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APGA INFORMATION PAPER

Making pipelines piggable in the 21st century

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1. Abstract [as submitted Feb 2022]

This paper is a continuation of the previously submitted paper from 2019. It presents a progress update of the shortlisted 19 'un-piggable' pipelines marked for conversion (to 'piggable') from the portfolio of APA's pipelines across Australia.

Pipelines were risk ranked according to AS2885, APA's corporate risk matrix and using a quantitative risk ranking methodology to prioritise the conversion project.

The following 19 unpiggable pipelines being above risk appetite in high consequence areas were identified as per state - 10 in VIC, 4 in NT, 3 in QLD and 2 in WA.

APA's board approved a program, driven by a dedicated project team, to make these unpiggable pipelines in high consequence areas piggable or safe with a revised completion date period of FY26.

Progress update for the 9 NT/QLD/WA pipelines:

- 4 projects complete (pigging completed - at target risk levels).
- 2 pipelines made piggable and are waiting on intelligent pigging tool to arrive
- 3 pipelines waiting on customers to increase flow rates or to restart operation to allow intelligent pigging.

Progress update for 10 VIC pipelines:

- 2 highly complex projects complete.
- 3 concept studies complete resulting in decision to not make 3 pipelines piggable.
- 4 projects schedule delayed due to resource constraints and alignment with conventional ILI delivery strategy.
- 1 pipeline under review pending confirmation from customer as to pipelines future.

Project highlights, inspection results, challenges and key lessons learnt were taken from 2 recently completed projects in High density VIC locations:

- T33 - South Melbourne-Brooklyn pipeline:
  - world first bi-directional pigging of a critical, live high pressure in inner city Melbourne.
- T64 - Newport pipeline:
  - running parallel to the Yarra River, this pipeline feeds Newport Power station, a critical peaking power asset in Melbourne's inner West

The remaining 'Unpiggables' projects have full commitment by APA and are gaining efficiency through the implementation of lessons learnt. A more detailed overview of the above will be presented in this paper including results.

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2. Introduction

Pigging, or In-line Inspection (ILI), is APA's primary and most accurate method of pipeline inspection. Current intelligent pigging technology provides a rapid and accurate assessment of a pipelines condition (including metal loss, corrosion, cracking and shape) to enable the company to prioritise pipeline repairs, which enables APA to operate its pipeline assets confidently and safely into the future.

There are currently a number of 'unpiggable' pipelines (pipelines with no launcher/receivers installed) in APA's portfolio, that currently fall outside of the company's risk appetite.

2.1 Background

In 1997 APA identified and converted all unpiggable pipelines greater than 10km in length and 150mm diameter.

In 2018 a team was appointed to revisit and review the remaining list of Unpiggable pipelines with the view to further lower APA's risk profile. 19 pipelines were identified nationally, and the findings were summarised in an Audit and Risk Committee Meeting below:

- APA has a number of pipelines that are not currently piggable, which results in a risk outside the tolerance set out in APA's Risk Appetite Statement;
- A program is in progress to convert the Category A pipelines (i.e. 19 of the pipelines in high consequence areas) to piggable or reduce the risk using an alternative method and return the risk to within the tolerance of the Risk Appetite Statement;
- The following criteria for categorising the Unpiggables remains unchanged:
  A. Category A High Consequence Areas (HCA) that do not meet categories below – Made Piggable.
  B. Category B High Consequence Areas (HCA) pipelines less than 400m in length or have zero flow – use non piggable technique to confirm pipeline integrity or reduce risk to make safe (i.e., suspension if applicable).
  C. Category C High Consequence Areas (HCA) pipelines that have a nominal diameter of less than 150 mm – Explore new pigging technology and assess to ensure adequate actions are in place to mitigate risk.
  D. Category D – Non HCA: ongoing assessment and mitigation as required per integrity management plan and Safety Management Study.

2.2 Objectives

The objectives of the Unpiggables program are to safely convert unpiggable pipelines to be suitable for pigging, to give certainty of the pipelines condition and improve certainty for calculating remaining life for unpiggable pipelines that do not meet APA acceptable risk tolerance.

The purpose of this paper is to provide a project status and results of the nominated pipelines with a key focus to 3 key challenging projects recently completed in Victoria 1) the South Melb – Port Melbourne pipeline and 2) the Newport pipeline, and 3) the Channel Island Lateral pipeline in NT.

2.3 Benefits

The conversion of unpiggable pipelines will enable more effective inspection of ageing assets and will help to ensure asset integrity and safe operation, especially for assets located in urbanised areas. This will help to maintain reliability of supply to customers and consumers in the Victorian Transmission System and provide safety to the community.

3. Methodology

In order to establish the appropriate level of pipeline inspection method, the following identification and assessment of Options were considered.

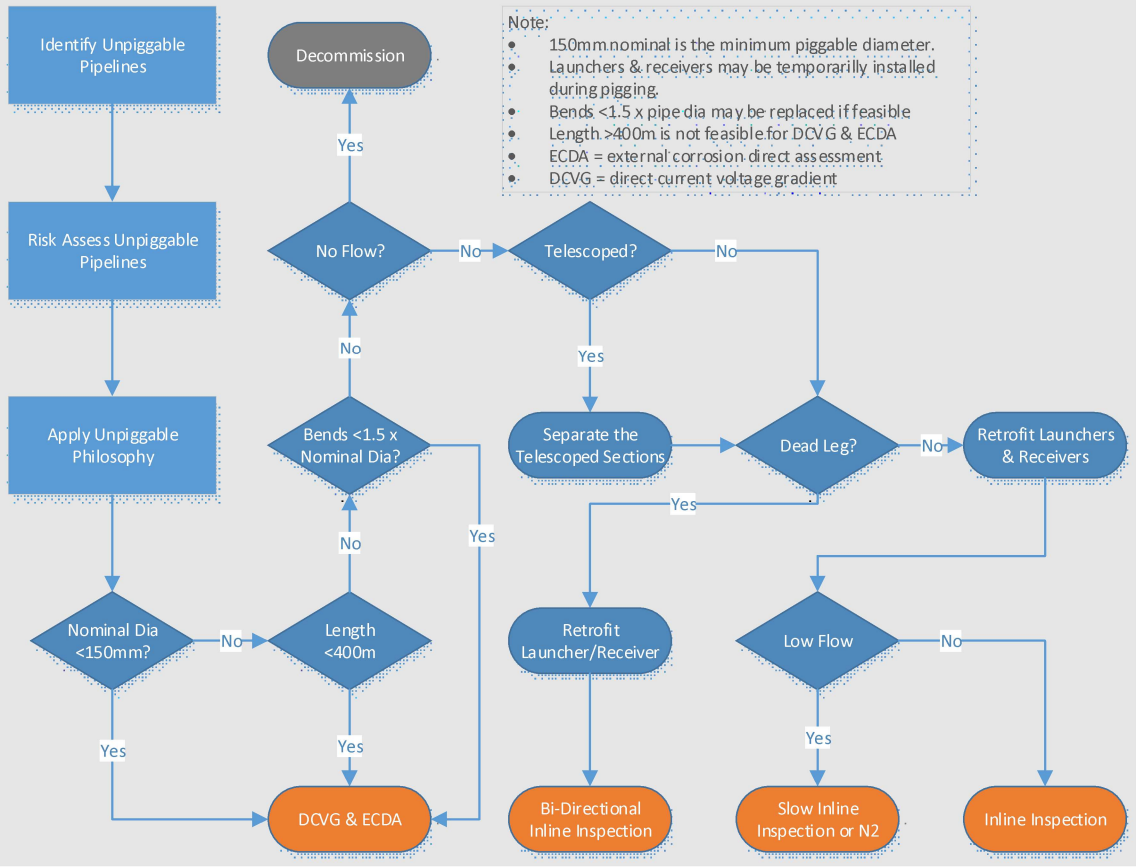
3.1 Option 1: Continue to operate

This option involves continuing to operate the unpiggable pipeline as-is, with no in-line inspection condition assessment and instead rely on numerical modelling for remaining life predictions and DCVG surveys to identify coating defects.

APA pipeline integrity engineers recommend this as non-viable option due to the risk ranking remaining at moderate for this option. In addition, an ALARP assessment would be required to allow continued operation. Option 1 Do nothing option does not meet the principle to reduce the risk level to As Low as Reasonably Practicable and does not align with good industry practice.

3.2 Option 2: Convert unpiggable pipelines

Using the APA unpiggable pipeline strategy, the appropriate course of action is selected and executed for each unpiggable pipeline. This strategy is outlined below in a simplified flow chart that explains the approach applied.



The above flow chart was applied to and reduced to the 19 pipelines detailed in Section 4.

4. Program Scope & Status

Below is a tabulation by state, of the 19 pipelines identified as being above APAs risk tolerance and the status of the conversion and In-line inspection.

4.1 Northern Territory, Queensland and Western Australia

State	Pipeline	Dia (mm)	Length (km)	Pressure (KPag)	Status
NT	Channel Island Lateral, Darwin	300	12	9,650	COMPLETE
NT	Wickham Point Lateral, Darwin	300	12	9,650	COMPLETE
NT	Darwin - Berrimah Pipeline	150	19	5,000	DELAYED Launcher/Receiver installed, unpiggable due to low flows dependent upon installation of new power station, date TBC
NT	Mt Todd Lateral	200	10	9,650	DELAYED Launcher/Receiver installed. Suspended state of operation until confirmation of gold mine restart. Date TBC
QLD	RBP Oakey-Gatton	400	65	9,600	COMPLETE
QLD	RBP Gatton-Swanbank	400	72	9,600	COMPLETE
QLD	Mount Isa Mines (MIM) Pipeline HP segment	250	100	9,900	COMPLETE
WA	Donaldson Rd (HiSmelt/Tianqi Lateral)	200	2	5,610	DELAYED Launcher/Receiver installed awaiting customer for adequate flow rate. Date TBC
WA	Parmelia Pipeline - S1 (Dongara to CS3)	350	12	6,300	COMPLETE

4.2 Victoria

Below is a tabulation of the 10 Victorian pipelines identified as being above APAs risk tolerance and status. Concept studies have concluded that a conversion to piggable was not always viable.

4.2.1 Make piggable

State	Pipeline	Dia (mm)	Length (km)	Pressure (KPag)	Status
VIC	**T33:** Pt Melb - Sth Melb	200	1.6	2,760	COMPLETE
VIC	**T64:** Newport (Power Station)	300	1	2,760	COMPLETE
VIC	**T110:** Snowy Hydro (Power Station)	150	1.5	5,000	DELAYED Launcher/Receiver installed; ILI scheduled for FY24.
VIC	**T37:** Tyres - Maryvale (Paper Mill)	150	5.5	6,890	Q2-FY23 Target completion
VIC	**T38:** Pakenham	150	1.2	2,760	Q4-FY22 Target completion
VIC	**T102:** Somerton (Power Station)	250	3.5	2,760	DELAYED Pending Land acquisition

4.2.1 Proceed with alternative

State	Pipeline	Dia (mm)	Length (km)	Pressure (KPag)	Status
VIC	**T15:** Oakleigh (Regent St)	200	1	2,760	Converting to CTM & decom. Q2-FY24 Target completion
VIC	**T89:** Bay St (Unichema)	150	0.5	2,760	No customer - decom. Q3-2022 Target completion
VIC	**T01:** Morwell -DNG (Jeeralang Station)	300	0.3	2,760	Managed with DCVG direct assessment.
VIC	**T88:** Laverton - Coogee	150	1.6	2,760	Pipeline not operational, clarity on future customer expected in FY24.

5. Project Highlights

Both projects listed below were selected as notably complex, primarily due to their highly industrialised and residential locations which posed various operational and constructability challenges.

5.1 T33: Port Melbourne - South Melbourne pipeline

5.1.1 Pipeline Summary

Built	1977
Length	1.6 km
Size	750mm (30")
MAOP	2,760kPag
Material	API 5L X42
Wall thickness	9.52mm

5.1.2 Key challenges

- Agreement and negotiations with AEMO to configure network to reverse flow.
- Pig trap only able to be installed at on western end.
- Bidirectional Pigging possible never undertaken prior.
- High density/trafficked area - difficulty tracking.

- Multiple 'on field' stakeholders playing various roles - tracking, traffic management, flow control etc.

5.1.3 Key highlights

- **HSE:** Incident free Field Execution (~4,000 hours total).
- **Schedule:** completed in April 2021 as agreed with AEMO.
- **Completed** world first bi-directional pigging of a critical, live high pressure gas pipeline in a high-density location. Confirming only 2 defects with <20% metal loss.
- **High stakeholder engagement**, communication, and motivation to succeed by all parties. Early buy-in meant people felt a part of the team.
- **Positive recognition** by key external stakeholders (ESV, AEMO and ROSEN)

5.2 T64: Newport pipeline

5.2.1 Pipeline Summary

Built	1980
Length	1.0 km
Size	450mm (18")
MAOP	2,760kPag
Material	API 5L X42
Wall thickness	7.9mm

5.2.2 Key challenges

- Poor or no as-built records
- Provings around 3rd party assets (BP, Shell etc.)
- Contaminated Soil, Ground water levels, proximity to Yarra River.
- Complex Tie-ins, sheet piling

5.2.3 Key highlights

- **HSE:** Incident free Field Execution (~15,000 hours total)
- **Schedule:** completed within tight Power Station shutdown window
- **Completion:** of project with challenging constructability and environmental conditions.

5.3 Channel Island Pipeline

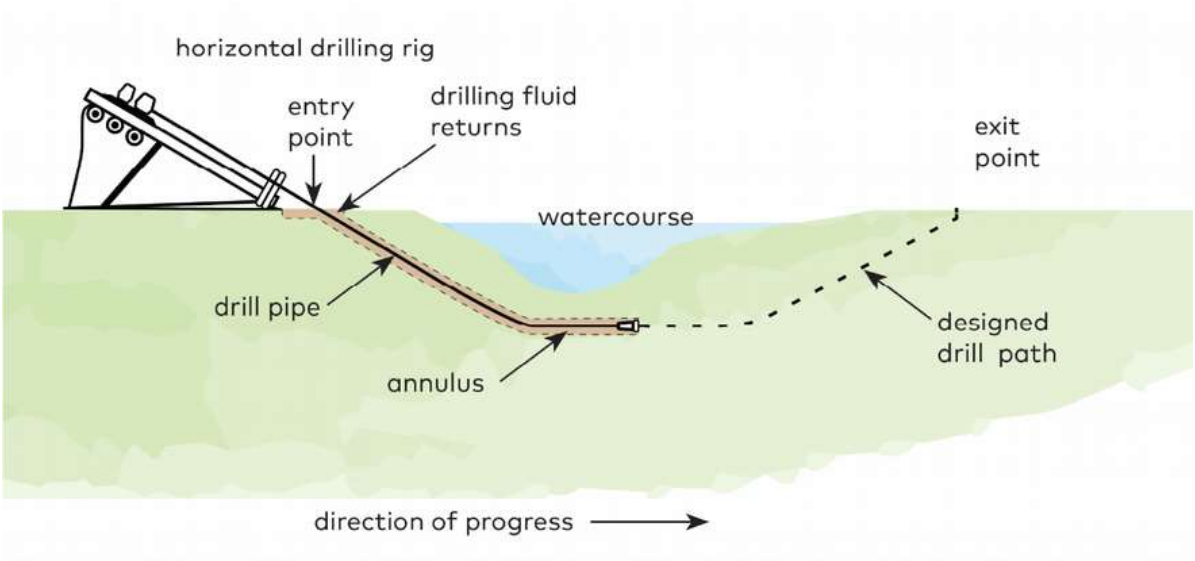
The Channel Island pipeline is a lateral of the Amadeus Gas Pipeline (AGP) between Darwin City Gate and the Channel Island Meter Station.

5.3.1 Pipeline Summary

Built	1986
Length	11.9 km
Size	300 mm (12")
MAOP	9650 kPa
Material	API 5L X52 & API 5L X60
Wall thickness	7.9mm / 9.5mm

5.3.2 Key challenges

- Existing pipeline through Channel Island Bridge is smaller diameter than the main line, preventing passage of an ILI tool.
- Replacement required 1.3 Kilometre HDD bore through complex geology of sediment and hard rock.



5.3.3 Key highlights

- HDD bore and pipeline pullback completed as planned
- The full pipeline length has now been successful inspected

6. Inspection Results

In-Line inspection has now been completed on the following assets

6.1 T33: Port Melbourne - South Melbourne pipeline

Inspection of the T33 detected an unexpected offtake or drain point to be investigated further, one corrosion anomaly and no dents.

The lack of other features confirms that the coating system isn't shielding, and its CP is providing adequate protection.

The corrosion anomaly has been scheduled for excavation, and the ability to continue safely operating the pipeline has been confirmed.

6.2 T64: Newport pipeline

Inspection of the T64 located numerous milling anomalies, no dents, and two external corrosion clusters associated with failed heat shrink sleeves.

The deepest corrosion feature was 15% of nominal wall. These will be excavated within the next 12 months however the excavations will be challenging due to access and potentially contained soils in the area.

Demonstrating the integrity of this pipeline using External Corrosion Direct Assessment methods (DCVG) is likely to have required significantly more excavation locations, and is unlikely to have been effective in locating shielding corrosion features such as this (Photo below is an example from a different pipeline).

The inspection has provided confidence that the pipeline can continue to be operated safely and the integrity program will continue to monitor the condition of heat shrink sleeves.

6.3 Channel Island pipeline

Inspection of the Channel Island Lateral detected four previous Clockspring repairs not shown in records, a number of corrosion features, and allowed a known lightning strike damage to be pinpointed.

The defects have now all been inspected with the largest requiring a Petrosleeve repair.

The lightning strike has been repaired with a stand-off sleeve. The four Clocksprings have been scheduled for excavation and inspection over the next year.