PLAN

ASSET MANAGEMENT

VTS AMP

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table of contents

Executive Summary

This Asset Management Plan (AMP) details the long term objectives of the Victorian Transmission System (VTS). This document also outlines the strategic direction of each asset class to ensure compliance with regulatory, safety, and environmental obligations and to ensure the performance requirements of the pipeline system is maintained to a suitable standard for current and future needs.

This document is for the five year planning period operating upon the calendar years of 2018 to 2022.

The VTS assets transport sales quality, natural gas from processing facilities and other pipelines to and from Melbourne, regional towns, and delivers gas to significant industrial consumers in a safe and reliable manner. The VTS also connects to interstate pipelines and is capable of receiving or delivering gas to other States through the APA East Coast Gas Grid.

The VTS is comprised of licenced pipelines of various diameters and operating pressures totalling over 2,200 km in length and containing facilities which include various metering facilities, and compression facilities located at Gooding, Brooklyn, Euroa, Iona, Wollert, and Springhurst. The total replacement value of the VTS is estimated at $3 billion. Refer to the Facility Description within the VTS Safety Case for a more detailed description of the pipeline system characteristics.

The objective of the AMP is to ensure the VTS is maintained in a safe and reliable operating condition, and with a minimum level of risk with respect to its lifecycle cost whilst meeting stakeholder expectation through systematic management of all threats (refer to the VTS PIMP, Safety Management Study and Formal Safety Assessment within the Safety Case) to the operation and expansion of the asset throughout its lifecycle.

Asset investment is primarily driven by the need to maintain a reliable operating pipeline transmission system. Increased gas demand has led to further investment for greater transport capacity, and to improve system utilisation.

The primary role of the VTS is to satisfy the demand of gas consumption in Melbourne. The growth of this demand is closely monitored by the operator of the VTS; the Australian Energy Market Operator (AEMO).

There has been a focus to improve the security of gas supply into Melbourne, by reducing the over-reliance of gas supply from Longford into the system and being able to source gas from other supply points within the State. Many pipeline and compressor augmentations during th previous planning period enable the interconnectivity from other gas supply sources and injection points.

Opportunities to export gas out of Victoria and into the NSW gas market present further growth opportunities and increases the utilisation of existing rotating plant.

The levels of investment to maintain the assets are shown in Appendix A. The annual investment to fund the life cycle management plan in section 6 and is dominated by compressor station upgrades, rectification for inline inspection and inline inspections. A project to increase protection of pipeline assets from urban encroachment is to be delivered before 2020.

The integrity of the VTS stations are managed to comply with various Australian Standards, and primarily maintained by time dependant inspections.

The revenue generated by the VTS is from transportation tarrifs by gas volume. These tarrifs are regulated by the Australian Energy Regulator (AER) whom also approve capital and operational costs. Volumes are dependant on market demands and is controlled by AEMO.

APA's Opex program has been developed in line with our financial forecasts and in accordance with AS 2885.3 and provides the funding for fundamental maintenance of the pipeline system. Critical maintenance activities are developed on a risk and asset condition basis and are documented in a Pipeline Integrity Management Plan in accordance with the Standard. These activities form the basis of maintaining safe and reliable pipelines and are supplemented by best practice developed through maintenance regimes for other items that typically reflect reliability in operation.

Maintenance generally consists of preventative maintenance, inspection and corrective maintenance. Whilst the asset base remains constant some fluctuation in the Opex expenditure occurs as maintenance personnel work on Capex items temporarily, however over the longer period this can be expected to level out.

1. Introduction

1.1 Purpose

The Asset Management Plan ("AMP") covers the planning period from 1 January 2018 to 31 December 2022 and is updated and reissued on an annual basis. The AMP also details the current financial year project information in addition to providing a summary of the previous financial year project performance.

The AMP identifies the necessary actions required to optimally manage the APA owned and operated Victorian Transmission system pipeline assets. A long-term consideration of the integrity of assets is necessary to ensure that they remain fit-for-purpose.

The AMP is diligently prepared on the basis of the best known information at the time of writing.

1.2 Scope

The scope of the AMP is:

- To provide a comprehensive understanding of the current management approach relating to the assets, their condition and their utilisation;
- To present CAPEX and OPEX longer term funding requirements;
- To provide a platform for approval of work programs by providing discussion of the options available and recommendations; and

To identify specific issues affecting the assets and the proposed remediation for budget consideration.

1.3 Pipeline Management System

AS2885.3 requires that the Licensee have in place a documented and approved Pipeline Management System (PMS) which provides instruction to the organisation regarding high pressure pipeline management and operation techniques. It provides the framework for a consistent and appropriate process throughout the business for all pipelines operating under AS2885. The PMS sets out an approved system to ensure that the asset integrity is known and risk is maintained to ALARP or below. The PMS has been audited and the content and approach of the PMS was found to be compliant to the requirements of the Standard.

APA is currently developing a new pipeline asset management system which will incorporate the PMS and also document fuller asset management practices along the lines of ISO 55001.

1.4 Governance

The AMP is reviewed and approved each financial year to ensure that the content is current.

Changes to the assets will inevitably occur during the life of the AMP. Unless there are issues identified that significantly impact the validity of the Plan it is only intended to amend the AMP at each annual review.

1.5 Exclusions

Only regulated assets - defined as the Victorian Transmission System are covered in this AMP.

1.6 Terms & Abbreviations

The Generic APA Terms and Abbreviations are listed in the Terms and Abbreviations Glossary.

The Specific Terms and Abbreviations used in this document are listed below:

Table 1 Terms

Item	Definition
MEJ	Major Expense Job (Opex) – 'spikes' in the operational budget to incorporate major works outside normal annual expenses (either significant expenditure or significant complexity)
SIB	Stay In Business Project (Capex)

Table 2 Abbreviations

Item	Definition
AEMO	Australian Energy Market Operator
AMP	Asset Management Plan
ILI	Inline Inspection
PMS	Pipeline Management System
PIMP	Pipeline Integrity Management Plan
PAMS	Pipeline Asset Management System

1.7 References

All work performed in accordance with this Plan shall be in conformance with the current issue, including amendments, of those national and international standards, codes of practice, guidelines and APA documents listed in Table 3.

Table 3 Referenced Documents

Referenced Document	
APA Standards	
320-POL-AM-0018	Pipeline Management System
320-PL-HEL-001	Lands Management Plan
Australian Standards	
AS reference	Document Name
AS2885.3	Pipelines – Gas and liquid petroleum – Operation and Maintenance
International Standards	
Reference	Document Name

1.8 Superseded Documents

This Plan replaces the previously used document listed in Table 4.

Table 4 Superseded Documents

Superseded Document	
	All previous versions of the VTS AMP

2. Asset Objectives

The following objectives are nationally based and reflect the vision and direction of the organisation.

2.1 Fitness For Purpose

Legislation and the Pipeline Asset Management Policy require our assets to be operated and maintained in a fit for purpose condition and protected from any foreseeable threat of failure. In this regard failure can be regarded as a loss of containment or an action that could have resulted in a loss of containment. It is also a requirement to maintain the pipeline assets in fit for service condition with respect to the supply and delivery of customer nominated amounts of energy.

To achieve these requirements the Pipeline Asset Management System (PAMS) details in the system manual the management practices and processes that shall be utilised to manage the lifecycle of the assets. The processes are designed to maintain the asset condition to satisfy, wherever possible, the conditions detailed in the original design basis for the assets.

2.2 Compliance

Pipelines are required to be compliant with State Regulation and Australian Standards. Where regulation or Australian Standards don't exist, Pipeline Acts and International Standards are typically adopted.

APA requires all pipelines to be operated and managed in accordance with the requirements and in accordance with their original Design Basis.

All operational groups will be audited for compliance to these requirements.

2.3 Risk Management

APA Group has established an enterprise wide risk management strategy and framework. The Board is ultimately responsible for determining the risk appetite of APA Group and approving and reviewing the risk management strategy and policies of the company. The Board has established a separate Audit and Risk Management Committee with specific responsibility to provide assistance to the Board in fulfilling its corporate governance and oversight responsibilities.

AS2885 specifies pipeline specific risk management techniques, safety management studies, which are used throughout the life of the assets. These are non-negotiable and all pipeline operating groups will manage risk on their assets in direct accordance with this Standard.

One of the significant risks that will require significant risk management is that of the potential of third part damage to APA's pipelines as a direct result of the continuing urban encroachment largely due to the expansion of and development of new housing and industrial estates adjacent to the pipeline corridors.

The following objectives are nationally based and reflect the vision and direction of the organisation as defined in the Infrastructure Development Strategic Goals and Transmission Strategic Goals.

Table 5 Asset Objectives

Catergory	Objective	Performance Measure
Asset Condition	Condition Monitor pipelines to prevent permanent reduction of MAOP	MAOP maintained No ruptures, no significant loss of containment Pressure vessels fitness for service without reduction of operational capability
Asset Risk (threats to operation)	Identify, manage and control all pipeline threats Maintain residual risk within APA risk appetitie	Multiple independent controls for all identified threats[1]. ALARP maintained and demonstrated. Reverse spin and surge exceedance occurrences zero per year. Reverse flow through regulating stations zero per year
Asset Value	Maintain profitability within scope of economic regulation or contract	EBITDA improved yr/yr Stable or improved regulatory position Turbine life to exceed 25,000 hours before overhaul Maintenance costs not to increase more than 2% yr/yr
Stakeholders	Deliver contracted gas supply Actively engage stakeholders	Achieve 100% contracted gas supply 99% of the time Achieve 80% landowner laison per year 98% of DBYD enquiries responded within 72* hours Maintain system security
Availability & Reliability	Critical equipment at 100% available	All Mainline Valves to be 100% available Reliability turbines of 98% annually Availability of 95% (3 start

		attempts) seasonally by station
Emergency Response/Recovery	Tools, spares and skills available	Emergency spare capability auditied
Expansion	Identify opportunities to extract unrealised value	
Delivery	Gain synergies from maintenance and capital delivery in a timely fashion	90% projects as planned completed yr/yr Efficient use of internal resources
Safety	Zero Harm	

3. System Overview

3.1 Asset Overview

VTS consists of licenced pipelines and associated facilities supplying the Melbourne metropolitan area, country Victoria and supply for export to NSW. It extends to Culcairn within NSW.

Figure 1: VTS asset map

Refer to the VTS Safety Case Manual, Attachment 01, Facilities Description, for more details and a structured breakdown of the VTS.

3.1.1 Asset Condition and Age

The oldest VTS operating asset is the Morwell to Dandenong Pipeline, commissioned in 1956. The development of growth projects and upgrades to assets has resulted in continued growth of the physical asset base over time. Numerous pipelines of varying dimensions have been added to the asset base over time, refer to the Safety Case Facility Description for details.

Typically, the assets are in a good condition and where they have been identified to not be functioning in accordance with APA Policies, they are scheduled to be addressed. An output of this AMP is the description this planned work.

3.2 Demand Management

The demand information herein is extracted directly from AEMO reports.

The Victorian gas market is an established economy currently operating with primary demand types; System demand and Gas Powered Generation (GPG) demand.

System demand incorporates the base load of the VTS and is relatively stable with a forecasted decrease from 204 PJ in 2016 to 192 PJ in 2020, an average annual decline of 1.2%. This decrease in total demand per year is notably inverse to the increase in daily peak consumption forecast in the below table. This creates the scenario where the overall tarrif revenue (total throughput) is decreasing by volume whereas the daily demand (system capacity) by volume is increasing. This inverse trend is similar to the problem that gas distributors have been overcoming in recent years where capital expenditure is required to maintain system supply, however cumulative volumes are static.

Gas Powered Generation is sensitive to a number of factors most notably the intraday wholesale electricity and gas prices.

Newly committed and completed augmentations to the VTS, including the Victorian Northern Interconnection Expansion will increase the export capacity of the system. New withdrawl stations recently built are Mt Cottrell, Bannockburn, Winchelsea to cater for future Victorian gas demand in accordance with committed expansions detailed in the 2016 AEMO Statement of Gas Opportunities (GSOO).

3.3 Transportation Demand

AEMO Annual DTS demand forecast for the Victorian Gas market as published in the GSOO states that the Declared Transmission System (DTS) can supply the 1 in 20 year system demand of 1,257TJ per day for the period 2015-2019.

The below table shows the forecast daily peaks of a 1 in 2 and 1 in 20 gas day.

Figure 2: Winter Maximum Demand Forecast for Victoria (TJ/day).

	Total		GPG		Residential, Commercial & Industrial	
	1-in-2	1-in-20	1-in-2	1-in-20	1-in-2	1-in-20
2015	1233.2	1341.9	77.3	77.3	1188.4	1297.1
2016	1245.5	1355.6	143.0	227.5	1198.5	1308.6
2017	1233.7	1344.0	125.6	227.0	1196.0	1306.3
2018	1192.3	1300.8	138.6	226.5	1162.4	1270.9
2019	1196.6	1305.2	150.5	228.4	1155.8	1264.4
2020	1192.3	1301.4	163.5	230.0	1152.0	1261.1
2035	1274.6	1391.7	292.3	397.3	1208.9	1326.0

3.3.1 Operating Contraints

The Facility and Pipeline assets of the VTS are operated as designed with no artificial constraints imposed restricting supply.

The system capacity of 1,450 TJ /d is expected to meet demand for the next five years (AEMO VGPR 2016).

3.3.2 Maintenance Contraints

There are no long term maintenance constraints limiting the supply capability of the VTS though short term interruptions can be expected to enable maintenance projects to proceed. APA will advise and seek approval of AEMO prior to the commencement of any planned maintenance activity that may constrain supply.

3.3.3 Demand Projects

Transmission pipelines and compressors are expensive to construct and typically designed to meet future loads for at least 20 years. This creates uneven long term expenditure profile as these projects are generally a few years apart.

There are often smaller projects designed to maximise the utilisation of an existing asset to defer the commencement of the next large augmentation project. These projects are opportunistic and do not always provide enough capacity increase to defer larger projects long enough to be economically viable.

Generally APA separate projects by their fundamental reason for the project; Stay-In-Business (SIB) and Growth. SIB is driven by; integrity, security of supply, obsolescence, utilisation, safety, risk, minor performance and compliance. Growth projects are designed to augment the capacity of the VTS to export gas into other transmission systems, thereby increasing, supply diversification and capability.

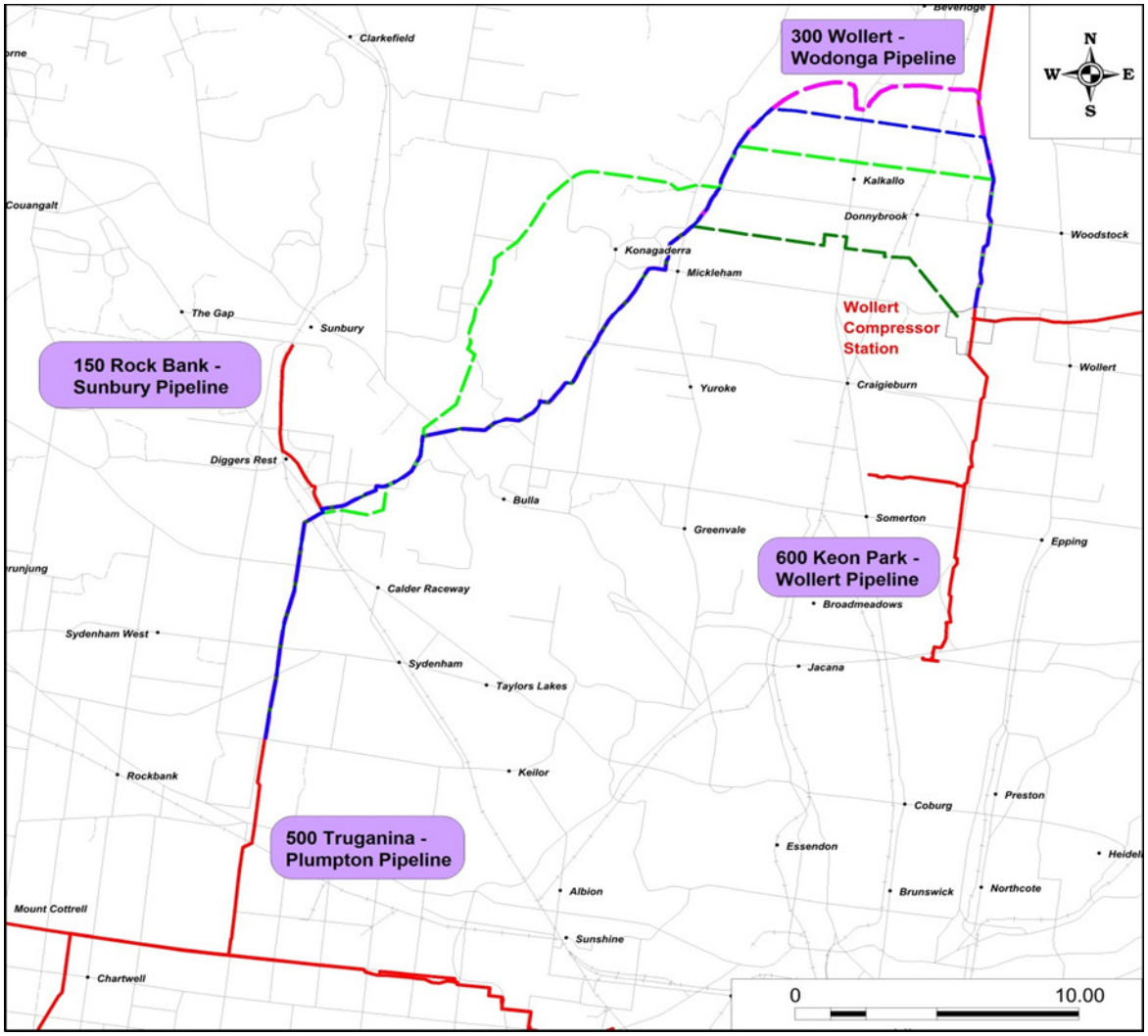
3.3.4 Significant Projects

3.3.4.1 Western Outer Ring Main

The most significant project is the called the Western Outer Ring Main (WORM) and is not currently planned for delivery within this planning period. The WORM is a 500mm pipeline from Truganina (Rockbank) to Wollert Compressor station. Stage 1 is complete and comprises of the 500mm Plumpton to Truganina Pipeline primarily to solve the Sunbury constraint. The WORM pipeline is intended to operate at up to 10,200kPa, approximately 49km in length and depicted in Figure 4.

The illustration shows multiple route options for the pipeline, depending on other stakeholders', ground conditions and possible environmental constraints.

Figure 3: WORM alignment options.



The purpose of the WORM is to be able to deliver gas to and from the storage and production facilities in the Otway region to Melbourne efficiently during peak, especially if there is a supply constraint or failure with the Longford-Dandenong pipeline or Eastern Outer Ring Main (Pakenham-Wollert pipeline).

The alternative to the WORM is to significantly upgrade Brooklyn Compressor station (up to 3 additional units). This is inferior to the WORM.

The WORM also provides distribution companies with ideal locations to back feed the Melbourne metro area and feed the new housing and industrial estates in the new Urban Growth boundary. Interest in up to four new CTM sites has been indicated with over 130kscm/h of demand forecast.

The WORM is intended to be built post 2020, however is unlikely to be built prior to 2025.

5.5.1.2. Victorian Northern Interconnect Expansion

A significant project is the increase in export capacity to NSW by looping pipeline T74. This project has completed over 190km of looping (loops 1-5) however another expansion from Glenrowan (loops 6-9) is in construction at time of writing.

This loop is capable of operating at a pressure of 15.3 MPa, whereas the original T74 pipeline is only capable of operating at 7.4 or 8.8 MPa. As each loop is complete the new loop is able to be detached from T74 and operated at higher pressures, usually 10.2 MPa.

3.3.4.2 Warragul Loop

An increase in local demand in the township of Warragul has led to contract minimum pressures being breached. Looping the 4.8km from the Lurgi TP to the Warragul CTM will solve this constraint for the current and future flows. This project is currently in the planning stage.

3.3.4.3 Anglesea TP

The Corio City Gate is the only supply to Geelong with 100TJ/d of demand. A new pipeline would be extended from the SWP to a new CTM in the Anglesea-Torquay area. The new CTM would provide a second supply point to the distribution network, hence increasing security of supply and capacity for future growth in the network.

3.4 Compliance

3.4.1 Legislation

The pipelines and facilities of the VTS comply with the regulatory and legislative requirements listed in the VTS Safety Case, Appendix D.

VTS has been declared an "Operator of an Essential Service" under the Terrorism (Community Protection) Act 2003.

The natural gas pipelines and facilities (with exception of LNG and Customer Transfer Metering Facilities) are part of the covered pipeline and regulated by the Australian Energy Regulator (AER) under the National Gas Law.

3.4.2 Codes and Standards

Pipelines and associated facilities of the VTS are principally maintained and operated in compliance with AS 2885.3 and AS 4041 respectively. A full list of codes and standards is contained within the VTS Safety Case.

3.4.3 Licenses

VTS pipelines are licenced by the Department of Economic Development, Jobs, Transport and Resources as required under the Pipelines Act 2005.

The Compressor Stations at Brooklyn, Springhurst and Gooding are licenced by the Environmental Protection Agency (EPA) Victoria as required under the Environmental Protection Act 1970.

3.4.4 Changes to Regulatory Compliance Framework

There have been no significant changes to the content of Acts and Regulations affecting the VTS and Stations in recent years.

4. Asset Management Strategies

Life cycle strategy and the Enterprise Asset Management Project
APA has undertaken a business process project called Enterprise Asset Management (EAM). The outcome of this project has produced a national standard maintenance strategy for every pipeline related asset class that APA owns. These strategies were developed by APA subject matter experts and an external consultant. These national strategies have been rolled out to the VTS in October 2015 with the Safety Case and other maintenance documents updated to reflect the new maintenance strategies.

4.1 Pipelines

A tabulated summary of VTS licenced pipelines is given in the facilities description in the Safety Case.

4.2 Strategy

Pipelines are maintained by condition based maintenance predominately determined by Inline Inspection (ILI). The condition assessement of each pipeline from the ILI determines the frequency of the ILI for each pipeline.

Cathodic Protection systems are maintained and inspected on a time based schedule and anode bed replacement occurs at depletion or failure.

Current and planned levels of investment are not likely to produce a significant change in the integrity or reliability of the pipeline assets in the short or medium term.

Pipelines of the VTS are in good condition structurally, though corrosion induced metal loss, the deterioration of coatings systems and third party encroachment, remains a continued threat. These threats are identified and reviewed through the SMS and Formal Safety Assessment process and the risk level is managed to As Low As Reasonably Practicable (ALARP) through physical and procedural protection measures, and integrity management programs as outlined in the PIMP.

4.2.1 Coating Condition

Coating systems applied to pipelines of the VTS reflect the advancement in coating technologies and the need to tailor coating systems to specific environmental and physical conditions. Within the VTS, five Coating Systems are in use; Bitumen, Coal Tar Enamel, FBE, Polyethylene and Trilaminate.

Table 6: VTS External Coating System Summary.

Coating	Number of Pipelines	Range of Diameters (mm)	Total Length (km)
Bitumen	1	450	127
Coal Tar Enamel	18	80-750	664
Dual Layer Fusion Bonded Epoxy	2	150-500	59
Fusion Bonded Epoxy	1	400-500	450
Polyethylene	30	100-600	1000
Trilaminate	1	350	1.6

Bitumen and Coal Tar Enamel Coating types are known to be deteriorating at a greater rate than alternate coating systems. Extruded Polyethylene Coating has also displayed signs of deterioration particularly at the field joint coating. This has been assessed for each pipeline and, where applicable, inspection frequencies are based on corrosion rates, refer to the PIMP.

In all pipelines the coatings were factory applied coatings and the current condition of coating systems generally is excellent. The only exception is the heat shrink sleeves that were applied in the 1970's- 1980's were often applied incorrectly. These sleeves are often causing cathodic protection shielding which premits corrosion induced metal loss at a far higher rate than the rest of the pipeline. The most prudent approach to mitigating this threat is Inline Inspection. There are no coating remediation works planned in the short to medium term.

The condition and integrity of Coating Systems is monitored via the following approved strategies:

- Direct Current Voltage Gradient (DCVG) Survey of the full pipeline length every 10 years for pipelines not subject to ILI;
- ILI for piggable pipelines;
- Direct Assessment, generally as part of data validation works; and
- Monitoring CP

DCVG surveys are also conducted where long term access to the pipeline is to be constrained or where suspected coating damage has occurred resulting from 3rd party interference. Suspected ground movement can also be a cause to conduct a DCVG survey, refer to the PIMP.

4.2.2 Above Ground and Exposed Coating Condition

The main differences between exposed and buried pipeline coatings is the environment is usually dry, exposed to ultraviolet light, easily inspected and without the benefit of cathodic protection.

Routine inspections have discovered a number of locations where exposed pipeline coating requires remediation in some locations. This task can be difficult if the pipeline is consistently damp due to surface temperature of the pipeline being constantly below ambient dew point temperature, which creates moisture on the surface. These projects are:

- T56 Brooklyn to Ballan Pipeline
- T57 Ballan to Ballarat Pipeline
- T63 Tyers to Morwell Pipeline
- T61 Pakenham to Wollert
- T001 Morwell to Dandenong
- T16 Dandenong to West Melbourne
- T70 Ballan to Bendigo Pipeline
- Wandong to Bendigo Pipeline
- T24 Brooklyn to Corio Pipeline
- Mt Franklin to Maryborough
- T59/T71 Euroa to Echuca
- T1 Morwell to Dandenong (Lurgi Line)
- T74 Wollert to Wodonga.

The need for this coating refurbishment does not introduce a new threat to the pipelines as the pipelines are visually inspected and monitored routinely – details set out in the PIMP. Since there are no new threats identified, the work is scheduled to be completed over the period set by this AMP.

4.2.3 Pipeline Condition

Pipe specification within the VTS is a reflection of a range of differing functional requirements of the various pipelines in addition to the advancements in pipe materials and manufacturing technologies over a lengthy period of time. VTS pipelines range from diameters of 80 to 750mm and steel grades from API 5L Grade A to Grade X70. The Morwell to Dandenong Pipeline, constructed of SAA A33 Class D steel, is a notable exclusion from this being constructed before the advent of the API 5L steel grade standard.

The condition and integrity of VTS pipe is regarded as good with corrosion induced metal loss is low and third party pipe strikes posing the most significant direct concern. The Remaining Life Reviews should be referred to for specific, holistic reviews for each pipeline asset.

Corrosion induced Metal Loss (ML) has been identified at several locations within the VTS, most notably on the Morwell to Dandenong Pipeline. Failure of the heat shrink sleeves of this pipeline has also resulted in ML of the system. With the exception of this pipeline, all others are expected to not require direct ML related remediation works for the planning period of this document.

Unreported external damage is likely to exist though significant defects with the potential to grow through fatigue causing a major integrity concern are unlikely. Unreported damage is minimised through both physical and procedural protection measures (refer to the PIMP) and would be detected by the next ILI for piggable pipelines.

The condition and integrity of pipe is also monitored via risk based scheduling of Metal Flux Leakage (MFL) ILI. The MFL ILI strategy is all pipelines greater than 100mm where ILI is technically and practically possible. A review of affected pipelines has been conducted and the required ILI infrastructure has been identified.

The following table shows the pipelines expected to be inspected in the next five years:

Table 7: Pigging Schedule for 2018 to 2020

Pipeline	Expected Year	Diameter (mm)
Derrimut to Sunbury	2018	150
Ballan to Ballarat	2018	300
Mt Franklin to Kyneton	2020	300
Mt Franklin to Bendigo	2020	300
Pakenham to Wollert	2020	750
Wandong to Kyneton	2020	300

The schedule is based on a time based schedule which is verified using previous results and corrosion rates as outlined in the PIMP.

4.2.4 Cathodic Protection

Cathodic Protection (CP) systems are designed to protect pipelines from metal loss induced corrosion. CP Systems are monitored, operated and maintained in accordance with AS 2885.3 and AS 2832.1. No new CP sites for existing pipelines of the VTS are expected to be constructed before the end of 2022.

Anode Beds have a life expectancy of between 25 to 30 years and are replaced on an as needs basis. The replacement of two beds annually to ensure effective protection levels is expected and planned.

CP voltage control devices are reaching the end of their serviceable life. To maintain CP reliability and effectiveness two Transformer Rectifiers are scheduled for replacement annually for at least the next five years.

APA ensures CP potentials are documented in accordance with regulatory requirements. Data loggers employed to record this information are approaching the theoretical end of their useful life and require replacement. A project proposal is being considered to install telemetry on all CP units and test points. This would drastically reduce the quantity of maintenance inspections whilst increasing the level of data and data quality. Refer to Section 5.4.1. If this project is not adopted then the existing 30 data loggers will need to be replaced. A staggered replacement strategy is preferred to be implemented to renew 5 devices annually through to 2022. Since the data loggers are still operational, replacing the devices over the allocated AMP period is suitable.

4.2.5 Pipeline Protection

Pipeline protection is the physical and procedural controls that mitigate the threat of third party damage. This damage is usually from excavation and earth moving equipment from construction and maintenance activities of other utilities, road and rail operation.

The consequences of the damage varies from minor to catastrophic depending on the equipment used, the pipeline struck and the surrounding environment at the location of the incident.

The two physical controls to third party threats is the depth of cover and pipeline wall thickness.

The first pipeline constructed in the VTS was in the 1950's and a steady rate of expansion has continued since. The urban development of Melbourne has grown outwards from the centre, mainly in an easterly direction for decades. The urban boundary was constrained until 2011 when the Victorian Planning Minister allowed further development to what is now referred to as the Melbourne 2030 boundary. This boundary has mainly expanded in the north, west and south western areas of Melbourne.

The pipelines that now traverse within the Melbourne 2030 boundary were not designed and constructed to be routed through an urban environment. This has prompted the need to increase the levels of protection of these assets to protect the public from the pipeline, and for APA to comply with Pipeline License requirements.

There are multiple options available to increase protection levels of these pipelines. These are detailed in the business case 230. The cost of this work is estimated at $85m in 2016.

4.3 Pipeline Sites and Stations

4.3.1 Strategy

All Station components are inspected periodically in accordance with the PIMP and managed by Maximo. Capital expenditure is primarily driven by replacement with minor and moderate upgrade works to enhance safety, reliability or performance. The strategy for most station components is to continuously monitor and investigate to identify these areas for improvement, rather than operate until failure.

The current condition of most site components is good with few exceptions. The most significant project is the overhaul of existing actuators on the large bore main line valves.

4.3.2 Electrical and Instrumentation

Preventative maintenance and routine testing of Station Electrical and Instrumentation components is conducted in accordance with defined APA procedures and scheduled Maximo. A regulatory requirement is to inspect and demonstrate the continued compliance and safety of electrical equipment installed within hazardous areas.

Electrical equipment includes the following:

- Station Control Systems;
- SCADA and Communication;
- Instrumentation;
- Fire Suppression Systems;
- Power Systems; and
- Earthing Systems.

Preventative maintenance and routine testing of Electrical and Instrumentation (E&I) components is conducted in accordance with defined APA procedures. Most maintenance is either to inspect, calibrate or operate for performance, safety and general condition.

4.3.2.1 Control Systems

Control Systems are located at many facilities, are well maintained and have a conservative, theoretical life expectancy of between 10 to 15 years. Several Control Systems have reached this duration.

The Brooklyn Compressor Station incorporates a Tricon Safety System and a Tricon Process Control System. The processor modules of the two Tricon systems are approaching the end of their useful life as support of the modules is reduced. Replacement of the modules will also necessitate the replacement of the Control Systems communication modules.

Discussion of Compressor Station Unit Control Systems will be detailed within Section 4.4, Rotating Equipment.

4.3.2.2 Instrumentation

Instrumentation provides process data to the onsite operator and the facilities control system for monitoring and control purposes. There is no predefined useful life period or set replacement schedule, with devices being upgraded on an as needs basis.

The Hazardous Area Inspection will identify deteriorating and faulty Electrical components with the Hazardous Area Rectification capital allowance providing the funding for their replacement or upgrade. Both inspection and the capital allowances are funded for on an annual basis.

4.3.2.3 Power Systems

Mains Power is the primary and first choice source of electrical power supply to facilities and where availability does not permit this, supply is typically obtained through the use of Solar Powered systems. The Monitor and Control Systems of all facilities have a secondary backup powered by 24 VDC battery banks and recharging systems.

The VTS has 16 battery banks. These battery systems have an expected life of 8-10 years and incur regular maintenance for condition. The below table details the battery fleet and expected replacement year.

Location	Type	Year Installed	Replacement Year	Replacement Cost (2016)
Gooding CS	Eaton	Batteries installed 2006. Replaced 2014.	2020	$15,000
Wollert CS	Eaton	2007	2017	$13,000
Wollert CG	Eaton	2008	2018	$10,000
Brooklyn CS	Eaton	Stage 1 Building 2013 Stage 2 Building 2013	2021	$15,000
Brooklyn CG	Eaton	2008	2018	$10,000
Iona CS	Unknown	Not after 2007	2018+	$15,000
Springhurst CS	Eaton	2010	2018	$10,000
Euroa CS	Eaton	2012	2022	$10,000
Winchelsea CS	Eaton	2014	2024	$10,000
Lara CG	Unknown	Unknown	ASAP	$25,000
Wondong CG	Unknown	Not after 2007	2018+	$15,000
Longford MS	Unknown	Not after 2007	2018+	$15,000
Pakenham	Unknown	Unknown	ASAP	$10,000
Morwell CG	Unknown	Not after 2007	2018+	$15,000
Tyres PL	Unknown	Not after 2007	2018+	$15,000
Dandenong CG	Eaton	2015	2023	$10,000

4.3.3 Mechanical

The maintenance of Station Mechanical components is scheduled through Maximo and where applicable in accordance with APA Policy OPS-509, Maintenance Schedules and the PIMP.

The following paragraphs briefly illustrate the upcoming projects over the next five years. Further detail is recorded in business cases and condition assessment reports that are generated from field inspection, failure rates and maintenance software.

4.3.3.1 Exposed Surfaces

The paint coating of mechanical components is vital to corrosion prevention of above ground facilities and below ground pits. Refurbishing the paint coating incorporates gritblasting and repainting of components which is conducted on an as needs basis. The following stations require some minor refurbishment:

- Various line valve sites
- Various pig trap assemblies
- Koroit and Allansford City Gate
- Wollert Compressor Station
- Gooding Compressor Station
- Springhurst Compressor Station
- Brooklyn Compressor Station

The coating condition is visually inspected on an ongoing basis, refer to the PIMP.

4.3.3.2 Isolation Valves and Actuators

Isolation Valves of the VTS including actuated and non-actuated Line, Branch and Station Valves are maintained in accordance with Field Services Maintenance Schedules OPS-509. With few exceptions, valves and actuators are considered to be in good condition based on maintenance history and meet functional requirements and these are routinely checked in accordance with the Field Services Maintenance Schedules. Where these are found to require work such as coating repairs, these are raised as follow up work orders.

With the exception of the valve that isolates the LNG facility to the VTS tagged UV326 all other major isolation valves and actuators are in sound condition. The valve UV326 needs to be upgraded to Fail Safe with bypass and to ball type. The station isolation valves at Brooklyn were replaced in 2016 and unit isolation valves and actuators at Gooding Compressor Station are being replaced at time of writing.

The unit and station check valves at Gooding Compressor Station are the orginial valves and suffer from hydraulic oil leakage and required a modification to perform the specified closure time. Replacement of these valves is necessary for the long term integrity of the rotating plant.

4.3.3.3 Line Valves

The manually operated Line Valves within high consequence areas as defined by AS2885 with primary location classes residential (T1) and high density (T2) and secondary classes industrial (I), sensitive (S), and heavy industrial (HI) may contribute to consequence escalation in the event of a pipeline rupture. A study has been conducted to investigate the need to convert manually operated valves on the Dandenong to West Melbourne pipeline to an automated actuated system. Funding requirements have been anticipated and this amount has been included in this planning period.

Line Valve Actuators of the Longford to Dandenong (T60) will be overhauled with the Murray River to Culcairn (T99) and Iona to Lara (T92) pipeline actuators being overhauled as necessary.

Line Valves of the Longford Dandenong Pipeline (T60) incorporate hydraulic hand pumps enabling on site manual actuation of the valve. The devices, commissioned in 1969, are no longer supported with spare part availability and leak oil preventing effective operation. Replacement of the Hand Pumps is scheduled during this planning period.

4.3.3.4 Regulators

Regulators of the VTS limit pressure excursions beyond set limits. The devices generally considered to be in a good condition with some exceptions, based on the performance monitored by the SCADA system and scheduled maintenance.

Pressure Regulators of the Wandong Pressure Limiter have deteriorated over time and will require a major service to extend their useful life. Overhaul of the regulators is scheduled to be completed in the planning period.

The monitor tracking system of the Lara CG Pressure Regulator is slow to react, requires frequent recalibration and is no longer supported with spare part availability. This CG is scheduled for major upgrade in this planning period

4.3.3.5 Pig Traps

Pig Traps enable the physical launching and receiving of In-Line-Inspection tools. Pig Trap assemblies are maintained in accordance with OPS-509 Appendix D and are fully serviced prior to the commencement of an ILI operation. Scraper facilities are generally considered to be in good condition from the routine inspections and maintenance, although there is concern related to the operability of some trap doors. There is an ongoing program for rectification as required.

4.3.3.6 Piping

Piping incorporating pipe, reducers, elbows and flanges, are regularly inspected for indications of corrosion and external interference in accordance with Appendix D of the Field Services Maintenance Schedules. Piping is considered to be in good condition.

4.3.3.7 Syphons

A Syphon is a below ground pipe and valve arrangement designed to capture liquids from within the pipeline, originally the VTS contained some liquids in the form of compressor oil, however this is no longer a reasonable threat and thus not installed in new pipelines. Syphons are maintained in accordance with OPS-509 Appendix G, and are believed to be in good functional condition although due to their relative inaccessibility this is difficult to confirm. Three syphons were excavated on the Wollert to Euroa section of the Melbourne-Wodonga-Bendigo Pipeline. All three syphons were inspected with no significant integrity concerns recorded. As a result, no funds have been allocated for this AMP period for replacement works for syphons.

4.3.3.8 Pressure Vessels

Pressure Vessels are pressure retaining devices supporting the pipelines of the VTS. The vessels are well maintained and routinely inspected in accordance with the Maintenance Schedules (Reference R11) and the requirements of AS 1210. Scheduling of vessel inspections is co-ordinated through Maximo. Due to the current condition, no capital expenditure is allocated for pressure vessels in this planning period.

4.3.3.9 Filters and Coalescers

Filters and Coalescers provide upstream gas conditioning for components including metering devices, compressors and regulators. Filters and Coalescers are generally believed to be in good condition. There is an ongoing project to augment the liquid capture at each station as required, primarily at Wollert, Pakenham and Brooklyn.

The inlet filter at Brooklyn Unit 12 was installed from another compressor station. The design of this filter has led to the inability to maintain the filter adequately. Replacement of this filter is expected within this planning period.

4.3.3.10 Gas Heaters

Process Gas Heaters heat high pressure gas prior to pressure reduction, thereby ensuring safe minimum operating temperatures. The devices are well maintained and routinely inspected in accordance with the Maintenance Schedules (Reference R11) and where applicable the requirements of AS 1210. Scheduling of the devices inspections is coordinated through Maximo and incorporated within the Major Maintenance Program.

4.3.3.11 Piping Supports

Piping Supports provide structural stability to components including Pig Traps, piping, valves and filters. Supports are routinely inspected as part of the general facility inspection processes. They are considered to be in good condition though a design of the supports where the piping is insulated in some cases has a threat of external corrosion, as the piping cannot be fully inspected at those locations.

The design of some supports prevents the full inspection of the components they support and promote hidden corrosion. The replacement of these supports has an annual program.

4.3.3.12 Pressurised Control and Power Systems

Pressurised Power and Control Systems provide the motive force to perform or monitor actions in the control of a facility. Components requiring power systems utilise three forms of Pressurised Systems; Instrument Air (IA), Power Gas (PG) and Instrument Gas (IG). All forms of Pressurised Systems are maintained in accordance with Maintenance Schedules (Reference R11) and are generally considered to be in good condition.

An inherent design feature of the PG & IG Systems is the venting of gas into the atmosphere. To reduce greenhouse gas emissions it is planned where reasonably practical, to convert existing Instrument Gas (IG) Systems to Instrument Air (IA) Systems. The Wollert City Gate, Wollert Compressor Station A and Brooklyn Compressor Station are all scheduled to undertake upgrades to Instrument Air.

4.3.3.13 Vent Systems

A project to assess the functionality, location, and safety of Main Line Valve vents has been conducted with the Isolation Plan reviews. There may be a need to mitigate safety risks due to surrounding environment changes, in particular at within the urban growth boundary, where heavier use of the surrounding freehold land is anticipated.

The vent valves and actuators at the Gooding Compressor Station have reached end of life and require replacement.

4.3.4 Gas Quality Measurement

Gas Chromatographs and ancillary equipment measure gas composition and gas quality at injection points and other strategic locations of the VTS. All gas chromatographs were replaced in 2016. An injection point into the VTS is at Culcairn, this location does not have a gas quality system installed to the requriements of AEMO. The installation of this is planned in this planning period.

4.3.5 Odorant Plant

APA own and operate an odorising facility at Longford and Dandenong.

The Longford odorising facility is critical to the odorisation of gas within the VTS. It incorporates storage tanks, metering pumps, an odorant meter and a control system to ensure a target odorising rate of 7 mg/m^3.

The Longford Odorant Station is considered to be in good functional condition with no ongoing concerns. There are no planned Major Maintenance activities of Capital Works scheduled before 2018.

The Dandenong Odorant Station has been recently upgraded and no further work is scheduled in this planning period.

4.3.6 Site Security

[Confidential] - redacted

4.4 Rotating Equipment

4.4.1 Gooding

The Gooding Compressor Station (GCS) incorporates four Solar Centaur units. The Units are in good condition with major overhaul scheduled for Unit 3 within the planning period depending on run hours and borescope inspection.

The Control Systems of the four Gooding Compressor Units have been recently upgraded with no ongoing issues of concern.

GCS Units Valves are designed to operate to a 'Fail-Last' state that could lead to an unsafe operating condition. Replacement of the eight Unit valves and their actuators with Fail-Safe design arrangements is being conducted during time of writing.

The four Fast-Stop Valves (FSV) of the GCS Units are subject to frequent operation at high differential pressure though their soft seated ball valve design is not suited to this operating condition. Replacement of the FSV conforming with the specifications is scheduled for implementation in 2016.

4.4.2 Brooklyn

The Brooklyn Compressor Station (BCS) incorporates five turbine compression units; two Solar Saturn (Units 8 and 9) and three Solar Centaur (Units 10, 11 and 12). The units are operated and maintained in accordance with APA policies and procedures and are considered to be in good functioning condition with no major overhauls scheduled before 2017 with the exception of the below identified projects.

Other works will be required to ensure that the long term integrity of the existing station is maintained.

The list of works required are as follows:

- Replacement of control systems and instrumentation units 8, 9, 10 & 11
- Fuel gas upgrade for type B compliance units 8, 9, 10 & 11
- Air inlet housing replacement units 8, 9, 10 & 11
- Augmentation of enclosure fans units 8, 9, 10 & 11
- Safety process and controls (entire station)
- Exhaust stack replacement units 8, 9, 10 & 11

- Fire suppression units 8, 9, 10 & 11
- Instrument Air augmentation and reliability

The following projects are being conducted during time of writing or completed in 2016

- Station Isolation Valves including loading valves
- Aftercooler for units 10 & 11
- Gas Engine Alternator replaced with diesel engine alternator

4.4.3 Wollert

Station A

Wollert Compressor Station A (WCS A) incorporates three Solar Saturn Compression Units. Each Unit is operated and maintained in accordance with APA policies and procedures and is considered to be in good functioning condition from routine inspections and maintenance. Concerns though have been identified in relation to the condition of auxiliary equipment.

The station has had little use over the last ten years and all replacement and upgrade projects had been deferred for that reason. The VNIE project has created the need for this station to increase its duty and thus the following rectification works are planned for completion by the end of 2017:

- Reinstrumentation on skid
- Hazardous area equipment rectification (based on reinstrumentation requirements)
- Fire suppression in control room
- Fire detection improvements
- Type B rectification works for the fuel gas system
- Replacement of control valve positioners

Station B

Wollert Compressor Station B (WCS B) incorporates two Solar Centaurs Compression Units. Each Unit is operated and maintained in accordance with APA policies and procedures and is considered to be in good functioning condition. The following minor works are required to be implemented in the planning period:

- Seal gas system modification

The two compressor units are expected to reach overhaul hours in this planning period, approximately in the year 2021.

4.4.4 Springhurst

The Springhurst Compressor Station (SCS) is dependent on the single Solar Centaur 50 Compressor Unit. The Unit is operated and maintained in accordance with APA policies and procedures and is considered to be in good functioning condition with no major overhauls scheduled before 2017.

The VNIE project has restaged the compressor which has reduced the need for after cooling. Previously the aftercooler was undersized on hot summer days, the restaging of compressors has deferred the upgrade of the aftercooler indefinitely.

The control room building has an inferior material that is not able to be extinguished should the material ignite. The result of a fire igniting this material would be total loss of the control room and its contents. This material is being scheduled for replacement in January 2017.

4.4.5 Euroa

Euroa Compressor Station was commissioned in 2012 and is essentially in as new condition.

4.4.6 Winchelsea

Winchelsea Compressor Station was commissioned in 2014 and is essentially in as new condition.

4.4.7 Reciprocating Compressor Units

4.4.7.1 Iona

The Iona Compressor Station (ICS) incorporates two reciprocating compression units.

Changes in the capacity demand on pipelines of the VTS have led to an increase in operating pressures for the Lara to Iona Pipeline. This increase has prevented the ICS Units from compressing gas into the Iona to Paaratte Pipeline to a very low usage rate. Alterations have been completed to station piping to reduce inlet pressures to an acceptable level for testing the units for maintenance purposes.

The ICS aftercooler is undersized during high ambient temperature thus incapable of reducing discharge gas temperatures below maximum pipeline design temperatures resulting in a reduction in station capacity when ambient temperature is high. The design of the Coolers also results in excessive differential pressure drop between the inlet and outlet headers. The priority to upgrade the ICS Coolers is dependent on a further review of forecast pipeline pressures.

4.4.8 Backup Power Generation

Backup power generation is incorporated into the design of Compressor Stations (with Iona as the exception) to ensure operability in the event of a prolonged mains power failure. Gas Engine Alternators provide the Backup power generation at Gooding, Brooklyn and Wollert with a Diesel Engine Alternator at Springhurst, Euroa and Winchelsea. The devices are considered to be in good functioning condition though there are several ongoing concerns.

4.4.8.1 Gooding Compressor Station GEA

Backup Power is supplied to the Gooding Compressor Station by a 325 kVA Caterpillar GEA, sourced from the Bulla Park Compressor Station in NSW and installed at Gooding in 2007. The GEA is in a good functional condition though the Fuel Gas supply to the device has been found to limit power generation. Fuel gas supply is limited by the existing under

sized Fuel-Gas Regulator. Replacement or augmentation of the existing regulator is being conducted at time of writing.

4.4.8.2 Brooklyn Compressor Station GEA

Backup Power is supplied to the Brooklyn Compressor Station by a 315 kVA Caterpillar GEA. The GEA is is undersized and has not had a Type B compliance assessment. Upgrade of the GEA at BCS is being conducted during time of writing.

4.4.8.3 Wollert Compressor Station GEA

Backup power is supplied to the Wollert Compressor Stations A and B by a 325 kVA Caterpillar GEA, installed in 2007. The GEA is in a good functional condition and satisfies all demand requirements.

4.4.8.4 Springhurst Compressor Station DEA

Backup Power generation capabilities were introduced to the Springhurst Compressor Station in 2011 following the installation and commissioning of a Diesel Engine Alternator. There are no ongoing issues of concern.

4.4.8.5 Euroa and Winchelsea Compressor Station DEA

Backup Power generation capabilities were installed in the Euroa CS (Diesel Engine Alternator) in 2012 and at Winchelsea in 2014. There are no ongoing issues of concern.

4.5 Plant and Operational Assets

Plant and Operational Assets enable the safe and correct maintenance and operation of the VTS. Generally maintenance is performed reactively or scheduled from equipment hours.

Replacement occurs when the equipment can no longer be maintained economically or when performance becomes unsatisfactory.

Low value purchases for the replacement of addition to this asset base outside of the categories listed below is funded for through a generic annually funded purchases program.

4.5.1 Dandenong Complex

The Dandenong complex provides office space for operations, engineering and administrative staff in addition to equipment storage and workshop facilities. The complex is well maintained with improvements scheduled to meet changing demands and offset general wear and tear of existing assets.

The office facilities at Dandenong support over 140 staff. The following upgrade works are scheduled to maintain asset condition and provide functional improvements to the facility:

- Operations Building Replacement. A new office building is planned for construction to cater for Dandenong staff. Refer to business case for further detail.

- Sheltered storage space has reached capacity as maintenance and emergency equipment is consolidated and as completed projects return surplus equipment. A new building designed to meet this demand is planned.
- Asbestos impregnated material utilised within buildings of the complex pose an ongoing concern to the health and wellbeing of persons within the Complex. A perpetual program to eradicate or make safe on a risk based prioritisation program has been established and will continue to be implemented throughout the planning period.

The Complex buildings including Stores and Workshop buildings are showing visible signs of wear including watermarks and other stains. Painting of the Complex building exterior is planned.

Surplus buildings of the Dandenong site, where appropriate, are made available for lease to a third party.

The water mains used for fire suppression were repetitively leaking and have been replaced during 2015.

4.5.2 Operational Storage

The storage capability at Springhurst and Wollert is insufficient for operational needs.

The existing storage shed at Wollert is not capable of housing the all terrain forklift, turbine lubricating oil and basic workshop requirements. Theft has become a problem as the existing building is easily reconnitored by thieves due to the chain wire door way. The storage shed at Springhurst has similar capability problems.

The Dandenong storage shed is continuously full with emergency equipment. Another building is scheduled to be constructed in this planning period

4.5.3 Vehicles

A fleet of vehicles are in service operating throughout the VTS ranging from light cars and 4WD to trucks. These vehicles are generally retained for pre-established periods or distances, either four years or 150,000km. The fleet is well maintained, regularly serviced and reflects a program of staggered renewal. It is APA Policy to renew all passenger vehicles through a lease arrangement.

4.5.4 Tools and Equipment

A large and varied collection of tools and equipment are supplied to enable the safe and correct maintenance and operation of the VTS. Tools and equipment are well maintained and replaced on an as needs basis. Provision for general replacement is contained within the forecast period and the following tools have been identified for replacement in the near future.

The purchase and general replacement of ‘Spark Proof’ tools is planned to maintain and execute safe working practices.

A gas detector is required to open a Hot-Work Permit and must be used for all confined spaces activities. Replacement of detectors will be on an as needs basis.

4.5.5 Emergency Response Equipment

A full range of Emergency Response Equipment, spare parts is kept at 180 Greens Road, Dandenong South in preparation for a response to an emergency event. The stockpile is reviewed and supplemented as components deteriorate and emergency response needs change. This general replacement and upgrade program is carried out on an annual basis. Occasionally equipment or parts need to be retested to assure the components are fit for purpose.

Emergency equipment for Gas de-pressurisation, diesel fuel storage, spare pipe and fittings, radio communications, general response equipment and on-site caravan are required for continuous capability to deal with any likely emergency that may arise within the VTS. Their procurement or replacement is scheduled over the next few years, refer to the business case.

4.5.6 Heavy Plant

Heavy Plant Machinery supports the VTS maintenance and operation activities. All Heavy Equipment is well maintained and in good condition based on routine inspection and maintenance with a development and renewal schedule based on an as needs basis.

4.6 SCADA and Communications

Telemetry and communications systems transmit and receive process control signals and data to enable the remote monitoring and control of facilities. Components of these systems have a defined life expectancy of 10 years and are generally considered to be in good condition with few exceptions. The existing SCADA platform is Open Enterprise system and is being replaced with 'CLEARSCADA' utilising an OsiPi Historian at time of writing. This system will then align with all other APA Group SCADA systems, enabling development and operation to be performed by APA staff through the APA Integrated Operating Centre (IOC).

Another APA wide project is to standardise the WAN and communications architecture. The national approach to both systems has many advantages to the VTS; faster recovery and delivery capability, updated historian system and client functionality. This project has commenced and is scheduled for completion in 2017/18.

The Bristol 3000 series Remote Transmitting Unit has provided the basis for communications at many facilities of the VTS though the device is now obsolete with spare parts and vendor support no longer available. Replacement of these devices is ongoing and expected to be complete by the end of this planning period. However the need to continuously replace RTUs is expected the installed model becomes obsolete and spare parts are maintained internally through preventative replacement.

The serial radio network still operates within the VTS. This communication method is obsolete and is currently costing significantly more than contemporary modes of data transfer. The SCADA WAN project will upgrade remaining radio sites.

4.7 Environment, Cultural Heritage, Tenements

Easements are maintained for a variety of reasons, predominately to ensure safe operation of the pipeline from natural and third party threats. Easement management is conducted reactively to changes in the environment or land use.

Land access agreements exist for all pipelines and facilities of the VTS. The easement entitlements provide rights to the pipeline owner and operator to control the activities conducted within the easement boundaries. Existing easements provide the necessary measures to protect the pipeline.

Easements also afford provisions for the installation of additional pipelines though encroachment from third party developments may limit this in select areas. The allocation of new easements is generally project driven and determined on a case by case basis.

Currently the easement features are being documented on a GIS system to record and monitor the easements. There is also an ongoing program to maintain the marker signs and to ensure line of sight criteria are met as well as criteria for vegetation.

The most significant ongoing concern to easement land is urban encroachment. Easement is not permitted to be held on land owned by the Crown (including Road Reserve). Restrictive easements are viewed as an encumberance on the land and thus when land is rezoned the private owners usually choose to place roads on APA easements and thus expunge the easement and encumberance. This process is very difficult for APA to prevent and slowly depletes the strength of this procedural control preventing third party damage, and increases the costs of any excavation on APA pipelines.

4.7.1 Third Party

Third Party encroachment is a constant threat to the integrity of the VTS with the vast majority of pipeline incidents in Australia attributed to external interference threats. The threat of Third Party interference is assessed in accordance with AS 2885.1 and the Land Management Plan. Detailed procedural protection measures are provided in more specific documents than in the Land Management Plan. Some of the areas the Land Management Plan covers include the following:

Participation in the Dial Before You Dig program

Regular liaison with land owners, utilities and their contractors, emergency services and local councils

4.7.2 Aerial and ground patrols

The number of planning applications and One Call dealings increases annually as Melbourne's urban boundary expands.

The execution of these procedures overseen by the Infrastructure Planning and Protection team requires an ongoing funding.

4.7.3 Environment

APA has an obligation to ensure that any damage to the pipeline easement as a result of its activities is remedied. The most common instances of this are trench subsidence, weed management and soil erosion. Procedures have been established and implemented and these ongoing activities are overseen by the Infrastructure Planning and Protection team.

Regular contact with land holders, ground and aerial patrol enable identification of environmental damage. Resulting Minor Easement rectification work is an ongoing activity and budgeted for on an annual basis.

Remnant Native Vegetation is protected under the Planning and Environment Act 1987. The clearing and excavation for maintenance or construction activities in areas of remnant native vegetation can be delayed and additional cost burdened by the requirements of the Act. Such requirements may require the development of an Offset Management Plan and lead to costs to implement the plan.

4.7.4 Aviation

Aerial patrol of pipeline easements by fixed wing aircraft is conducted as a procedural protection measure for threats to the VTS, particularly the threat of external interference. The frequency of patrols is dependent on the location class of the pipeline and is detailed in the Aerial Surveillance Procedure, overseen by the Infrastructure Planning and Protection team. APA does not own any aviation assets.

4.8 Improvement Plan

Primarily the improvements initiated with the assets are listed in the capital expenditure summary. These improvements are driven by integrity, inspections, reliability, compliance and obsolecence. The following initiatives are driven by efficiency.

4.8.1 Remote Monitoring of CP

The CP system is monitored through monthly or bimonthly inspections. This approach is resource intensive as the time required to do the work is dominated by travel. The maturity and expansion of wireless data services in regional areas has enables the approximately 70 CP and TR units to be remotely monitored using SCADA. The benefits to this project are:

- the elimination of resource intensive inspections
- the increased rate monitoring from monthly to almost constant
- identification of CP failure with alarms instead of delays until next inspection

This project is not currently committed.

4.8.2 Serial radio network upgrade

The metering data is transmitted using a serial based radio network. The network is owned and maintained by a third party and charge an ongoing fee for the service. The maturity and expansion of wireless data services in regional areas permits the upgrade from a serial based radio system to a data based cable, wireless or satellite. The expected benefits are:

- The service will have a longer lifecycle than the existing radio network that can be decommissioned within 12 months of the third party notifying APA of its intension to do so
- The service fee is expected to be reduced
- The integration into the SCADA system will require significantly less development
- The solution is likely not require replacement for at least 20 years

This project is committed and expected to be completed by the end of 2017.

5. Risk Management

APA Group has established an enterprise wide risk management strategy and framework. The Board is ultimately responsible for determining the risk appetite of APA Group and approving and reviewing the risk management strategy and policies of the company. The Board has established a separate Audit and Risk Management Committee with specific responsibility to provide assistance to the Board in fulfilling its corporate governance and oversight responsibilities.

AS2885 specifies pipeline specific risk management techniques, safety management studies, which are used throughout the life of the assets. These are non-negotiable and all pipeline operating groups will manage risk on their assets in direct accordance with this Standard.

One of the significant risks that will require significant risk management is that of the potential of third party damage to APA's pipelines as a direct result of the continuing urban encroachment largely due to the expansion of and development of new housing and industrial estates adjacent to the pipeline corridors in Melbourne.

Management systems employed by APA for integrity management are:

PAMS which sets out APA's management system approach for the operation and control of AS2885 class pipelines;

- PIMP which sets out APA's approach and program of activities for the overall effective management of both pipeline and station integrity;
- Management of Change (MOC) system which systematically controls, assess and authorise changes to the pipeline infrastructure, procedures processes and controls in a coordinated manner.

APA also has in place best of practice policies, procedures and guidelines for integrity management. These documents complement the PAMS and they are implemented nationally.

There are many threats to safe operation of the VTS, however the following table describes asset risks that require capital works to improve the risk profile of the VTS pipelines from all perspectives, not just safe operation:

Table 8: Asset Risks

Description	Impact	Action
Failed heat shrink sleeves on non-piggable pipelines	Safety Asset Value	Rectification program for pipelines not currently capable to be inline inspected
Mainline valves in urban areas not able to be expediently closed in emergency	Consequence escalation Maintainability	Program of work to actuate MLVs in T1 areas
Third party damage	Safety	ALARP analysis and program of pipeline

leading to rupture in urban areas	Asset value	protection
Emergency Spares	Consequence escalation Maintainability Availability	Spares procurement and audit
Pipeline and Station Integrity	Safety Asset value	Inline inspection, Direct assessment. Liquid Management program.
Loss of critical equipment due to fire	Availability	Fire suppression program
Obsolete equipment, inferior design, lifecycle maturity	Safety Maintainability Availability	Lifecycle replacement programs

6. FIVE YEAR CAPITAL EXPENSE FUNDING

A Five Year Plan which details the Capital expenditure profiles is attached in Appendix A; the plan covers the planning period from FY18 to FY22.

The plan identifies specific items and associated costings that are considered essential to maintain the pipelines and facilities in a Fit-For-Purpose condition. The plan however does not consider growth projects.

The plan is forward looking and has been prepared in response to specific asset class maintenance strategies, integrity inspections and reports, regulatory compliance driven equipment upgrades and Safety Management Studies outcomes in addition to equipment that poses a threat to commercial operations due to being unsupported by a manufacturers.

A summary of the Five Year capital spending is detailed below.

Table 9: Five year capex plan

Project Name	Planned Work Year Scheduled
Replacement of emergency fittings and Equipment	Ongoing
Emergency - refurbish and re-testing of pipes	Ongoing
Emergency - SMR radio upgrade	Complete
Emergency Plidco fittings - Sleeve vent	FY2017
Emergency - fully equipped caravan	Post 2019
Emergency diesel fuel storage	Post 2019
Liquid management - Brooklyn	Post 2019
Liquid management - Gooding	Post 2019
Liquid Management - Pakenham	Post 2019
Valve - UniBolt Phase 5 Replacement	Ongoing
Hazardous Area Rectification	Ongoing
CP - Cathodic Protection Replacement	Ongoing
CP - Corrosion Protection Testing Equipment (Five data loggers)	Ongoing
Zonal Chromatograph Bottle Regulator Panels Upgrades	Ongoing
Zonal Chromatograph Insertion Probes	Ongoing

Chromatograph Replacement	Complete
Exposed pipeline coating refurbishment	Ongoing
Valve - Tyers Branch Valve Actuator Replacement	Post 2019
Physical Security	Ongoing
Station Pressure Piping Inspection - Remediation Activities	Ongoing
Valve - Actuate MLV's in T1 areas	Ongoing
Pig Trap - Enclosure upgrade	Ongoing
Pig Trap - Pipe Support Upgrade	Ongoing
Somerton to Somerton Pipeline Pig Trap Installation (238)	Refer to Pigging program
Pig Trap Install (Keon Park - Wollert)	Refer to Pigging program
Pigging - Two portable liquid collectors for pigging	Refer to Pigging program
A Branch Valve on Pipeline 108 to Newport Pig Trap Installation (124)	Refer to Pigging program
Dandenong to Princes Highway Pipeline Pig Trap Installation (129)	Refer to Pigging program
James Street to Laverton Pipeline Pig Trap Installation (253)	Refer to Pigging program
Laverton North to Laverton North Pipeline Pig Trap Installation (162)	Refer to Pigging program
Pakenham to Pakenham Pipeline Pig Trap Installation (68)	Refer to Pigging program
Pigging - Tracking and locating tools	Refer to Pigging program
Pigging Program (T1 Dandenong - Morwell)	Refer to Pigging program
Pigging Program (T56 Brooklyn - Ballan)	Refer to Pigging program
Pigging Program (T57 Ballan - Ballarat)	Refer to Pigging program
Pigging Program (T57 Ballan - Ballarat)	Refer to Pigging program
Pigging Program (T59 Euroa - Shepparton)	Refer to Pigging program
Pigging Program (T62 Derrimut - Sunbury)	Refer to Pigging program
Pigging Program (T67 Guilford - Maryborough)	Refer to Pigging program

Pigging Program (T70 Ballan - Bendigo)	Refer to Pigging program
Pigging Program (T71 Shepparton - Tatura)	Refer to Pigging program
Pigging Program (T74 Wollert - Wodonga)	Refer to Pigging program
Pigging Program (T85 Kyabram - Echuca)	Refer to Pigging program
Pigging Program (T92 Iona - Lara)	Refer to Pigging program
Princes Highway to Regent Street Pipeline Pig Trap Installation (36)	Refer to Pigging program
Tyers to Maryvale Pipeline Pig Trap Installation (67)	Refer to Pigging program
RTU & Control System Upgrade	Ongoing