Pipeline Integrity Data: An Essential Asset

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Introduction

- Capturing and evaluating integrity data is a complex exercise
- As an industry we sometimes do not fully embrace the opportunity
- Efforts made to collect accurate and reliable integrity data are not always on the same level as, for example, those made when designing and constructing new pipelines
- In day-to-day operations, capacity is always maximised so that every possible hydrocarbon molecule moves through the pipeline without interruption
- So why not also maximise the value of our integrity data?

The Integrity Data Collection Process

Plan Design Capture Assess Integrate

Plan

- It is critical that integrity engineers, as well as operations personnel and management, are aware of the activities and frequencies outlined in the IMP
- IMP activities generate key inputs which, if not fed into the budget cycle promptly, an opportunity to make the appropriate corrections could be missed
- A strong governance system embedded in the PMS is often key to ensuring any deficiencies are addressed in time
- Multi-year plan is often developed, approved and funded for execution.
- A schedule should also be developed in parallel with the budget so that once funds are allocated, the program can begin without delay.

Output	Response
Cathodic protection survey	Anode bed replacement
	Transformer/rectifier overhaul, replacement, new installation
	Fast-tracked coating defect survey
	Close-Interval Survey, natural-potential survey
	Test point, cross-bond installations, MIJ/IF replacement
In-line inspection data	Dig program
	Re-inspection
	Repairs
	Remaining life review
Coating defect survey	Dig up program
	Coating repairs
	Close-Interval Survey, natural-potential survey
	Fast-tracked ILI
Pipeline history (same or similar pipeline)	Dig up program
	Coating repairs
	Close-Interval Survey, natural-potential survey
	Fast-tracked ILI

Design

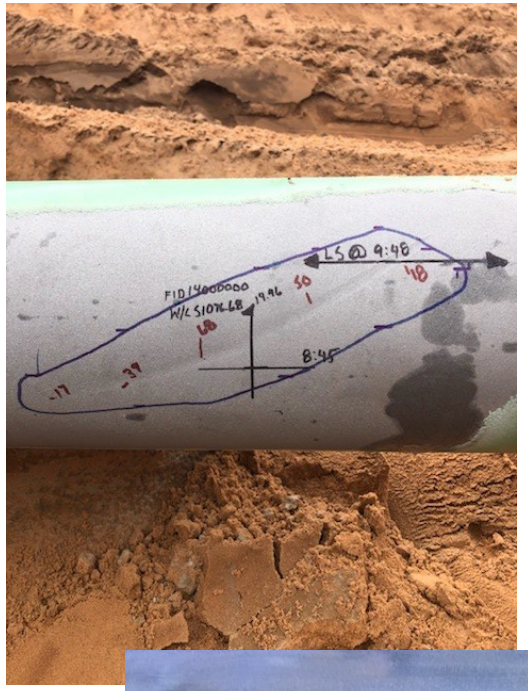
- **Take the time to think about and engage stakeholders!**
  - Pipeline Integrity/Engineering
  - Field surveyors
  - Engineering Consultants
  - Inspection vendor(s)
  - Construction contractors (excavation, coating removal/reinstatement, pipeline repairs)
  - Pipeline operations and Control Room
  - Commercial and customers
  - Landholders, Cultural Heritage and other third parties
  - HSE
  - HR and Training
  - State Regulators

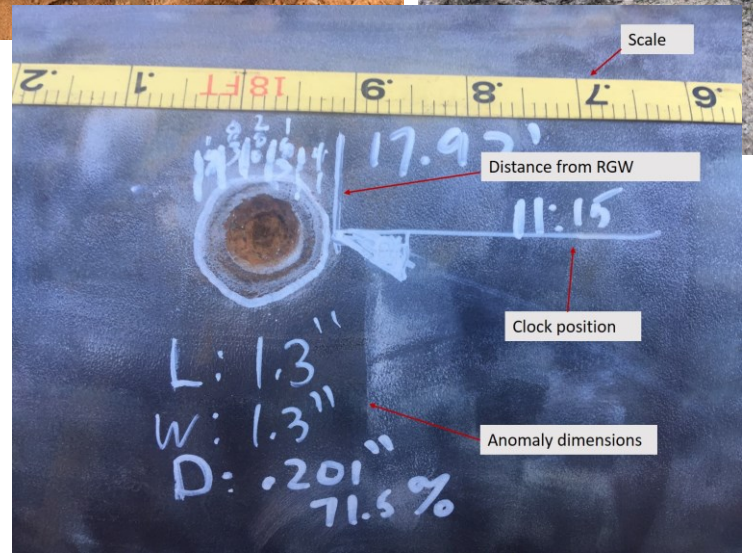
Capture

- Ensure that the desired resources and conditions are in place
- Establish Roles and Responsibilities
- Hold regular meetings
- Communications

Capture

- Expected feature type, required integrity assessment, possible repair methods
- Pipeline history
- Data requirements
- Required operating conditions
- Equipment, materials and consumables
- Personnel (transport, accommodation, induction and training requirements)
- Procedures, forms and templates
- Communications protocol, Emergency Response
- Risk Assessments, JHAs and Work Permits
- Access to site, land permits, weather patterns
- Supporting equipment (i.e. excavation, sandblasting and coating, lifting, venting/flaring, welding)





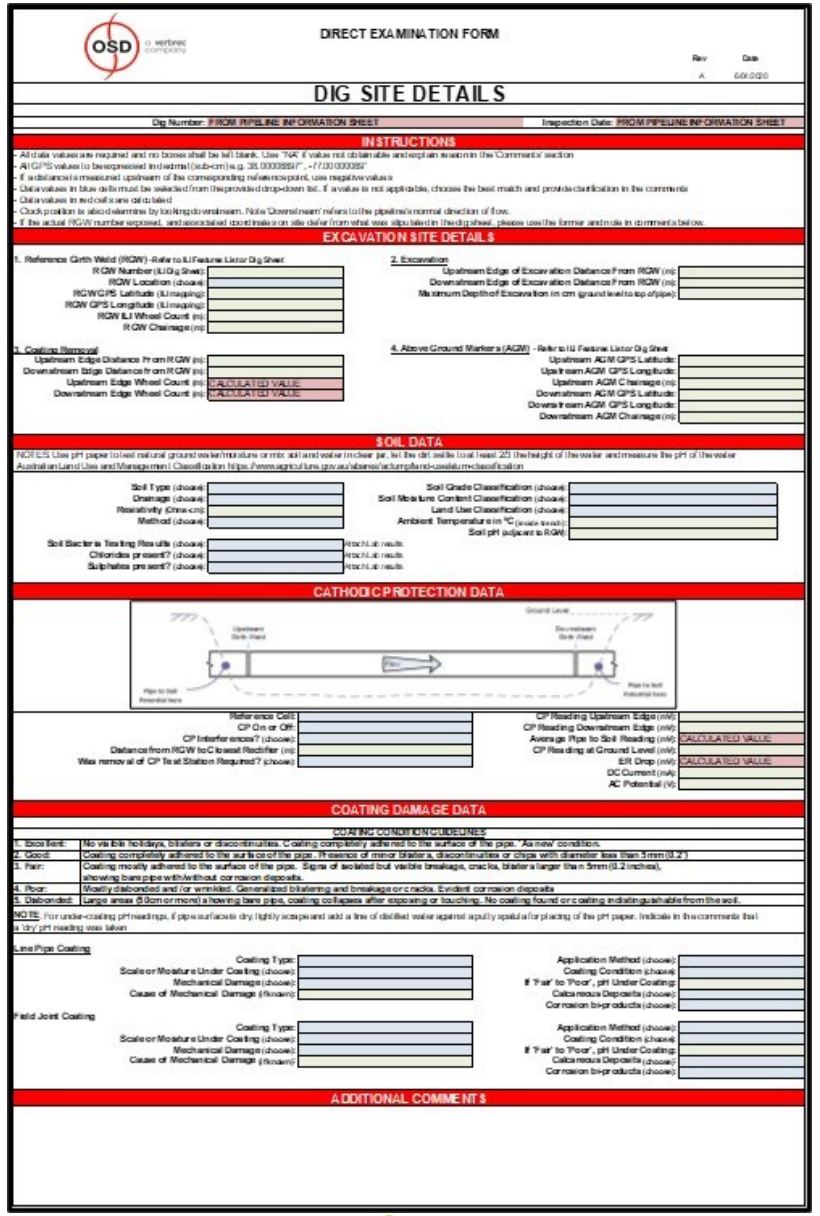
Capture

- Forms and Templates

COATING CONDITION GUIDELINES	
1. Excellent:	**No visible holidays, blisters or discontinuities. Coating completely adhered to the surface of the pipe. 'As new' condition.**
2. Good:	**Coating completely adhered to the surface of the pipe. Presence of minor blisters, discontinuities or chips with diameter less than 5mm (0.2")**
3. Fair:	**Coating mostly adhered to the surface of the pipe. Signs of isolated but visible breakage, cracks, blisters larger than 5mm (0.2 inches), showing bare pipe with/without corrosion deposits.**
4. Poor:	**Mostly disbonded and /or wrinkled. Generalized blistering and breakage or cracks. Evident corrosion deposits**
5. Disbonded:	**Large areas (50cm or more) showing bare pipe, coating collapses after exposing or touching. No coating found or coating indistinguishable from the soil.**
NOTE: For under-coating pH readings, if pipe surface is dry, lightly scrape and add a line of distilled water against a putty spatula for placing of the pH paper. Indicate in the comments that a 'dry' pH reading was taken	

INSTRUCTIONS

- All data values are required and no boxes shall be left blank. Use "NA" if value not obtainable and explain reason in the 'Comments' section
- All GPS values to be expressed in decimal (sub-cm) e.g. 38.00008897°, -77.00000089°
- If a distance is measured upstream of the corresponding reference point, use negative values
- Data values in blue cells must be selected from the provided drop-down list. If a value is not applicable, choose the best match and provide clarification in the comments
- Data values in red cells are calculated
- Clock position is also determine by looking downstream. Note 'Downstream' refers to the pipeline's normal direction of flow.
- If the actual RGW number exposed, and associated coordinates on site defer from what was stipulated in the dig sheet, please use the former and note in comments below.



DIRECT EXAMINATION FORM

DIG SITE DETAILS

INSTRUCTIONS

EXCAVATION SITE DETAILS

SOIL DATA

CATHODIC PROTECTION DATA

COATING DAMAGE DATA

ADDITIONAL COMMENTS

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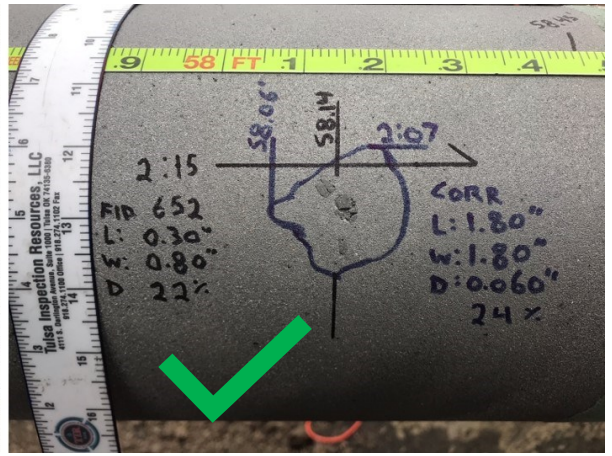
Capture

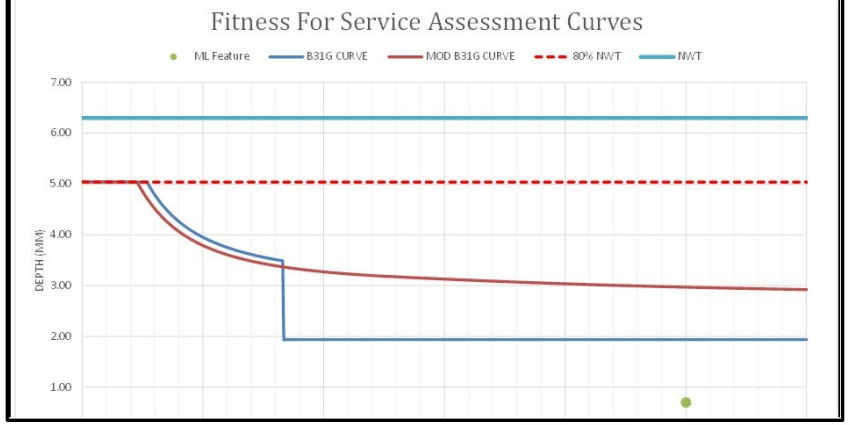
- Pipeline location
- Girth weld location and verification
- Excavation and pipeline exposure
- Close visual inspection (pre-coating removal)
- pH and damaged coating sampling
- Cathodic protection readings, soil sampling
- Coating removal and grit-blasting
- Pipe wall inspection
- Review of data collection forms
- Integrity assessment
- Repairs and/or re-coating
- Backfilling

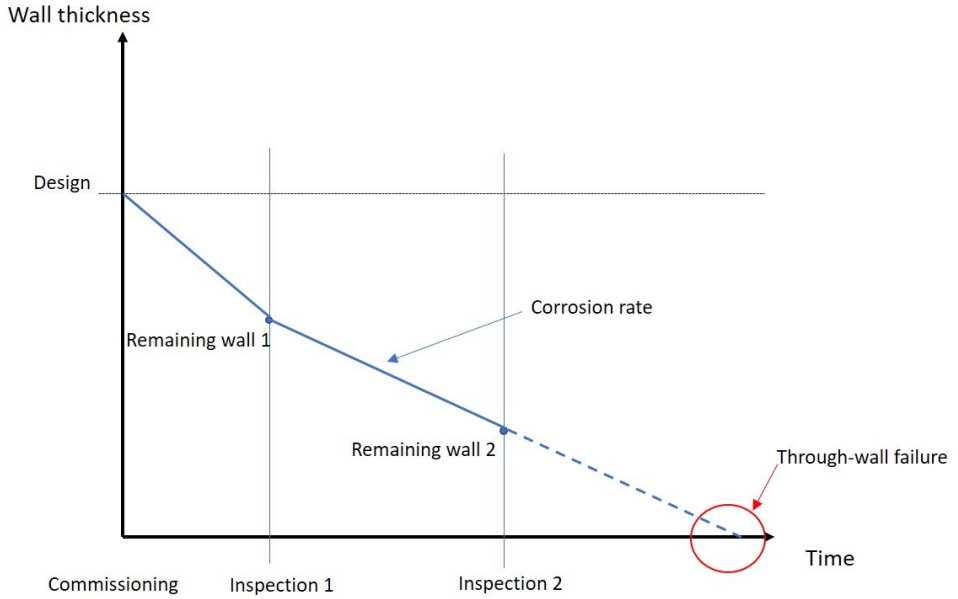


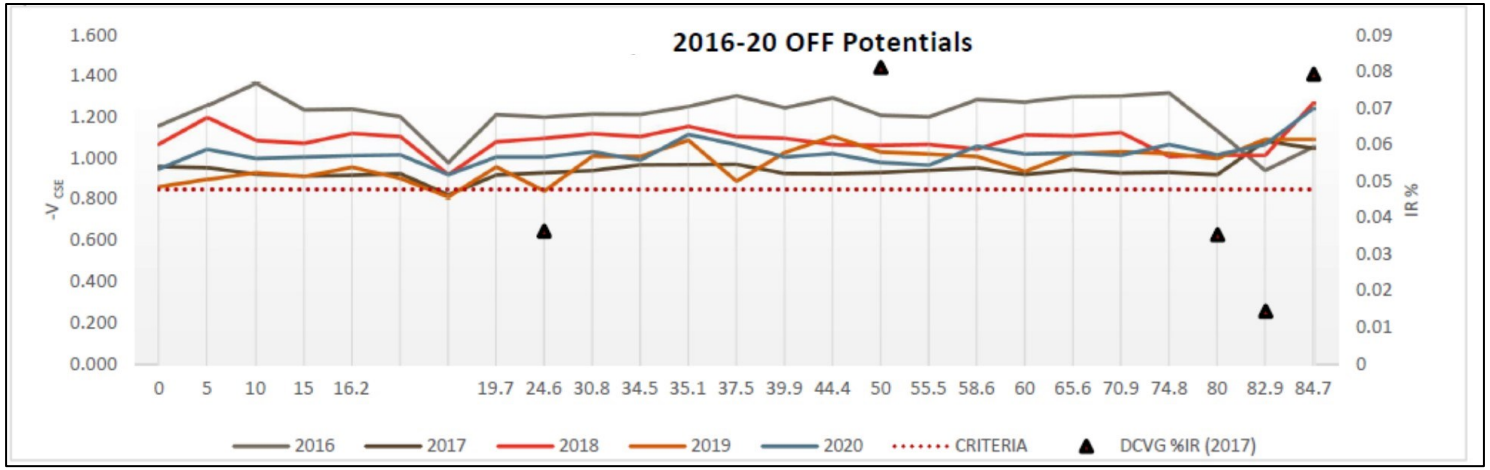
Assess, Integrate

	Client:		Document No:	
OSD a verbrec company	Project:		Revision:	0.00
	Description:	ASME B31G FITNESS FOR SERVICE CALCULATION	Date:	29/09/2021

		Unit		Note
1	GENERAL PIPELINE INFORMATION		Input Values	
1.1	Pipeline name	-		
1.2	KP	-		
1.3	API 5L Pipe Grade (Select)	-	X-46	
1.4	Nominal Diameter (Select)	mm	DN 200 (8")	
1.5	Nominal Wall Thickness	mm	6.30	
1.6	Design Factor (f)	-	0.72	AS2885.1
1.7	MAOP	MPag	10.10	
1.8	P&ID	-	NA	
1.9	Line Number	-	TBA	
2	PIPELINE CALCULATED PARAMETERS		Calculated Values	
2.1	Pipe Grade SMYS	MPa	320	
2.2	Pipe Outside Nominal Diameter	mm	219.1	
2.3	Hoop Stress at MAOP	MPag	175.63	
		%SMYS	54.88%	
2.4	Yield Pressure (Barlow)	MPag	18.40	$Py = 2St/D$
2.5	Max Design Pressure	MPag	13.25	$Py \times f$
3	ANOMALY/DEFECT DIMENSIONS		Input Values	
3.1	Depth	mm	0.70	Max depth
3.2	Length	mm	500.00	Max length
3.3	Corroded wall pipe	mm	6.30	
4	ASSESSMENT CURVES			







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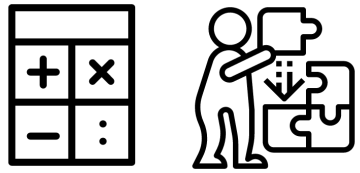

- It is the ability to utilise the full range of data collected during the inspection what will allow the integrity engineer to also understand the possible cause for the damage, as well as identifying the best mitigation measures so that there are no more occurrences.
- This is the phase of the data collection cycle where the most value can be extracted out of the opportunity, but once again relying on the quality and completeness of the data collected.

Assess, Integrate

- Use, store, manage, re-use all your data

Data Set	Benefit
Detailed coating defect data (pipe, joint, transition)	- Validate DCVG data - Align coating defect and ILI metal loss - Define levels/severity of disbondment - pH (validate effectiveness of CP) - Identify possible blistering (CP over-protection, poor installation conditions) - Effects of soil type - Identify interference (AC and/or DC)
Soil type/condition	- Effects of soil on coating - Drainage, moisture, resistivity - Bacteria and contaminants in soil
Cathodic protection potentials (at pipe level)	- Validate %IR for future CP surveys - Effects of CP on coating condition
Pipeline alignment	- Identify high/low points - Sources of soil moisture (creeks, drainage) - Evidence of soil movement
GPS coordinates (anomalies, girth welds, appurtenances)	- Validate ILI mapping tool accuracy - Validate DCVG equipment accuracy - Validate GIS alignment data - Identify pipe movement
Material Identification	- Pipe grade, SMYS - Weldability - Hard spots
Anomaly data (pre and post coating removal)	- Clock position - Distance from reference girth weld - Interaction with other anomalies/seam weld - Presence of corrosion bi-products

Closing

- The collection of integrity data is often highly technical and requires great attention to detail to ensure reliability
- Opportunities to conduct these activities can be rare and it is incumbent on the pipeline operator to maximise their value
- Identifying stakeholders and ensuring they all understand the purpose of the activity, as well as making sure the data parameters are appropriately identified, is key
- The time and effort spent planning and preparing for the activity will always turn into a valuable investment when compared to possible re-work or the cost of collecting unusable data.


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