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Distribution Services Strategy

CY2017 - CY2022

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Originated By

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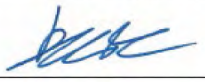
Asset Performance Engineer	Daryl Lee		19/12/2016

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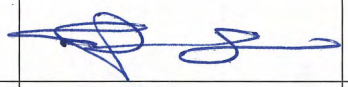
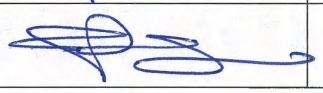
Endorsed	Head of Gas Network Strategy and Performance	Troy Praag		19/12/2016
Approved	General Manager, Gas Networks	for Mark Beech		19/12/2016

Executive Summary

This document outlines the maintenance, replacement, and other capital projects strategy associated with distribution services on the Multinet Gas network. This strategy aims to achieve a high level of reliability and safety for distribution services installed through the unplanned repair and replacements of services. Planned replacements take place as part of mains replacement activities – refer to Multinet's Mains Strategy (MG-SP-0009).

Preventative maintenance on services takes the form of leakage surveys, cathodic protection and investigations / provings which also serve as preventative maintenance activities for distribution mains.

Multinet Gas plans to maintain the current unplanned services replacement program and introduce a new initiative to improve safety in bushfire regions. Drivers for the programs are in alignment with Multinet Safety and Customer objectives. Mutlient's expenditure forecast is dominated by the unplanned services replacements (>90%) with that component trending in line with historical expenditure.

Table 0-1 provides the financial summary of the capital expenditure which is expected to be incurred in the calendar year period 2017 to 2022. Table 0-1 includes a breakdown of direct, overheads and real cost escalators for the purpose of reconciliation with that of the overview documentations which support our forthcoming Access Arrangement submission.

Table 0-1: Summary of Capital Expenditure ($'000)

Program	CY2017	CY2018	CY2019	CY2020	CY2021	CY2022
Unplanned Service Replacements	$1,144	$1,144	$1,144	$1,144	$1,144	$1,144
Thermal activated shut off devices	$21	$111	$111	$111	$111	$111
Total Direct Expenditure	$1,165	$1,255	$1,255	$1,255	$1,255	$1,255
Overheads	$70	$75	$75	$75	$75	$75
Subtotal	$1,235	$1,330	$1,330	$1,330	$1,330	$1,330
Real cost escalation	-	$8	$7	$10	$14	$16
Total Expenditure	$1,235	$1,338	$1,337	$1,340	$1,345	$1,347

Table of Contents

1. Document Overview

1.1. Objectives

This document articulates Multinet Gas' approach to the management of its existing distribution services and their associated components.

It has the following objectives:

- Articulate the key areas of focus in relation to asset management, risk, investment, cost and service standard outcomes for distribution services; and
- Show alignment of asset management practices with Gas Network Objectives.

The document is intended for use by:

- Multinet Gas staff (and it's contractors); and
- Regulators – Technical, Safety and Economic.

1.2. Scope

This strategy aims at increasing reliability and quality of supply and mitigating safety risk to personnel and public by optimising the replacement and maintenance of services in Multinet's gas distribution network.

This strategy applies to services located throughout the Multinet Gas distribution system and encompasses services operating at pressures up to 515kPa. It includes the pipework from the main up to, and including, the service valve.

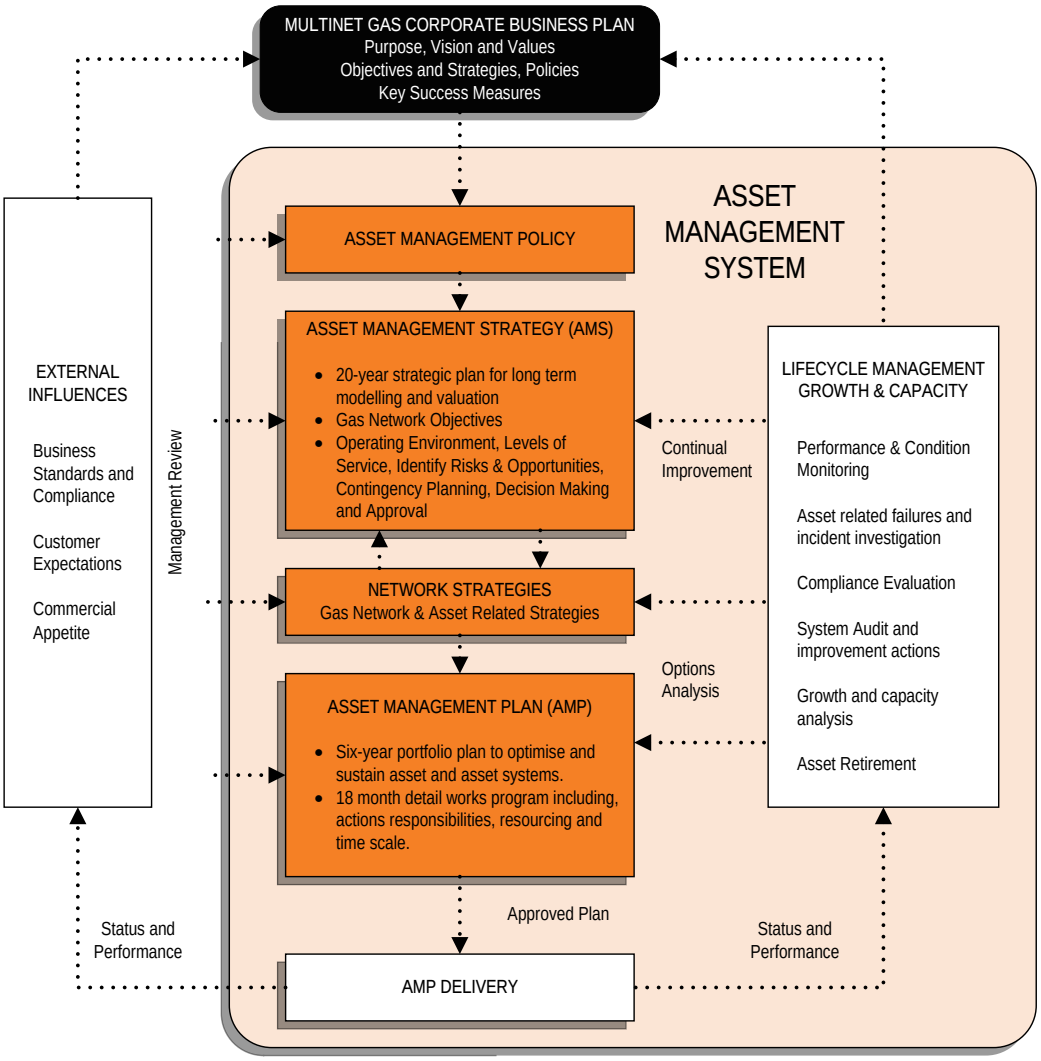
The strategy does not cover:

- Service valves that are covered by a planned maintenance inspection (e.g. Dual Run Inlet Valves) are not included in the scope. Refer to Multinet's Large Consumer Regulator (MG-SP-0005).
- The installation of new services for new customer connections. Refer to Multinet's Capital Growth Plan (MG-PL-0002).

1.3. Relationship with other Key Asset Management Documents

The Distribution Services Strategy is one of a number of key asset management documents developed and published by Multinet Gas in relation to its gas network. As indicated in Figure 1-1, detailed asset strategies - including the Distribution Services Strategy - informs both the Asset Management Strategy (AMS) and Asset Management Plan (AMP) of the programs needed to achieve the long-term objectives of the gas distribution network.

Figure 1-1: Asset Management Framework



1.4. Phasing and Financial Disclosure

All programs defined within this strategy are presented in calendar years, consistent with the reporting requirements of the Australian Energy Regulator (AER) and where applicable the Gas Distribution System Code (Version 11).

Where required for conversion to financial year (July to June), dollars and volumes can be estimated using a 50:50 expenditure split.

All financial figures quoted within this document - unless otherwise specifically stated - have the following characteristics:

- Real Expenditure / Cost (reference year = 2017);
- Direct Expenditure only (i.e. excludes overheads and finance costs);
- In units of $1,000 (i.e. '000); and
- All years are denoted in Calendar Year format.

Total values shown in tables and referred to in the text of this document may not reconcile due to rounding.

Conversion factors used in the escalation of historic expenditure to real 2017 equivalent expenditure is provided in Table 1-1. Cumulative conversion factors have been provided by Multinet Gas' Regulatory department.

Table 1-1: CPI Conversion Factors

	2012	2013	2014	2015	2016	2017
CPI Index - $2017	1.09619	1.07465	1.05192	1.02819	1.01296	1.00000

1.5. Data Sources

The following data sources have been drawn upon in development of the Distribution Services Strategy:

- SAP: ERP tool used for data collection, analysis and maintenance management of MG assets[1]
- 2013 – 2015 Regulatory Information Notices: Annual regulatory document submitted to the AER on network operations

1.6. References

- AS 4645 series - Gas Distribution Networks;
- Gas Safety Case;
- Gas Distribution System Code (Version 11).

1.7. Document Review

This document shall be reviewed every two (2) years or earlier if required. The next review is due on or before 31 December 2018.

[1] Some data abnormalities are expected in the SAP system due to legacy data management systems and migration between database management systems.

2. Asset Overview

2.1. Introduction

Distribution network services are constructed of various materials and operate at low, medium and high pressures.

Materials used include galvanised iron, steel (coated and un-coated), Poly Vinyl Chloride (PVC) and polyethylene. Some old and existing services may also be constructed of cast iron (for larger consumers). Services sizes vary from 10mm polyethylene up to 150mm for large consumers. The majority of services provide gas to domestic or small consumers (under $10m^3/hr$) with the length of varying from 5m to 100m.

Table 2-1 shows the percentage breakdown of services by pressure and service type. There are approximately 690,000 customers on the network with approximately 643,725 services[2].

Table 2-1: Breakdown of distribution services

Pressure	Service Type	Percentage
High Pressure	Commercial Service	1%
	Domestic Service	65%
	Industrial Service	0%
Medium Pressure	Commercial Service	0%
	Domestic Service	8%
	Industrial Service	1%
Low Pressure	Commercial Service	1%
	Domestic Service	24%
	Industrial Service	0%

Services are required to be insulated from the consumer piping (fitting line) for cathodic protection and electrical fault reasons. This is achieved by the use of an insulating device in the regulator/meter setup.

Services are defined by pressure and material type. The material type ultimately determines the life of the service. These are discussed below.

2.1.1. Cast Iron

Cast Iron services exist in small numbers throughout the distribution network. They are limited to larger sizes, operate at low and medium pressure, and were laid over 50 years ago. These services are susceptible to leakage, and can be likened to the cast iron mains with their joints being the biggest contributor to leaks. The service life is assumed to be the same and can be likened to be as that of the main. It is therefore logical to replace these services when the main is replaced provided the service does not experience signs of failure in which case it may be replaced earlier (i.e. reactively replaced)

2.1.2. Poly Vinyl Chloride

Poly Vinyl Chloride (PVC) was used from 1970 to 2000 exclusively in the low pressure network. Its usage has dropped over the years and is now only used in rare cases. PVC is joined by the use of glue and therefore is susceptible to joint failure, which gives rise to leaks and allows water to ingress into the low pressure network. Unlike steel mains, PVC pipes won't rust or corrode over time because they do not react with air and water in the way steel does; which

[2] SAP extract 9/9/2016. A single service can provide gas to multiple customers.

results in a significantly longer useful life. PVC pipe can be expected to outlast steel pipe without the need for protective coating or liners.

Due to the policy of laying services to high pressure standard the on-going usage of PVC is now redundant.

2.1.3. Polyethylene

Polyethylene is used for services operating at low, medium and high pressure. Its use has seen a reduction in escapes by corrosion but has also seen the increase in 3rd party damages due to the ease with which polyethylene can be damaged. Polyethylene (both mains and services) is preferred by Multinet due to its low labour and material costs, and ease of repair.

Polyethylene services come in a number of sizes:

- Series 3 - nominal bore: 10, 18, 25, 32, 40 and 50mm; and
- Series 2 - outside diameter: 16, 20, 25, 32, 40, 63mm.

Method of jointing is by butt, socket or electrofusion.

When upgrading a service from low to high pressure, a polyethylene main can be inserted into an existing low pressure service, providing cost savings and additional protection.

2.1.4. Unprotected Steel and Galvanised Iron

This piping system is based on bare steel, galvanised iron, and steam pipe that have been joined by having threads cut into the ends and screwed into joining couplings. This form of piping system is susceptible to corrosion especially at the threaded joints where the pipe cross-section is reduced by thread cutting. These pipes were installed prior to the 1970's and made up a large proportion of all early services installation. Black tape (1960 – 1970) pipe is also considered as unprotected due to high probability of flaws in the coating combined with the susceptibility of the tape to breakdown over time.

The life of this piping system is governed by the corrosive effects of the surrounding soil. Pitting corrosion is the predominant mode of deterioration for these pipes. The galvanised pipe does not behave very different to un-coated pipe, as the galvanising would dissolve within 5 to 10 years of installation exposing the bare metal to pitting corrosion. Bare or galvanised steel pipe is therefore regarded as having a relatively short life.

Reports of leakage from corrosion on unprotected steel mains indicate that these services are approaching end of life. It is therefore recommended that un-protected steel services be renewed subject to reported leaks and damages. It is not economical to repair such services as they are likely to be repeat offenders once leakage from corrosion is reported. This is further detailed in the Replacement Section 3.2.4 of this strategy.

2.1.5. Protected Steel

Coated steel services (both screwed and welded) are dependent on the corrosion protection coating. The effective life of this piping system is determined by the faults in the corrosion protection coating, most likely caused by third party damage. Pipe coatings (polyethylene and enamel) have a very long effective lives (~100 years), however, it is recognised that pin hole defects will be unavoidable in any type of coating. The cathodic protection (CP) of the pipe will effectively prevent corrosion through the pinholes. Therefore any deterioration of coated steel pipe will occur only in the absence of cathodic protection, through perforations or damaged sections of the coating.

Screwed joints are seen as a vulnerable part of the system in that the pipe wall has been reduced by the threading operation and the corrosion protection depends on field-applied corrosion protection coating at the joints. On the assumption that there is the potential for leaks at the joins the effective life of screwed jointed pipe has been slightly reduced.

Protected steel for the purpose of this strategy is deemed as enamel and polyethylene coated pipe. All steel used to operate at high pressure is welded.

It is recommended that these services are replaced on an upgrade basis and only where extensive corrosion or damage has occurred.

2.1.6. Upstand / Riser

Also of importance is the upstand, which is the above-ground component of the Service. Upstands have changed little over the time with steel the most widely used construction material. Copper and aluminium has seen small usage but steel dominates as the material of choice. Upstands were initially bare steel pipe wrapped for protection. They were also manufactured on-site from raw steel which required threading, welding, wrapping and bending. The current 15mm upstand that is in use comes threaded, coated and contains a socket fusion fitting ready for socket welding. This upstand is used for medium and high pressure installations. Low pressure services are laid to high pressure standard but require the use of a larger size upstand (to achieve the required capacity). This larger size upstand incurs a higher cost than the standard upstand due to increased pipe size, larger valve and transition fitting. This is relevant as the majority of replacements will be on the low pressure system.

2.1.7. Thermal Shut Off Devices

Thermal shut off devices are a new initiative that Multinet intends to implement from 2017. Installed in high bushfire areas, they will be rolled out onto any new connections and services in the field, and a program will be in place to install these fire safety valves on any existing services.

A thermal shut off devices (otherwise known as “fire valves”) is essentially a fitting that goes on the service upstand and can be placed before or after the isolation valve. A heat sensitive compound within the fitting will melt in the presence of a fire, and a stopper held in place by the compound will stop the flow of gas. This prevents natural gas (which acts as a fuel) from contributing to the size of the fire and property damage.

2.2. Asset Age Profile

The distribution services age profile encompasses a broad time-span, with some services spanning more than 50 years. The majority of these sites were installed / constructed by the former Gas and Fuel Corporation and are spread throughout the Multinet Gas distribution network.

The average service age is 24 years, with the percentage of services according to age and material shown below in the Table 2-2 below.

Table 2-2: Age profile of distribution services – Percentage of Network

Material	0 - 10 Years	11-20 Years	21 - 30 Years	31 - 40 Years	41 - 50 Years	50 Years Plus	Total
Polyethylene	38%	30%	21%	6%	6%	0%	**100%**
Steel	47%	24%	9%	13%	7%	0%	**100%**
PVC	1%	28%	56%	6%	9%	1%	**100%**
Cast Iron	12%	54%	10%	15%	5%	5%	**100%**
Other	0%	0%	11%	74%	15%	0%	**100%**
Total Network	**26%**	**20%**	**17%**	**28%**	**9%**	**<1%**	**100%**

When considering ‘average age’ the following should be taken into account:

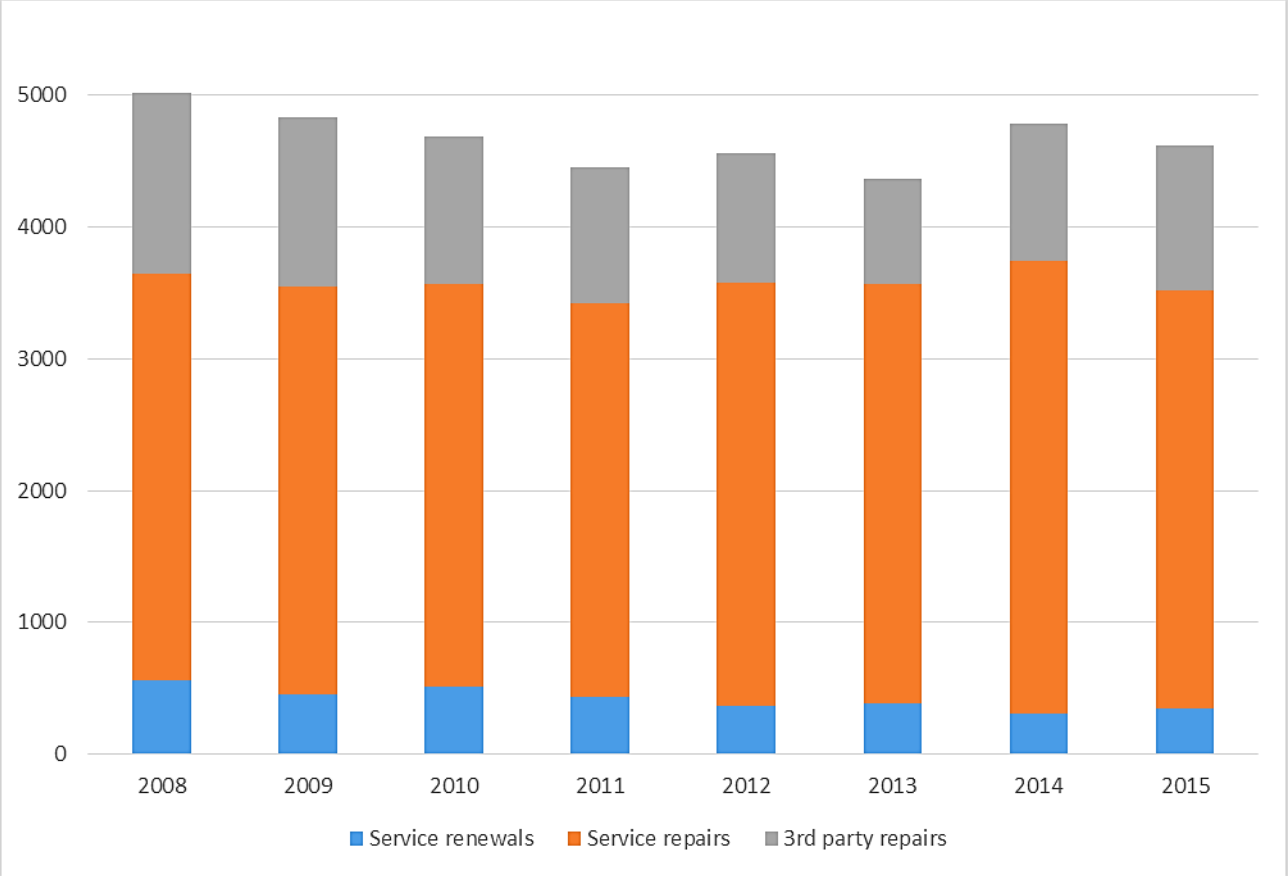
- The site’s commissioning date, in some cases, was based on when the conversion from manufactured gas to natural gas occurred, as the original commissioning date is unknown;
- Individual components may have been replaced many times since original commissioning date; and
- Database migrations may have altered data fields relating to commissioned dates.

2.3. Asset Performance

Figure 2-1 below shows the volumes of unplanned service renewals, service repairs, and third party damage repairs from 2008 to 2015. The volumes for service renewals consists of a range of service types that will be elaborated further in Section 4.

The decreasing trend in unplanned service renewals is attributed to the replacement of older services with new polyethylene pipe with considerably longer technical lives. However, early generation polyethylene pipe is expected to suffer from susceptibility to brittle fracture especially if it has had any squeeze off operation on it; which is an activity that can occur as a result of repairing 3rd party damages which according to the graph remains relatively level. Typically, services are assumed to have the same economic life of the main it is connected to.

Figure 2-1: Volume of Work by Activity Type

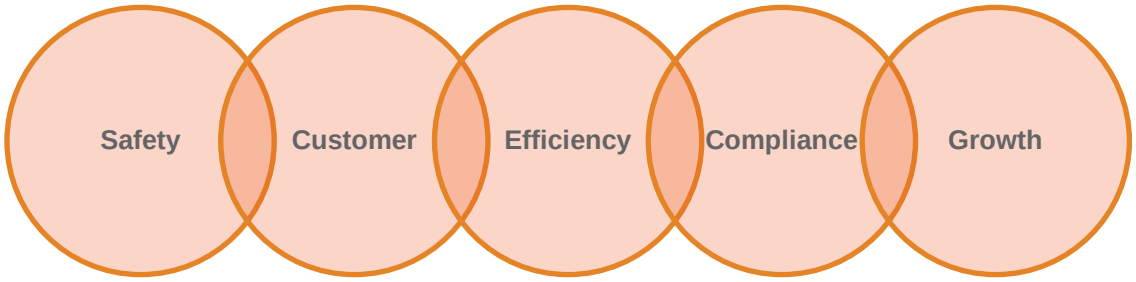


3. Asset Management Drivers

3.1. Network Objectives

Multinet Gas has established five (5) network objectives that govern how the network is operated and maintained. This is reflected mostly in regulatory obligations and in some cases prudent and responsible behaviour, justifiable on economic grounds. Achievement of these objectives ensures the sustainable and reliable operation of the gas distribution network.

Figure 3-1: Gas Network Objectives



The alignment between network objectives and the Distribution Services strategy is detailed below.

3.1.1. Safety – Achieve Zero Harm, while maintaining current levels of network safety.

This strategy aims to achieve a high level of reliability and personnel / public safety through inspection, preventive and corrective maintenance and asset replacement. The repair and renewal of services (planned or unplanned) aims to reduce the volume of leaks originating from services in poor condition. This in turn reduces the risk to personnel and public safety by reducing the chances of ignition of an ideal gas/air mixture.

This strategy also aims to achieve a high level of safety by introducing a new initiative to incorporate thermal shut off devices in new and existing services. These will be implemented in high bushfire risk areas where there is risk of fire.

3.1.2. Customer – Effortless Customer Experience

This strategy aims to achieve a high level of customer satisfaction and experience by providing a reliable means of gas supply to the customer. The planned maintenance activities are designed to cause minimum or no interruption of supply to the customer to ensure that the maintenance or replacement of existing assets does not cause a supply interruption or financial loss to the customer. Unplanned replacements and repairs are unfortunate and unavoidable but are designed as such to ensure safe and reliable supply to the end customer.

3.1.3. Efficiency – Sustainable and prudent network investment

The maintenance strategies outlined in this document are aimed at improving the cost efficiency of the distribution services installed in the Multinet Gas network. Depending on the material type and age of the service, the decision to replace or repair the service represents a trade-off between safety and prolonging the life of the asset thus deferring unnecessary expenditure.

3.1.4. Compliance – Maintain regulatory and technical compliance

Any new services installed are tested to AS4645 standards before being commissioned. Services are sized to ensure that they are capable of meeting the customers demand and ensuring that the end customer experiences the network pressures required in the Gas Distribution System Code.

3.1.5. Growth – Seek opportunities for new growth

The distribution service strategy applied to the lifecycle management of Multinet's existing assets. Refer to Multinet's Capital Growth Plan (MG-PL-0002) for a forecast of expenditure for new services.

3.2. Lifecycle Management

Planned replacement of services occurs in conjunction with mains replacements and therefore their replacement rate will track that of the mains replacement program (Refer to Multinet's Mains Strategy – MG-SP-0009). Unplanned or ad-hoc replacements occur due to failure of individual services requiring immediate replacement.

3.2.1. Inspection

No physical inspection program exists for gas distribution services, with the exception of Leakage survey activities which involves the survey of distribution mains and a minor volume of services covered as part of the annual and systematic surveys.

3.2.2. Preventive Maintenance

This is limited to cathodic protection and investigations / provings.

Service investigations and provings are either at the request of the public or other utilities to locate Multinet Gas assets or as an internal proving function for planning construction works.

3.2.3. Reactive Maintenance

Multinet undertakes a number of reactive maintenance activities for distributing services, including:

(a) Services Repair (Leaks)

Service repairs are generated predominantly from public reports with a small percentage from leakage survey. It is not possible to distinguish between the initiator of the repair but it is estimated that 80% are from the public. Leak repairs in Multinet's network are classed as un-planned maintenance.

In most cases this maintenance is as a result of the failure of the service due to corrosion at the riser or service line. It occurs mainly on low pressure steel services.

(b) Services Repair (Damage)

This maintenance is as a result of 3rd Party Damages. It invariably involves a service breakage, which could be due to major construction work or as simple as a shovel through a plastic service. This type of repair requires no leak detection and is in the majority of cases associated with a plastics service, which can be repaired quickly and cheaply.

(c) Clear Service Stoppage

This maintenance is as a result of water ingress into the mains and or service, which restricts or stops the flow of gas in the service resulting in a gas outage. Notification is from the consumers who have poor or no gas supply.

(d) Service Cut-Offs

This activity is as a result of a building coming down (BCD), bad debt or after a service renewal where the new service is laid and the old one is no longer required.

(e) Service Alter/Lower

This activity is as a result new construction where the existing service to the building needs to be moved. In the past years this activity has included 'Audco' upstand valve changeovers.

(f) Service Valve Changeovers

The only components that can be maintained on a service are the service valves. As these components have moving parts they tend to seize over time due to the mechanism drying out and become a risk in the case of gas isolation and a source of leaks. The two types of valves, which are more likely to cause problems, are gas cocks isolated to the low pressure network and Audco valves found in both the medium and high pressure network.

The strategy is that any maintenance work on the following types of valves where the valve is found to be leaking, that the valve be replaced regardless of it serviceability: 25mm gas cock, 20mm and 25mm Audco valve.

The decision to replace these valves is due to the fact that they will continue to leak and provided a source of a safety risk, Un-Accounted for Gas (UAFG), and public complaints.

(g) Service Reconnect after Debt

This is a low volume activity and is a result of a debt payment issue between the retailer and consumer been resolved such that the gas needs to be reconnected.

3.2.4. Replacement

(a) Unplanned Service Replacement

It is assumed that the economic life of a service is consistent with that of the main that it is connected to. This combined with the lack of information on service material types and location requires that services be replaced:

1. In line with the mains replacement program given that the service has not previously been replaced with polyethylene; or
2. On an assessment basis, this is required when the service is not fit for purpose due to leakage and the failure of a pressure test irrespective of material type. (Unplanned or ad-hoc service renewals); or
3. If a corrosion leaks was detected on a steel service.

Total replacements since 2007 have averaged around 420 per year with a decreasing trend. Taking a more recent 5 year average, the estimated number of unplanned service renewals is expected to remain around [redacted] per annum for the forecast period (Section 4.2).

(b) Planned services replacement

Planned services replacement numbers can be inferred by applying the average service per km of main ratio. This ratio is currently averaging 93 services per km of main replaced.

Table 3-1 shows the approximate length of main to be replaced from LP to HP mains replacement projects over the coming years and the likely number of service replacements from these main replacements. Cost for these replacements are captured in the Mains Replacement strategy, incorporated into project costs.

Table 3-1: Estimated Planned Service Renewals

Year	Length (km)	Planned Service Renewals
2017	128	11,842
2018	126	11,698
2019	128	11,815
2020	128	11,826
2021	135	12,524
2022	107	9,935

3.3. Performance Measures

Distribution Service performance is measured by the services ability to:

- Convey natural gas at pressures up to 5 times atmospheric;
- Resistance to internal pressure and external loading/impact;
- Resistance to chemicals and stray currents;
- Exhibit a minimum life cycle of 50 years.

These measures are typically measured at time of commissioning, testing or installation.

There is no program to measure the performance of distribution services that are in service. The only form of programmed inspection or measurement that relates to a structured ongoing maintenance program is a leakage survey. Although leakage survey involves the surveying of distribution mains, some services are included as part of the annual and systematic surveys.

4. Capital Program 2017 - 2022

4.1. Overview

Multinet Gas plans to complete the following annual capital programs:

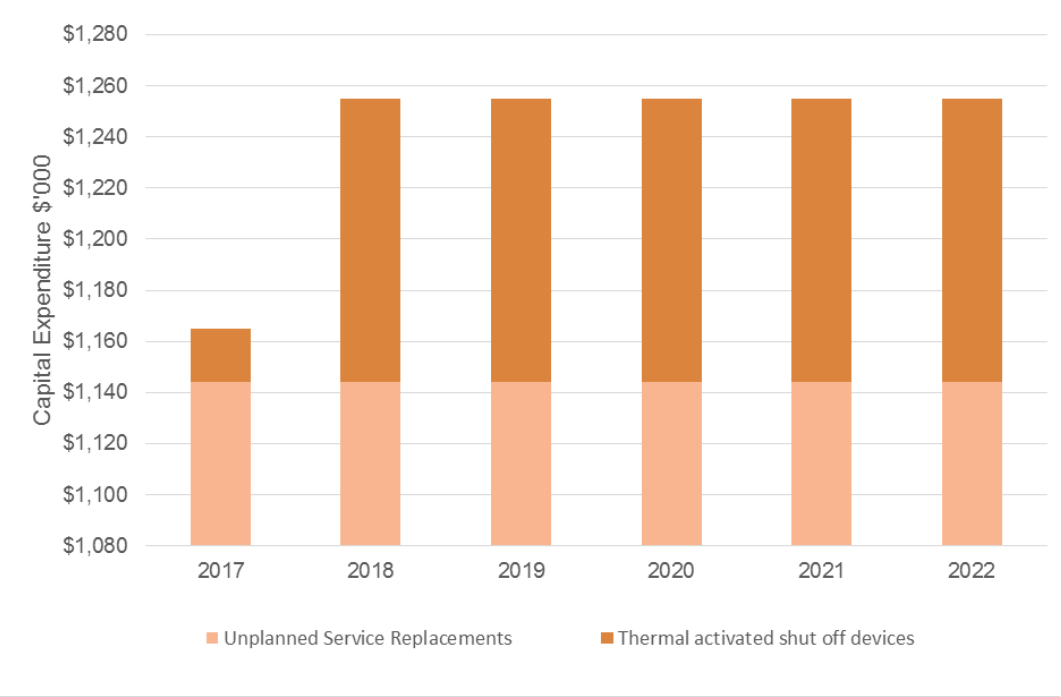
- Unplanned Service Replacements;
- Installation of Thermal activated shut off valves (i.e. Bushfire Valves).

Table 4-1 and Figure 4-1 provides a breakdown of capital expenditure from 2017 to 2022 by program.

Table 4-1: Capital Expenditure Summary

Ref	Program	2017	2018	2019	2020	2021	2022
4.2	Unplanned Service Replacements	$1,144	$1,144	$1,144	$1,144	$1,144	$1,144
4.3	Thermal activated shut off devices	$21	$111	$111	$111	$111	$111
	Total Expenditure	**$1,165**	**$1,255**	**$1,255**	**$1,255**	**$1,255**	**$1,255**

Figure 4-1: Capital Expenditure Summary



4.2. Unplanned Service Replacements

4.2.1. Introduction

Multinet uses SAP Material Activity Type (MAT) codes to differentiate and group the various types of service renewal activities undertaken on Multinet's distribution network as summarised in Table 4-2.

Table 4-2: Reactive Service Renewal Categories

Material Activity Type (Code)	Definition
RAC	Renew Service - Industrial & Commercial
RAE	Renew Service - Enlargement
RAH	Renew Service - Domestic HP
RAL	Renew Service - Domestic LP
RAR	Renew Service - Relocation
RAT	Renew Service - Trunk
RAU	Renew Service - Domestic Complex

Each MAT code aligns to a defined activity and unit rate negotiated annually between Multinet Gas and its network service providers.

4.2.2. Scope

The reactive replacement of services on Multinet's network.

For reiteration, planned service replacements have been captured as a part of the overall unit rates for projects listed in Multinet's Distribution Mains Strategy (MG-SP-0009).

4.2.3. Business Drivers and Strategic Alignment

Undertaking reactive service replacement is reflected in Multinet's network objectives through:

- **Safety:** Allowances for these works ensure that risk to public and personnel is lowered by reducing the volume of natural gas leaking from services.
- **Customer:** Renewing a service for customers ensures that we are able to deliver a reliable supply of gas with minimal interruptions or pressure losses

4.2.4. Works Program

Multinet's forecast for reactive service replacement volumes aligns with actual volumes of replacement undertaken over the past 5 years i.e. 367 replacements per year. Refer to Table 4-3.

Table 4-3: Historical Service Renewals

Activity code	5 year average	8 year average
RAC	7	6
RAE	0	1
RAH	71	82
RAL	275	314
RAR	0	0
RAT	9	7
RAU	5	3
Total	**367**	**413**

Table 4-4 outlines the capital cost associated with reactive service replacement.

Table 4-4: Capital Expenditure Summary – Unplanned Service Replacement

Program		2017	2018	2019	2020	2021	2022
Unplanned Service Replacements	Unit	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Expenditure		**$1,144**	**$1,144**	**$1,144**	**$1,144**	**$1,144**	**$1,144**

4.3. Thermal-activated Shut-off Devices

4.3.1. Introduction

Multinet is introducing the use of thermal activated shut-off valves (i.e. bushfire valves) to be installed on new and existing services in bushfire prone areas. Bushfire valves operate by automatically turning off the gas supply in the event of a fire, preventing explosions and the fuelling of the fire.

Zetco Valves are able to supply 2 types of thermally activated fittings; one to be retrofitted onto existing sites and another to be implemented on new sites. The difference in these two fittings are that the fitting can be implemented downstream of the isolation valve for the case of existing sites and a combined fitting of thermal safety device and isolation valve for new sites.

The thermal-activated gas shut-off device operates by automatically turning off the gas supply when the outside temperature reaches 95-100°C the metal alloy that keeps plug & cartridge together melts and the spring pressure pushes the plug against the gas opening to close it completely. No fire or heat detectors are required to automatically intercept gas flow.

Figure 4-2: Thermal Shut Off Devices

4.3.2. Scope

Multinet has spatially investigated in detail the types of hazardous bushfire zones within the Multinet Gas area. The spatial datasets were provided by the Forest, Fire and Regions department of the Department of Environment, Land, Water and Planning. The bushfire areas can be categorised according to the list below, each with increasingly discrete areas of bushfire risk.

- Bushfire Prone Areas;
- Bushfire/Wildfire Management Overlay; and
- Bushfire Risk Landscape (BRL) Impact Risk levels.

The dataset used for the analysis was the BRL Impact Risk levels. This was in due to the fact that it provided a risk ranking to certain areas and covered additional discrete patches of land not overlapped with the other two spatial datasets. In addition to this, the BRL Impact Risk dataset assigned many distinct risk levels:

- Low
- Moderate
- High
- Very High
- Extreme

For the purposes of this analysis, only the Extreme and Very High risk ranking areas were selected as they presented a good compromise between feasibility and safety. In doing so, it was determined that there were a total [redacted] customers in these designated bushfire regions selected for thermally activated safety device retrofitting. Averaged out over 5 years, this assumes a total of [redacted] gas services retrofitted per year. These devices are intended to be installed downstream of the service isolation valve and therefore are equivalent to the cost of replacing a meter under the OMSA agreement. Diagrams of the overlay over the Multinet area can be found in Appendix 5.2.

4.3.3. Business Drivers and Strategic Alignment

Installing thermal activated shut-off devices (Bushfire valves) is reflected in Multinet's network objectives through:

- **Safety:** The installation of valves prevent additional fuel from dangerously contributing to an existing fire.

4.3.4. Works Program

Multinet's forecast for thermal activated shut-off devices is summarised in Table 4-5.

Table 4-5: Capital Expenditure Summary - Thermal Activated Shut-off Devices

Program		2017	2018	2019	2020	2021	2022
Thermal activated shut off devices	Unit	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Expenditure		**$21**	**$111**	**$111**	**$111**	**$111**	**$111**

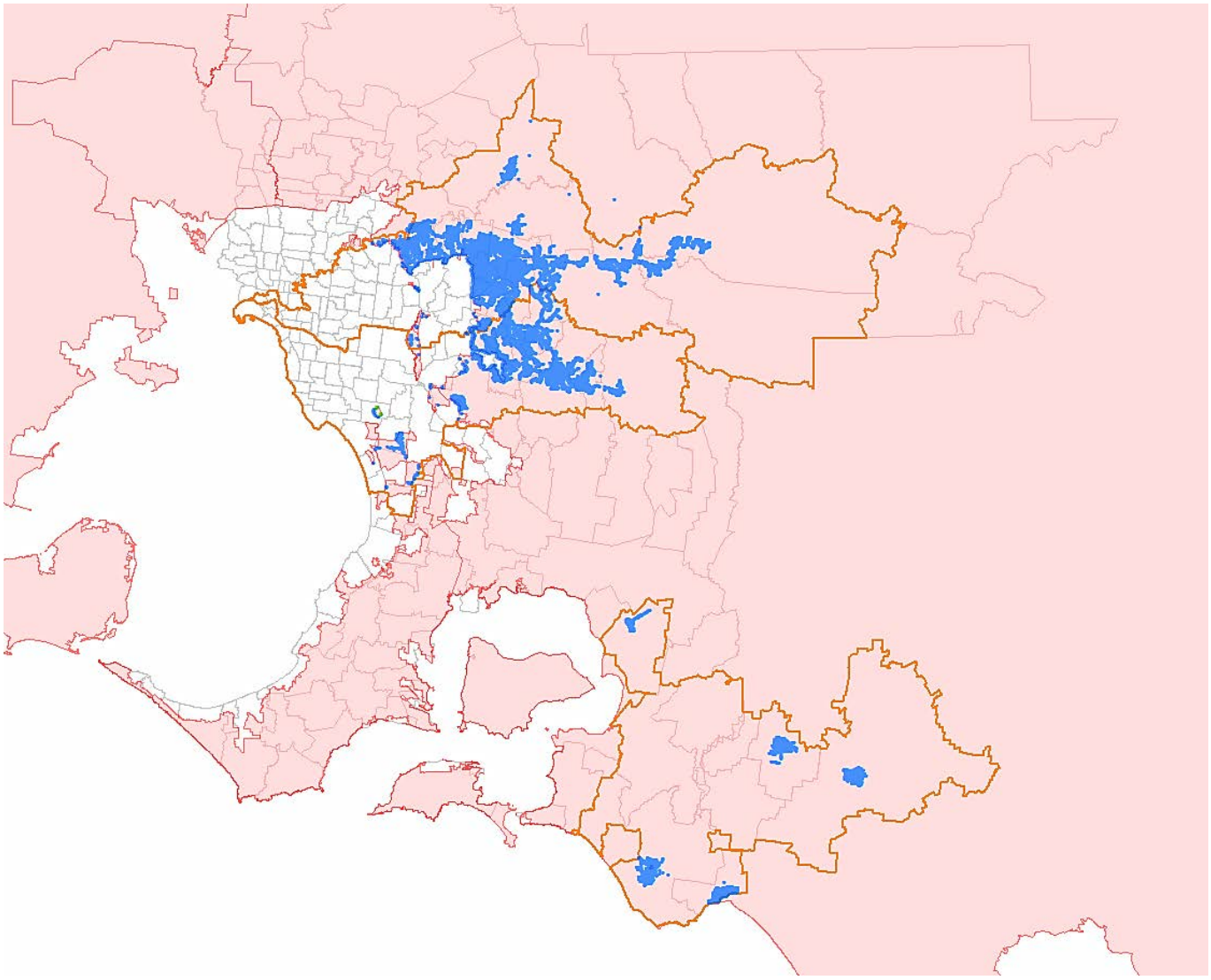
5. Appendix

5.1. Glossary & Definitions

Term	Meaning
AER	Australian Energy Regulator
BRL	Bushfire Risk Landscape
DELWP	Department of Environment, Land, Water and Planning
ESV	Energy Safe Victoria
Gas Meter	Mechanical device (usually) used to measure the volumetric flow rate of gas that passes the device. The volume of energy that passes through the meter is dependent on both gas pressure and temperature when the volume is measured
GFC	Gas and Fuel Corporation
GDSC	Gas Distribution System Code
HP	High Pressure (Pressure Range: 140 to 515 kPa)
HP2	High Pressure 2 (Pressure Range: 515 to 1050 kPa)
I&C	Industrial and Commercial connections
LP	Low Pressure (Pressure Range: Up to 7 kPa)
MAT	Material Activity Type. A SAP three (3) letter code assigned to work activities. Enables volumes and unit costs to be allocated and reported.
MG	Multinet Gas
MP	Medium Pressure (Pressure Range: 35 to 210 kPa)
OMSA	Operational and Management Services Agreement
PVC	Poly Vinyl Chloride
SAP	Systems Applications and Products is an Enterprise Resource Planning tool which used at Multinet Gas for recording asset data and maintenance management.
SMS	Safety Management Study
TP	Transmission Pressure (Pressure Range: Above 1050 kPa)

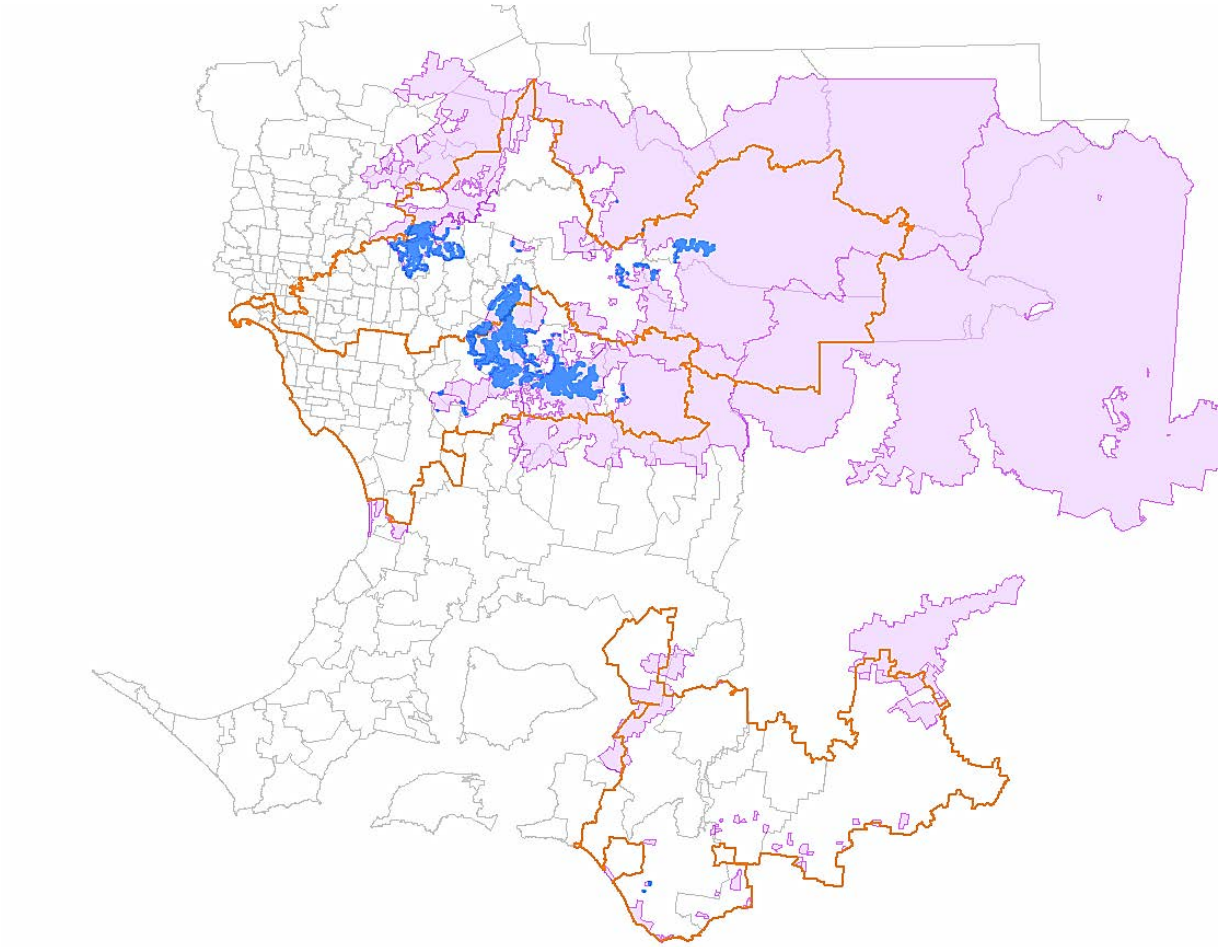
5.2. Bushfire Overlays

Figure 5-1: Bushfire Prone Area with Associated Supply Points



The figure above indicates over 60,000 supply points in need of retrofitting.

Figure 5-2: Bushfire Management Overlay



The figure above which shows the Bushfire/Wildfire Management Overlay with Multinet Gas supply points indicates a smaller (more discreet) region for implementation of the thermal safety devices, however this still gives a total of over 18,000 services to be retrofitted.

Figure 5-3: BRL Impact Risk Overlay

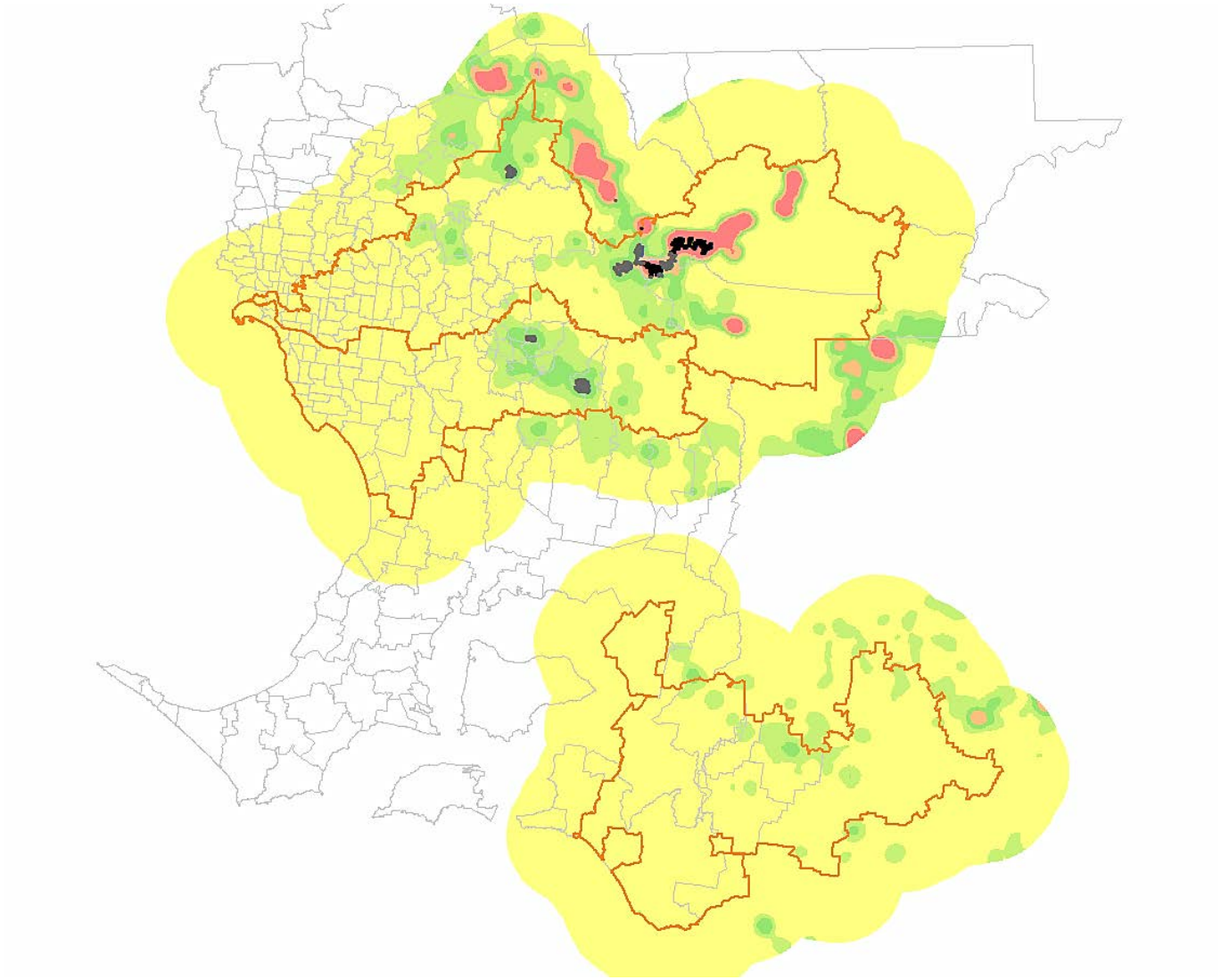


Figure 5-3 shows the BRL Impact Risk layer overlaid with Multinet Gas supply points. This dataset, obtained from the Department of Environment, Land, Water and Planning ranks areas based on

- Locations at highest risk of houses being lost due to bushfire;
- Worst case scenario with NO suppression attempted and NO fuel reduction works ever having been undertaken; and
- Number of properties in an area with 1 km ignition grid.

Selecting supply points in areas ranked Extreme and Very High gave a total of [redacted] supply points, a feasible volume of retrofitting to be carried out within the next access arrangement.

5.3. List of Tables

5.4. List of Figures