Business Case – Capital Expenditure

VTS Mainline Isolation Valve Upgrade

Business Case Number BC275 AA23-27

1 Project Approvals

TABLE 1: BUSINESS CASE – PROJECT APPROVALS

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2 Project Overview

Project resubmitted – ongoing program of work

TABLE 2: BUSINESS CASE – PROJECT OVERVIEW

Description of Issue/Project	The aim of this project is to ensure that Victorian Transmission System pipeline mainline isolation valves are able to operate safely and reliably when required. The objective of this project is to target with remedial actions all mainline isolation valves in a high consequence areas with any of the following issues; The mainline valve has internal leaks or internal friction which prevent the valve from isolating gas flow as per AS2885 requirements. The mainline valve has external leaks The mainline valve is located in residential property. This is an ongoing program.
Options Considered	The following options have been considered: Option 1: Do Nothing Option Option 2: Overhaul the existing isolation valve Option 3a: Replace the existing isolation valve Option 3b: Install new mainline valve in a safer location and decommission existing isolation valve (Preferred solution is both 3a and 3b).

Estimated Cost	$3,650,000
Relevant Standards	Australian Standard 2885.1:2012 Section 4.6.4 Isolation Valves: "Valves shall be provided to isolate the pipeline in segments for maintenance, operation, repair and for the protection of the environment and the public in the event of loss of pipeline integrity. APA applies principle of As Low as Reasonably Practicable to address identified risks.
Consistency with the National Gas Rules (NGR)	The replacement of these assets complies with the new capital expenditure criteria in Rule 79 of the NGR because: it is necessary to maintain and improve the safety of services and maintain the integrity of services (Rules 79(2)(c)(i) and (ii)); and it is such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of providing services (Rule 79(1)(a)).
Key Stakeholders	The stakeholders affected by this project are Australian Energy Market Operator Energy Safe Victoria Worksafe Victoria.
Benefits to Customers and Consumers	The mainline valve replacement program prevents consequence escalation during an emergency. In addition, (where required) the relocation of the isolation valve away from residential areas is the only viable alternative to reduce potential for residential incidents. The benefit of this program is to improve safety for the public and APA personnel by permitting downstream maintenance and project work to occur safely and without further isolation and ensures confidence the integrity of the valve into the future.

3 Background and Project Need

The VTS pipelines and laterals are divided into manageable volume sections with isolation valves to mitigate natural gas releases in the event of pipeline leak/rupture requiring an emergency response. Isolation valves are used at mainline valve (MLV) sites to isolate affected sections of pipework allowing the gas to be safely vented without venting the entire pipeline.

APA is progressively assessing VTS mainline isolation valves to ensure they satisfy function and integrity requirements. Mainline isolation valves that do not meet requirements will be overhauled, replaced or relocated for any of the following reasons:

- The valve does not produce the sealing capability required of an isolation valve
- The valve leaks externally
- The valve open or close function is unreliable due to excessive internal friction
- The valve proximity is too close to a residential dwelling
- The valve is at the end of useful life.

The VTS is governed by Pipeline Licence, Gas Safety Act, Pipelines Act, Pipeline Regulations and Gas Safety Regulations. They refer to Australian Standard 2885 with reference to AS2885.1:2012 Section 4.6.4 Isolation Valves:

> *"Valves shall be provided to isolate the pipeline in segments for maintenance, operation, repair and for the protection of the environment and the public in the event of loss of pipeline integrity."*

This section and others that refer to maintenance requiring the valves to be in fit condition for their purpose. Currently some isolation valves on the VTS are not meeting this requirement fully. In some cases, valves are located in close proximity to residential areas and pose an increased risk in the event of failure.

4 Risk Assessment

The risk scenarios considered are:

- The mainline valve is required for an emergency isolation but is unable to positively isolate the pipeline, which then requires closure of the next mainline valve and potentially the venting an additional pipeline section.
- The mainline valve has external leaks potentially in the proximity of ignition sources.
- The mainline valve is placed too close to a residential dwelling and has an undetected external leak or is inadvertently damaged causing a leak.

TABLE 3: RISK RATING

Risk Area	Risk Level
Health and Safety	Moderate
Environment	Low
Operational	Moderate
Customers	Moderate
Reputation	Moderate
Compliance	Moderate
Financial	Moderate
Final Untreated Risk Rating	Moderate

5 Identification and Assessment of Options

5.1 Identification of options

There are three options identified for addressing the risks associated with valves.

5.1.1 Option 1: Do Nothing

The Do Nothing option is to accept the existing condition of the mainline isolation valves. This will result in consequence escalation in the event of pipeline leak or encroachment rupture requiring emergency isolations that cannot be provided due to the condition of the existing safety isolation valve. Option 1 does not meet ALARP requirements and is not considered a viable option.

5.1.2 Option 2: Overhaul Mainline Isolation Valve

This option involves excavating to expose the faulty valve, then installing hot tap stopples to safely isolate to enable overhaul to meet or exceed the original valve functional requirements.

Assessment

The main benefit of option 2 is that it potentially avoids the need to cut the pipeline to install a new valve and as such would generally cost less than replacement.

Disadvantages of this option
Compared to overhauling the mainline isolation valve in situ, valve upgrades have better maintenance window certainty i.e. installing a complete new valve versus sourcing replacement parts but finding during valve overhaul that the parts are incorrect leaves the valve offline while the correct parts can be sourced.

Overhaul or upgrade could both be successful, however the upgrade option while more expensive will improve certainty of success and reduce the likelihood for rework.

The targeted isolation valves will have been in service for at least 30 years and will be of indeterminate condition internally, therefore it is difficult to conclude the feasibility of overhaul and ensure the necessary spare parts are available for the maintenance window. Therefore the main disadvantage of this option is the risk of mainline valve functional requirements not being met during commissioning, or the valve fails in before end of pipeline life and requires rework. For this reason this option should only be considered where the cost of rework is low and access not complex, therefore this option is generally not recommended.

5.1.3 Option 3a: Replace Mainline Isolation Valve

This option involves excavating to expose the faulty valve, then installing hot tap stopples to safely isolate to enable cutting out the existing valve and welding in a new valve that meets or exceeds the original functional requirements.

Assessment

Overhaul or upgrade could both be successful, however the upgrade option while more expensive will improve certainty of success and reduce the likelihood for rework.

The benefits of this option are;
The targeted isolation valves will have been in service for at least 30 years and will be of indeterminate condition internally so replacement is the safest option to ensure objective success.

Replacement avoids costly rework as mainline isolation valves are generally buried and often in complex locations (e.g. under pits on roads etc.) and the effort required to isolate and access the valve is likely to cost more than procuring and replacing the valve, so avoiding rework is an imperative.

Replacement provides better maintenance window certainty (as a complete new valve is being installed whereas finding incorrect replacement parts during overhaul of an existing isolation valve leaves the valve offline while the correct parts can be sourced).

Disadvantages of this option are;
Associated costs of replacing the isolation valve will be higher than overhaul.

Lead-time for replacement will generally be higher than for overhaul, however the vintage of valve will influence lead-time.

5.1.4 Option 3b: Install new mainline valve in a safer location and decommission existing isolation valve

This option is as per option 3a: but involves installing the new valve in a more suitable location with adequate clearance from residential areas. Refer to appendix A for an aerial image of the Keon Park valve site that requires this option to address an identified encroachment risk

Assessment

This has been found to be the most cost effective way to reduce risk where valves have been encroached by residential developments. Leaving a valve in the vicinity of a residential dwelling would not meet ALARP requirements.

The benefits of this option are:

- The zoning/encroachment risks are addressed and ALARP requirements can be realised.
- Limited disturbance if compared to procuring affected properties or relocating the pipeline.

5.2 Assessment of Options

TABLE 4: SUMMARY

Option	Description	Costs	
Option 1	Do Nothing	Indeterminate	
Option 2	Overhaul isolation valve	Cost not provided as overhaul introduces project objective uncertainty. Due to the associated costs, it is imperative that complex rework is avoided and the maintenance window is not vulnerable to extension due to the availability of suitable spares. Cost of the works will depend on the complexity and need for spare parts which is not known until the valve is excavated. Depending on the condition, the overhaul option may require several site visits causing greater disruption. The uncertainty of this option makes it not viable.	
Option 3a	Replace isolation valve	T16 LV03	$950,000
		T16 LV04	$850,000
		T16 Total	$1,800,000
Option 3b	Install new mainline valve in a safer location and decommission existing isolation valve	T18 LV15	$1,850,000

5.2.1 Summary Assessment

Option 1 does not meet ALARP requirements so is not considered a viable option.

Option 2 is likely to be a more complex, costly and risky option. The targeted isolation valves will have been in service for at least 30 years and will be of indeterminate condition internally, therefore it is difficult to conclude the feasibility of overhaul and ensure appropriate spare parts available for the maintenance window. This can result in having to revisit the site multiple times which is costly and disruptive.

Options 3a and 3b are the considered to be the only viable options.

5.3 What are the Proposed Solutions?

Option 3 is preferred and involves:

3a. Replacing mainline isolation valves where they are found to be failing to operate reliably, isolate adequately or have external leaks and the identified issues require major maintenance.

3b. In addition, if the location of an existing mainline isolation valve is assessed to not meet ALARP requirements due to proximity of valve to residential dwellings (or similar zone risk), the existing valve should be decommissioned (removed or encapsulated) and a new suitable valve installed in a safer location to restore the safe and reliable isolation functional requirements.

5.3.1 Why are we proposing this solution?

The replaced and upgraded mainline isolation valve prevents consequence escalation during emergency, permits downstream maintenance and project work to occur safely and without further isolation and ensures confidence the integrity of the valve into the future.

In addition, (where required) the relocation of the isolation valve to a more suitable location is the only viable alternative to reduce potential for residential incidents.

Not proceeding with the proposed solution(s) leaves the existing condition of some mainline isolation valves prevents them providing adequate isolation during emergency which is not to ALARP requirements. This results in further escalation of emergency consequences and delays the ability of APA to isolate the required VTS pipeline section in such circumstances.

6 Consistency with the National Gas Rules

Consistent with the requirements of Rule 79 of the National Gas Rules, APA considers that the capital expenditure is:

- Prudent - The expenditure is necessary in order to maintain and improve the safety of services and maintain the integrity of services to customers and personnel and is of a nature that a prudent service provider would incur. The proposed program aligns with requirements under Australian Standard 2885.1:2012 Section 4.6.4 Isolation Valves and the principle of As Low as Reasonably Practicable to address identified risks.

- Efficient - The work will be contracted under APA's procurement policy. The field work will be carried out by external contractors who have demonstrated specific expertise in completing the installation of the facilities in a safe and cost effective manner. The expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.

- Consistent with accepted and good industry practice - Addressing the risks associated with the poor condition of a number of below ground transmission system regulators and replacing assets that have reached the end of their useful life is accepted as good industry practice. In addition, the reduction of risk to as low as reasonably practicable in a manner that balances cost and risk is consistent with Australian Standard AS2885.

- To achieve the lowest sustainable cost of delivering pipeline services - The sustainable delivery of services includes reducing risks to as low as reasonably practicable and maintaining reliability of supply.

7 Forecast Cost Breakdown

The forecast estimate for this project is based on similar valve works conducted on the T33 pipeline, in addition the pipe relocation required for the T18 LV15 is based on a similar valve relocation on T16 at LV02.

TABLE 5: SELECTED SITE PROJECT COST ESTIMATE – IN ORDER OF PRIORITY

Asset / Site	Complexity	Option	Est. related costs (civil works)	Est. valve procure and installation cost	Est. Total
T18 LV15 Keon Park West	Pipe relocation required as pit is currently placed on residential land.	4	$1,500,000	$350,000	$1,850,000
T16 LV03 Henty Street	Large pit on road.	2	$600,000	$350,000	$950,000
T16 L04 Noble Park	Large pit on road.	2	$500,000	$350,000	$850,000
Totals			$1,100,000	$700,000	$3,650,000

TABLE 6: PROJECT COST ESTIMATE

	Total
Internal Labour	$350,000
Materials	$1,500,000
Contracted Labour	$1,300,000
Other Costs	$500,000
Total	**$3,650,000**

8 Acronyms

Acronym	Definition/Description
AEMO	Australian Energy Market Operator
AGA	Australian gas association – Type B compliance governing body
API	American Petroleum Institute – publisher of standards
CHAZOP	Control system HAZOP – study of the control system functions to identify logic vulnerabilities
ESD	Emergency shutdown – control system-initiated shutdown designed to prevent incident escalation if operating parameters are breached
ESV	Energy Safe Victoria
HAZOP	Hazard and operability study
HMI	Human machine interface
ILI	Inline inspection – pipeline internal inspection
OEM	Original Equipment Manufacturer
RA	Risk Assessment
RBI	Risk Based Inspection – a process used to prioritise maintenance or inspection activities based on risk of failure.
SIL	Safety Integrity Level – an assessment used to rank control systems by their ability to fail safely
SMS	Safety Management Study
VTS	Victorian Transmission System

9 Appendix

Appendix A: Keon Park LV15 Aerial Image

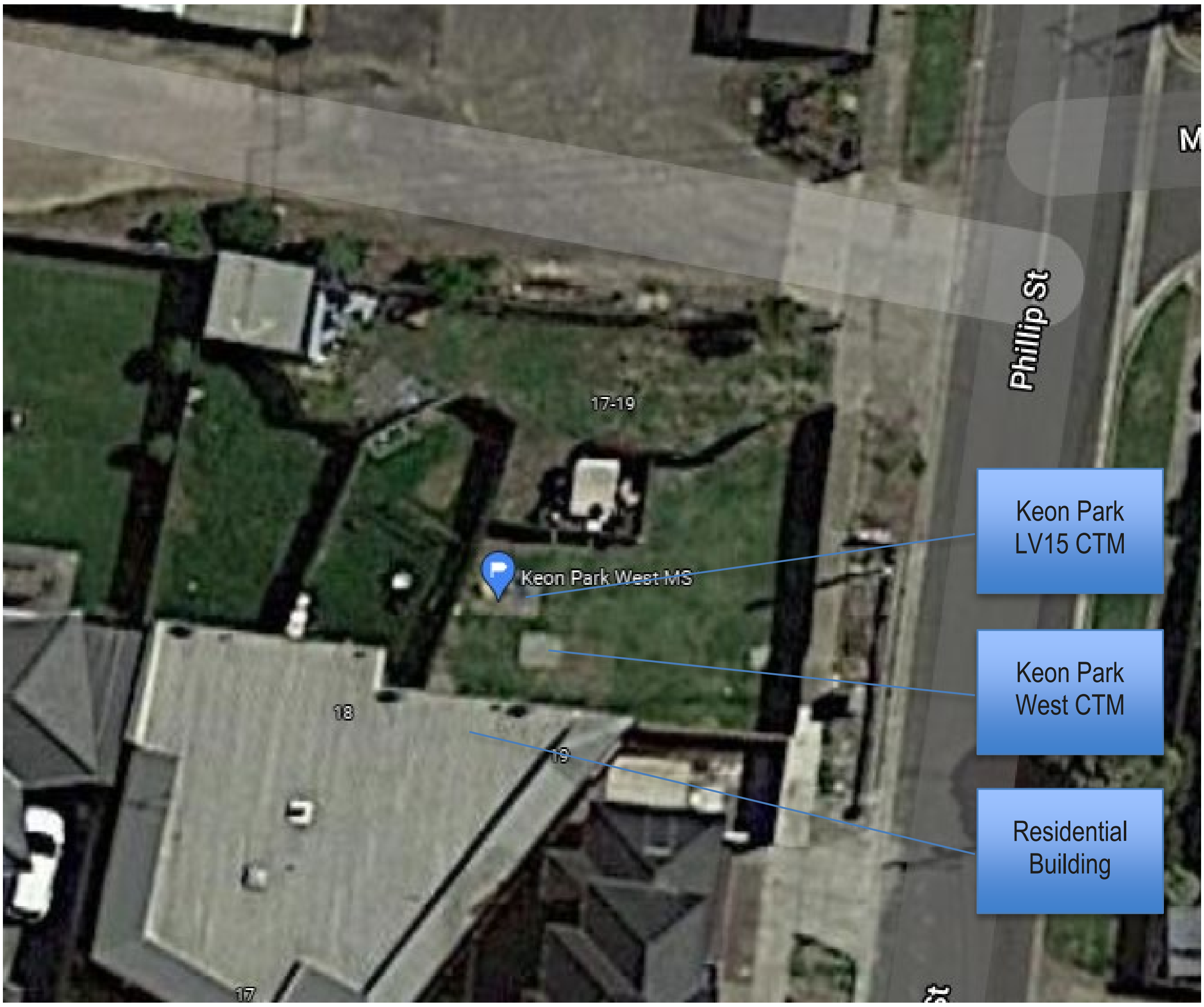

Figure 1 - T18 LV15 aerial view showing residential dwelling proximity