakesh Kant	03.03.2025	<i>Rakesh</i>	Name	Date	Signature																																																					
Submitted to Client	04.03.2025		Date																																																								
Client approval	RAJESH VADLAPATLA	04/03/25	<i>Rajesh</i>	Name	Date	Signature																																																					

Client- Vedanta Limited  
 Subcontract No- PF-109943-R-24-189  
 Pipeline Name- 14" RT - RD, Water Injection  
 Pipeline Pipeline Length- 10.64 Km



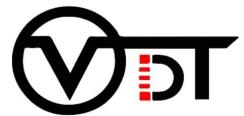
Client	VEDANTA LIMITED			 <small>ISO - 9001 : 2015 Certified Company</small>				
Subcontract No.	PF-109943-R-24-189							
Pipeline Name	14" RT - RD, Water Injection Pipeline							
Length	10.64 KM							
<b>EGP REPORT</b>								
<b>RUN DATA</b>								
Run #	Tool Name	PU OD (before run)			Launching		Receiving	
		Cup	GD	SD	Date	Time	Date	Time
01	EGP	355	310	355	14.11.2024	10:08 HRS	14.11.2024	13:15 HRS
<b>RUN RESULT</b>								
Run #	Cup		GD		SD		Debris	
	OD(m/m)	Damage	OD(m/m)	Damage	OD(m/m)	Damage	Product (Wax)	
01	353	No	308	No	352	No	2 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
<b>OPERATING CONDITIONS</b>								
Pressure		Temperature		Flow rate		Velocity		
min	max	min	max	min	max	min	max	
[Psi]	[Psi]	[°C]	[°C]	BB/HR	BB/HR	[m/s]	[m/s]	
990	1020	35	40	1200	1400	0.8	1.0	
<b>Velocity range</b>								
		<b>Required</b>		<b>Achieved</b>				
		0.5 - 2	m/s	0.9	m/s			
		900 - 1200	Psi	1000	Psi			
		30 - 50	°C	38	°C			
		3 - 7	hrs	03:07	hrs			
SD	Sealing Disc							
GD	Guiding Disc							
OD (min/max)	After run completion remove PU from tool body and measure the maximum and minimum diameter for the disc or cup worn most severely							
Product	What type of debris is collected (sludge, condensate, solid debris, metallic debris, Wax etc)							
<b>CONCLUSION</b>								
EGP Tool received in good condition. Data was downloaded and sent to DA team for further analysis.								
Prepared by		RAKESH KANT	14.11.2024	 <small>Signature</small>				
		Name	Date					
Submitted to Client		04.03.2025	Date					
Client approval		RAJESH VADLAPATLA	04/03/25	 <small>Signature</small>				
		Name	Date					

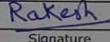
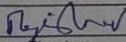
Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
Pipeline Name- 14" RT - RD, Water Injection Pipeline  
Pipeline Length- 10.64 Km



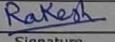
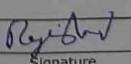
Client	VEDANTA LIMITED	
Subcontract No.	PF-109943-R-24-189	
Pipeline Name	14" RT - RD, Water Injection Pipeline	
Length	10.64 KM	
<b>EGP COMPLETION CERTIFICATE</b>		
<p>Hereby it is confirmed that VDT Pipeline Integrity Solutions Pvt Ltd had successfully completed the EGP run for above mentioned pipeline with the above mentioned Contract. The details of the EGP run are summarized under EGP Report.</p>		
<b>REMARKS</b>		
<p>EGP tool Data was downloaded and sent to DA team for further analysis.</p>		
Prepared by	Rakesh Kant	14.11.2024
	Name	Date
Submitted to Client	04.03.2025	
	Date	
Client approval	RAJESH VADLAPATLA	04/03/25
	Name	Date
		Signature

Client- Vedanta Limited  
 Subcontract No- PF-109943-R-24-189  
 Pipeline Name- 14" RT - RD, Water Injection Pipeline  
 Pipeline Length- 10.64 Km



Client	VEDANTA LIMITED			 <small>ISO - 9001 : 2018 Certified Company</small>				
Subcontract No.	PF-109943-R-24-189							
Pipeline Name	14" RT - RD, Water Injection Pipeline							
Length	10.64 KM							
<b>MFL REPORT #01</b>								
<b>RUN DATA</b>								
Run #	Tool Name	PU OD (before run)			Launching		Receiving	
		Cup	GD	SD	Date	Time	Date	Time
01	MFL	355	N/A	N/A	12.11.2024	08:24 HRS	12.11.2024	11:04 HRS
<b>RUN RESULT</b>								
Run #	Cup		GD		SD		Debris	
	OD(m/m)	Damage	OD(m/m)	Damage	OD(m/m)	Damage	Product (Wax)	
01	349	No	N/A	No	N/A	No	3 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
<b>OPERATING CONDITIONS</b>								
Pressure		Temperature		Flow rate		Velocity		
min	max	min	max	min	max	min	max	
[Psi]	[Psi]	[°C]	[°C]	BB/HR	BB/HR	[m/s]	[m/s]	
1090	1160	40	45	1200	1400	1.00	1.10	
<b>Velocity range</b>								
		Required		Achieved				
		0.5 - 2	m/s	1.0	m/s			
Pressure range		900 - 1200	Psi	1300	Psi			
Temperature range		30 - 50	°C	42	°C			
Max. operating time		3 - 7	hrs	02:40	hrs			
SD	Sealing Disc							
GD	Guiding Disc							
OD (min/max)	After run completion remove PU from tool body and measure the maximum and minimum diameter for the disc or cup worn most severely							
Product	What type of debris is collected (sludge, powder, condensate, solid debris, metallic debris, Wax etc)							
<b>CONCLUSION</b>								
MFL Tool was received in good mechanical condition. A re-run was recommended since data could not be retrieved from the tool.								
Prepared by	RAKESH KANT		13.11.2024		 <small>Signature</small>			
Submitted to Client	04.03.2025							
Client approval	RAJESH VADLAPATLA		04/03/25		 <small>Signature</small>			
	Name		Date					



Client	VEDANTA LIMITED			 <small>ISO - 9001 : 2015 Certified Company</small>				
Subcontract No.	PF-109943-R-24-189							
Pipeline Name	14" RT ~ RD, Water Injection Pipeline							
Length	10.64 KM							
<b>MFL REPORT#02</b>								
<b>RUN DATA</b>								
Run #	Tool Name	PU OD (before run)			Launching		Receiving	
		Cup	GD	SD	Date	Time	Date	Time
01	MFL	355	N/A	N/A	02.03.2025	12:41 HRS	02.03.2025	16:23 HRS
<b>RUN RESULT</b>								
Run #	Cup		GD		SD		Debris	
	OD(m/m)	Damage	OD(m/m)	Damage	OD(m/m)	Damage	Product (Wax)	
01	350	No	N/A	No	N/A	No	2 MINUTES BLACK WATER BEFORE TOOL RECEIVING	
<b>OPERATING CONDITIONS</b>								
Pressure		Temperature		Flow rate		Velocity		
min	max	min	max	min	max	min	max	
[Psi]	[Psi]	[°C]	[°C]	BB/HR	BB/HR	[m/s]	[m/s]	
1088	1203	40	45	1300	1500	0.70	0.80	
<b>CONCLUSION</b>								
MFL Tool received in good condition. Data was downloaded and sent to DA team for further analysis.								
Prepared by		RAKESH KANT		03.03.2025				
		Name	Date			Signature		
Submitted to Client		04.03.2025						
		Date						
Client approval		RAJESH VADLAPATLA		04/03/2025				
		Name	Date			Signature		

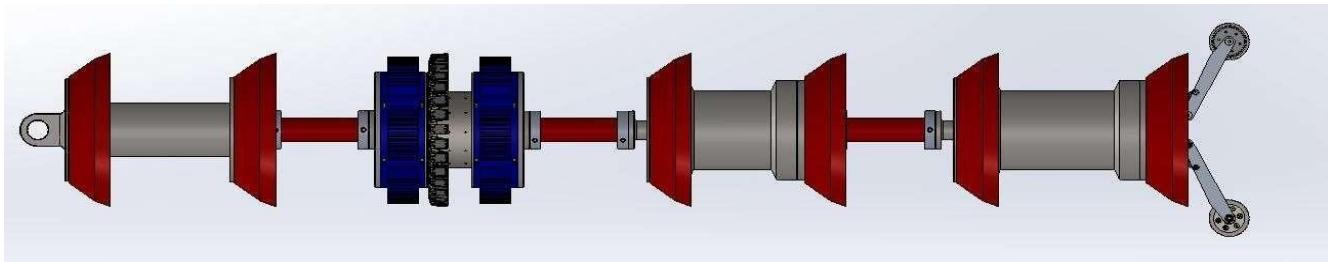
Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
Pipeline Name- 14" RT - RD, Water Injection Pipeline  
Pipeline Length- 10.64 Km



Client	VEDANTA LIMITED		
Subcontract No.	PF-109943-R-24-189		
Pipeline Name	14" RT - RD, Water Injection Pipeline		
Length	10.64 KM		
MFL COMPLETION CERTIFICATE			
<p>Hereby it is confirmed that VDT Pipeline Integrity Solutions Pvt Ltd had successfully completed the MFL tool run for above mentioned pipeline with the above mentioned Contract. The details of the MFL tool run and summarized under MFL tool Report.</p>			
<b>REMARKS</b>			
<p>MFL tool Data was downloaded and sent to DA team for further analysis.</p>			
Prepared by	Rakesh Kant	03.03.2025	<i>Rakesh</i>
	Name	Date	Signature
Submitted to Client	04.03.2025		
	Date		
Client approval	RAJESH VADLAPATLA	04/03/25	<i>Rajesh</i>
	Name	Date	Signature

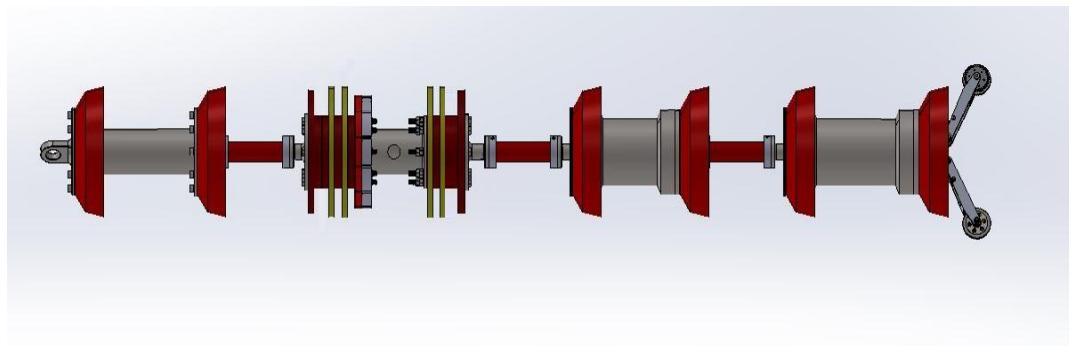
## Appendix B. Tool data sheet

### 14" A-MFL PIG Technical Data Sheet



General Specification		Pipeline Specification	
Tool Length	2400 mm	Pipeline Nominal Dia.	14"
Sampling Frequency	1500 sample/second	Tool Run Velocity	0.5 - 4 m/s
Minimum bore in Straight Pipe	270 mm	Maximum Wall Thickness	28 mm
		Maximum Run duration	100 hours
Minimum bend radius	3 D	Medium	Liquid and Gas
Gross Weight	250 Kg	Operating Temperature	-10 °C to 80 °C
Transmitter	Yes (For Tracking Purpose)	Operating Pressure	5 to 80 Bar
No of Odometers	2	No of sections	4
Data Storage	Solid-state flash memory	Inertial Navigation Sensor	Solid State Inertial Sensor
Magnetic Sensor type	Hall effect linear sensor	ID/OD Sensor type	Discrete proximity sensor
Sampling Frequency	Up to 1500 samples per second	Magnetization Direction	Longitudinal

## 14" EGP PIG Technical Data Sheet



ELECTRONIC GEOMETRY PIG		
Sr. No	Description	Details
1.0	Weight of tool	200 Kg
2.0	Number of Modules of tools and length of tool	4 Module, 2500 mm
3.0	Principle of operation	Eddy Current sensors
4.0	Capability of inspecting Maximum length in single run.	100 Km
5.0	Pressure range	5 to 80 Bar
6.0	Temperature range	-10 - 80 °C
7.0	Battery life	70 Hrs
8.0	Capability of detecting 2% dent	YES
9.0	Accuracy for depth sizing for dent	1 % of pipeline ID with certainty = 90%
10.0	Speed range for data generation	0.5 to 3 m/sec
11.0	Number of sensors	24 nos.
12.0	Number of Odometer	2 no
13.0	Frequency or distance of sampling	1500 Data / Sec
14.0	Bend radius the tool is able to negotiate	3 D

## Appendix C. Definitions and terminology

We use internationally accepted terminology in this document (API 1163; API NACE 2002; POF, etc.). For easy reference their definitions are listed below.

**Above Ground Markers (AGM):** A portable or permanently installed device placed on a surface above a pipeline that both detects and records passage of an in-line inspection tool or transmits the signal that is detected and recorded by the tool.

**Anode:** The electrode of an electro chemical cell at which oxidation occurs. Electrons flow away from the anode in the external circuit. Corrosion usually occurs and metal ions enter the solution at the anode.

**Anomaly:** An unexamined deviation from the norm in pipe material, coatings, or welds. See also imperfection, anomaly and feature.

**ASME/ASME B31 G:** American Society of Mechanical Engineers, also known as ASME International. It is a commonly used analysis criterion for metal loss anomalies in a pipeline.

**Arc strike:** Localized points of surface melting, caused by an electrical arc (also referred to as hot spot).

**Attachment:** An external object connected to the pipeline.

**Bend:** A physical pipe configuration that changes pipeline direction.

**Caliper tool:** A type of tool used to measure internal diameter of the pipeline.

**Casing:** A cylinder surrounding the pipeline, installed for the purpose of protecting the pipeline from external damage.

**Cathode:** The electrode of an electro chemical cell at which the reduction is the principal reaction. Electrons flow toward the Cathode in the external circuit.

**Cathodic Protection Technique (CPT):** A technique to reduce corrosion of a metal surface by making the corroding surface the cathode of an electro chemical cell.

**Characteristic:** Any physical descriptor of a pipeline (e.g. grade, wall thickness, manufacturing process) or an anomaly (e.g. type, size, shape).

**Characterize:** To identify the type of pipeline anomaly, component or characteristic, or estimate the size of pipeline anomaly.

**Clamp:** Any of various devices used to join, grip, support, or compress mechanical or structural parts of the pipe.

**Cleaning pig:** A utility pig that uses cups, scrapers, or brushes, to remove dirt, rust, mill scale and other debris from the pipeline. Cleaning pigs are utilized to increase the operating efficiency of a pipeline or to facilitate inspection of the pipeline.

**Construction anomaly:** Anomaly that arises during construction of the pipeline, including a girth weld faults, mechanical damage, arc strike and ground loads.

**Corrosion:** The deterioration of a material, usually a metal, that results from a reaction with its environment.

**Crack:** A fracture type discontinuity characterized by a sharp tip and high ratio of length to width to opening displacement.

**Critical anomaly:** An anomaly for which an analysis, such as ASME B31G, would indicate that the pipe is approaching failure at pressure equal to maximum operating pressure or the maximum allowable operating pressure for the pipe.

**Cup pig:** A utility pig that is supported and driven by cups made of a resilient material such as neoprene or polyurethane. At least one of the cups forms a piston-like seal inside the pipe.

**Cold work:** Permanent strain in a metal accompanied by strain hardening.

**Data analysis:** The evaluation process through which inspection indications are classified and characterized.

**Defect:** A physically examined anomaly with dimensions and characteristics that exceed acceptable limits. See also imperfection.

**Dent:** A local change in piping surface contour caused by an external force such as mechanical impact or rock impact.

**Detect:** To sense or obtain a measurable indication from a feature.

**Detection Threshold:** A characteristic dimension or dimensions of an anomaly that must be exceeded to achieve a stated probability of detection. See also **measurement threshold** and **reporting threshold**.

**DSAW:** Double submerged arc welding. A welding process used in the manufacture of pipe.

**ERW:** Electric resistance welding. A welding process used in the manufacture of pipe.

**Evaluation:** A review, following the characterization and examination of an anomaly to determine whether the anomaly meets specified acceptance criteria.

**False call:** An indication from an inspection that is classified as an anomaly where no imperfection, defect, or critical defect exists.

**Feature:** Any object detected by an ILI tool during the performance of an inspection run. Features may be anomalies or indications, pipeline valves and fittings, nearby metallic objects, or other items.

The reported Features are classified as per the following terminology:

- Above Ground Marker (AGM)
- Additional Metal/material (ADME)
- Anode (ANOD)
- Anomaly (ANOM)
- Crack Arrestor begin / end (CRAB/CRAE)
- Casing begin / end (CASB/CASE)
- Change in wall thickness (CHWT)
- CP Connection (CPP)
- External Support (ESUP)
- External Metal
- Ground Anchor (ANCH)
- Magnetic Marker (MM)
- Offtake (OFFT)
- Other (OTHE)
- Pipeline Fixture (PFIX)
- Reference Magnet (MGNT)
- Repair (REPA)
- Tap
- Tee (TEE)
- Valve (VALV)
- Weld (WELD)

**Gauging pig:** A utility pig mounted with a flexible metal plate or plates, to gauge the internal diameter of the pipeline. Pipe bore restrictions less than the plate diameter or short radius bends will permanently deflect the plate material.

**Geometry tool:** An instrumented in-line inspection tool that measures deformations in the pipe. See deformation tool.

**Gouge:** Elongated grooves or cavities usually caused by mechanical removal of metal. See also cold work.

**Girth weld:** A complete circumferential butt weld joining pipe or components.

**Girth weld anomaly (GWA):** An anomaly in the weld root or the heat affected zone of the girth weld.

**Grinding:** Reduction in wall thickness by removal of material by hand filing or power disk grinding.

**Heat affected zone:** The area around a weld where the metallurgy of the metal is altered by the rise in temperature caused by the welding process.

**Identification:** The process of differentiating a signal caused by one type of defect from signals caused by other types of anomalies or pipeline features.

**In-line Inspection (ILI):** An inspection of a pipeline from the interior of the pipe using an in-line inspection tool. Also called intelligent or smart pigging.

#### **In-Line Inspection Report**

A report provided to the Operator that contains a comprehensive analysis of the data from an in-line inspection.

#### **In-Line Inspection System**

An inspection tool and the associated hardware, software, procedures, and personnel required for performing and interpreting the results of an in-line inspection.

#### **In-Line Inspection Technology**

A class of inspection methodologies (i.e., EMAT, MFL, Ultrasonic, caliper, etc.) used in the performance of an in-line inspection.

#### **In-Line Inspection Tool**

An instrumented device or tool that uses a non-destructive testing technique to inspect the pipeline from the inside or that uses sensors and other equipment to measure one or more characteristics of the pipeline. Also known as intelligent or smart pig.

**Instrumented tool or pig:** A device used for internal inspection of a pipe, which contains sensors, electronics, and recording or output functions integral to the system. Instrumented pigs are divided into two types:

(1) Caliper pigs, which measure the pipeline geometry or the conditions of the inside surface of the pipe.



Client- Vedanta Limited  
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(2) In-line Inspection Tools that use non-destructive testing techniques to inspect the wall of the pipe for corrosion, cracks, or other types of anomalies.

**Insulation Joint (IJ):** The Pipeline Insulation Joint is a high-resistance fitting used to electrically isolate sections of a pipeline to improve the effectiveness of Cathodic protection systems and to reduce ground-loop currents. The IJ is factory assembled, and provided with extension nipples that match the pipeline wall and grade and are long enough to eliminate any possibility of thermal damage to the PIJ during field welding.

**Intelligent pig or tool:** See In-line Inspection tool.

**Joint:** A single section of a pipe welded to other sections in order to make up a pipeline.

**Launcher:** A device used to insert an in-line inspection tool into a pressured pipeline, may be referred to as a pig trap or scraper trap.

**Manufacturing anomaly (MFG):** An anomaly that arises during manufacture of a pipe joint or component.

**Maximum Allowable Operating Pressure (MAOP):** The maximum internal pressure permitted for the operation of a pipeline as defined by the Code of Federal Regulations.

**Maximum Operating Pressure (MOP):** The maximum internal pressure expected during the operation of a pipeline, which cannot normally exceed the maximum allowable operating pressure.

**Measurable:** Producing an inspection signal that is above the noise level inherently present in the pipe.

**Measurement Threshold:** A characteristic, dimension or dimensions above which an anomaly measurement can be made. See also Detection Threshold and Reporting Threshold.

**Metal Loss:** Any pipe anomaly in which metal has been removed. Metal loss is usually due to corrosion or gouging.

**Mid wall feature:** Any feature which does not run out to either the internal or external surface.

**Nominal Wall Thickness:** The wall thickness specified for the manufacture of the pipe. Actual wall thickness will vary within a range permitted by the pipe manufacturing standard/specification and sometimes will vary outside that range if the manufacturing was not performed within the stated tolerance.

**Obstructions:** Any restriction or foreign object that reduces or modifies the cross section of the pipe to the extent that flow is affected or in-line that inspection pigs get stuck (Ovalities, collapse, dents, undersized valves, wrinkles, bends, weld drop-through). Obstructions also include any foreign object in the pipeline.

**Operator:** A person or organization that owns or operates pipeline facilities.

**Ovalities:** Out of roundness, i.e. egg shaped or broadly elliptical.

**Pig:** A generic term signifying any independent, self-contained or tethered device, tool, or vehicle that moves through the interior of the pipeline for inspecting, dimensioning, or cleaning. A pig may or may not be an in-line inspection tool.

**Pig trap:** An ancillary item of pipeline equipment, with associated pipe work and valves, for introducing a pig into a pipeline or removing a pig from the pipeline.

**Pipe mill defect:** A defect that arises during manufacture of the pipe, as for instance a lap, sliver, lamination, non-metallic inclusion, rolls mark and seam weld defect.

**Pipeline:** A continuous part of a pipeline facility used to transport a hazardous liquid or GAS. Includes pipe, valves, and other appurtenances attached to pipe.

**Pipeline Component:** A feature or appurtenance, such as a valve, Cathodic protection connection, or tee that is a normal part of the pipeline. See Component.

**Pitting:** Localized corrosion of a metal surface that is confined to small areas and takes the form of cavities called pits.

**Probability of Detection (POD):** The probability of a feature being detected by an in-line inspection tool.

**Pipeline Operator Forum (POF):** A document incorporating the specifications and requirements for intelligent pig inspections of pipelines. This document encompasses the specifications of MFL, UT, Geometry (Caliper) and Geographic tool.

**Bend radius:** The radius of the bend in the pipe as related to the pipe diameter (D). Example: a 3D bend would have a radius of three times the diameter of the pipe measured to the centreline of the pipe.

**Receiver:** A pipeline facility used for removing a pig from a pressurized pipeline, may be referred to as trap, or pig trap or scraper trap.

**Recognizable:** Producing a signal that can be identified as coming from a particular type of defect.

**Reference wall thickness:** The actual wall thickness surrounding a feature.

**Reporting threshold:** A parameter that defines whether or not an anomaly will be reported. The parameter may be a limiting value on depth, width, or length of an anomaly or feature.

**Seam weld:** The longitudinal or spiral weld in pipe, which is made in the pipe mill.

**Seamless:** Pipe made without a seam weld.

**Smart pig:** See In-line Inspection Tool.

**Spalling:** Abrasion of the pipe's surface that results in shallow surface laps and that can potentially lead to hardening of the below material.

**Specified Minimum Yield Strength or Stress (SMYS):** The minimum yield strength prescribed by the specification under which pipe is purchased from the manufacturer.



Client- Vedanta Limited  
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Pipeline Name- 14" RT - RD, Water Injection Pipeline  
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**Spiral Weld:** A longitudinal DSAW that traverses helically around the pipe. A welding process used in the manufacture of pipe.

**Stress:** Tensile, shear or compressive force per unit area.

**Survey:** Measurements, inspections, or observations intended to discover and identify events or conditions that indicate a departure from normal operation of the pipeline.

**Support:** a pipeline installation that holds or provides physical support of pipeline sections or pipeline pressure system components.

**Tap:** a fitting used in pipelines as part of the pressure system to connect instruments or other fittings together.

**Tee:** A structure that connects, or puts together two or more pipelines.

**Tool:** A generic term signifying any type of instrumented tool or pig.

**Touching:** A metal object touching the outer surface of the pipeline wall.

**Type:** The reported Types of pipeline components and anomalies are classified as per the following abbreviations:

Additional Metal / Material

- Debris (DEBR)
- Touching
- Other (OTHR)

Anomaly

- Arc Strike (ARCS)
- Artificial Defect (ARTD)
- Buckle (BUCK)
- Corrosion (CORR)
- Corrosion Cluster (CLUSTER)
- Crack (CRAC)
- Dent (DENT)
- Dent with Metal Loss (DEMEL)
- External corrosion (EXT. Corrosion)
- Gouging (GOUG)

- Grinding (GRIN)
- Girth Weld Crack (GWCR)
- Girth Weld Anomaly (GWA)
- Hydrogen Induced Cracking (HIC)
- Internal Corrosion (INT. Corrosion)
- Lamination (LAMI)
- Longitudinal seam weld crack (LWCR)
- Longitudinal weld anomaly (LWAN)
- Ovalities (OVAL)
- Pipe Mill Anomaly (MIAN)
- Pipe Mill Anomaly Cluster (MIAC)
- Stress Corrosion Cracking (SCC)
- Spalling (SPAL)
- Spiral Weld Crack (SWCR)
- Spiral Weld Anomaly (SWAN)
- Wrinkle (WRIN)
- Other (OTHE)

## Weld

- Bend start / end (BENS/BENE)
- Change in diameter (CHDI)
- Change in wall thickness (CHWT)
- Adjacent Tapering (ADTA)

**Utility pig:** Pig that performs relatively simple mechanical functions, such as cleaning the pipeline.

**Verification:** An excavation/diving made to verify the reported results of an in-line inspection.

**Verification Measurement:** The dimensions or characteristics of an anomaly as physically measured when the anomaly has been exposed for measurement during a verification dig.

**Weld feature:** Feature in the body of a weld.

**Yield pressure:** The pressure at which the nominal hoop stress in the wall of a pipe equals the specified minimum yield stress of the pipe grade.

**Abbreviations/Glossary:**

**ASME:** American Society of Mechanical Engineers

**AXGR:** Axial Grooving

**CIGR:** Circumferential Grooving

**CICL:** Circumferential Slotting

**DP/Pdesign:** Design Pressure

**D/S:** Down-stream

**ERF:** Estimated Repair Factor

**Ext:** External

**GW:** Girth weld

**GENE:** General

**Int.:** Internal

**ID:** Internal Diameter

**IPS:** Intelligent Pigging Survey

**m:** Meter / **mm:** Millimetre

**MAOP:** Maximum Allowable Operating Pressure

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**MFG:** Manufacturing anomaly

**MPa:** Mega Pascal

**m/s:** Meter per second

**MM:** Magnetic Marker

**N/A:** Not applicable

**NWT:** Nominal Wall Thickness

**OD:** Outside Diameter

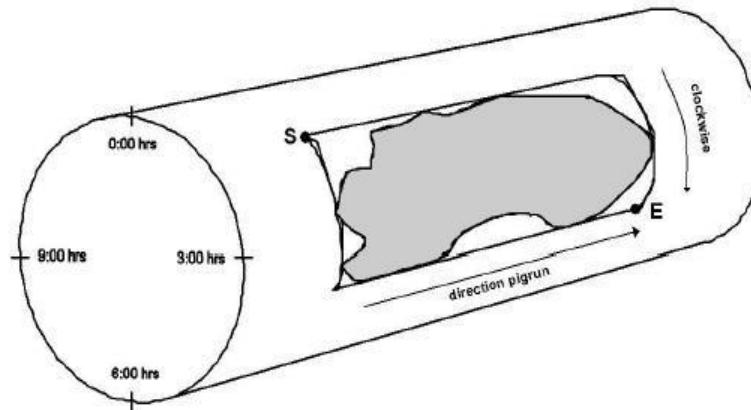
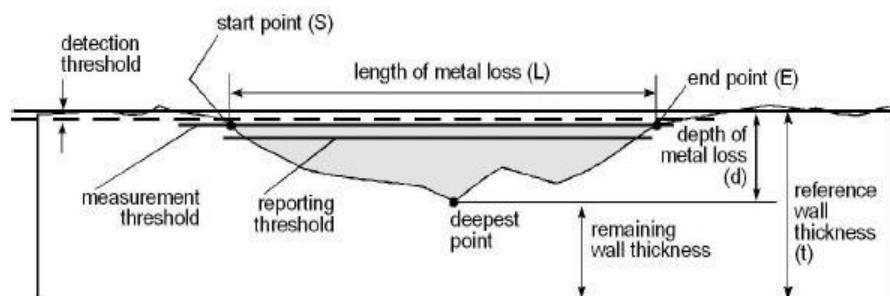
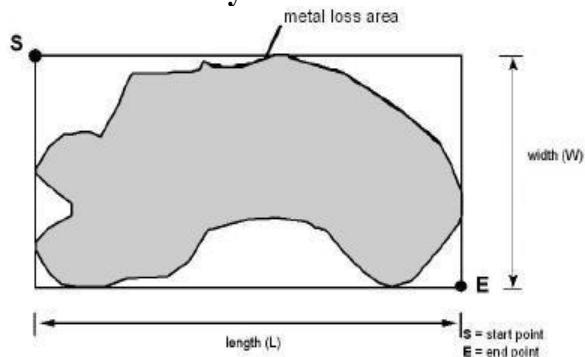
**PITT:** Pitting

**POF:** Pipeline Operator Forum

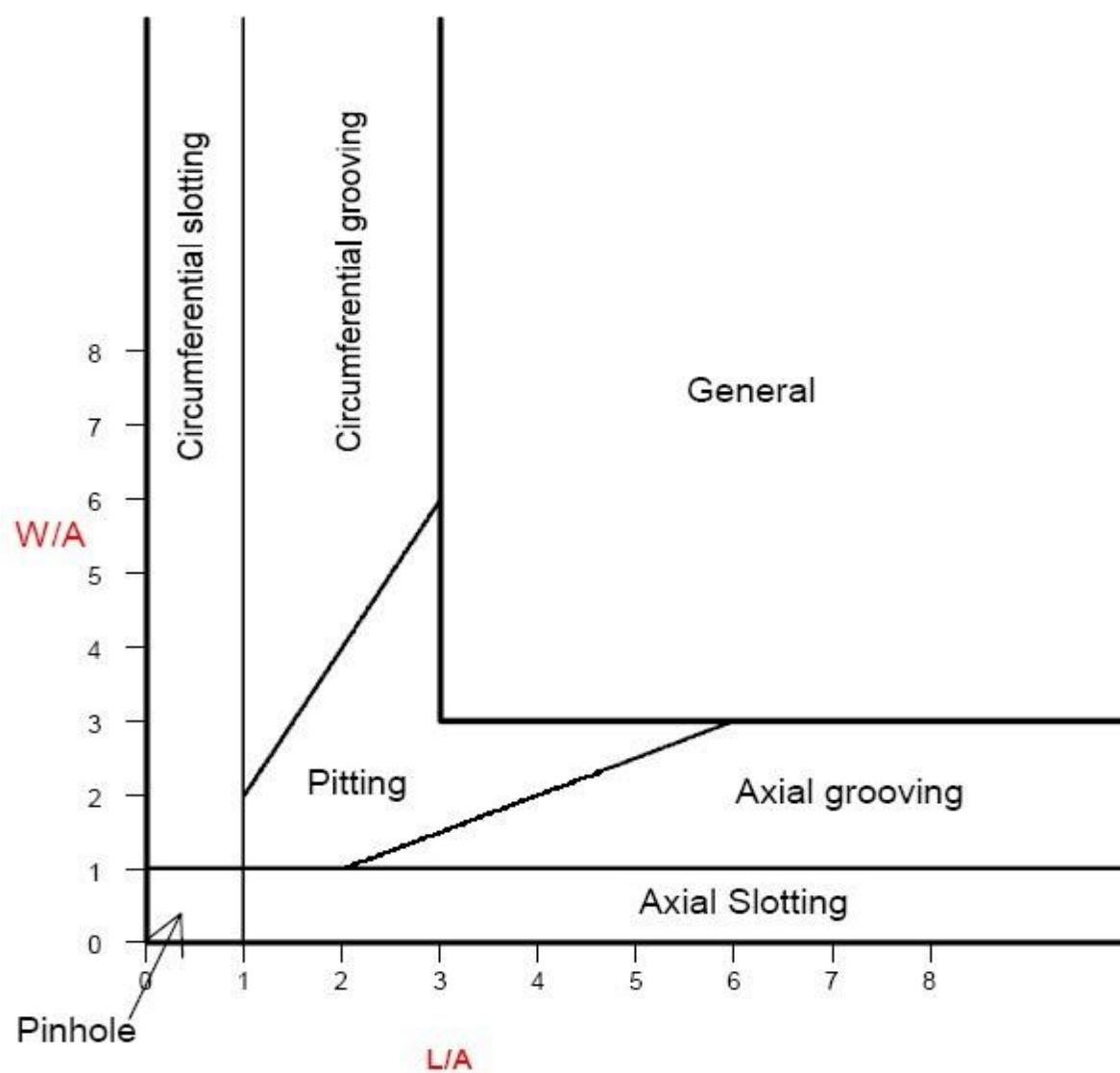
**t:** Nominal wall thickness/reference wall thickness

**U/S:** Up-stream

## Location & dimensions of metal loss anomaly-



A graphical presentation of metal loss anomalies per dimension classes is given below:



The geometrical parameter A is linked to the NDE methods in the following manner:

If  $t < 10$  mm then  $A = 10$  mm

If  $t \geq 10$  mm then  $A = t$

## Appendix D. Metal loss anomalies assessment

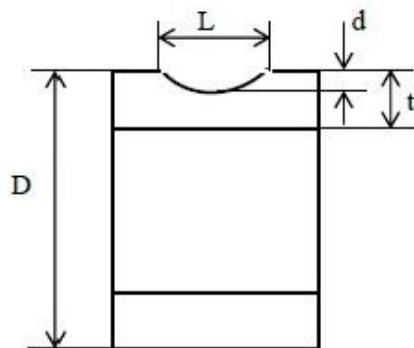
There are several approaches that have been used to characterize the behavior of both through-wall and part-wall corrosion anomalies.

### ASME B31G

ASME is a widely used Manual for evaluating the remaining strength of smoothly corroded pipes. This supplement to B31 was developed over 25 years ago, although it has recently been re-issued. ASME B31G is a very conservative criterion that aids operators in avoiding unnecessary cutouts. It is based on an empirical fit to an extensive series of full-scale tests on vessels with narrow machined slots. The basis of the equation used in B31G is relatively simple and involves the following:

- Assumption that the maximum pipe hoop stress is equal to the pipe material's yield strength;
- Characterization of corrosion geometry by a projected parabolic shape for a relatively short corrosion, and a rectangular shape for long corrosion.

The anomaly dimensions and parameters are as follows:



### 1. Computation of z -

$$z = \frac{L^2}{Dt}$$

Where

L=length of the metal loss

D=specified outside diameter of the pipe.

t=pipe wall thickness

### 2. Computation of bulging stress magnification factor M -

M can be calculated using below formula

$$M = (1 + 0.8z)^{1/2}$$

### 3. Computation of estimated failure stress level – $S_F$

a) For values of z less than or equal to 20.

$$S_F = S_{flow} \left[ \frac{1 - \frac{2}{3}(\frac{d}{t})}{1 - \frac{2}{3}(\frac{d}{t})/M} \right]$$

b) For values of z greater than 20.

$$S_F = S_{flow} \left( 1 - \frac{d}{t} \right)$$

$S_{flow}$  = flow stress

$$S_{flow} = 1.1 * SMYS$$

SMYS=Specified minimum yield strength of the material at ambient condition.

L= Length of the metal loss.

D=specified outside diameter of the pipe.

t=pipe wall thickness.

M= bulging stress magnification factor

#### 4. Computation of estimated failure pressure - $P_F$

$$P_F = \frac{2S_F t}{D}$$

#### 5. Computation of safe operating pressure of corroded area - $P_S$

$$P_S = \frac{P_F}{SF}$$

**SF= Safety Factor**

Note- Safety Factor is considered to be 1.39 for the pipelines operating with a hoop stress of 72% of SMYS; however, there is no single safety factor that is suitable for all types of pipeline construction, for all modes of pipeline operation, or for all types of flaws or anomalies.

ASME B31G recommends a minimum safety factor equal to the ratio of the minimum hydrostatic pressure required for the given type of pipeline construction to the MAOP or MOP, but usually not less than 1.25.

#### 6. ERF calculation

Finally, the Estimated Repair Factor (ERF) associated with the metal loss defect is calculated using the following equation:

$$ERF = \frac{MAOP}{P_S}$$

MAOP is the pipeline Maximum Allowable Operating Pressure. Hence when ERF is  $\leq 1$ , the anomaly is acceptable, and when ERF is  $> 1$ , the anomaly is not acceptable as per ASME B31G and should further be analyzed using a less conservative assessment procedure (e.g. RSTRENG, Finite Element Analysis etc.) or, the anomaly should be repaired using an approved procedure (e.g. replacement of the affected section or encirclement by a pressure retaining clamp).

#### 4. Computation of estimated failure pressure - $P_F$

$$P_F = \frac{2S_F t}{D}$$

#### 5. Computation of safe operating pressure of corroded area - $P_s$

$$P_s = \frac{P_F}{SF}$$

SF= Safety Factor

Note- Safety Factor is considered to be 1.39 for the pipelines operating with a hoop stress of 72% of SMYS; however, there is no single safety factor that is suitable for all types of pipeline construction, for all modes of pipeline operation, or for all types of flaws or anomalies.

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## Appendix E. Disclaimer

The opinions and recommendations provided by VDT Pipeline Integrity Solution Pvt Ltd. regarding the pipeline's condition are based on data interpretations, analyses, and calculations made in good faith. These are not warranties or guarantees of the pipeline's structural integrity, merchantability, fitness for use, or any other conditions.

VDT Pipeline Integrity Solution Pvt Ltd. assumes no liability for any consequential damages. The data interpretations are influenced by several factors, some beyond VDT's control, and therefore, VDT cannot guarantee their accuracy.

This report is issued in accordance with a "VDT Agreement" or another written agreement. It is based on an indirect pipeline inspection, with final data interpretation relying on specific defect assessment formulas and customer input. The inspection results are intended to prioritize excavations and should not be used to alter the pipeline's established operating parameters.

VDT's data and reports do not constitute a warranty or guarantee of quality, and under no circumstances should the data be used to violate or alter any law, regulation, or industry standard. VDT and its affiliates are not liable for any indirect or consequential damages, including those related to pipeline failure, pollution, or loss of business.

Client- Vedanta Limited  
Subcontract No- PF-109943-R-24-189  
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## Appendix F. Contact VDT

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