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2018 to 2022 Revised Access Arrangement Information

Attachment 2 - Revised Mains Replacement Program

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2018 to 2022 Revised Access Arrangement Information

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1. Mains replacement program

1.1 Response summary

We have not implemented the AER's adjustments to our mains replacement capex program. However, while we do not agree with the scale of the AER's reductions to the volume of mains scheduled for replacement during the 2018-22 access arrangement period, we have revisited our proposal and updated it for the latest information.

First of all, we have reviewed the proposed unit rates for the replacement program. By using the latest tender costs, and applying it to the revised replacement volumes and locations discussed below, the average direct unit rate for the low pressure replacement program has fallen from $334.50 per metre to $332.60 per metre.

We have also reduced the volume of low pressure mains scheduled for replacement by 15%. Our revised replacement volume of 531 kilometres (average 106 kilometres per year), reflects a reasonable rate of replacement that we will deliver during the 2018-22 period. It also represents an amount that will set a platform for achieving our Energy Safe Victoria (ESV)-endorsed target of removing all low pressure, high risk material from the network by 2033, while maintaining the overall level of network risk associated with these assets to as low as reasonably practicable.

Though our low pressure mains replacement volumes have not been reduced to the levels proposed in the AER's draft decision, we consider the revised replacement schedule is a prudent program that reflects an efficient delivery rate while managing the network risk to an acceptable level.

We also do not agree with the AER's decision that a lesser volume of medium pressure cast iron mains can be safely replaced during the period, and that the high-risk early first generation HDPE mains can continue to be safely managed via monitoring and maintenance activities alone. We consider that not replacing the specified medium pressure cast iron and early first generation HDPE mains during the 2018-22 access arrangement period would not reflect the actions of a prudent network operator managing risk to as low as reasonably practicable.

Therefore, we do not propose any change to the volume of replacement for medium pressure cast iron mains (24 kilometres[1]) and early first generation HDPE mains (31 kilometres[2]). These mains have the same or higher risk than low pressure cast iron mains.

We understand that the AER's draft decision has been formed based on its interpretation of the information presented to it. Therefore, in this proposal we have provided the following additional information to demonstrate the prudence and efficiency of our modified mains replacement program:

- Revised unit rates (see section 1.5);
- A risk assessment that applies the framework specified under AS/NZS 4645 (see section 1.2);
- Additional information on our 2017 delivery performance and future capability (see section 1.3);
- Fracture and leak rates for the medium pressure mains (see section 1.4.1); and
- Break and leak rates for the early first generation HDPE mains (see section 1.4.2).

In summary, in this revised proposal, we submit that:

- The current level of risk associated with the low pressure cast iron mains under the AS/NZ 4565 risk assessment framework is rated as high. This risk rating implies that these mains must be replaced

[1] 24 kilometres of medium pressure cast iron mains will be replaced and a further 4 kilometres will be abandoned, removing a total of 28 kilometres of medium pressure cast iron mains from the network.

[2] In order to replace 31 kilometres of early first generation HDPE mains, a further 9 kilometres of PE will need to be replaced making a total of 40 kilometres replaced under this program.

as soon as practicable, and that it would not be prudent to extend the proposed replacement program beyond the 2033 target agreed with ESV;

- Medium pressure cast iron mains are higher risk mains than low pressure cast iron mains, and should be replaced as a priority. While the Graham Street and Aughtie Drive medium pressure replacement programs do support the low-pressure mains replacement program that is not the primary driver for replacing these assets. The risk associated with all medium pressure cast iron mains is high, and is the reason all of this material must be removed from the network as quickly as possible, regardless of whether it directly supports the low pressure replacement program;
- Early first generation HDPE mains are assessed as higher risk than low pressure cast iron mains and have higher break rates. The program to replace these mains will coincide with the completion of the medium pressure cast iron mains replacement program.

We also note that ESV provided the AER information that supported Multinet maintaining the 2033 target completion date for the low pressure mains replacement program. ESV recognised that the medium pressure cast iron mains and early first generation HDPE mains can be higher risk than low pressure cast iron mains[3]. Therefore, we consider our revised program is consistent with good industry practice and will enable us to achieve our safety obligations within the 2033 time frame.

Our revised mains replacement capex is $230.8 million. This a reduction of $36.1 million compared to our initial proposal (see Table 1-1).

Table 1.1: Comparison of forecast MRP capex for the 2018 - 22 access arrangement period ($M, real 2017)

	Original	Draft Decision	Revised	Variance to Draft Decision
Low pressure mains	209.0	142.4	176.6	(34.2)
Medium pressure cast iron	18.1	10.4	18.1	(7.8)
Early first generation HDPE	15.9	-	15.9	(15.9)
Reactive mains replacement	1.0	1.0	1.0	-
Unplanned service renewals	5.7	5.7	5.7	(0.0)
Total direct expenditure	**249.7**	**159.5**	**217.3**	**(57.9)**
Overheads	15.0	8.5	11.7	(3.3)
Escalation	2.2	1.3	1.8	(0.5)
Total expenditure	**266.9**	**169.2**	**230.8**	**(61.6)**

Table 1-2 shows the revised mains replacement volumes compared with the initial proposal and the AER's draft decision. The AER accepted the reactive mains replacement and unplanned service renewals as proposed. We are proposing no changes to these programs. The following table presents our revised proposal for the low pressure program together with the medium pressure cast iron and early first generation HDPE programs.

Table 1.2: Comparison of forecast MRP volumes (km) for the 2018 - 22 access arrangement period

	Original	Draft Decision	Revised	Variance to Draft Decision
Low pressure mains	624.0	425.0	531.0	(106.0)

[3] Energy Safe Victoria, email response to questions from the AER about Multinet's mains replacement program, 3 May 2017.

	Original	Draft Decision	Revised	Variance to Draft Decision
Medium pressure cast iron	24.0	12.0	24.0	(12.0)
Early first generation HDPE	40.0	-	40.0	(40.0)
Total volume (km)	**688.0**	**437.0**	**595.0**	**(158.0)**

Table 1-3 shows the revised annual expenditure.

Table 1.3: Revised annual forecast capex for the 2018-22 access arrangement period ($M, Real 2017)

	2018	2019	2020	2021	2022	Total
Low pressure mains	41.7	35.3	38.8	30.7	30.2	176.6
Medium pressure cast iron	7.2	4.6	6.3	-	-	18.1
Early first generation HDPE	-	-	-	8.7	7.2	15.9
Reactive mains replacement	0.2	0.2	0.2	0.2	0.2	1.0
Unplanned service renewals	1.1	1.1	1.1	1.1	1.1	5.7
Total direct expenditure	**50.3**	**41.2**	**46.4**	**40.7**	**38.7**	**217.3**
Overheads	2.7	2.2	2.5	2.2	2.1	11.7
Escalation	0.3	0.2	0.3	0.4	0.5	1.8
Total expenditure	**53.3**	**43.7**	**49.2**	**43.4**	**41.3**	**230.8**

Table 1-4 shows the revised annual replacement volumes.

Table 1.4: Revised annual forecast volumes for the 2018-22 access arrangement period (km's)

	2018	2019	2020	2021	2022	Total
Low pressure mains	111.7	112.4	111.1	99.0	96.8	531.0
Medium pressure cast iron	10.2	5.5	8.1	-	-	24.0
Early first generation HDPE	-	-	-	22.3	17.7	40.0
Total replacement km's	**121.9**	**117.9**	**119.2**	**121.3**	**114.5**	**595.0**

1.1.1 Impact of the AER's proposed mains replacement program

When determining our revised mains replacement program, we also considered the impact on network risk if Multinet undertakes a mains replacement program as specified in the AER's draft decision. The AER's draft decision proposes 85 kilometres per year of low pressure mains be replaced, and that only the portion of the medium pressure cast iron replacement program that supports the low pressure program should be replaced (12 kilometres, half that proposed by Multinet). The draft decision does not provide for replacement of any of the early first generation HDPE mains.

The AER, on the advice of Zincara, considered there is unlikely to be a credible impact on, or risk to, public safety of reducing the mains replacement volumes to these levels. However, our analysis suggests that the draft decision mains replacement program would result in 1242 kilometres of high risk mains remaining at the end of the 2018-2022 regulatory period, including 78km of highest risk mains. Assuming the replacement rate of 85km p.a. continues, 452 kilometres of high risk low pressure cast iron and unprotected steel mains will remain in the system at the end of 2033 and not be completely removed until the end of 2040.

We estimate that undertaking 85 kilometres of low pressure mains replacement per year during the 2018-2022 regulatory period would result in an additional 182 leak incidents, of which 60 could potentially be fractures as a result of the reduction or deferral of mains replacement activities. However, over the life of the program (to 2033) an additional 2,876 leaks and 317 cast iron fractures could be expected.

Table 1-5 shows the impact of the draft decision mains replacement program on the residual risk in the Multinet network at the conclusion of the 2018-22 regulatory period compared with Multinet's revised proposal.

Table 1.5: Risk impact of draft decision relative to revised proposal

Mains replacement programs	High Risk Volume mains to be replaced in 2018-2022 (km)[4]	High risk mains at end of 2022	Risk at end of 2018-2022 regulatory period	High risk mains at end of 2033 (km)	Risk in 2033
Draft Decision					
Medium pressure CI	12	16	High	16	High
Early first generation HDPE	0	62	High	62	High
Low pressure CI / UPS	324[5]	1164	High	452	High
Total	**336[6]**	**1242**	High	**530**	High
Revised Proposal					
Medium pressure CI	28Error! Bookmark not defined.	0	N/A	0	N/A
Early first generation HDPE	31Error! Bookmark not defined.	31	High	0	N/A
Low pressure CI / UPS	396[7]	1092	High	0	N/A
Total	**455[8]**	**1123**	**High**	**0**	**N/A**

Therefore, we do not consider undertaking a mains replacement program consistent with that outlined in the draft decision would reflect the actions of a prudent network operator managing risks to as low as reasonably practicable (ALARP).

It should be noted that most natural gas distribution networks around Australia have undertaken mains replacement programs to address the high risk associated with cast iron and unprotected steel mains.

[4] Includes high risk mains only.

[5] 425km of replacement of which 324km are CI / UPS mains.

[6] 437km of replacement of which 336km is assessed as high risk.

[7] 531km of replacement of which 396km are CI / UPS mains.

[8] 595km of replacement of which 455km is assessed as high risk.

Multinet has reviewed the cast iron replacement programs for AGN Victoria[9], AGN South Australia[10] and AusNet Services[11] and identified that all of these networks will have completed their cast iron replacement programs by 2027.[12]

There is a marked difference between the risk Multinet customers will continue to be exposed to over the next 15 years compared to other Australian gas distribution businesses. If Multinet undertakes the mains replacement program specified in the draft decision, customers would be exposed to this risk for even longer as shown in Table 1-6.

Table 1.6: Volume of cast iron mains in Victorian and South Australian gas distribution networks

	Volume end of 2017	Volume end of 2022	Volume end of 2027	Volume end of 2033
Multinet (revised proposal)	1,085	801	437	0
Australian Gas Networks (Victoria)	148	0	0	0
AusNet Services	209	81	0	0
Australian Gas Networks (South Australia)	496	418	0	
AER Draft Decision	N/A	843	613	337

1.2 Risk assessment of Multinet's revised proposal

In its draft decision, the AER drew on internal and external engineering and technical expertise, which included a report from Zincara[13] and responses from Energy Safe Victoria[14]. The AER assessed that continuing replacements at the historical average (85 kilometres per year) during the 2018–22 access arrangement period will continue to improve network integrity and public safety.[15] We do not agree that replacing only 85 kilometres of low pressure mains per year is sufficient to efficiently and effectively address the high risk of these mains.

We are committed to minimising the risks arising from our gas distribution network and complying with legislation and standards to maintain a safe gas network. Our aim is to ensure processes and activities do not expose personnel, service providers, members of the public or the environment to unacceptable risks. As such, the mains replacement program is designed to reduce the maximum amount of risk over the period.

The volumes of mains forecast to be replaced in our revised proposal are in line with our current delivery capacity. Nevertheless, we will seek to replace more mains where possible and we are confident that the improvements in our contracting arrangements and competitive tendering processes will enable the delivery of more mains. We expect to be able to utilise additional industry capacity to replace higher volumes in future regulatory periods as other gas distribution businesses complete their programs. This will enable us to meet or exceed the 2033 target completion date.

We do, however, acknowledge that further information and clarity is required to support a higher volume of replacement than that prescribed in the draft decision. In particular, it is important to establish that the medium pressure cast iron mains and early first generation HDPE mains present higher risk than the low pressure cast

[9] https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/australian-gas-networks-victoria-and-albury-access-arrangement-2018-22/proposal

[10] https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/australian-gas-networks-sa-access-arrangement-2016-21

[11] AusNet Gas Services, Gas Access Arrangement Review 2018–2022, Appendix 6E: Mains and Services Strategy – Public, December 2016, p. 19.

[12] Based on assessment of the information publicly available.

[13] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017.

[14] Energy Safe Victoria, email response to questions from the AER about Multinet's mains replacement program, 3 May 2017.

[15] Attachment 6 – Capital Expenditure I Draft Decision – Multinet Gas access arrangement 2018-2022, p.6-18

iron and unprotected steel mains. Therefore, in the following sections we have outlined an assessment of the risk associated with different categories of mains.

1.2.1 Risk management systems

At Multinet we have an extensive suite of policies, processes and systems in place to ensure the safe operation of the gas transmission and distribution networks throughout the entire asset lifecycle of design, construction, commissioning, operation, maintenance and modification; through to decommissioning of assets at end-of-life.[16] These are embedded in the Multinet Gas Safety Management System, which is the framework within which we manage network risk. Collectively, the component parts of the safety management system are designed to ensure safe operation of the gas network through systemic reduction of network risks to what the industry considers as low as reasonably practicable.

The Multinet distribution mains network comprises 10,001 km of mains, which include cast iron, PVC, unprotected steel, protected steel and PE (see Table 1-7).

Table 1.7: Distribution mains by material forecast at end 2017 (kilometres)

Material	Length (km)	Percentage (%)
Cast Iron (CI)	1,085	11%
Poly Vinyl Chloride (PVC)	465	5%
Unprotected steel (UPS)	431	4%
Protected steel (PS)	3,302	33%
Polyethylene (PE)	4,718	47%
Total	**10,001**	**100%**

We have undertaken an assessment of the risk associated with each category of mains. The outcome of this risk assessment informs the mains replacement program, ensuring a targeted and prioritised delivery schedule.

When assessing the risk associated with different mains on our network, we take into account:

- The material the mains are constructed from, the consequential propensity of the mains to fail and the method of failure (this will impact on the likelihood of a failure occurring and the consequence of the failure);
  - For gas to escape, the mains must fail. The form of failure (which can vary based on material type) will affect whether there is a sudden escape of large volumes of gas or a slower leak;
- How the pressure of the main will impact on the integrity of the material and the quantity of gas escaping;
  - Higher pressure mains of the same material type are usually rated as a higher risk than lower pressure mains due to the volume of gas that might escape; and
  - How the location of the main will affect the likelihood of gas escaping into the atmosphere or accumulating under the ground (e.g. a building) as well as the number of people likely to be exposed to release; and
- Any other risk related differentiator identified through operations and maintenance activities.

[16] Gas Safety Case Overview, page 8

To undertake the risk assessment, we have categorised different mains based on the characteristics that affect risk.

Table 1-8 shows the categories and characteristics of mains considered in assessing comparative risk. For all subsequent tables, categories are referenced by their number (1 to 7) noted in Table 1-8.

Table 1.8: Mains inventory by individual category forecast at end 2017 (kilometres)

#	Material Type	Length (km)
1	UPS (Low Pressure)	431
2	Cast Iron (Medium Pressure)	28
3	Cast Iron (Low Pressure)	1,057
4	HDPE (Early first generation)	62
5	PVC (Low Pressure)	465
6	PE (All Pressures)	4,656
7	Protected Steel (Medium and High Pressure)	3,302
	Total	**10,001**

1.2.2 Consequence rating

We have reviewed the consequence of an incident for each of these categories of main, applying the AS/NZS 4645 framework, which considers consequences of a mains failure event on people, gas supply and the environment. The framework ranks the severity of the failure event from ‘catastrophic’ (multiple fatalities) to ‘trivial’ (minimal impact on health and safety) across people, supply and environment.

Key considerations in the assessment of consequence are:

- The consequence of an incident is influenced by the pressure and the location of the main;
  - An increase in pressure increases the volume of gas which can escape, whilst the location of the main can affect the volume of gas reaching premises, and therefore the volume of gas which can accumulate and ignite, thereby causing injuries or fatalities;
- The potential for an incident on a gas distribution network to result in few fatalities or several people with life threatening injuries is consistent across all material types;
  - This is because there is an inherent risk associated with pressurised natural gas mains. All material types have the potential, under certain failure conditions, to release gas which can result in an explosion that can cause significant harm. The number of people impacted could differ depending on the pressure of the mains, its location with respect to dwelling density, and its proximity to people;
- The consequence of an incident in terms of interruption of supply does differentiate across categories of asset;
  - Medium pressure cast iron mains represent a higher consequence (severe rather than minor) in terms of duration of supply restriction or interruption, due to their higher operating pressures, larger diameters, and the fact that they usually supply downstream networks. Speciality equipment known as ‘Iris Stop Equipment’ must be employed for all repair and alteration works on large diameter medium pressure cast iron mains and this equipment is only available from a single service provider

in Victoria putting the gas network at risk in both emergency and planned stop off and plugging operations; and[17]

- From an environmental perspective, there is an ongoing commitment to ensure environmental impacts from methane emissions associated with gas released in to the environment (unaccounted for gas (UAFG)) are reduced across the entire network.[18]
  - The impact of an individual incident of a gas mains network on the environment is low ('trivial') as the gas released will naturally and quickly dissipate.

Figure 1.1 shows our assessment of the consequence of events for each type of main against each event category.

Figure 1.1 – Risk consequence assessment by individual mains category

	Catastrophic	Major	Severe	Minor	Trivial
People	Multiple fatalities result	Few fatalities or several people with life-threatening injuries 1 2 3 4 5 6 7	Injury or illness requiring hospital treatment	Injuries requiring first aid treatment	Minimal impact on health and safety
Supply	Long term interruption of the supply	Prolonged interruption or long-term restriction of supply	Short term interruption or prolonged restriction of supply 2	Short term interruption or restriction of supply but shortfall met from other sources 1 3 4 5 6 7	No impact; no restriction of gas distribution network supply
Environment	Effects widespread, viability of ecosystems or species affected, permanent major changes	Major off-site impact or long-term severe effects or rectification difficult	Localised (<1ha) and short-term (<2 yr) effects, easily rectified	Effect very localised (<0.1 ha) and very short term (weeks), minimal rectification	No effect, or minor on-site effects rectified rapidly with negligible residual effect 1 2 3 4 5 6 7

Key:

1. Unprotected Steel - Low Pressure
2. Cast iron – Medium Pressure
3. Cast iron – Low Pressure
4. HDPE (early first gen)
5. PVC – Low Pressure
6. Latest generation PE
7. Protected Steel – Medium and High Pressure

1.2.3 Likelihood rating

The potential to harm people is considered the most severe consequence and so is the risk category used in the assessment of risk for each category. This is consistent with the application of AS/NZS 4645 adopted by other gas distribution networks in Australia.

[17] Multinet Gas, Distribution Mains Strategy, CY2017-CY2022, Document No. MG-SP-0009, December 2016, p. 40.

[18] Multinet Gas, Distribution Mains Strategy, CY2017-CY2022, Document No. MG-SP-0009, December 2016, p. 42.

Given that the most severe consequence associated with mains failure is ‘major’ harm to people, the next stage of the risk assessment is to consider the likelihood of major harm to people occurring, again applying the AS/NZS 4645 risk framework. The framework ranks the likelihood of the major event from ‘frequent’ (expected to occur once per year or more) to ‘hypothetical’ (theoretically possible but has never occurred on a similar gas distribution network).

The likelihood of an event occurring is impacted by the likelihood of the material failing which leads to a volume of gas escaping, accumulating unnoticed and causing an explosion that seriously injures or kills someone. The likelihood of an event will therefore differ by material type, the failure mode and pressure.

For example, the major failure mode for cast iron is pipe fracture. Cast iron mains fracture either circumferentially or axially depending on the pipe diameter, extent of corrosion and external stresses. These fractures are primarily caused by ground movement creating stress on the pipe in excess of its beam strength. The result is that the main breaks completely, resulting in an uncontrolled release of gas. A medium pressure cast iron main that fractures will release more gas and so medium pressure cast iron mains are rated as more likely to lead to the major event than low pressure cast iron.

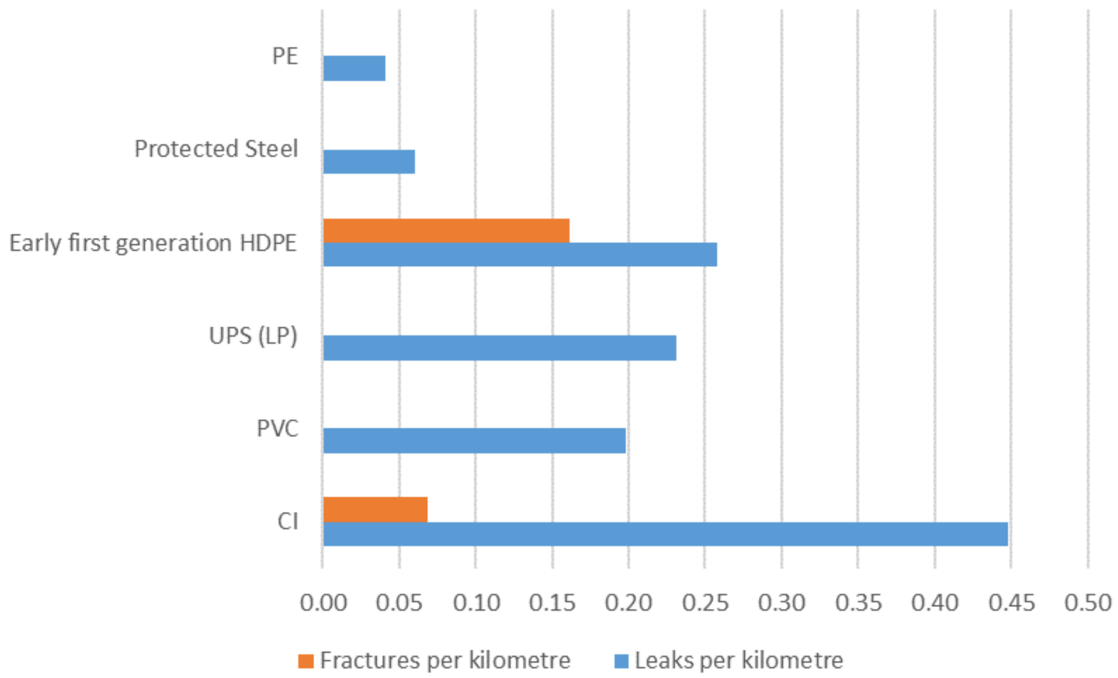
An example of an event that supports the severity rating of ‘major’ on medium pressure cast iron is a gas in building (GIB) event that occurred in Port Melbourne in September 2014. In response to a public report of “smell of gas”, Multinet crew attended a building where gas had filled 60% of the building. The site was evacuated and residents relocated. The gas escape was significant enough that a gas cloud had formed in the area necessitating the need to reduce network pressures from 40kPa to 20kPa to both reduce the volume of gas and enable safe access to the main in order to facilitate its repair. The leak was a result of a fracture of the 300mm medium pressure cast iron main located in the nature strip of Graham Street.

The failure mode of unprotected steel is corrosion, which would result in a smaller leak when compared to cast iron fractures. The early first generation HDPE has higher leak and brittle fracture rates compared to cast iron. The failure mode of HDPE is a brittle, slow longitudinal crack growth through the pipe wall. Failure can occur prematurely with mains damaged in squeeze-off operations where very high localised plastic deformations occurred from over squeezing. Consequently, HDPE mains have a tendency to crack and release high volumes of gas. These mains are usually operated at medium pressure resulting is a greater loss of gas during a gas leak, hence a potential greater hazard.

PVC mains have a lower propensity to fail, while later generation PE and protected steel mains are the least likely to fail.

Figure 1-2 compares leak and fracture incident rates per kilometre across material types.

Figure 1-2 – Leak and fracture incident rates per kilometre by main category (CY2016)



The leak and fracture incident rate per kilometre illustrates that early first generation HDPE has a higher fracture rate than cast iron. The higher pressure of medium pressure cast iron increases the volume of gas that will escape increasing the likelihood of a major consequence event.

The outcome of our risk likelihood assessment is shown in Figure 1-3.

Figure 1.3 – Risk likelihood assessment by individual mains category

Frequency class	Frequency description	Multinet Gas asset classification
Frequent	Expected to occur once per year or more	
Occasional	May occur occasionally in the life of the gas distribution network	2 4
Unlikely	Unlikely to occur within the life of the gas distribution network, but possible	1 3
Remote	Not anticipated for this gas distribution network at this location	5
Hypothetical	Theoretically possible but has never occurred on a similar gas distribution network	7 6

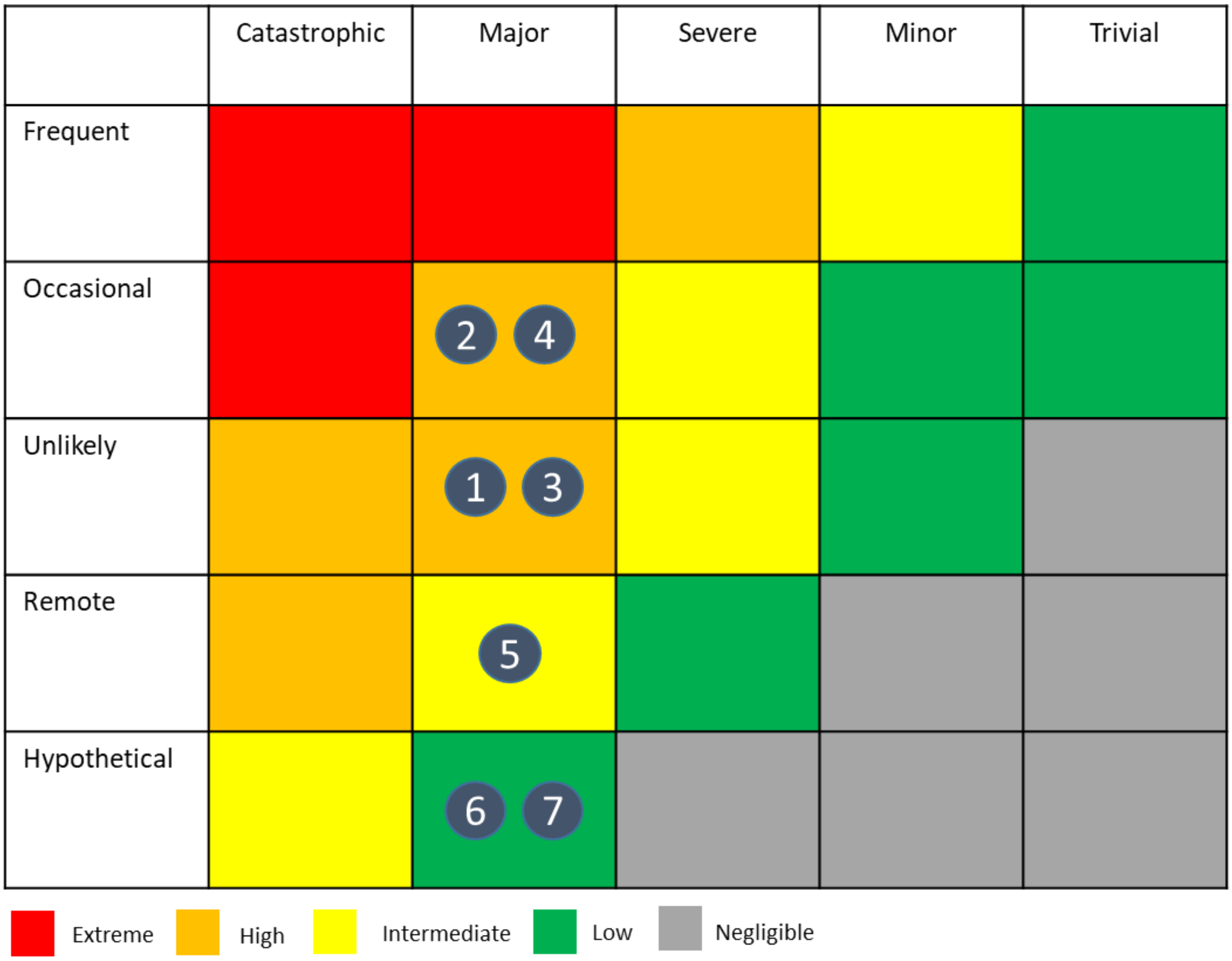
Key:
1. Unprotected Steel - Low Pressure
2. Cast iron – Medium Pressure
3. Cast iron – Low Pressure
4. HDPE (early first gen)
5. PVC – Low Pressure
6. Latest generation PE
7. Protected Steel – Medium and High Pressure

1.2.4 Overall risk rating

By identifying the consequence and likelihood of each asset category, an overall risk assessment can be completed, identifying the risk rating for each category. The risk can be either extreme, high, intermediate, low or negligible.

Figure 1-4 shows the risk rating of all mains categories based on their identified consequence and likelihood.

Figure 1-4 – Risk assessment by individual mains category



Key:
1. Unprotected Steel - Low Pressure
2. Cast iron – Medium Pressure
3. Cast iron – Low Pressure
4. HDPE (early first gen)
5. PVC – Low Pressure
6. Latest generation PE
7. Protected Steel – Medium and High Pressure

The risk assessment mapping identifies categories 1 to 4 as being high risk, while PVC (5) is intermediate and PE and Protected Steel (6 and 7) are considered low. The 4 categories identified as high risk include all UPS, CI and early first generation HDPE.

As a result, of the 10,001 kilometres of mains inventory forecast at the beginning of the next regulatory period, 1,578 kilometres are rated as 'high' and 465 kilometres as 'intermediate' risk (see Table 1-9).

Table 1.9: Risk rating assessment by individual mains category

#	Material Type	Km in Network	Risk Ranking
1	UPS	431	High
2	Medium pressure CI	28	High
3	Low pressure CI	1,057	High
4	First generation HDPE	62	High
5	PVC	465	Intermediate
6	PE	4,656	Low
7	Protected steel	3,302	Low
	Total	**10,001**	

Our risk assessment - particularly the relative risk of medium pressure cast iron and early first generation HDPE - is consistent with the response provided by ESV to the AER about Multinet's mains replacement program.

The AER asked ESV if the network would be exposed to less risk if Multinet focussed on its low pressure program rather than on also replacing other types of mains (medium pressure CI and early generation HDPE). ESV confirmed in its response that medium pressure cast iron is a higher risk than low pressure networks and that failures of the nature exhibited in early first generation HDPE as a result of squeeze off damage also have the potential to be of higher risk than the low pressure network.

ESV's response is reproduced below,

> *"Cast iron medium-pressure main is considered to be of a higher risk than low-pressure networks. Cast iron medium-pressure mains are generally larger diameter and operate at significantly higher pressures than low-pressure cast iron. The failure modes are similar but a medium-pressure failure will result in a higher volume of gas escaping with a higher risk due to the larger size of the pipe and the higher pressure. In addition, the larger diameter cast iron medium-pressure mains at higher pressures are much more difficult to stop off potentially resulting in large gas escapes that can continue for many hours whilst tapping and bagging operations are carried out potentially increasing risk.*
>
> *The high density PE replacement is driven by squeeze off failures. The early generation high-density PE has low crack growth resistance. Locations on the pipe that have been damaged by squeeze off are believed to be prone to time-dependent failure. Unfortunately, the location of squeeze off sites is not known and as such organisations can only react to failures as they occur.*
>
> *A failure results in a split in the high-pressure pipe and a very significant gas escape results at a pressure of 450kPa. Failures of this nature have the potential to be of a higher risk than low-pressure network failures."*[19]

Multinet has an obligation to manage the risks on its network to minimise the risk to public. Replacing these mains is the only way to minimise the risks from high to low. Ongoing operating and maintenance activities assist in identifying fractures and leaks to enable temporary repairs but they do not prevent them on cast iron

[19] Energy Safe Victoria, email response to questions from the AER about Multinet's mains replacement program, 3 May 2017.

and HDPE mains. Further, temporary repair activities exacerbate the problems leading to further leaks and fractures.

We do not have the capacity to replace all the high risk mains in a single year or a single regulatory period. Therefore, a prioritisation method has been adopted. The AER accepted our method for prioritising the replacement of low pressure mains based on advice from Zincara.[20]

1.2.5 Risk mitigation

The AER accepts the low pressure mains replacement program is justified on the grounds that it is necessary to improve the safety and maintain the integrity of services. However, on advice from Zincara, the AER considers Multinet can maintain its current risk level by only replacing 85 kilometres of low pressure mains per annum during the 2018-2022 regulatory period. Further, the AER accepted Zincara's view that the medium pressure cast iron replacement program is based on the technical life of these assets, and if this is the case, a watching brief would be sufficient to manage the risk associated with these mains. The AER considered the risk associated with early first generation HDPE mains could be managed with operating and maintenance activities.

The operating and maintenance activities associated with managing the life cycle of mains is outlined in our Distribution Mains Strategy.[21] These activities include operating, monitoring, inspection, preventative and corrective maintenance. The last stage is decommissioning which includes replacement or abandonment.

Monitoring and inspecting mains provides information on the condition of assets and the extent to which the condition affects the integrity of the main and potential for safety issues to arise. These activities do not prevent or reduce leaks, breaks or fractures. Once an issue is identified, for example a leak, the leak must be repaired.

Preventative maintenance can lessen the likelihood of mains failing. However, the majority of preventive maintenance is to the coated steel network, which since the mid 1970's has incorporated an active cathodic protection system. Other preventative maintenance activities include syphon pumping to address water ingress and sign posting to reduce third party incidents. These activities do not reduce or prevent fractures or leaks caused by failure of CI, UPS or HDPE.

Corrective maintenance can rectify network faults so that the failed or damaged assets can be restored to an operational condition. These activities include temporary repairs of leaks and fractures when they are identified through leak surveys or public reporting. However, temporary repairs on cast iron mains require a steel clamp and temporary repairs on PE mains require squeeze off. Both methods cause further weakness in the mains, exacerbating the problem and leading to additional leaks and fractures and consequential further repairs. Further, leaks, breaks and fractures become more difficult to repair on higher pressure mains. In addition to the increasing number and cost of repairs, the likelihood of a safety event is increased.

If a leak cannot be repaired safely, the main is replaced. The only effective method for reducing the high risk on medium pressure cast iron and early first generation HDPE is to replace the mains with latest generation PE. The most efficient way to replace low and medium pressure mains is block replacement by inserting a smaller diameter HDPE main inside the existing larger diameter main and upgrade the pressure to high pressure. The block replacement method is standard industry practice and is a lower cost solution than piecemeal or reactive replacement. [22]

Block replacement means all the mains in a defined area are replaced at the same time. Over the years, the cast iron and HDPE network has been interspersed with PVC and PE mains respectively, which have been introduced into the system as cast iron and HDPE mains have failed (or been deemed at risk of imminent failure). This means some PVC and PE mains will be replaced as part of the cast iron and HDPE mains replacement program.

[20] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017, p. 42.

[21] Multinet Gas, Distribution Mains Strategy, CY2017-CY2022, Document No. MG-SP-0009, December 2016, p. 24-27.

[22] The block replacement method was reviewed and accepted by Zincara, see p. 42.

It is worth noting that PVC mains carry an 'intermediate' risk. Given the PVC mains located among the high risk cast iron mains scheduled for replacement are likely to be the highest risk of the PVC mains population, we consider replacing these as part of the block program is an efficient way of managing this 'intermediate' risk over time.

Table 1-10 shows the risk treatment actions forecast during the 2018-2022 regulatory period by mains type and risk rating.

Table 1.10: Risk rating and treatment by individual mains category

#	Material Type	Km in Network	Risk Rating	Risk treatment actions forecast for 2018-2022
1	UPS	431	High	Proactive replacement
2	Medium pressure CI	28	High	Proactive replacement/abandonment
3	Low pressure CI	1,057	High	Proactive replacement
4	First generation HDPE	62	High	Proactive replacement
5	PVC	465	Intermediate	Replace where efficient to do so (through block replacement programs)
6	PE	4,656	Low	Monitor
7	Protected steel	3,302	Low	Monitor
	Total	**10,001**		

1.3 Delivery capacity

Multinet's low pressure mains replacement program commenced in 2003 with an expectation that all low pressure mains would be replaced by 2033. By the end of 2017 there will be 1,953 kilometres of low pressure mains still to be replaced. To replace these mains by 2033, we will need to replace approximately 130km per year over the next 15 years.

Since the commencement of the program, we have identified a further 90 kilometres of mains assessed to be higher risk than the low pressure cast iron mains (28 kilometres of medium pressure cast iron and 62 kilometres of early first generation HDPE). Therefore, we propose these mains be replaced in parallel with the low pressure mains replacement program so that synergies between the programs can be achieved. During the 2018-2022 regulatory period, this will require the replacement of an additional 24km of medium pressure cast iron and 31km of early first generation HDPE.[23]

Multinet's delivery capacity for the mains replacement program has increased substantially over the current regulatory period, growing from 57 kilometres in 2013 to 113 kilometres in 2016 and targeting 162.4 kilometres to be replaced in 2017.

Table 1-11 shows the annual mains replaced over the 2013 to 2017 regulatory period.

Table 1.11: Annual volumes of mains addressed during the 2013 to 2017 regulatory period

	2013	2014	2015	2016	2017 (forecast)	Total
Mains replaced	**57**	**110**	**85**	**113**	**162**	**527**

[23] As noted earlier, 24 kilometres of medium pressure cast iron mains will be replaced and the additional 4 kilometres will be abandoned. Of the 62 kilometres of early first generation HDPE, 31 kilometres of them have been prioritised for replacement in the next regulatory period. The replacement of 31 kilometres of early first generation HDPE requires the replacement of 9 kilometres of other PE mains also, due to the block replacement program adopted by Multinet.

So far in 2017 we have replaced 62.4 kilometres of main as of 30 June 2017, with arrangements in place to replace an additional 100 kilometres of mains during the second half of the year. Despite the plans to increase delivery capacity during July to December 2017, we acknowledge that the 2017 half-year replacement rate indicates a current delivery capacity of around 120 kilometres per year.

Therefore, in revising the mains replacement program, we have used the 2017 half-year replacement rate as the basis for ongoing replacement during the 2018-2022 access arrangement period. Our revised proposal is consistent with delivering 119 kilometres of mains on average per year, consistent with our demonstrated delivery capacity.[24] We consider this is a reasonable and conservative starting point for the forward-looking mains replacement program.

Table 1-12 shows the annual volumes forecast to be delivered over 2018- 2022.

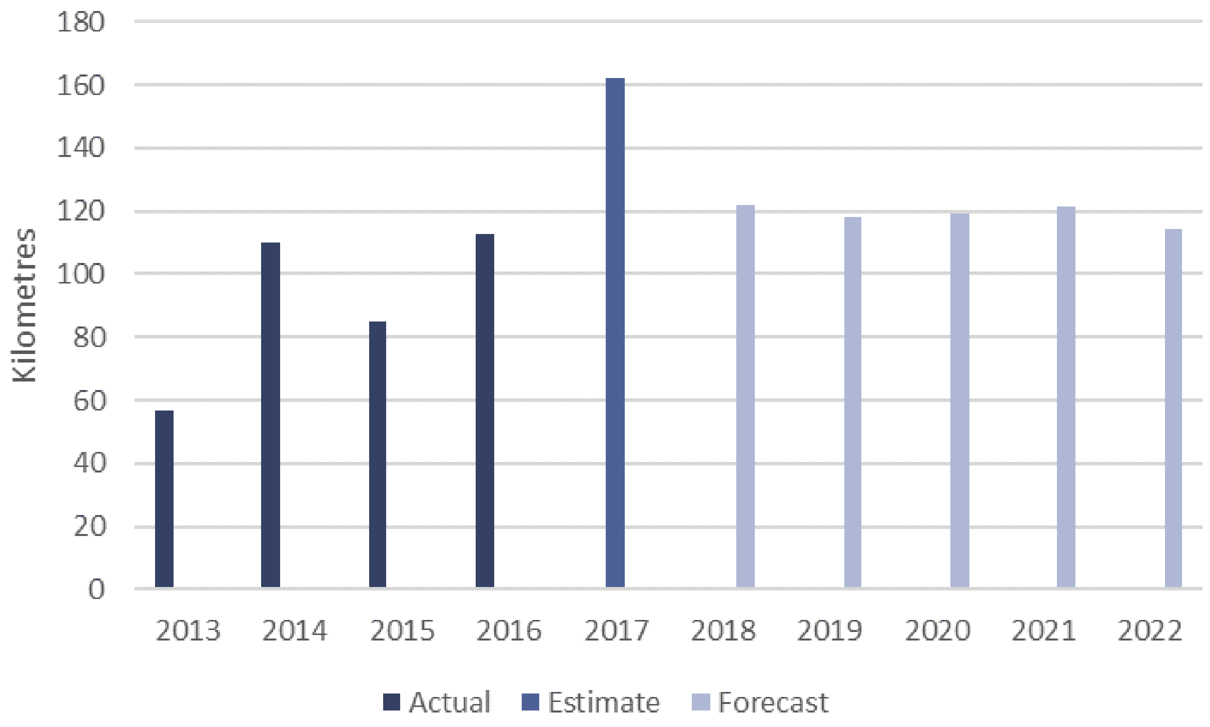
Table 1.12: Annual volumes of mains addressed (kms)

	2018	2019	2020	2021	2022	Total
Low Pressure All	111.7	112.4	111.1	99.0	96.8	531.0
Medium Pressure CI	10.2	5.5	8.1	-	-	23.8
Early First Generation PE	-	-	-	20.4	11.0	31.4
Other	-	-	-	1.9	6.6	8.5
TOTAL	**121.8**	**117.9**	**119.2**	**121.2**	**114.5**	**595.0**

[24] The prioritisation method is based on identified suburbs and projects within suburbs. Therefore, the planned replacement targets 120km on average. However, given the unique make up of projects and factors that may impact on timing and delivery rate, for example, moving from outer to inner regions, the outcome is 119km per year on average.

Figure **1-**5 shows the actual, estimated and forecast delivery program over the 2013 to 2022 period.

Figure 1-5 – Annual volumes of mains replaced and forecast to be replaced during the 2013 to 2022 regulatory periods



1.3.1 Changing contracting arrangements over time

We acknowledge there has been inconsistency in delivery rates across the 2013 to 2017 access arrangement period. However, we would like to clarify that these movements in delivery volumes were not a result of insufficient capacity to deliver, or increased complexity due to higher density urban locations.

Two distinct events occurred during the current access arrangement period that had a temporary, but material impact on delivery. These were related to commercial (rather than operational) changes, and are described below:

- In July 2013, in order to reduce reliance on single provider and introduce increased competitive tension with regards to unit rates, Multinet commenced transition from a single service provider ZNX to a dual service provider model which included ZNX and Comdain. With this, the Multinet gas network was divided into two geographical territories (north and south). The introduction of a new service delivery partner meant that there was a slowdown in the rate of delivery as Comdain began deliver in the south region.

  As the new Operations and Maintenance Service Agreement (OMSA) model was embedded, Multinet experienced improved delivery efficiency as mains replacement works were directly issued to service providers within their territory. Both service providers had visibility of work for the regulatory period, and were able to resource accordingly.

- In June 2015, Multinet introduced a two party tender process to replace the direct issue of projects based on allocated geographical territories which had previously been in place.

With this change, the service providers no longer had visibility of future work. To address this, and support the service providers' desire to resource appropriately, Multinet sought to prepare and tender work out for multiple years. This was time consuming and impacted on the volume of mains replaced for a time, but it did achieve the desired outcome of achieving efficiencies in overall project costs.

In May 2017, we introduced a competitive works panel to further increase capacity and efficiency of capital program delivery. The competitive works panel was designed to operate alongside the OMSA and therefore increasing the works completed by introducing new players in the Multinet market. These ongoing improvements and changes in contracting arrangements underpin the efficient delivery of the program forecast for the 2018-2022 regulatory period.

1.3.2 Independent review of 2013-2017 delivery program

Given the variation of mains replaced compared to plans over time, we have sought assurance that the targeted 162.4 kilometres of mains can be delivered in 2017. We engaged Advisian to independently review the replacement completion program to 30 June 2017 and to assess the likelihood of replacing the required annual volume to meet the 527 kilometres target for the current access arrangement period[25].

The Advisian report provides support for the delivery of 527km in the 2018-2022 regulatory period and found that plans are in place to deliver as much as 10 kilometres more than targeted. The report outlines the kilometres completed to date and contractual arrangements in place or awarded as follows:

- 426.7 kilometres actual length completed between 1 January 2013 and 30 June 2017 reflecting:
  - 364.3 kilometres from audited RIN statements for the period 1 January 2013 and 31 December 2016; and
  - and 62.4 kilometres between 1 January 2017 and 30 June 2017;
- 110 kilometres of mains to be replaced between 1 July 2017 and 31 December 2017, to be delivered using the following strategy:
  - Comdain to complete approx. 66 kilometres of remaining works under current OMSA requirements scheduled for completion by December 2017; and
  - Approximately 44 kilometres being awarded to market under a Closed Tender market arrangement to ZNX and Ventia with contracts signed and practical completion scheduled for December 2017[26].

Advisian have independently examined the information received and confirm the actual length of mains completion in the 2013-2017 replacement program (up until the 30th June 2017) is 426.7Kms.

Advisian further advise that the management processes and strategies adopted by Multinet Gas should enable an additional 100kms of mains to be delivered between 1 July 2017 and the 31 December 2017, thereby achieving the Multinet Gas target of 527Kms proposed in the earlier Pass Through Submission to the AER

1.3.3 Delivery capacity for the 2018-2022 regulatory period

Multinet has improved its ability to efficiently and effectively manage delivery capacity and contractual arrangements over time and is in the process of putting in place arrangements to maintain and increase delivery capacity in the future. This will be required to ensure our low pressure mains replacement program is completed by 2033 and we are able to respond effectively to emerging risks as they arise.

Our ability to deliver, and our ability to continue to deliver at these rates, has been acknowledged by the ESV. In its response to the AER in relation to its questions about our mains replacement program, the ESV stated,

[25] Advisian, AER Pipework Projects, Independent Report: Validation of Pipework Lengths, 27 July 2017

[26] Advisian, AER Pipework Projects, Independent Report: Validation of Pipework Lengths, 27 July 2017 pages 4-5.

"*The proposed low-pressure replacement program for the next access arrangement period is about 20% higher than the current program and brings back on target for the 2033 completion date. Despite the fact that the current program is a little back-ended Multinet propose to increase their service provider capacity from two service providers to three, theoretically allowing Multinet the resources to achieve the 20% higher rate of replacement this year.*

On this note Multinet plan to award three replacement projects to this new service provider for this current calendar year which is intended to bring Multinet up to the target of 527km for the current access arrangement period."[27]

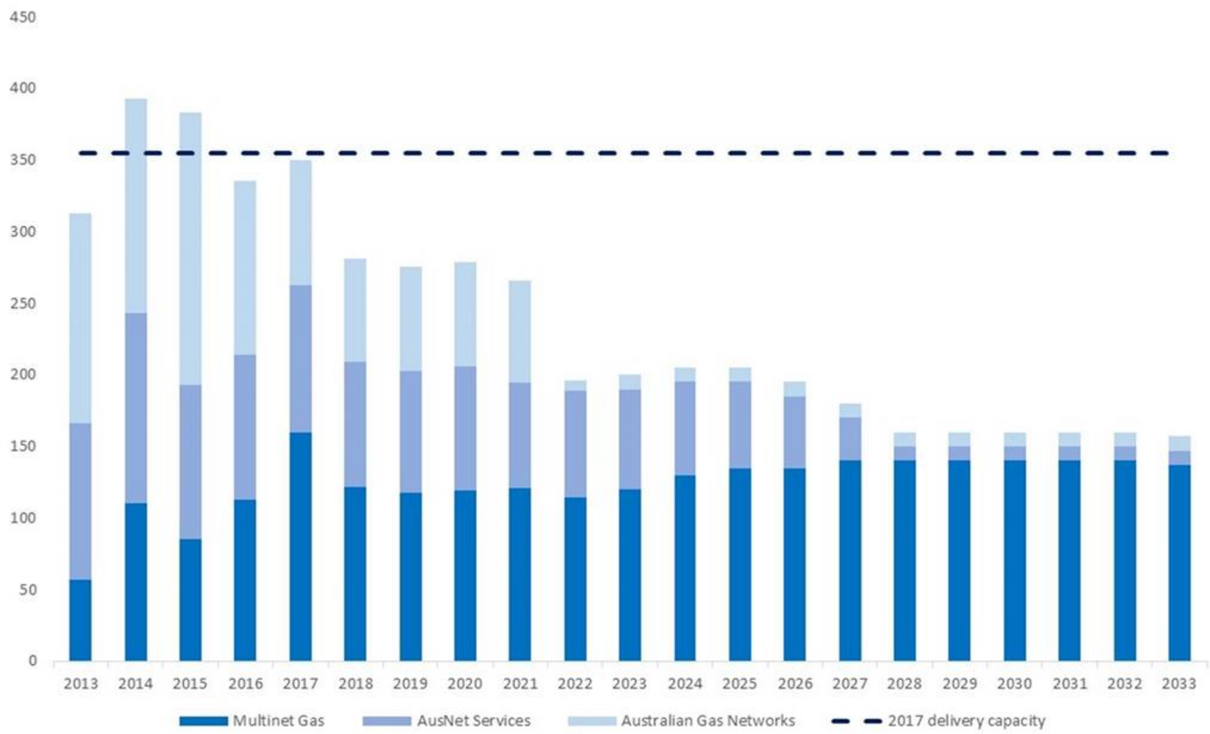
1.3.4 Additional capacity available in future periods

To achieve the 2033 target date to replace the low pressure mains, we will need to increase replacement rates from 119 kilometres per year to 146 kilometres per year for the remaining ten years of the program from 2023 to 2033. We have made changes to our contracting processes that will support this level of mains replacement.

Over the past five years, all three of the Victorian gas distribution networks have pursued accelerated replacement programs for cast iron mains, motivated by the common goal of eliminating the risk associated with cast iron mains from their respective networks. Over this period, the delivery capacity in Victoria has been on average 355 kilometres per year.

Figure 1-6 shows delivery capacity across all three gas distribution networks to deliver mains replacement programs. As the mains replacement programs for the other gas distribution networks are completed and ramp down, it is likely that some of this capacity will become available to Multinet, particularly in future periods.

Figure 1-6 – Historical and future mains replacement capability in Victoria[28]



[27] Energy Safe Victoria, email response to questions from the AER about Multinet's mains replacement program, 3 May 2017.

[28] Data Sources used – AGN's 2018-22 Regulatory Submission and AER draft decision; ATCO Gas – 2014 Asset Management Plan; Forecast for Ausnet & Multinet based on Smoothing (AusNet) and revised proposal for Multinet (MG).

1.4 Prioritisation of replacement

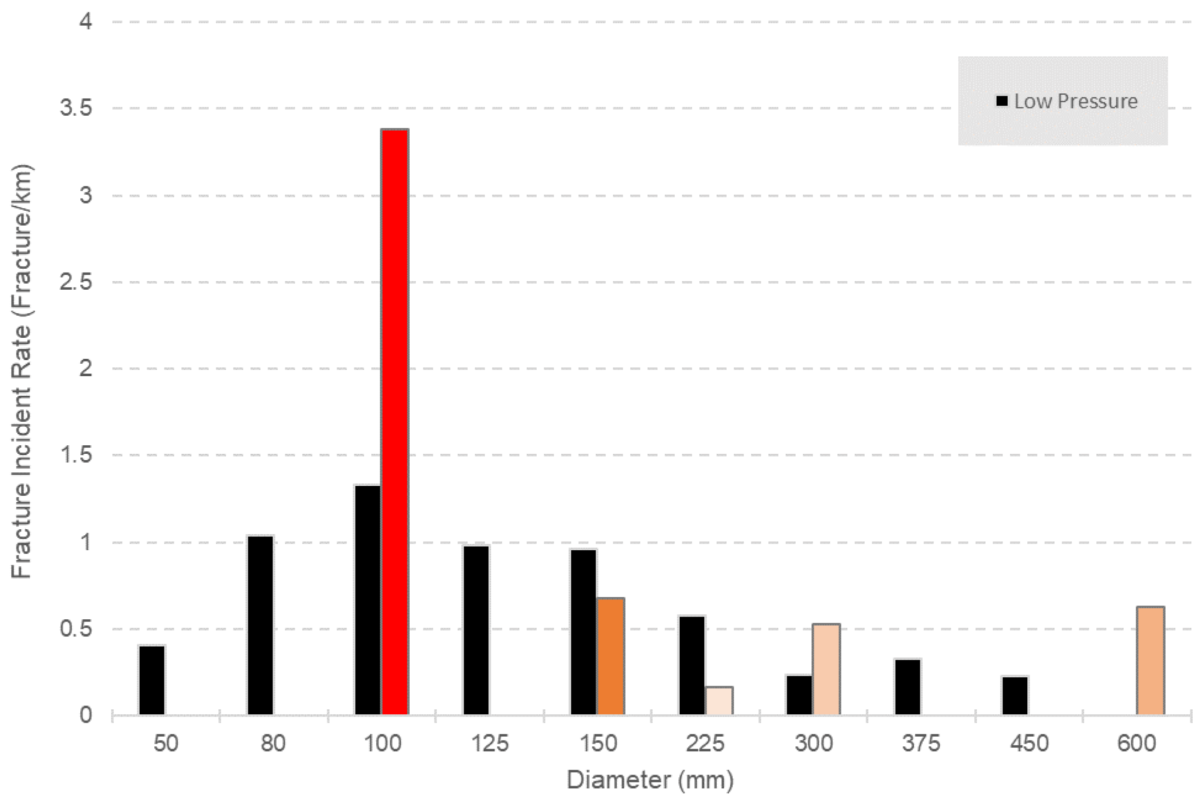
We have used the risk assessment outlined in section 1.2 and the revised delivery capacity outlined in section 1.3 to prioritise mains for replacement. This prioritisation has not resulted in any change to the proposed replacement volume for medium pressure cast iron and early first generation HDPE when compared with our initial proposal. These mains are highest priority based on the risk assessment and their replacement is supported by ESV.

1.4.1 Medium pressure cast iron

Replacement of mains in all four of the medium pressure cast iron replacement projects will be undertaken in the first three years of the 2018-2022 regulatory period. In its draft decision, the AER, on the advice of Zincara accepted that only two of the medium pressure cast iron projects be undertaken. The reason for accepting the two projects was because these programs were considered to be required to be undertaken to support the low pressure mains replacement program.[29] The accepted projects were Graham Street and Aughtie Drive. The other two projects, (Clayton South and Like for Like) were not supported due to insufficient information on the condition of mains.[30] We have therefore provided further information in Section 1.2.4 to demonstrate that the medium pressure cast iron mains are rated at higher risk than the low pressure cast iron mains. The fracture and leak rates for each project are set out in Table 1-13 (below).

Figure 1-7 and Figure 1-8 show the fracture rates of the different diameter of cast iron mains (Figure 1-7) and the composition of mains with different fracture rates in each project (Figure 1-8). The projects not accepted by the AER include a high proportion of mains of the diameter with the highest fracture rates.

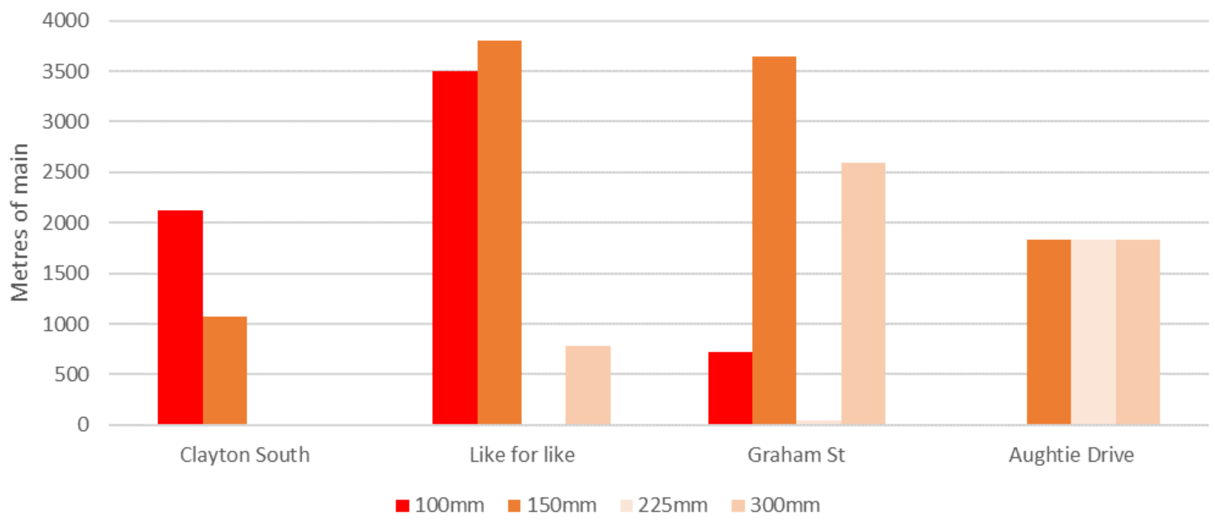
Figure 1-7 – Fracture incident rates (FIR) by diameter of medium pressure cast iron mains (compared with low pressure cast iron mains)



[29] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017, p. 46.

[30] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017, p. 46.

Figure 1-8 – Composition of medium pressure cast iron mains by project and diameter



The medium pressure projects not accepted by the AER contain a higher proportion of 100mm diameter mains. This type of mains has the highest fracture incident rate. The driver for the medium pressure mains replacement projects is the inherent risk associated with this type of mains, and not solely because some of the projects support the low pressure replacement program. Therefore, our revised proposal includes the replacement of the same projects and volumes of medium pressure cast iron mains as the initial proposal.

Table 1-13 shows the leak and fracture rates associated with each of the four medium pressure cast iron programs and the profile of replacement and inventory of medium pressure cast iron mains.

Table 1.13: Fracture and leak rates for medium pressure cast iron mains replacement programs with volumes (kilometres)

	Fracture rate	Leak rate	2018	2019	2020	2021	2022	Total
Clayton South	0.20	0.28	3.2	-	-		-	**3.2**
Like for like	0.08	0.57	-	-	8.1	-	-	**8.1**
Graham St, Port Melbourne	0.04	0.50	7.0	-	-	-	-	**7.0**
Aughtie Drive, St Kilda	0.04	0.37	-	5.5	-	-	-	**5.5**
Total			**10.2**	**5.5**	**8.1**	**-**	**-**	**23.8**

Table 1-14 shows the capex associated with the medium pressure main replacement program.

Table 1.14: Medium pressure cast iron mains replacement capex for the 2018-22 access arrangement period ($M, real 2017)

	2018	2019	2020	2021	2022	Total
Clayton South (MP CI Block Renewal)	1.49	-	-	-	-	1.49
Like for Like Replacement	-	-	6.27	-	-	6.27
Graham Street, Port Melbourne	5.76	-	-	-	-	5.76
Aughtie Drive, Albert Park	-	4.61	-	-	-	4.61

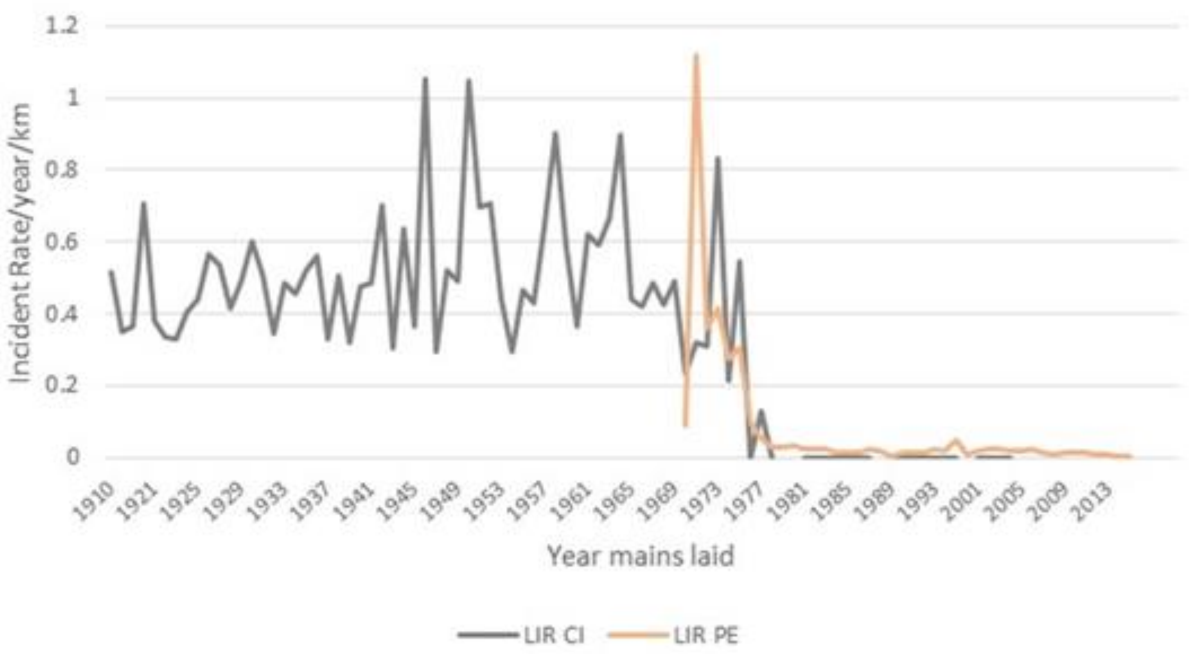
	2018	2019	2020	2021	2022	Total
Total direct expenditure	**7.24**	**4.61**	**6.27**	**-**	**-**	**18.13**
Overheads	0.39	0.25	0.34	-	-	0.99
Escalation	0.04	0.02	0.05	-	-	0.11
Total expenditure	**7.68**	**4.88**	**6.66**	**-**	**-**	**19.22**

1.4.2 Early first generation HDPE

The revised mains replacement program includes the replacement of 31 kilometres of early first generation HDPE mains. There is no change from the initial proposal.

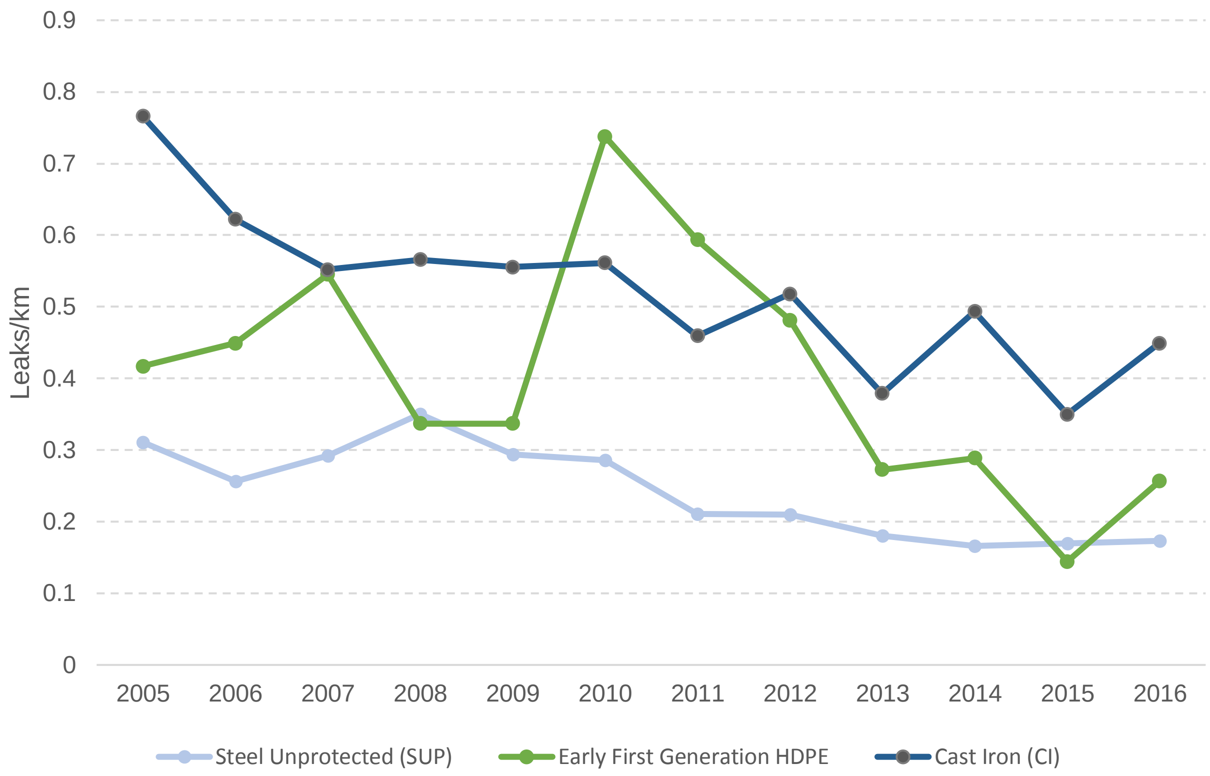
While more than 4,718 kilometres of mains are PE and are generally considered low risk, there is a small volume of early first generation HDPE mains (62 kilometres) which are rated high risk. These mains were laid between 1970 and pre 1976 and have leak incident rates ranging from 0.2 leaks/km/year to 1.1 leaks/km/year. Figure 1-9 shows the leak incident rates for polyethylene mains by year in which they were laid. PE laid in the 1970s have significantly higher leakage incident rates than other polyethylene mains and similar leakage incident rates to cast iron mains laid between the 1910s to the 1970s.

Figure 1-9 – Comparison of leakage incident rates between generations of PE and cast iron mains by year laid



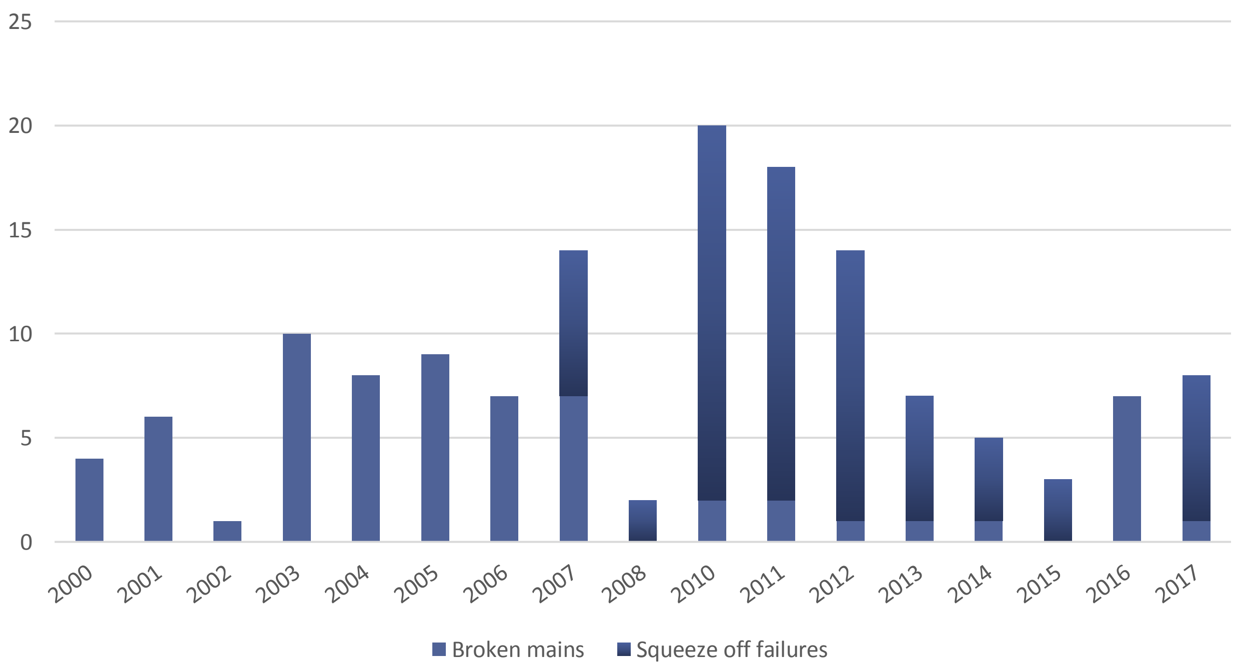
Since Multinet's proposal, information on leakage incident rates for 2016 has become available. Figure 1-10 compares the leak incident rates for early first generation HDPE between 2005 and 2016 compared with leak incident rates of cast iron and unprotected steel mains. Leakage incident rates for first generation HDPE and cast iron mains have deteriorated further in 2016.

Figure 1-10 – Leak incident rates



Multinet has been monitoring squeeze off failures as a sub-set of broken mains since 2007 when a specific code for squeeze off failure was introduced into SAP ERP (Multinet's assets and works repository system). Prior to this, failures of this nature were recorded under the broken mains code. The contribution of squeeze off failure to PE broken mains is significant. Figure 1-11 shows the contribution of squeeze off failures to the broken mains failures for PE.

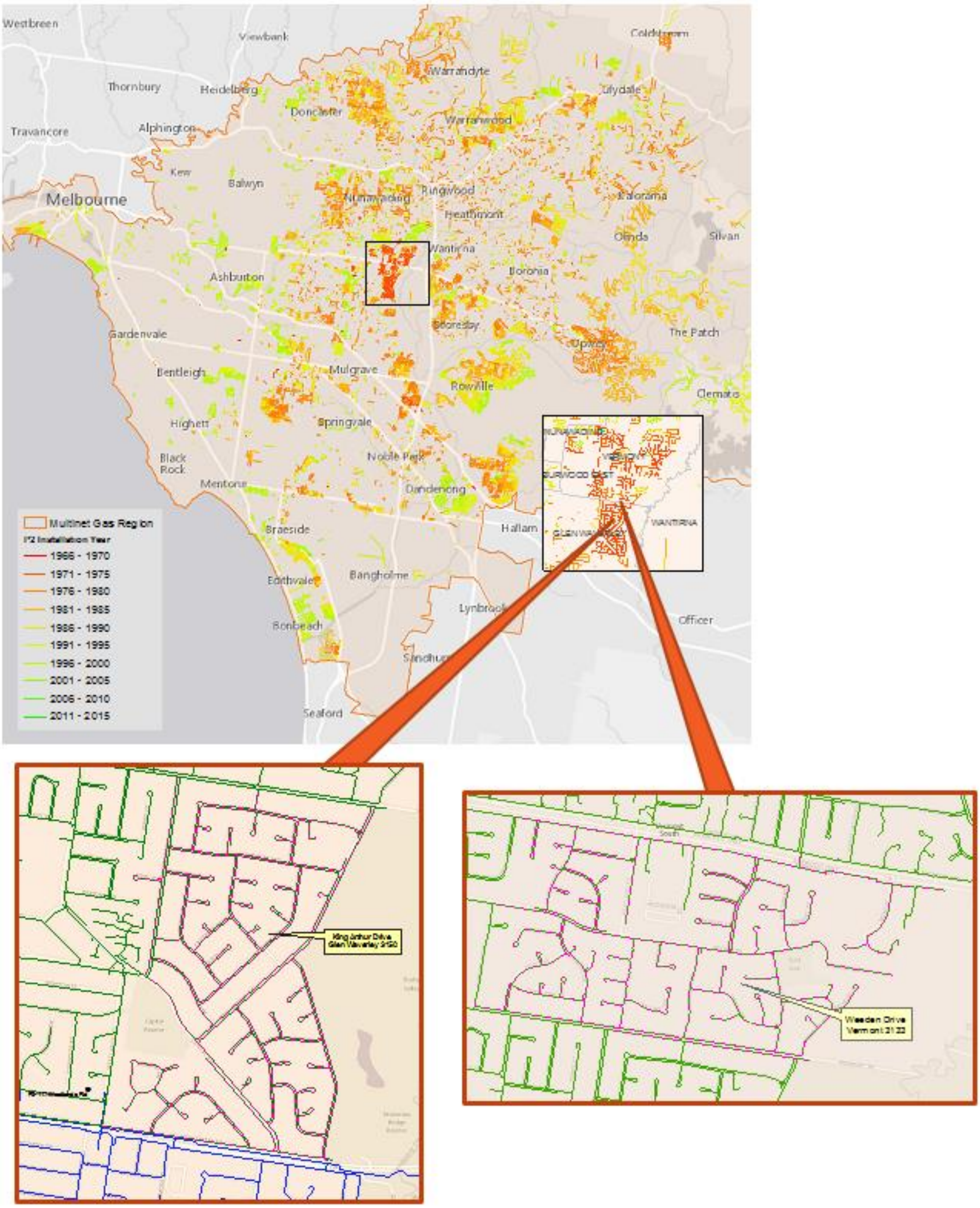
Figure 1-11 – Polyethylene broken mains



To establish volume and prioritisation for the proactive replacement of early first generation high density polyethylene mains, a spatial dataset was developed to identify the geographic location of polyethylene mains according to their age (generation) and fault history (leak and break incident rates). Analysis was limited to that of the first generation polyethylene, categorised as material code P2.

Figure 1-12 provides a spatial map overview of the Multinet gas distribution area for first generation polyethylene mains by year of installation. The spatial map shows the geographic concentration of the earliest (pre 1976) generation polyethylene mains in the postcodes of Glen Waverley 3150 and Vermont 3133. 80% of pre 1976 polyethylene being concentrated within these two postcodes.

Figure 1-12 – Spatial map early first generation HDPE (P2) by year installed



Early first generation HDPE mains have not been scheduled to be replaced until the last two years of the 2018-2022 regulatory period. This will ensure the replacement program will coincide with completion of the medium pressure cast iron replacement program. The remaining 31 kilometres early first generation HDPE mains will be replaced in the subsequent regulatory period.

The block replacement program will target replacement of all early first generation HDPE mains located in areas of high concentration of failures within each postcode (Glen Waverley 3150 and Vermont 3133) and will include 9 kilometres of other mains as a result of the block replacement approach. This results in a total of 40 kilometre of main to be replaced.[31] When selecting this subset of early first generation HDPE for replacement, we also considered:

- The availability or provision of high pressure assets; and
- Existing and future supply constraints.

Table 1-15 shows the fracture and leak rates in Glen Waverley and Vermont and the volumes of early first generation HDPE mains to be replaced over the 2018-2022 regulatory period.

Table 1.15: Early first generation HDPE replacement volumes (kilometres)

	Fracture rate	Leak rate	2018	2019	2020	2021	2022	Total
Glen Waverley	0.09	0.38	-	-	-	22.3	-	22.3
Vermont	0.16	0.40	-	-	-	-	17.7	17.7
Total			**-**	**-**	**-**	**22.3**	**17.7**	**40.0**

Table 1-16 shows the capex associated with the early first generation HDPE mains replacement program.

Table 1.16: Early first generation HDPE mains replacement capex for the 2018-22 access arrangement period ($M, real 2017)

	2018	2019	2020	2021	2022	Total
Glen Waverley	-	-	-	8.65	-	8.65
Vermont	-	-	-	-	7.22	7.22
Total direct expenditure	**-**	**-**	**-**	**8.65**	**7.82**	**15.87**
Overheads	-	-	-	0.47	0.39	0.86
Escalation	-	-	-	0.09	0.09	0.18
Total expenditure	**-**	**-**	**-**	**9.21**	**7.70**	**16.92**

1.4.3 Low pressure mains

There are 1,953 kilometres of low pressure cast iron, unprotected steel and PVC mains identified for replacement in the Multinet system. We propose these mains are replaced as per our 30 year program, which commenced in 2003. Our aim is for all of these high risk mains to be removed from the system by 2033. We have also made this commitment to ESV.

These low pressure cast iron mains have been prioritised based on their respective fracture incident rates (FIR) and leak incident rates (LIR) and then on the availability or provision of high pressure assets. Other factors, such as the potential to deliver synergies with other replacements, have also been considered. Zincara agreed with this prioritisation methodology.[32]

Re-visiting the deliverability assumptions has resulted in a reduction in low pressure mains replacement volumes forecast for the next regulatory period, which in turn has required a change to project sequencing. This has resulted in some minor adjustments to the proposed profiling of mains replacement per postcode.

[31] Block renewal provides the lowest cost of replacement for the 31km of HDPE identified for renewal.

[32] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017, p. 42.

Notable are the introduction of postcode 3124 Camberwell, with a single 12.5 kilometres project scheduled in 2018 resulting from supply sequencing constraints with the scheduled replacement of neighbouring postcode 3146 Glen Iris[33] and the deferment to post 2022 of postcodes 3192, 3127 and 3102 based on lower fracture and leak incident rates relative to prioritised postcodes.

Prioritisation of the replacement of low pressure mains is based:

- Primarily on fracture incident rates related to cast iron mains; and
- Secondarily on leak incident rates.

Incident rates are aggregated at a postcode level and the overall program is prioritised having regard for:

- The availability or provision of high pressure assets;
- Synergies with the removal of the medium pressure cast iron mains;
- Existing and future supply constraints; and
- In general, the practice of working inwards from the outer boundary of the low pressure network.

Zincara agrees with Multinet's approach to target the high fracture areas. However, Zincara considered that Multinet could effectively manage the same level of fractures and maintain the same level of risk as experienced over the 2013-17 period by replacing only 85 kilometres per year.[34] Further, Zincara considers that while reducing the replacement rate to 85 kilometres per year would extend the program by a further seven years from 2033 to 2040, the current risk profile should be able to be maintained.[35] Multinet is obliged to reduce the risk to low or ALARP. Maintaining the current level of risk and extending the program beyond 2033 is inconsistent with prudent and efficient management of the risk and would be non-compliant with our obligations.

Zincara's views appear to be based on the lack of incidents that have occurred in the past. Our assessment of risk, and identified treatment of risk, is based on preventing incidents in the future. We consider it is not prudent to manage risk on the basis that major safety incidents have not occurred to date. The risk framework, applied properly, is designed to ensure such safety incidents do not occur, however it does not eliminate the risk potential or severity of consequence. Given the condition of high risk assets will only deteriorate over time, the more prudent approach is to remove the risk from the network as quickly and efficiently as possible.

1.5 Unit rates

In its draft decision, the AER accepted that Multinet's forecast unit rates are arrived at on a reasonable basis and represent the best forecast possible in the circumstances and applied Multinet's unit rates in determining the alternative estimate.[36]

Zincara found that:[37]

- The methods for forecasting unit rates are consistent with typical industry practice; and
- The increases in rates are due to Multinet moving from the outer boundary of its low pressure network into higher density and more complex areas.

[33] Postcodes 3146 and 3147, scheduled for 62 kilometres of LP replacement, are synergised with the abandonment of the 3.1 km section of Large Diameter MP Cast Iron known as M15 "Ashburton Rd, Glen Iris".

[34] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017, p. 40.

[35] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017, p. 41.

[36] Attachment 6 – Capital Expenditure I Draft decision, Multinet access arrangement 2018-2022, page 6-14

[37] Zincara, AER Access Arrangement 2017 Multinet, prepared for AER, June 2017, p. 43.

- The AER expects that any outcomes of any new tendered unit rates will be reflected in the proposal.[38]

We have applied the same methodology in calculating its unit rates for this revised proposal as it did in the calculation of its initial proposal's unit rates.

This methodology considered four source methods. In order of preference, these methods were identified as:

- Where works are sufficiently well defined, a two party competitive tender process;
- Where a tender is not practical, actual historical rates if it has not previously worked in the postcode;
- If it has not previously worked in the postcode, engaging independent estimator, Advisian; and
- If it undertook postcode density correlation to establish unit rates in similar post codes based on actual historical rates.[39]

Applying this same methodology to the revised project locations and volumes has resulted in a decrease in the average direct unit rate from $334.50 per metre to $332.60 per metre as shown in Table 1-17.

Table 1.17: Revised low pressure annual unit rates for the 2018-22 access arrangement period ($M, real 2017)

	2018	2019	2020	2021	2022	Average
Low Pressure						
Initial	356.2	331.3	328.3	315.8	344.0	334.5
Revised	373.1	314.0	348.7	310.5	311.4	332.6
Variance	**16.9**	**(17.3)**	**20.4**	**(5.3)**	**(32.5)**	**(1.9)**

The changes include:

- updated unit rates for the average rates identified in tender responses received since the initial submission (to the specific exclusion of the highest and lowest rates submitted);
- the addition of a new project from postcode 3124 (Camberwell, Camberwell North, Camberwell South, Camberwell West, Hartwell, Middle Camberwell) to be scheduled in 2018 resulting from supply sequencing constraints with the scheduled replacement of neighbouring postcode 3146 Glen Iris
- Revised volumes across 14 projects as a result of prioritisation and reduced delivery volumes; and
- The removal of projects in postcode 3192 (10 kilometres - Cheltenham, Cheltenham East, Cheltenham North, Southland Centre), 3127 (15 kilometres - Mont Albert, Surrey Hills, Surrey Hills North) and 3102 (10 kilometres – Kew East) due to lower fracture and leak incident rates relative to prioritised postcodes.

There have been no changes made to the unit rates for medium pressure cast iron and early first generation HDPE.

[38] Attachment 6 – Capital Expenditure I Draft decision, Multinet access arrangement 2018-2022, page 6-14

[39] Multinet, *13.9.1 – Capital expenditure overview – mains replacement*, 15 December 2016, p. 30