Attachment 9.4

Distribution Mains and Services Integrity Plan

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PUBLIC

Australian Gas Networks

APA

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Executive summary

What we have achieved

The Distribution Mains and Services Integrity Plan (DMSIP) for our South Australian distribution network outlines the program of work we will undertake to manage network performance and integrity over the next access arrangement (AA) period (July 2026 to June 2031). Historically, mains and services replacement has been one of the largest ongoing capital programs – both in terms of scale and cost. However, after decades of intensive work and commitment, we are nearing completion of the largest and highest priority project within the DMSIP program; removal of low pressure ferrous mains.

By the end of the current AA period (2021 to 2026) we will have removed all low pressure cast iron (CI) and unprotected steel (UPS) from our network and replaced them with fully fused polyethylene (PE) pipe. The low pressure ferrous mains were old, prone to corrosion and leaks, and scattered throughout Greater Adelaide and surrounds. As of January 2025, less than 30km of these mains were left and they will all be replaced by the end of the period. We have also removed all vintage thin-walled high density polyethylene class 250 (HDPE 250) pipe, which were the next highest-risk mains, and have begun inspecting and reinforcing HDPE 575 mains.

This means that at the beginning of the next AA period, we will have finally got on top of the single largest legacy issue in our distribution network, and we can commence a period of more balanced and sustainable ongoing mains and services integrity management. As a result, we expect expenditure on mains and service replacement during the next AA period to be substantially lower, moving from ~[redacted] million in the current AA period, to [redacted] million in the next. This is a ~60% reduction in costs.

Where we are heading

Eliminating the risk associated with CI/UPS and HDPE 250 mains is a huge achievement. However, it does not mean our work is finished. The DMSIP is an ongoing program of works and integrity management will always remain a vital part of our operational and investment activities. Now the low pressure ferrous mains are no longer a problem, our focus can turn to the many other classes of mains and services in our network such as ageing HDPE, new PE, protected steel mains, and multi user sites.

The good news is that the current risk associated with these assets is far less pressing, and in the case of new PE in particular, asset condition is generally sound. But no gas distribution assets are completely risk-free. We have an obligation as a prudent asset manager, as well as under our licence agreement and Australian Standards, to continue to monitor and address risks as they are identified.

We have therefore developed a program of works for the next AA period that is focused on inspection, data collection and sampling to inform ongoing mains/services replacement. We will still remove the next highest risk class of assets in our network (for example ageing multi user sites), but we will do so based on a better understanding of asset condition and at a less intensive rate.

Put simply, we are now in a position where we can take a far more proactive and pragmatic approach to managing our network mains and services, which will avoid us having to undertake high-cost, high intensity, reactive programs in the future.

What we will deliver in the next AA period

Our focus during the next AA period is on the following programs:

- **Protected steel mains inspection and replacement** – we will commence a protected steel mains program, whereby we replace only the poorest condition/riskiest protected steel assets
- **In line camera inspections and monitoring of vintage HDPE 575 mains** – we will continue inspection and reinforcement of HDPE 575 mains, while sampling and testing with Deakin University to fully understand how HDPE mains reinforcements are performing
- **Replacing our highest risk services based on age, condition and location** – we will focus on replacing the riskiest multi user sites and removing 3,500 redundant services
- **Improving our leak detection capabilities** – we will replace our aged Selective Methane Leak Monitoring Approach (SELMA) equipment with more modern fit-for-purpose technology, to help us more accurately identify leaks and plan asset integrity strategies

We will also continue our ongoing program of unplanned mains and services replacement, where mains or services fail unexpectedly. Unplanned replacement forecasts are based on historical volumes and failure rates.

TableExecSumm 1 summarises the estimated costs of the mains and services replacement program for the next AA period.

TableExecSumm 1: DMSIP work program proposed – next AA period, $'000 January 2025

Program	Untreated risk	Proposed treatment	Treated risk	Cost ($'000)*
Mains				
Mains replacement	Moderate	Replace 12.6 km of protected steel mains testing replaced sections and ~5 km unplanned mains replacement	Low	[redacted]
HDPE mains inspection and testing	Moderate	Camera inspection and repair of 105 km of HDPE 575 and sample 20 locations. Reinforce where necessary	Moderate (ALARP)	[redacted]
Services				
MUS replacement	High	Replace MUS at 810 priority 2A and 150 Priority 2B location. Inspect and monitor MUS at 317 priority 2B locations	Low	[redacted]
Unplanned services replacement	High	Reactively replace approximately 2,450 services, based on historical averages	Low	[redacted]
Redundant services removal	High	Remove inventory of 3,500 redundant services	Low	[redacted]
Integrity				
Leak detection	NA	Replace end of life leak detection vehicle with industry standard	NA	[redacted]
Total ($'000)				[redacted]

*All cost estimates in this plan are direct costs (excluding overhead) presented in real dollars of January 2025 and do not include real cost escalation, unless otherwise stated. The methodology is described in Section 5 with additional information in the Unit Rates Report, provided at Attachment 9.9 to the Final Plan.

**redundant services removal are opex.

Variances in the current AA period

We have achieved significant safety milestones for our business and delivered against our commitments made to the South Australian Office of the Technical Regulator (OTR). By the end of the current period, we will have addressed 704 km of mains. This is slightly less than the 770 km estimated for the 2021 to 2026 period, which includes renewal of over 40,000 services and 900 multi user sites. This 66 km variance is due to the volume of LP block and Class 575, which was overstated by 64 km and 2 km respectively.

We also found that the most cost effective and prudent strategy for 20 km of HDPE 575 in Port Pirie was camera inspection in preference to direct replacement. The outperformance of multi user sites was achieved through extensive surveys that extended beyond the original forecast scope of 457.

TableExecSumm 2 provides a summary of the actual and forecast volume of mains and services replacement for the current AA period by asset category.

TableExecSumm 2: Mains and services replacement actual versus forecast volumes – current AA period

Asset category	AA forecast volumes	Actual volume	Variance
Mains replacement & Inspection			
CI/UPS - block (km)	558	494	64
HDPE 250 - remaining (km)	14	14	0
HDPE 575 DN40 HP (km) installed pre 1993	198	176	22
Camera inspection of HDPE 575 DN40 MP initially forecast for replacement	0	20	20
Total mains replacement	770	704	66
Inline Camera Inspection			
HDPE 575 DN50 HP & MP – inspected (km)	316	364	48
Services			
MUS sites resolved	457	795	338
Unplanned replacement	2,450	2,431	19

1 Managing our network

The DMSIP is used to document how we plan to manage and invest in our distribution mains and services. Our aim is to act in accordance with accepted good industry practice to maintain and/or improve the safety and integrity of gas distribution services at the lowest sustainable cost. The DMSIP outlines:

- The process undertaken to develop the mains and services replacement/inspection work program
- Our obligations and responsibilities under law and regulations
- The program planned for the next AA period

Core activities within the DMSIP work program include:

- Planned and unplanned (reactive) mains and service replacement
- In line camera inspections and reinforcement of mains
- Monitoring and inspection programs
- Decommissioning redundant assets

When planning and prioritising these activities we consider:

- Available condition and performance information including reports of leaks and leak repairs, other material failures, incidents of water in mains or gas in buildings, age and other mains specific data
- Our capacity to efficiently deliver the required works
- The operational and financial impact of delivery

This DMSIP covers a five-year period to align with the regulatory cycle frequency. This also allows us to build the DMSIP work program based on customer input captured as part of the AA process. The DMSIP work program is reviewed annually to ensure new data, practical experience and lessons learnt are captured in the annual business planning process and built into ongoing programs of work.

Our DMSIP work program for the next AA period continues proven asset and risk management practices. It also applies a proven delivery model, which has enabled us to deliver large volumes of work over successive AA periods, culminating in the replacement of all our low-pressure CI, UPS and HDPE 250 mains by the end of 2025/26, and HDPE 575 replacement and inspection programs.

During the next AA period we will continue to focus on replacing the highest risk assets in our network in a manner that:

- Is consistent with the actions of a prudent and efficient service provider
- Best meets the National Gas Objective (NGO) as it addresses the inherent network risk
- Uses a combination of risk treatments that minimises asset replacement in the short term and allows for prudent asset management over the long term

Though the riskiest assets in our network (the CI and UPS) mains are almost gone, the job is not yet complete. Our focus turns to the next highest priority mains and services, for which we will develop and deliver an efficient and sustainable work program based on high quality information.

By adopting this approach, our customers will benefit from continued network safety, with minimal cost impact. We will continue to focus on delivering for our customers, through continuous improvements in technical and commercial outcomes supporting sustainable cost efficiency, as we aim to be the leading gas infrastructure business in Australia.

1.1 Obligations and responsibilities

In providing distribution services, we aim to:

- Achieve our vision
- Deliver on our business plan
- Comply with our obligations

A key aspect of our vision is to deliver for customers. Two of the ways we do this is by prioritising public safety and reliability, which entails maintaining the integrity of distribution mains and services.

The safe distribution of gas is governed by an exhaustive legislative framework. Key legislation are:

- Gas Act 1997 (SA)
- Work Health and Safety Act 2012 (SA)
- National Gas Laws (NGL)
- National Gas Rules (NGR)
- Risk management standards

Under the Gas Act, we have an obligation to minimise hazards and ensure the safety of our workers and the community. This is supported by the Work Health and Safety Act 2012.

The NGL and NGR contain obligations in relation to our pipeline safety duty as well as the requirement for the efficient investment in, use, operation and management of assets. Like many of our peers, our risk management framework is based on the risk assessment and rating contained in Appendix C of AS/NZS 4645 and ISO 31000, which provides guidance on the principles and processes for managing risks and a framework for assessing and mitigating risk.

Our systems, processes and policies are designed to ensure our ongoing compliance with our obligations and responsibilities. The requirements of each of these key pieces of legislation are summarised in the following sections.

1.1.1 Gas Act 1997 (SA)

The South Australian Gas Act 1997 is the primary regulatory instrument which directs our obligations regarding gas safety.

According to Part 1 Section 3, the objects of the Gas Act 1997 are:

a. to promote efficiency and competition in the gas supply industry; and
b. to promote the establishment and maintenance of a safe and efficient system of gas distribution and supply; and
c. to establish and enforce proper standards of safety, reliability and quality in the gas supply industry; and

d. to establish and enforce proper safety and technical standards for gas installations and appliances (including such standards relating to the design of gas installations); and

e. to protect the interests of consumers of gas

Under Section 55 of the Gas Act 1997, we have a responsibility to

"… take reasonable steps to ensure that –

a. the infrastructure complies with, and is operated in accordance with, technical and safety requirements imposed under the regulations; and

b. the infrastructure is safe and safely operated."

The relevant regulation references in Section 55 is Regulation 37, which provides:

"For the purposes of Section 55 of the Act—

a. gas infrastructure must be designed, installed, operated and maintained to be safe for the gas service conditions and the physical environment in which it will operate and so as to comply with any applicable requirements of AS/NZS 4645, AS/NZS 1596 and AS 2885 or achieve, to the satisfaction of the Technical Regulator, the same or better safety and technical outcomes; and

b. a gas installation must be designed, installed, operated and maintained to be safe for the gas service conditions and the physical environment in which it will operate and so as to comply with any applicable requirements of—

i. in the case of a liquefied petroleum gas installation—AS/NZS 5601 and AS/NZS 1596;

ii. in any other case—AS/NZS 5601."

As required by the Gas Act 1997 (and consistent with good industry practice, which requires compliance with applicable Australian Standards in the absence of any direction by safety legislation or a safety regulator to the contrary), we apply the AS/NZS 4645 standard to assessing the risk associated with our individual asset categories. We additionally adopt risk mitigation activities such as pressure reduction and increased inspections to reduce risk as required under the standard.

The work program identified in this DMSIP has been designed to achieve the maximum risk reduction possible given delivery capability, without imposing costs that are disproportionate to the risk reduction on customers.

Under Section 26, (and re-iterated in the Gas Distribution Code) as part of the condition of having a license to operate a gas distribution system we are required

(i) to prepare, maintain and periodically revise a safety, reliability, maintenance and technical management plan dealing with matters prescribed by regulation; and

(ii) to obtain the approval of the Technical Regulator—

a. to the plan (prior to the commencement of the operation of the distribution system to which the plan relates); and

b. to any revision of the plan; and

(iii) to comply with the plan as approved from time to time; and

(iv) to audit from time to time the entity's compliance with the plans and report the results of those audits to the Technical Regulator…"

Guidelines published by the South Australian government for the preparation of the Safety, Reliability, Maintenance and Technical Management Plan (SRMTMP) state:

"An SRMTMP should make particular reference to the technical and safety standards adopted by the entity. These standards should be consistent with the requirements of the Technical Regulator as set out in legislation.

The SRMTMP should include policies for:

- Protection of personnel
- Protection of property
- Protection of the public.
- Technical standards compliance

The SRMTMP should also cover the life cycle of all elements of the technical infrastructure, including:

- Planning
- Design
- Acquisition (construction, testing and commissioning)
- Operation
- Maintenance
- Repair and modification
- Decommissioning and disposal

The SRMTMP should include evidence that appropriate systems are established to ensure the SRMTMP is implemented. It should also address:

- The organisational structure and defined responsibilities
- Competencies of persons appropriate to their responsibilities
- Auditing of activities (key performance indicators)
- Cords and traceability
- Any special notes

Our SRMTMP is submitted annually to the Technical Regulator, most recently in November 2024. It is part of our overall approach to system management. It follows a continuous improvement cycle of Commit, Plan, Do, Check and Act, with the objectives of:

- Maintaining a strong focus on safety and reliability in relation to the operation and management of our distribution network
- Ensuring suitable safety management systems are in place and operating to effectively manage and keep risks associated with the operation of our network to as low as reasonably practicable
- Communicating relevant information related to the safe and reliable operation of our distribution network with our regulators

Our Asset Management Strategy (AMS) is a key part of our Asset Management Framework and safety management systems. The DMSIP is subordinate to our AMS and focuses on our approach to managing the integrity of our mains and services and provides the basis for the forecast replacement of mains over the next AA period. It outlines how we continually monitor, evaluate, plan and undertake asset integrity assessments to extend the remaining life, improve, replace, or

where necessary, retire assets. This ensures efficient, reliable and safe operations of the Network are maintained.

Though, our driver for compliance with the SRMTMP is to ensure the safety of the community and its employees, we are aware that failure to comply with the Gas Act 1997 can lead to the imposition of financial penalties and potentially criminal prosecution. Failure to comply with the approved SRMTMP would mean we are in breach of section 27 of the Gas Act 1997. Such a breach would expose us to a penalty of up to $1,000,000.

In summary, the Gas Act 1997 and regulations, codes and guidelines under it create a duty on us to ensure that we manage the safety and supply risks of our gas mains and services, and that we do so in such a way that is consistent with the requirements of the Technical Regulator (which includes technical standards compliance).

1.1.2 Work Health and Safety 2012 (SA)

In addition to safety obligations under the Gas Act 1997, we have obligations under the Work Health and Safety Act 2012 to ensure the health and safety of our workers and the community.

Division 2 Section 19 of the Work Health and Safety Act 2012 provides:

(1) A person conducting a business or undertaking must ensure, so far as is reasonably practicable, the health and safety of—

a. workers engaged, or caused to be engaged by the person; and

b. workers whose activities in carrying out work are influenced or directed by the person, while the workers are at work in the business or undertaking.

(2) A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that the health and safety of other persons is not put at risk from work carried out as part of the conduct of the business or undertaking.

Division 2 Section 19 imposes a general duty on an employer to ensure that both workers and other persons are not exposed to risks to their health or safety arising from the conduct of the undertaking of the employer, to the extent that is reasonably practicable.

Subdivision 2 Section 18 addresses reasonably practicable:

"In this Act—

reasonably practicable, in relation to a duty to ensure health and safety, means that which is, or was at a particular time, reasonably able to be done in relation to ensuring health and safety, taking into account and weighing up all relevant matters including—

a. the likelihood of the hazard or the risk concerned occurring; and

b. the degree of harm that might result from the hazard or the risk; and

c. what the person concerned knows, or ought reasonably to know, about—

    i. the hazard or the risk; and

    ii. ways of eliminating or minimising the risk; and

d. the availability and suitability of ways to eliminate or minimise the risk; and

e. after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk."

Our approach to ensuring the safety of our workers (and the community) is incorporated in the procedures and practices adopted in operating and maintaining our Network. These are captured in our Asset Management Plan and supporting plans and reports.

Our approach to identifying and managing safety risk is consistent with ISO 31000, AS 4645 and our SRMTMP.

1.1.3 National Gas Law

Under the NGL, AGN is required to ensure its approach to managing the integrity of mains and services is efficient. The NGL also requires that AGN provides services in a safe and effective manner. The National Gas Objective (NGO) under the NGL provides:

The National Gas Objective as stated in the National Gas Law (NGL) is:

> *"to promote efficient investment in, and efficient operation and use of, covered gas services for the long term interests of consumers of covered gas with respect to:*
>
> *a. price, quality, safety, reliability and security of supply of covered gas; and*
>
> *b. the achievement of targets set by a participating jurisdiction—*
>
> *i. for reducing Australia's greenhouse gas emissions; or*
>
> *ii. that are likely to contribute to reducing Australia's greenhouse gas emissions."*

The focus of the NGO is on the long term interests of consumers with respect to price, quality, safety, reliability, security of supply and the achievement of South Australia's decarbonisation targets. This DMSIP supports achievement of this outcome by ensuring the system and approach to managing supply and safety risks effectively identifies, assesses, prioritises and mitigates these risks in the most efficient way.

Section 28 of the NGL outlines the role of the AER in ensuring proposals and outcomes of gas distribution businesses will or are likely to contribute to the achievement of the NGO. The AER must take into account the revenue and pricing principles under section 28(2) of the NGL when exercising a discretion in approving or making those parts of an access arrangement relating to a reference tariff.

This provides the ability for a gas distribution business to recover the cost of efficient and effective risk management practices so as to not put at risk the implementation of effective risk management practices.

In the context of this Plan, the most relevant revenue and pricing principle is section 24(2) of the NGL, which provides:

> *"A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in—*
>
> *(a)* providing reference services; and
>
> *(b)* complying with a regulatory obligation or requirement or making a regulatory payment."

Section 6 of the NGL also includes a "pipeline safety duty", which is defined in section 2 of the NGL as:

> *"pipeline safety duty means a duty or requirement under an Act of a participating jurisdiction, or any instrument made or issued under or for the purposes of that Act, relating to—*
>
> *(a)* the safe haulage of natural gas in that jurisdiction; or
>
> *(b)* the safe operation of a pipeline in that jurisdiction;"

As outlined, there are several pipeline safety duties arising from the *Gas Act 1997* and the *Work Health and Safety Act 2012* requiring us to implement risk mitigation activities such as mains replacement.

1.1.4 National Gas Rules

The NGR impose requirements on a gas distribution business to ensure its asset management strategies and plans are prudent and efficient. In order to recover the efficient cost of providing services, the NGR provides for the AER to assess whether the expenditure required complies with the capital and operating expenditure criteria. Those criteria require capital expenditure must be *such as would be incurred by a prudent service provider acting efficiently, in accordance with accepted good industry practice, to achieve the lowest sustainable cost of delivering pipeline services* (NGR 79(a)).

In addition, capital expenditure must also be justified under NGR 79(2) as follows:

(a) the overall economic value of the expenditure is positive; or

(b) the present value of the expected incremental revenue to be generated as a result of the expenditure exceeds the present value of the capital expenditure; or

(c) the capital expenditure is necessary:

(i) to maintain and improve the safety of services; or

(ii) to maintain the integrity of services; or

(iii) to comply with a regulatory obligation or requirement; or

(iv) to maintain the service provider's capacity to meet levels of demand for services existing at the time the capital expenditure is incurred (as distinct from projected demand that is dependent on an expansion of pipeline capacity); or

(v) to contribute to meeting emissions reduction targets through the supply of services; or

(d) the capital expenditure is an aggregate amount divisible into 2 parts, one referable to incremental services and the other referable to a purpose referred to in paragraph (c), and the former is justifiable under paragraph (b) and the latter under paragraph (c)."

AGN's approach to managing mains and services integrity includes an assessment of options available to manage risk and test that the most efficient option is chosen and delivered at least cost. The framework of ISO 31000 is used to guide this process.

NGR also provides requirements for developing forecasts and cost estimates. NGR 74 states:

74 Forecasts and estimates

> *(1) Information in the nature of a forecast or estimate must be supported by a statement of the basis of the forecast or estimate.*

(2) A forecast or estimate:

(a) must be arrived at on a reasonable basis; and

(b) must represent the best forecast or estimate possible in the circumstances.

To satisfy these requirements, AGN uses the most recent asset management information and requirements as documented in its Asset Management Plan, to inform the DMSIP requirements.

Where practicable, forecast costs are informed by historical actuals for similar works. Where historical information is not available, AGN will seek quotes from the market and/or extract costs estimates from its panel of approved vendors. AGN may also issue a tender process for major programs, where required.

1.1.5 Risk management standards

AGN manages the integrity of mains and services and the arising safety and supply risks consistent with the relevant standards for managing risks on gas distribution networks. AS/NZS 4645.1:2018 Gas distribution networks Part 1: Network management (AS/NZS 4645) is the standard that applies to the management of gas distribution networks in Australia. This standard prescribes a risk management approach in accordance with ISO 31000, which outlines the process that should be adopted by a business that includes:

- Communication and consultation with external and internal stakeholders during all stages of the risk management process
- The internal and external environment in which the organisation seeks to achieve its objectives is to be assessed
- Risk assessment is the overall process of risk identification, risk analysis and risk evaluation
- Risk treatment involves selecting one or more options for modifying risks, and implementing those options
- There should be planned monitoring and review as part of the risk management process
- Risk management activities should be traceable

The risk analysis process under ISO 31000 may be undertaken with varying degrees of detail, depending on the risk, the purpose of the analysis and the information, data and resources available. This standard provides a framework for considering, assessing, rating and mitigating risks.

AS/NZS 4645 requires that all actions and activities not unduly expose personnel, the public or the environment to unacceptable risks. Measures to mitigate those risks are to be identified, reviewed and documented. The areas to be considered include:

- Safety of the public (including consumers)
- Safety of personnel working on the gas distribution network
- Integrity of the network
- Minimisation of environmental impacts
- Protection of property

AS/NZS 4645 is general in nature, therefore we have used the standard to underpin our risk management framework, expanding the risk considerations to include compliance, customer impact and financial impacts. This makes for a more rigorous and holistic assessment of risk, ensuring that customer and regulatory/economic impacts are built into our asset management

process. However, it is important to note that the fundamental principles of AS/NZ4645 with regard to safety, integrity, and environmental impact are typically the primary risk considerations.

The AS/NZS 4645 risk framework requires that all risks rated 'extreme' or high must be addressed immediately. Any risks rated 'intermediate/moderate' must be addressed as soon as reasonably practicable. However, where the cost of mitigating an 'intermediate/moderate' risk is disproportionate to the level or risk reduction achievable or is simply not economically viable, AS/NZS 4645 allows the business to determine the risk is as low as reasonably practicable (ALARP).

Again, taking guidance from AS/NZS 4645, our risk framework enables us to determine as risk is being managed to ALARP where the costs of risk reduction are prohibitive. Any risks rated ALARP are continually monitored and regularly reviewed to determine whether the risk remains tolerable and whether there is an economical way to reduce the risk to low.

2 Mains and services condition assessment and management options

This section outlines our network inventory and describes each type of distribution mains/services, and the condition and mitigation options available to best manage each category.

2.1 Distribution mains

There were 8,510 kilometres of distribution mains in our network as of 1 January 2025. These mains consist of different material types, with diameters ranging from 16 mm up to 450 mm, operating at different pressures. Pressures vary from 1.7 kPa to over 250kPa across our low, medium and high pressure networks:

- Low pressure – from 1.7 kPa
- Medium pressure – from 90 kPa
- High pressure – from 250 kPa

These material and pressure differences are the primary drivers of variability in condition and corresponding management activities over time. Table 2.1 shows our mains inventory at 1 January 2025.

Table 2.1: Mains inventory by pressure and material at 1 January 2025, in kilometres

	CI	UPS	HDPE 575	PE 100	PE 80 (MDPE)	Copper	HDPE 250	Protected steel	Total
Low	21	3.3	18.3	27.5	18.3	0.1	61.1	9.1	153.7
Medium	0.5	3.2	540.1	703.7	1385	1	2.3	481.1	3127
High	-	-	390.8	1775.7	1930	0.2	-	1133.5	5230.2
Total	**21.5**	**6.5**	**954.2**	**2506.9**	**3333.3**	**1.3**	**63.4**	**1623.7**	**8510.8**

Mains integrity issues can be identified and addressed in different ways depending on pipeline characteristics such as material type and diameter. We conduct regular inspection and sampling to monitor mains condition. To assess condition, we look at a suite of key integrity indicators, which can tell us whether the pipe is susceptible to failure. These integrity indicators are:

- **Leaks** – leaks indicate a failure of pipe integrity. Leaks are detected by regular leak surveys or through public reporting. Leak numbers and leak rate (number of leaks per kilometre) provide an indicator of the integrity of mains. Our current leak detection vehicle is reaching end of life and we are exploring standard industry technologies to enhance this aspect of our data and information
- **Cracks and breaks** – a sub-category of leaks. Cracks and breaks have been usually associated with CI mains, however HDPE mains also have a propensity (albeit lower) to crack. Unlike small leaks from joints, these types of failures can result in a sudden and unpredictable release of gas, which poses a greater risk to the public when compared to smaller joint leaks
- **Material testing –** samples of our mains are regularly taken for laboratory testing to understand how these assets are performing in different soil conditions and under different

stresses. We take samples of all material types, from various locations across our network. This allows us to develop a better understanding of network integrity, and whether the materials being used to distribute natural gas remain fit for purpose

- **Unaccounted for Gas (UAFG)** – UAFG is the difference between gas metered entering the network and the metered volume delivered to customers. UAFG has a number of contributing factors, including metering accuracy, fugitive emissions (leaks from the network), administrative errors and theft. UAFG is sometimes used as a proxy measure for the network condition (how 'leak tight' the network is), however this metric is more effective where the level of UAFG is relatively high compared to industry norms

We compare these performance and integrity indicators for different types of mains in order to understand contributors to risk. We facilitate preventative action by identifying mains that may be prone to failure. All things being equal, increasing trends in the above indicators are usually a sign of deterioration in the condition/integrity of the network.

The greatest risk associated with any gas network is the potential for assets to leak or fracture, and for the escaped gas to collect in sufficient quantities to become explosive (e.g. in or beneath a building) and ignites, leading to death or serious injury.

The most effective way of addressing the leak/fracture risk associated with any gas asset is to replace them with newer, more resilient assets.[1] However, there are often other options to address the risk or effectively monitor the assets to identify and rectify issues before they result in a failure. Therefore, although all mains will need to be replaced eventually (i.e. at the end of their useful life), we use a combination of qualitative and quantitative assessment throughout their lifetime to identify:

1. Mains that need to be replaced imminently
2. Mains that can be monitored and material tested effectively, so that issues are identified and rectified prior to failure
3. Mains that can remain safely in service

2.1.1 Cast iron and unprotected steel

CI and UPS were the first materials used to construct our network and are our oldest mains. Because of their early installation, they are located in older established suburbs.

The inherent risk of CI and UPS mains has been long understood. We commenced a large scale program over 20 years ago to remove CI and UPS from our network. We are pleased to report that by the end of the current AA period (June 2026), all CI and UPS mains will have been removed from our South Australian distribution network and replaced with PE.

On 1 January 2025 there were less than 30km of CI and UPS mains left in our network. As long as these assets remain, the risk associated with these assets is rated high. By the end of the current period, there will be none of these mains left, bringing the risk down to low.

[1] Consistent with the hierarchy of controls where the most effective control is to eliminate the hazard.

2.1.2 Vintage high density polyethylene (HDPE) mains

2.1.2.1 Overview

HDPE mains were first installed in the South Australian networks in the late 1970s and early 1980s. These older mains (known as first generation or vintage PE) are made up of two polymer types; HDPE 250 and HDPE 575. It has been reported that these vintage HDPE products have an oxidised inner surface that predisposes the surface to experience cracks more quickly than anticipated when certain stresses are applied. The resulting shortened crack initiation time leads to dramatically reduced overall pipeline longevity through a predominant failure mechanism known as slow crack growth (SCG).[2]

Early squeeze off procedures adopted by the industry resulted in the over-squeezing of the vintage HDPE mains. This, coupled with no restrictions in release rates, resulted in significant damage to the structural integrity of the main from which SCG occurs. Subsequent failures at squeeze off locations have and will continue to occur years later depending on the extent of the damage and the operating conditions. HDPE mains have typically been squeezed off every 60 to 80 metres;[3] therefore all of these points on the mains pose a risk of SCG and need to be investigated.

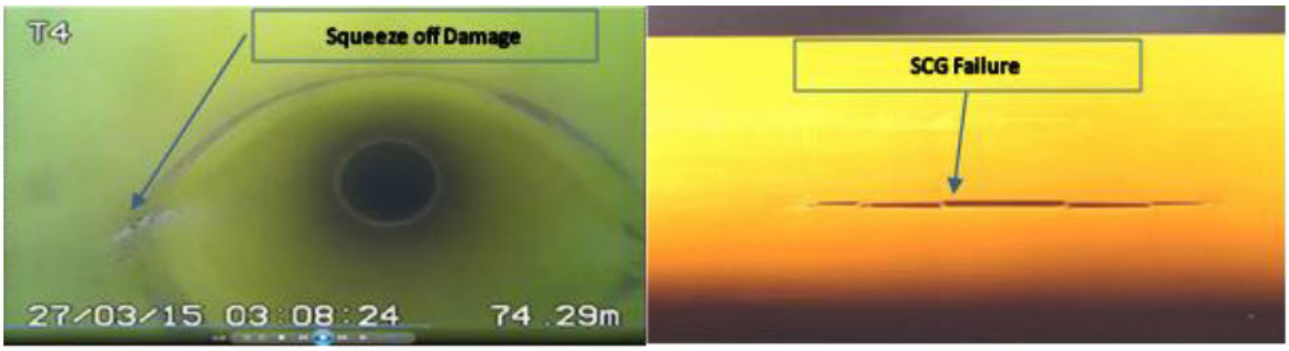
Figure 2.1 and

Figure 2.2 show cracks at squeeze off locations.

Figure 2.1: Image of a partial crack at an old squeeze off location

[2] Jacobs, "*Mains Replacement Program Review*", January 2016, pg. 24.
[3] Based on inspection results from South Australian inspection program.

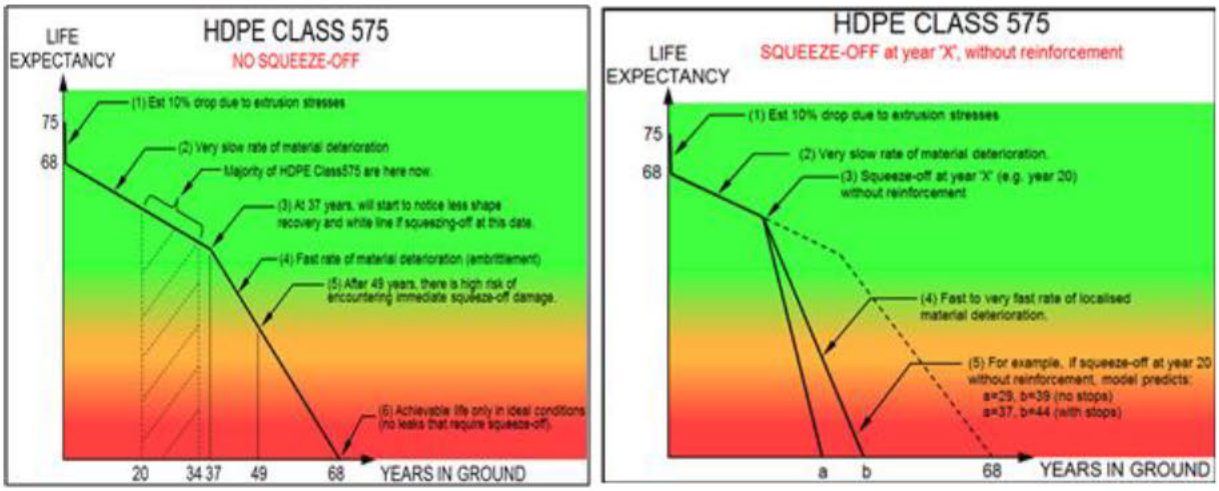
Figure 2.2: Pictures of squeeze off damage in the vintage HDPE mains



Of the two HDPE types, HDPE 250 was the poorer performing material. Therefore, we have already commenced programs to remove HDPE 250 from service. All HDPE 250 mains will be removed from the AGN South Australian network by the end of this current AA period.

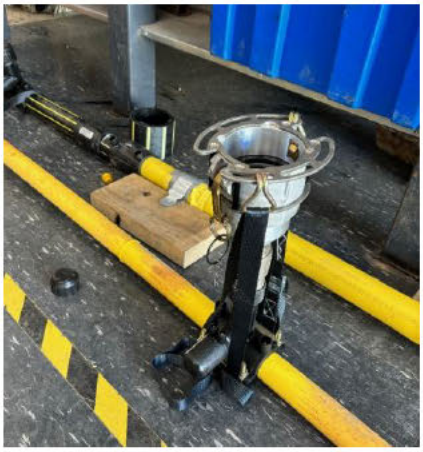
For HDPE 575, the performance has historically improved post 1993 due to improvements in the squeeze off practices and specified release rates, however as the mains age, the number of leaks has been increasing. Camera inspection of DN50 HDPE 575 has been successful and over 600 km has been completed in total over the past 10 years. Ten original samples were removed and tested in the laboratory by Deakin University as part of the Future Fuels CRC program. These samples were tested with the clamps shown to provide extension of life. Other Deakin research results indicate that clamps may even extend the life of the SQO to that of the bulk material. However, samples are limited and research is underway to quantify this further.

Figure 2.3: Overview of HDPE 575 modelled behaviour



As shown in Figure 2.4 below, we have successfully tested a new camera to allow inspection of DN40 HDPE 575 mains. A 20 km program is planned to be completed in Port Pirie by June 2026. The 20 km were initially part of the replacement program as the existing camera could not be used in mains with a small (40mm) diameter. The new camera is able to inspect these mains which will now be inspected and clamped instead of replaced.

Figure 2.4: Image of new DN40 camera equipment and tees



In Victoria, AGN, Multinet and Ausnet have been working closely together along with Deakin University to improve the end of life models for HDPE 575 and look for areas where new technologies can be used to extend the life of the HDPE 575 mains. Samples taken from HDPE 575 joints are being analysed at Deakin and within industry laboratories to close the information gaps and improve the accuracy of end of life assumptions. In South Australia a program to test the efficacy of the reinforcements will be undertaken, with 20 samples removed from the network and submitted to Deakin University for testing.

The risk associated with HDPE 575 is real. In 2007, South Australia experienced a number of gas in building incidents due to HDPE failure, including one that resulted in a life threatening injury. There was also an incident in New Zealand in 2021. Investigations found that the primary cause of these incidents was leakage associated with SCG failures, originating from squeeze off locations in older HDPE mains laid until the 1990s. Analysis of material behaviour concluded there is a risk of further, sudden, indiscriminate failures that could lead to additional gas in building incidents.

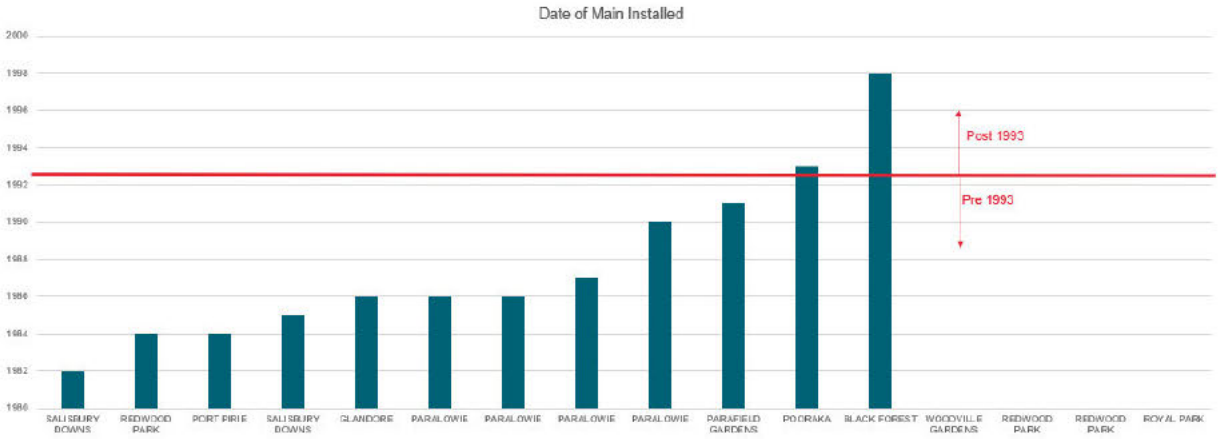
The crack rates of vintage HDPE in South Australia are typically ten times lower than CI. However, due to the location of the HDPE pipes (typically in urban and developed areas) and the greater volume of gas releases when sudden crack failure occurs (due to higher pipeline pressures), the consequence of a gas in building incident when a HDPE mains fail is greater than with CI pipes.

We prioritise HDPE mains inspection and replacement by disaggregating the HDPE 575 mains population based on:

- Age, operating pressure and diameter
- Leak and crack history by segment
- A deterioration factor for mains over 30 years

Figure 2.5 shows the relationship between leak/crack rates and the age of our HDPE mains for each suburb.

Figure 2.5: DN40 date of main installed per suburb

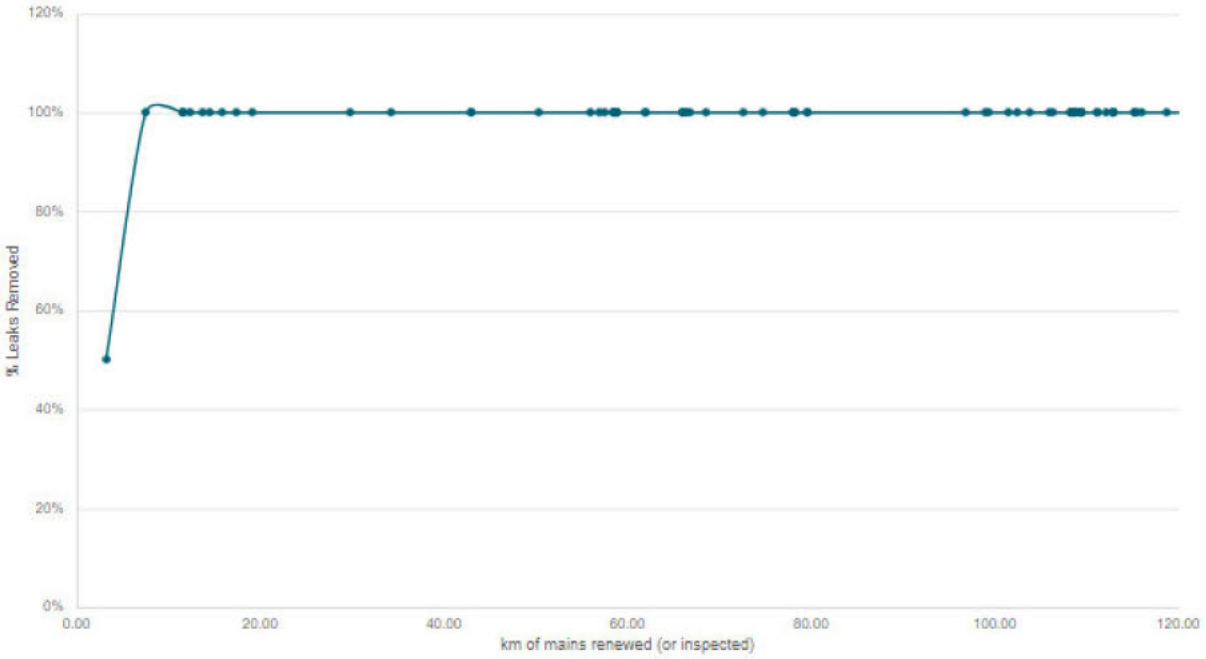


2.1.2.2 DN50 Class 575 high pressure (post 1993)

Blakeview and Seaford Rise are two high pressure suburbs with post 1993 HDPE 575 which have experienced squeeze off leaks. An assessment of leaks and the condition of the HDPE mains in these areas found the squeeze off failure rate is higher by comparison with similar mains in other suburbs. There are 120 km of post 1993 HDPE 575 DN50 mains in South Australia, with a total of 8 km of mains located in the Blakeview and Seaford Rise.

Our initial focus for renewal activities will be on these 8 km of mains, as these pose the highest risk of the entire population.

Figure 2.6: DN50 percentage of leaks removed vs. mains renewed



2.1.2.3 DN40 Class 575 medium pressure (post 1993)

South Australia has a total of 120 km of post 1993 DN40 HDPE 575 and mains with unknown install dates, which are believed to be pre-1993 mains. Pooraka, Woodville Gardens, Redwood Park, Royal Park and Black Forest are all high pressure suburbs which have experienced squeeze off leaks. An

assessment of leaks and the condition of the HDPE mains in these suburbs found the squeeze off failure rate is higher by comparison with similar mains in other areas. Our initial focus for renewal activities will therefore be on the mains in these high pressure suburbs, as these pose the highest risk of the entire population.

2.1.2.4 HDPE sampling program

Our focus for sampling activities will be to understand the performance of the inspection and reinforcement program on squeeze offs, by removing 20 samples of reinforcement clamps from the network and submitting to Deakin University for testing.

2.1.2.5 New polyethylene

New polyethylene (PE) mains comprise two categories – PE 80 and PE 100. PE 80 is also referred to as medium density polyethylene (MDPE) and was installed in our network from the late 1990s until early 2010s, when PE 100 was introduced.

PE 80 and PE 100 are expected to maintain their integrity for 50-100 years. Both these families of mains are rated as low risk and are not considered susceptible to cracking. No proactive risk mitigation action is planned in the current or next AA period.

2.1.3 Protected steel mains

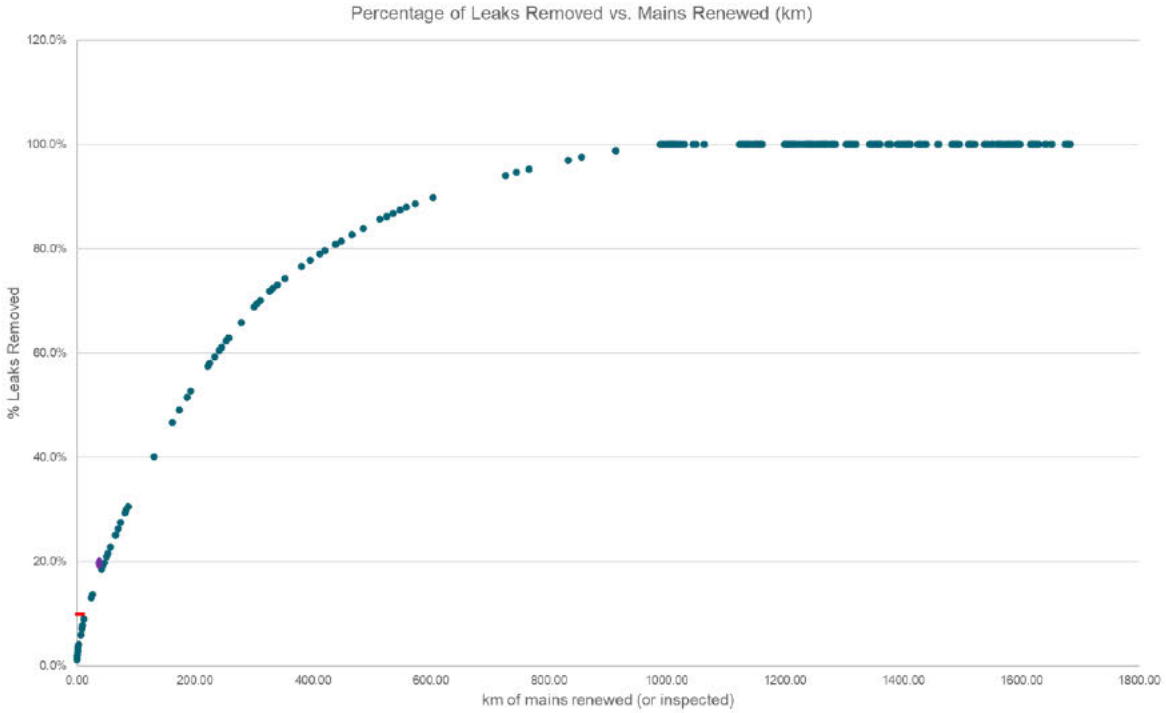
There are more than 1,600 km of protected steel mains in the network. These steel mains are typically either PE coated (yellow jacket) or coated with cold tar enamel (CTA) and are predominantly used for the high pressure system. These mains are not susceptible to the type of cracking and integrity issues that affect HDPE, CI or UPS pipes, however they are made of a ferrous material and are ultimately susceptible to corrosion. These mains are therefore cathodically protected to help prevent corrosion and maximise their asset life. Cathodic protection does not extend asset life indefinitely.

The overall risk of this asset class is escalating with time due to the pipeline age and increasing leak rates. The original protected steel mains are approaching 60 years old. These steel mains are still cathodically protected, however, cathodic protection becomes less effective as the pipeline integrity deteriorates with age. Figure 2.7 shows protected steel mains suffering from corrosion.

Figure 2.7: Example of corroded steel mains and challenging operating environment

Following an assessment of leaks, condition and location factors, we have identified 12.6 km of the oldest and highest risk protected steel mains that should be replaced during the next 5 years. As shown in Figure 2.8, based on reported leak rates, this 12.6 km accounts for 10% of the leaks in the protected steel networks.

Figure 2.8: Percentage of leaks removed vs protected steel mains renewal length



By focusing on this riskiest 12.6 km of steel main (0.75% of the network), not only will we eliminate 10% of the known leaks, but it will also provide valuable data and insight to inform future asset

management strategies and help us avoid a widespread intensive mains replacement program. The replaced sections of mains will be sampled and inspected.

It is important to note that replacement is not the only risk treatment proposed for protected steel mains. We also invest in our cathodic protection systems and other corrosion management activities such as coating, direct current variance gradient (DCVG) surveys, and direct dig-up and inspections. The cathodic protection and corrosion management activities proposed for the next AA period are discussed in a standalone business case: SA201 Corrosion management of steel pipework.

Even with our increasing efforts to protect these mains through the activities outlined in SA201, the risk associated with protected steel mains will increase over time as the assets age. They will need to be replaced at some point.

Reviewing and testing the replaced sections of main will give us insight into how protected steel performs. Allied with the ongoing cathodic protection surveys, this data will allow us to create a picture of overall asset condition.

2.2 Services

2.2.1.1 Unplanned service replacement

A service is a dedicated network asset that connects a customer's premises to the gas mains located in the street. They are typically located on private property (for example a customer's driveway or front yard) and comprises a service pipe, fittings and metallic upstand with isolation valve. Note a service does not include the customer's meter, which is treated as a separate asset and is covered by the Meter Replacement Plan.

There are over 485,000 services[4] in the AGN South Australian gas distribution network. Services are typically of the same vintage of the gas main to which they are connected, as they generally were laid together as one project. That is, when cast iron mains were laid, galvanised steel services would have been laid at the same time.

For this reason, mains and services in an area are deemed to share a similar risk profile.[5] Mains and services are not captured individually within our geospatial information system. This means that although there may be some exceptions, (for example where there has been recent subdivision and a new service has been laid), no distinction is made between mains and services when assessing useful life or risk. Exceptions are addressed on a case-by-case basis as mains replacement is undertaken in the area. Services also occasionally need to be replaced on an unplanned basis, for example when leaks or damage occurs and inspection reveals that the service is in poor condition or irreparable.

The optimum long term solution to manage the risk associated with leaks on services is to replace the service with PE. During the current AA period we replaced an average of 486 services per year.

For the purpose of forecasting our work program volumes, we assume the same level of unplanned replacement for the next AA period, as shown in Table 2.2 below. The number of premature failures is expected to continue at a steady rate over the next five years as there remains a large number of old/non-PE services in our network.

Table 2.2: Forecast unplanned service replacements

Category	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Unplanned service replacement	490	490	490	490	490	**2,450**

2.2.1.2 Multi user sites

Multi user sites (MUS) are locations where gas services are provided to multiple consumers within higher density unit developments and commercial premises. These assets are made from either steel, HDPE, or PE, based on the time of their installation.

In the current AA period, we are renewing multi user sites, prioritising those that are highest risk or have known issues (priority 1 assets as per the table below). By the end of the current period, we are on track to have renewed 163 priority 1 MUS and removed the risk of a further 632 sites through surveying.

4 Number correct as at January 2025

5 Noting there is a slightly higher likelihood of a gas-in-building incident associated with services due to the closer proximity of service pipes to a house or building.

During the course of conducting these MUS replacements, we have surveyed the remaining outstanding MUS sites. Through this survey and the lessons learnt from the program so far, it has become evident that as MUS assets age their condition tends to deteriorate and the likelihood of failure increases. This information has then been used to inform how we will address the balance of MUS sites.

We have categorised our MUS by priority order as per Table 2.3.

Table 2.3: MUS categorisation

MUS priority category	Criteria/description	Number of MUS by end of current AA period
Priority 1	MUS that require immediate replacement due to failure, very poor condition, or are located in non-compliant high risk locations (e.g. in an unventilated garage or near to a potential source of ignition).	0
Priority 2A	MUS that are constructed of ferrous materials or materials that are known to have failed previously, and are at or beyond their technical life, and are located in non-compliant (but not high risk) locations.	810
Priority 2B	MUS that are constructed of ferrous materials or materials that are known to have failed previously, and are at or beyond their technical life, but are not in non-compliant locations.	467
Priority 3	MUS that are made from new plastic materials and in compliant locations, such as recently replaced Priority 1's, or where dwellings within the MUS site are supplied with individual service connections direct to the main, as opposed to a boundary regulator and trunk service installation.	>3,000*

*MUS are classified as services and are therefore not specifically identified in GIS. There are in excess of 3,000, which is based on project experience to date.

Using this categorisation approach, we address priority 1 services first, then priority 2A, 2B and finally on to 3.

Priority 1 MUS are being addressed in the current AA period (2021-26), so our approach for the balance of MUS is to replace the 1,277 priority 2A and 2B MUS over the next 7-8 years. These services will be replaced with fully fused PE assets. Generally, MUS in priority category 3 are not expected to fail and should have the same 50 to 100-year useful life as other fully fused PE solutions. Therefore, no proactive replacement is anticipated for these MUS in the near term.

For the next AA period (2026-31), we aim to replace all the priority 2A assets and 150 of the priority 2B assets. Based on our experience to date this gives an achievable and sustainable replacement rate that will not put excessive pressure on our resource base, which would increase the risk of driving costs up. The proposed volumes are in line with our current delivery of MUS when including the sites currently renewed as part of the mains replacement program; therefore, we anticipate no additional resources will be required to deliver the perceived higher volume of MUS replacements.

Additional leak surveys and awareness campaigns will be implemented for priority 2A sites and the balance of priority 2B MUS until they are replaced. This approach ensures any new failures or changes in condition are identified in a timely manner, and reprioritisation or risk mitigation actions can be applied. If there are any issues with the reliability of the boundary regulator (another issue

we have encountered), these are solved by removing the regulator during the insertion and pressure upgrade process.

By prioritising these replacements based on age, condition, and compliance, we are committed to enhancing the safety and reliability of our gas distribution network for all multi user sites across our service areas. This approach ensures that we address the most critical needs first while efficiently managing resources to maintain and upgrade our infrastructure.

Estimating the cost of MUS replacement

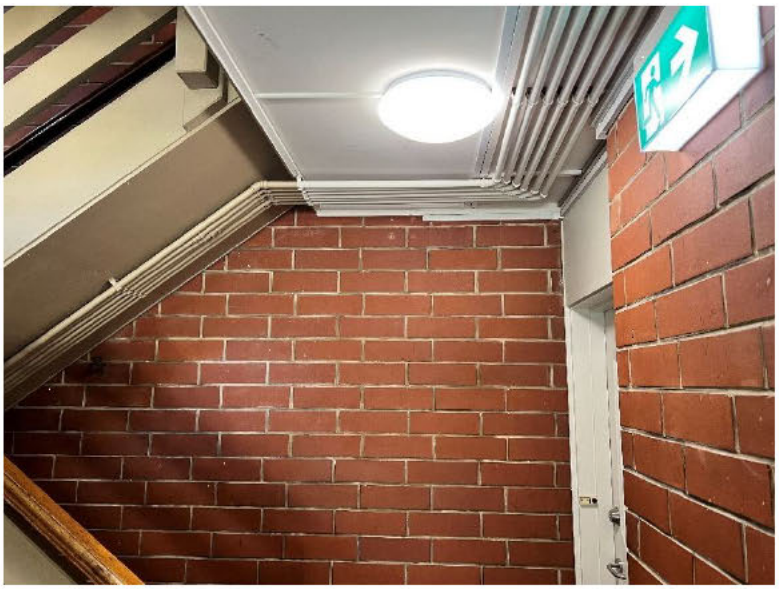
The cost of replacing an MUS can vary by site depending on the number of customers and complexity of the site. Based on our experience with MUS replacements, we have classified MUS sites into three categories: hard, medium, and easy, based on their complexity and the challenges they present.

- **Hard sites** generally involve the most complex and time-consuming tasks. These sites may have assets deeply integrated into the buildings or have locations with difficult access, significant non-compliance issues, and older, unprotected ferrous materials. They might also be located in high-traffic residential or commercial premises. The replacement process for these hard sites often includes extensive planning, coordination and additional resources, leading to higher unit rates
- **Medium sites** strike a balance between hard and easy sites. While they do pose some challenges, such as moderate access difficulties or partial integration of assets into the building, the replacement process is less intensive than hard sites. Consequently, the unit rates for medium sites are lower, but they still reflect the effort required to replace them
- **Easy sites** involve assets that are typically still vintage materials, but with more straightforward access and levels of compliance. These sites are typically located in less congested areas or have less service connections and working at heights. The replacement process for easy sites is more efficient and less complex, resulting in the lowest unit rates

Figure 2.9 shows a typical hard MUS site, while Figure 2.10 shows the potential solution we would put in place to address a difficult to access and non-compliant site.

Figure 2.9: Example of a hard site

Figure 2.10: Example of how we would address a hard/non-compliant site



Categorising sites into hard, medium, and easy allows us to estimate replacement costs with a reasonable degree of accuracy and allocate resources effectively. Table 2.4 shows the split of hard, medium and easy sites across the priority 2 and priority 3 MUS sites.

Table 2.4: Breakdown of hard, medium and easy sites

MUS priority category	Hard	Medium	Easy	Total
Priority 1	0	0	0	0
Priority 2A	70	352	379	810
Priority 2B	4	88	384	467
Total	**74**	**440**	**763**	**1,277**

The unit rate for MUS replacement is provided in the Unit Rates Report.

2.2.1.3 Redundant service removal

We currently have 3,500 redundant 'inlet only' services on our network. These residential services have a live supply to the metering location, including a vertical standpipe, but no meter in place. The standpipe is normally isolated by a closed ball valve with a cap. This situation arises when meters are removed due to billing issues, renovations or construction work, and a new meter is not re-installed.

We classify redundant services as locations that have not had gas meters for over 24 months. This means the customer(s) is not using gas and may not be aware that they have live gas assets on their property. It is good practice to remove these services to reduce the risk to the customer and other members of the public. Leaving a redundant customer inlet connection live unnecessarily exposes the service to the risk of damage from third party work and potential leak and ignition.

Figure 2.13: Example of redundant services where meter has been removed and live service remains

Many of the identified 3,500 redundant services are not accurately recorded on B4U dig plans, as these plans only give an indication that a service and meter are onsite. Service as-laid plans are kept with the meter in the meter box as an onsite sketch. With no meter onsite there are often no meter sketches onsite and it is quite often assumed there is no existing live service line. Currently there is also no proactive plan for disconnecting redundant services. They are generally only removed in a reactive unplanned manner as they are found and risks are identified.

To eliminate the risk associated with redundant services, we need to implement a proactive program aimed at removing these redundant services within a reasonable timeframe. Our goal is to address the backlog of redundant services over a 5-year period, at a rate of 700 per year. Following this initial project, we will transition to a sustainable level of removal, ensuring that the rate of redundant service removal matches the ongoing demand.

Service removals are an operational cost and therefore classified as operating expenditure (opex) in our regulatory forecasts and accounts.

While the redundant service removal is a new project for the AGN South Australian network, customer-initiated service removals are common in other networks, particularly in Victoria, where there has been a recent government policy shift away from natural gas connections. We have therefore used our historical costs and experience in our Victorian networks to inform the unit rates for South Australia.

2.3 Leak detection

Regular leak surveys of our gas network are important to maintain public safety, operational efficiency, and compliance. Our current methods include [redacted] technology, which is specialised equipment fitted to a vehicle that is driven around our distribution mains and conducts leak surveys.

Our [redacted] vehicle is 13 years old (originally commissioned in 2012) and is reaching the end of its useful life. We are therefore looking to replace the current [redacted]A system with a modern industry standard alternative.

We have chosen to move in the same direction as other gas businesses in Australia [redacted] and will be pursuing a single [redacted] vehicle. In summary, while both [redacted] and [redacted] are effective for gas leak detection, [redacted] is more specialised for methane detection, whereas [redacted] offers a broader range of gas detection capabilities with advanced data analytics, with the benefit of leak volume data to continuously and incrementally improve our asset management strategies.

[redacted] is a now a proven gas detection technology, with multiple advantages over traditional methods outlined in Table 2.6 below.

Table 2.5: Advantages of [redacted]o gas detection technology over traditional methods

	[redacted] gas detection technology
Enhanced Safety	[redacted] technology is broader, covering various gas emissions, including methane [redacted] patented gas analysis technology is approximately 1,000 times more sensitive than traditional leak detection equipment, capable of detecting leaks down to one part per billion in ambient air
Precision and accuracy	[redacted] uses cavity ring-down spectroscopy (CRDS) to measure gas concentrations with high precision. The system integrates wind direction and speed data with georeferenced information, allowing for more accurate identification of leak origins and reducing false positives from naturally occurring methane
Faster execution	[redacted]'s systems are used in a variety of settings, including mobile leak detection, stationary monitoring, and aerial surveys and it allows for quicker surveys and inspections, enabling faster detection and repair of leaks

Wider area coverage	High precision, ability to measure multiple gases, and integration with advanced analytics platforms for real-time data insights. [redacted] systems can monitor significantly larger areas—up to 150 meters wide under optimal conditions—compared to just 5–6 meters with traditional technologies

We plan to purchase one new gas detection system in the next AA period for use on the AGN South Australian network.

[redacted] technology can deliver analytical insights, scalability (which allows us to adjust the leak survey program), and data for the mains replacement programs, enhancing our understanding of network vulnerabilities and better informing our most significant investments in mains, services and leaking asset replacement activities.

We will therefore include [redacted] million in our capex forecast for gas detection technology.

This investment aligns with NGR 79(1)(a). Implementing the [redacted] system is in accordance with industry good practices, as gas operators in both Australia and around the world are adopting [redacted] technology.

This technology will maintain the safety of services in line with NGR 79(2)(c)(ii) by extending the coverage of leak surveys to include volumes of all mains and services leaks as well as better capture services and meter positions when compared to the current technology.

3 Risk assessment – approach, actions and outcomes

There is an inherent risk associated with gas mains and services. Whenever a main or service leaks, cracks or breaks there is the potential for a negative impact on people, gas supply or the environment. The risk can vary based on location, material type, pressure and age of infrastructure, which means the management and mitigation requirements of the underlying asset also vary. We review the performance indicators of mains and services to assess the potential risk associated with any deterioration in condition.

We manage network integrity by regularly updating our risk assessment to reflect new information on asset condition. A risk assessment and derived risk rating guides the actions and activities required ensuring that safety and compliance is maintained as efficiently and effectively as possible.

The following sections outline our risk assessment approach, the risk mitigation actions available to us, and the outcomes of our risk assessment for each mains and services asset class.

3.1 Risk assessment approach

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification. When considering risk and determining the appropriate mitigation activities, we seek to balance the risk outcome with our delivery capabilities and cost implications. Consistent with stakeholder expectations, safety and reliability of supply are our highest priorities.

Figure 3.1: Risk management principles

Our risk assessment approach focuses on understanding the potential severity of failure events associated with each asset and the likelihood that the event will occur. Based on these two key inputs, the risk assessment and derived risk rating then guides the actions required to reduce or manage the risk to an acceptable level.

Our risk management framework is based on:

- AS/NZS ISO 31000 Risk Management – Principles and Guidelines
- AS 2885 Pipelines-Gas and Liquid Petroleum
- AS/NZS 4645 Gas Distribution Network Management

The Gas Act 1997 and Gas Regulations 2012, through their incorporation of AS/NZS 4645 and the Work Health and Safety Act 2012, place a regulatory obligation and requirement on us to reduce risks rated high or extreme, to low or negligible as soon as possible (immediately if extreme). If it is not possible to reduce the risk to low or negligible, then we must reduce the risk to as low as reasonably practicable (ALARP).

Where assets are rated as moderate risk, we assess whether the risk can be reduced to low or negligible and how that might be achieved. For some assets, the only way to reduce identified risk is to replace them. For others, the risk can be appropriately managed through increased inspection

and monitoring programs. If the risk cannot be reduced to low or negligible, or the cost of doing so is disproportionate to the relative risk reduction, we will consider what action is required to reduce the risk to ALARP.

When assessing risk for the purpose of investment decisions, rather than analysing all conceivable risks associated with an asset, we look at a credible, primary risk event to test the level of investment required. Where that credible risk event has an overall risk rating of moderate or higher, we will undertake investment to reduce the risk.

Note that risk is not the sole determinant of what investment is required in our network. Many other factors such as growth, cost, efficiency, sustainability and the future of the network are also considered when we develop engineering solutions. The risk management framework provides a valuable tool to manage our assets, and prioritise our works program, however, it is not designed to provide a binary (yes/no) trigger for investment.

As prudent asset managers, we apply our experience and discretion to manage and invest in our distribution networks in the best interests of existing and potential customers.

3.1.1 Severity or consequence of risk events

For each category of mains and services, risk is assessed based on the severity (or consequence) of a risk event. The consequence of the failure event is then mapped against the severity classes in our risk management framework.

Our risk management framework considers the following risk consequences of a mains failure event:

1. **Health & safety** – injuries or illness of a temporary or permanent nature, or death, to employees and contractors or members of the public
2. **Environment** (including heritage) – impact on the surroundings in which the asset operates, including natural, built and Aboriginal cultural heritage, soil, water, vegetation, fauna, air and their interrelationships
3. **Operational capability** – disruption in the daily operations and/or the provision of services/supply, impacting customers
4. **People** – impact on engagement, capability or size of our workforce
5. **Compliance** – the impact from non-compliance with operating licences, legal, regulatory, contractual obligations, debt financing covenants or reporting / disclosure requirements
6. **Reputation & customer** – impact on stakeholders' opinion of AGN, including personnel, customers, investors, security holders, regulators and the community
7. **Financial** – financial impact on AGN, measured on a cumulative basis

Our, risk management framework, which is founded on AS/NZ 4645, ranks the severity of the consequences of a risk event from minimal to catastrophic. The most significant threats posed by mains and services generally relate to safety and/or operational capability.

Safety consequences

If a main or service fails, depending on the location of the asset, the pressure it operates at and the type of failure it experiences (e.g. slow leaks vs sudden cracking), it can cause a major safety incident. The most significant safety risk is that the escaped gas gathers in a building (or another

confined space) to a volume where it can cause an explosion if it meets a source of ignition. While these incidents are rare, they have been known to occur and are a credible safety risk.

If a main or service is not located near to a building or in a location where escaped gas is likely to collect in significant volumes, then the safety risk may not be as severe. However, due to the flammable nature of natural gas and the harm or damage that can be caused by striking our assets, there is always some degree of health and safety risk associated with gas escape or people (for example a third party groundworker) coming into contact with our network.

Operations consequences

Failure of a gas main or service can result in disruption to customers' supply (captured as 'operational capability' risk or 'operations' for short). This operations risk has greater consequences for large diameter or high pressure mains, which may supply a large number of people.

Our high pressure protected steel mains fall into this category. While protected steel mains are generally not located in high risk locations, they often serve many customers. Protected steel mains also take longer to flow-stop when compared to PE, which means there can be significant loss or disruption to downstream supply if they fail.

These two categories of risk consequence (safety and operations) are the primary considerations when managing our mains and services. However, we also consider the other consequence categories. For example, compliance, customer impact and reputational consequences can be severe if service interruptions are widespread, frequent, or long-lasting. Financial risk is also a consideration when testing whether risk treatments are economically efficient.

3.1.2 Likelihood of risk events

Once we have identified the credible risk events for each type of mains/services asset, the next step is to consider the likelihood (frequency) that the event will occur and result in the predefined consequence.

Our risk framework has five frequency classes:

1. Rare – conceivable by has not been known to arise previously
2. Remote – not anticipated but may occur if certain abnormal circumstances prevail
3. Unlikely – unlikely to occur but possible when certain circumstances prevail
4. Occasional – may occur occasionally or in many circumstances
5. Frequent – expected to occur on a regular basis and many times

Indicators of risk frequency are the asset material and condition (propensity to fail and the failure mode) the mains pressure (the volume of gas released from a failure). When assessing the likelihood of the risk event occurring, it is also important to consider proximity of the mains to the general population and/or the number of customers supplied by that main. We also consider historical occurrences of incidents that either resulted in or had the potential to result in a major risk event.

3.2 Risk mitigation options

Three primary risk mitigation options are available with regard to mains and services:

1. Remove the assets and/or replace with newer, low risk mains or services.
2. Inspect (ideally with in line cameras) and reinforce squeeze off locations where necessary.
3. Monitor the asset condition (via inspection & sampling) and undertake action as needed.

The effectiveness of these risk mitigation options varies, as shown in Table 3.1.

Table 3.1: Impact of primary risk mitigation options

Option	Description	Effectiveness
Replacement	Replace with new low risk main	Removes risk
Removal	Remove redundant equipment	Removes risk
In line camera inspection and reinforcement when required	Inspection of high risk main with squeeze off locations reinforced via steel clip clamping	Temporary reduction of risk by addressing key vulnerability through reinforcement
Sampling	Take samples of HDPE reinforcement clamps and estimate end of life based on testing	Reduces risk by creation of informed asset management strategies
Monitor	Monitoring of integrity and performance of mains through inspections and reporting The scope of monitoring activities is dependent on the residual risk of the asset, meaning, we do a higher number of leak surveys on assets in high-risk areas than assets that traverse a paddock. For assets that are being replaced, they are subjected to increased monitoring activities to reduce risk to ALARP prior to replacement.	No change but allows for prompt intervention

These primary risk mitigation activities are complemented by action such as surveys, reactive maintenance/repair and applying coatings or cathodic protection. Table 3.2 summarises these complementary risk mitigation options.

Table 3.2: Complementary risk mitigation options

Description	Effectiveness
Setting and monitoring relevant network KPIs	The monitoring of network performance allows us to identify trends in network performance and safety issues across asset classes to optimise safety outcomes. It also allows us to effectively manage our operations to ensure leaks are responded to and repaired within required timeframes.
Responding to leak reports and undertaking repairs	Prompt response and rectification of leaks reduce the potential for negative outcomes. Leak response is a top priority for our operational teams.
Leak surveys of mains	Proactive surveying of mains helps us identify, monitor and repair leaks before they become an issue or are detected by the public. Our Leak Management Plan outlines our leakage management frequencies. New technologies will be considered as our current leak survey vehicle reaches the end of its useful life.
Pressure reduction in areas with history of crack failure	The amount of gas released from a leak is related to the pressure within the gas mains. Where possible, we reduce network pressures to limit the volume of gas that might escape from a mains if a leak was to occur.

Description	Effectiveness
Gas odourisation to improve leak detection	Natural gas, in its natural form, is odourless. We odourise the gas so leaks can be detected by us and the public. Gas odourisation standards ensure gas is odourised to a level where it is discernible at 20% of the lower explosive limit.
Corrosion protection of steel mains	Corrosion protection increases the life of steel mains and reduces the likelihood of leaks.
Review of network condition and performance through Distribution System Performance Review (DSPR)	The monitoring of network performance allows us to identify trends in network performance and safety issues across asset classes to optimise safety outcomes.
Sampling program to improve information on condition and deterioration rates	Sampling mains helps us to proactively assess the condition of mains (through material testing) to better understand their condition.
Installation of ground vents over HDPE mains where ground conditions could seal gas leaks	It is common for leaks to occur on a gas distribution network. A leak, by itself, is not dangerous if the gas is venting to a safe location and never reaches a concentration where it has potential to become explosive. The installation of ground vents directs leaks (if they were to occur) to a safe location and not into enclosed spaces (e.g. within a building) where gas can build and become a hazard.

A combination of primary and complementary risk mitigation activities is proposed for the ongoing management of risk in our network.

3.3 Risk assessment outcomes by asset category

3.3.1 Failure events

As discussed in section 3.1.1, the primary risk consequences for mains and services are typically related to safety and security of supply (operations). The failure event that applies to each asset type can vary depending on the asset type, its use, and location. For example, HDPE mains are generally located in urban areas near buildings, leading to a safety risk. Other mains, such as large diameter protected steel may be located further away from buildings, but they supply many customers and therefore pose a significant supply risk.[6]

For each of the types of mains and services remaining in our network next AA period, we have defined a credible event/incident against which to assess risk. These are summarised in Table 3.3.

Table 3.3: Assessed credible risk event for each type of main and service

Asset type	Risk event	Primary risk consequence category	Severity
Protected steel mains	Pipeline corrodes and fails, causing leaks and supply integrity issues, including loss of supply to more than 1,000 customers connected to that section of the network.	Operations	Significant
HDPE 575 DN40 HP (Post 1993)	Pipeline cracks due to squeeze off failure, resulting in sudden release of gas that can gather in a building or other confined space in sufficient volumes to cause explosion if it comes into contact with an ignition source. This can cause serious harm or in extreme cases, death.	Health and safety	Major
HDPE 575 DN40 MP (Post 1993)	Pipeline cracks due to squeeze off failure, resulting in sudden release of gas that can gather in a building or other confined space in sufficient volumes to cause explosion if it comes into contact with an ignition source. This can cause serious harm or in extreme cases, death.	Health and safety	Major
Multi user sites	Pipelines corrode, crack, or are struck by a third party. The close proximity of services to the apartment building allows escaped gas to gather in or below the building in sufficient volumes to cause explosion if it comes into contact with an ignition source. This can cause serious harm, or in extreme cases, death.	Health and safety	Major
Redundant Services Removal	No gas usage or gas meter is at the house, customer likely unaware that a live service and standpipe is within the property boundary. Live infrastructure is damaged due to construction works, causing a leak and potential fire causing harm to people or property.	Health and safety	Significant
New PE	Main fails or is damaged resulting in sudden release of gas that can gather in a building or other confined space in sufficient volumes to cause explosion if it comes into contact with an ignition source. This can cause serious harm or in extreme cases, death.	Health and safety	Major

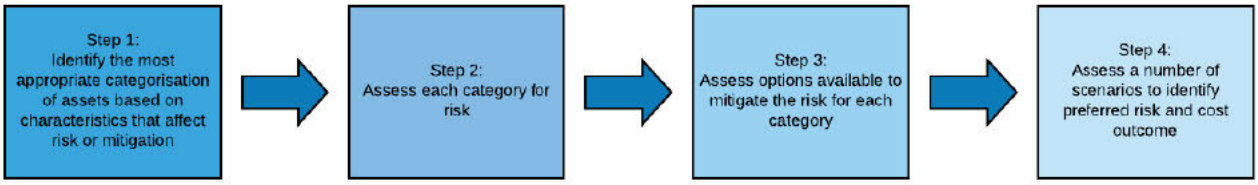
[6] Noting that some of our protected steel mains are located near buildings and therefore pose a significant safety risk too.

We have not conducted risk assessments for CI/UPS mains for the next AA period, as this asset type will have been completely removed from the network by the time the next AA period commences.

3.3.2 Assessing assets by characteristic

We have followed a four step approach to develop our DMSIP work program for the next AA period (see Figure 3.2).

Figure 3.2: Our approach to developing the mains and services replacement program



Historically, asset categorisation has focused on pressure, material and location. While these remain key determinants of risk, we have incorporated new information, performance and condition data to further delineate asset groups. This has allowed us to disaggregate asset categories further, identifying sections or families of assets within an asset class that have a different risk rating.

For example, HDPE 575 mains have been split into different categories based on diameter, pressure and whether they have been subject to our in-line camera inspection program, while MUS have been further disaggregated based on location, condition and compliance.

Based on the risk events and consequences outlined in Table 3.3 above, we have conducted a risk assessment for each subcategory of asset.

Table 3.4 (below) presents the risk assessment outcomes and the recommended risk treatment.

Table 3.4: Asset categories and associated risk and risk mitigation (treatment) in the next AA period

Asset category	Likelihood of risk event	Consequence of risk event	Untreated risk	Proactive risk treatment in next AA period	Treated risk
Protected steel – vintage main with highest leak rates	Unlikely	Significant	Moderate	Replace 12.6 km	Low
HDPE 575 DN40 HP (Post 1993)	Remote	Major	Moderate	Inspect and reinforce	Moderate (ALARP)
HDPE 575 DN40 MP (Post 1993)	Remote	Major	Moderate	Inspect and reinforce	Moderate (ALARP)
HDPE 575 – rest	Remote	Major	Moderate (ALARP)	Sample reinforcement clamps	Moderate (ALARP)
Protected steel – rest	Remote	Significant	Low	Inspect and enhance protection – as per SA201	Low
New PE	Rare	Major	Low	No proactive risk treatment proposed	Low
Service category			**Untreated Risk**	**Treatment in next AA**	**Treated Risk**
MUS - Priority group 2A	Remote	Major	Moderate	Replace	Low
MUS - Priority group 2B	Remote	Major	Moderate	Replace 150 sites. For the remaining sites, additional monitoring and leak survey activities and awareness campaign	Moderate (ALARP)
Service replacement	Unlikely	Significant	Moderate	Replace	Low
Redundant service removal	Unlikely	Significant	Moderate	Remove	Low

A brief discussion of the risk assessment outcomes for each asset type is provided in the following sections.

HDPE 575

The likelihood of a safety/gas in building event associated with HDPE in South Australia is rated unlikely. This means it is unlikely to occur within the life of the network, but possible when certain circumstances prevail.

We have rated the risk remote for these areas due to evidence of squeeze off failures in these parts of the network, as well as leak history. The likelihood of a safety/gas in building event for the rest of the HDPE 575 network is currently also considered remote. This means it is not anticipated but may occur if certain abnormal circumstances occur.

As a result, we propose the 105 km of HDPE 575 in South Australia to be prioritised for proactive risk treatment. This comprises in line camera inspection and reinforcing squeeze offs.

Protected steel

The likelihood of a supply (operations) event occurring on the 12.6km of protected steel mains in the proposed areas is considered unlikely. This is based on evidence that pipeline condition in these areas is deteriorating, and cathodic protection systems on these aged pipelines are less effective than in other regions. This give rise to a moderate risk under our framework, which must be addressed.

The likelihood of a supply risk event on the remaining balance of protected steel population is currently considered remote. A proactive replacement program is not necessary for these assets at this time.

New PE

New PE 80 and PE 100 mains are relatively new, are in good condition, and not expected to fail in the near future. The likelihood of a safety risk event is rare and has not been known to arise previously. These pipelines are expected to retain their integrity for 50 to 100 years. No proactive risk treatment is proposed for PE 80 and PE 100 mains at this time.

Multi user sites

The risk of a safety event for MUS in priority category 2A or 2B is considered moderate. While there is some possibility this group of services could fail, it is not expected unless abnormal circumstances prevail. However, the overall moderate rating means we must conduct work to reduce this risk to low or ALARP over a reasonable timeframe. We therefore aim to reduce the risk associated with the priority 2A MUS by the end of the period, and use leak surveys to monitor the balance of priority 2B MUS until they can all be replaced some time in the subsequent AA period.

MUS – Priority group 3 assets are low risk and there is no proactive risk treatment is proposed at this time.

Service replacements and removals

The likelihood of a safety/gas in building event associated with leaking services in South Australia is rated unlikely. This means it is unlikely to occur in within the life of the network, but possible when certain circumstances prevail. The redundant services warrant a proactive removal program within a reasonable timeframe to remove the risk. The service replacements are due to corrosion or damage, and we make safe and replace as soon as possible.

4 Options assessment

This section presents a number of options we considered for mitigating the risk associated with the four types of mains and services identified as requiring replacement and/or inspection during the next AA period. In each case we have considered options that achieve different levels of risk mitigation for a range of different costs, and have selected the option we believe is consistent with the actions of a prudent and efficient service provider, acting in accordance with accepted good industry practice to maintain and improve the safety of gas distribution services whilst minimising costs to customers.

When assessing each option, we have considered the following factors:

- Cost
- Risk reduction
- Consistency with our vision objectives

Satisfaction of the tests specified under the NGR, specifically those relating to prudence and efficiency under NGR 79(1) and (2).

Table 4.1 summarises the options considered for each asset type.

Table 4.1: Summary of distribution mains and services work program options

Option (* denotes the recommended option)	Estimated cost ($'000)	Treated risk	Consistent with vision objectives	Satisfies NGR 79
Protected steel				
Option 1* - Proactively replace 12.6 km of the highest risk mains. Unplanned replacement of approximately 5km of mains.	[redacted]	Low	Y	Y
Option 2 – Replace 45 km of mains to address ~20% of the calculated risk for the next AA period. Unplanned replacement of approximately 5km of mains	[redacted]	Low	Y	N
Option 3 – Replace 130 km of mains to address ~40% of the calculated risk for the next AA period. Unplanned replacement of approximately 5km of mains	[redacted]	Low	N	N
Option 4 – No proactive steel replacement. Unplanned replacement of approximately 5km of mains	[redacted]	Moderate	N	N

Option (* denotes the recommended option)	Estimated cost ($'000)	Treated risk	Consistent with vision objectives	Satisfies NGR 79
Vintage HDPE 575				
Option 1 – No proactive HDPE inspection – reactive works only	N/A	Moderate	N	N
Option 2* – Inspect and reinforce 105 km of the riskiest post 1993 HDPE mains in South Australia, and test 20 reinforcement clamp samples from across the network	[redacted]	Moderate (ALARP)	Y	Y
Option 3 – Inspect and reinforce all 240 km of post 1993 HDPE mains in South Australia, and test 20 reinforcement clamp samples from across the network	[redacted]	Moderate (ALARP)	Y	N
Services				
Option 1 – Maintain status quo – unplanned replacement only	[redacted]	Moderate	N	N
Option 2* – Replace all priority 2A and 2B MUS over 8 years and remove redundant services over 5 years	[redacted]	Moderate (ALARP)	Y	Y
Option 3 – Replace all priority 2A and 2B MUS and redundant services in next 5 years	[redacted]	Low	N	N

The following sections present further discussion of each option.

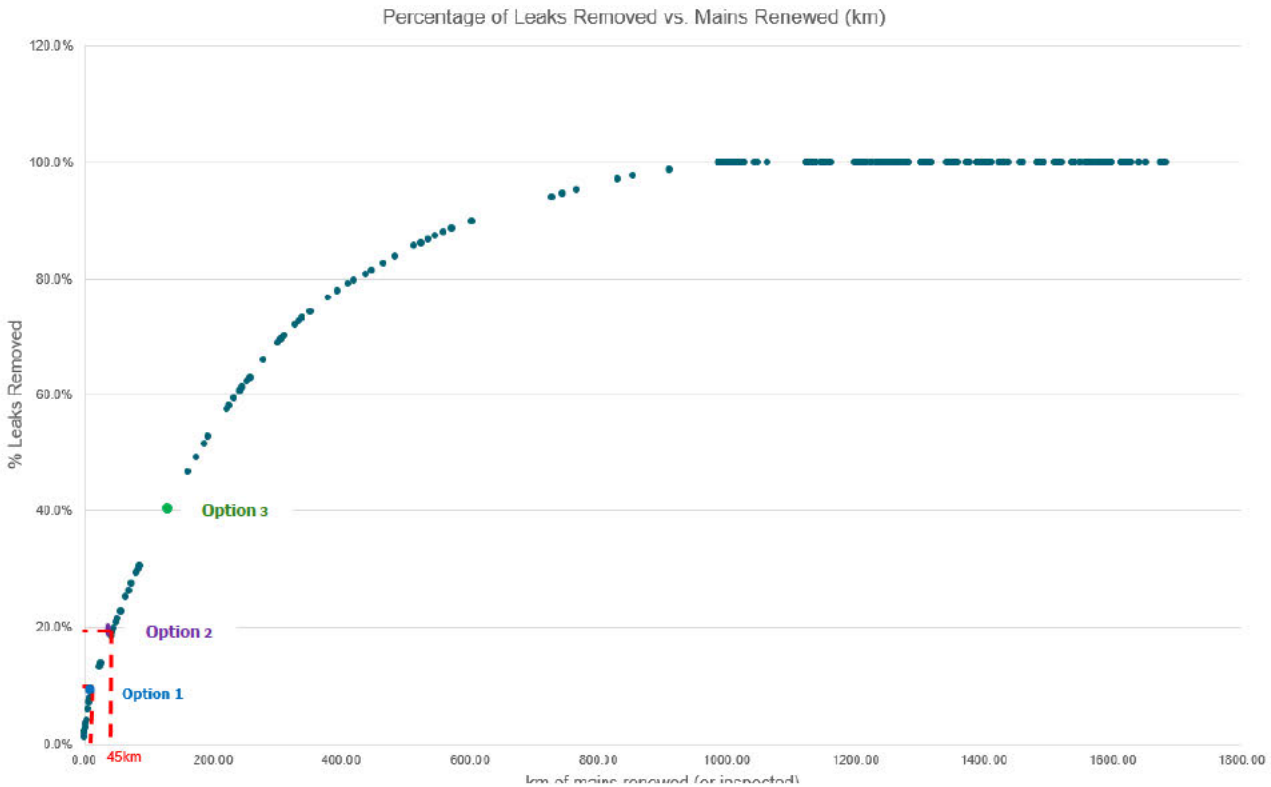
4.1 Protected steel

Some of the protected steel mains in our network are reaching 60 years old, and recent inspections indicate signs of deterioration. This asset class is therefore our next area of focus for replacement over the next 20 to 25 years. Rather than assume all our protected steel mains need replacing and immediately embarking on a large and expensive proactive replacement program, our plan is to replace a small number of the poorest condition/riskiest protected steel assets, and use data, unit rate costs, and samples from these mains (and other parts of the network) to inform a broader replacement program in the future.

Our options analysis considers the most prudent and efficient amount of protected steel mains to replace during the next AA period, striking a balance between risk reduction, cost, and providing sufficient data to inform our forward plans. As shown in Figure 4.1, the reported leaks on this asset class are associated with approximately 45 km of main (from a population of 1,624 km).[7] We have therefore considered options based on removing 10%, 20% and 40% of leakiest identified mains.

[7] Note this does not mean the remaining population of protected steel will not leak, rather the curve represents the fact that all the currently reported leaks relate to sections that comprise 1,683 km of main.

Figure 4.1: Comparative leak reduction per option



The 10% target was selected as it appears to represent the optimal leak reduction per km of mains replaced (based on current information). A 20% target was selected as a reasonable comparator, while 40% was selected as it represents an upper bound of what can reasonably be delivered for an efficient level of risk reduction during the next AA period.

In all options we are proposing a conservative replacement program, with the upper bound for replacement being less than 1% of the protected steel asset population. Evidence and data from the inspection, as well as ongoing leak reporting, will be used to update these leak rate assumptions for protected steel mains during the period.

Under all options we will also continue to conduct unplanned replacements of all types of mains (due to leaks/mains failure). We have based our forward forecasts on historical actuals and forecast ~5 km of unplanned mains.

4.1.1 Option 1 – Proactively replace 12.6 km of the highest risk mains

Under this option we will proactively replace 12.6 km of aged steel mains, predominantly located in a number of older established inner suburbs, surrounding the centre of Adelaide.

We will also conduct approximately 5 km of unplanned mains replacements (based on historical levels).

Under this option we would only complete the minimal proactive mains replacement to address the highest risk mains. The mains proposed for replacement have been identified based on a number of factors, including:

- Selecting sections of pipeline with the highest leak rate
- Highest density and sensitive areas

- Number of customers impacted by mains failure
- Age of mains

Based on current leak rates and asset information, we estimate replacing this 12.6 km of protected steel (0.78% of the asset base) will eliminate approximately 10% of the leakiest mains.

We will also conduct inspections of the removed/replaced mains to understand what is driving leaks.

4.1.1.1 Risk

As discussed in section 0, by eliminating these highest risk assets, Option 1 reduces the likelihood of a failure event impacting supply to >1,000 customers from occasional to remote. This will reduce the overall risk rating to low. Option 1 will also reduce the safety risk from moderate to low.

4.1.1.2 Cost assessment

The estimated cost of Option 1 is [redacted] million (see Table 4.2).

Table 4.2: Cost estimate – Protected steel replacement - Option 1, $'000 January 2025

Activity	2026/27	2027/2	2028/2	2029/3	2030/3	Total
Proactively replace 12.6 km of main	[redacted]	[redacted]	[redacted]1	[redacted]	[redacted]	[redacted]
Unplanned replacement of 5km	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Capex $('000)	[redacted]	[redacted]4	[redacted]	[redacted]	[redacted]	[redacted]

Further information on how costs were estimated is provided in section 5 of this DMSIP and in the Unit Rates Report.

4.1.1.3 Alignment with objectives

Table 4.3 shows how Option 1 aligns with our vision objectives.

Table 4.3: Alignment with vision objectives – Protected steel mains Option 1

Vision objective	Alignment
Customer Focussed - Public Safety	Y
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	-
A Leading Employer – Health and Safety	Y
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	Y
Operational Excellence – Benchmark Performance	-
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 1 enables us to address the supply risk to customers and the safety risk effectively, and therefore aligns with our objectives of being *Customer Focussed* and being *A Leading Employer*.

As Option 1 represents the lowest sustainable cost of addressing the risk and therefore aligns with our objective of practicing *Operational Excellence*.

4.1.1.4 Satisfaction of NGR

Option 1 meets the requirements of NGR 79(1) as eliminating the risk associated with these aged mains is consistent with good industry practice. It also reflects the actions of a prudent service provider as it achieves the desired risk outcome for the lowest cost, while providing sufficient information to enable AGN to develop an efficient replacement program over the longer term.

The proposed capex is justifiable under NGR 79(2)(i) and (ii) as it is necessary to maintain and improve the safety of services and maintain the integrity of services.

Option 1 satisfies NGR 74 as the forecast costs are based on the current contractual rates for previous work of a similar scope, and project options consider the asset management requirements as per the AGN South Australian Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

4.1.2 Option 2 – Proactively replace 45 km of the highest risk mains

This option is essentially the same as Option 1, however, we would expand the program to proactively replace 45 km of main with the highest leak rate. As shown in Figure 4.1 above, based on current information, replacing this protected steel will eliminate approximately 20% of the leakiest identified mains. As per Option 1, under Option 2 we will also conduct approximately 5 km of unplanned replacements.

4.1.2.1 Risk

By eliminating these highest risk assets, Option 2 reduces the likelihood of a failure event impacting supply to >1,000 customers from occasional to remote. This will reduce the overall risk rating to low.

Option 2 will also reduce the safety risk from moderate to low. However, it does this at a higher cost than Option 1.

4.1.2.2 Cost assessment

The estimated cost of Option 2 is [redacted] million (see Table 4.4).

Table 4.4: Cost estimate – Protected steel replacement - Option 2, $'000 January 2025

Activity	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Proactively replace 45 km of main	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unplanned replacement 5km	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Capex $('000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

4.1.2.3 Alignment with objectives

Table 4.5 shows how Option 2 aligns with our vision objectives.

Table 4.5: Alignment with vision objectives – Protected steel mains Option 2

Vision objective	Alignment
Customer Focussed - Public Safety	Y

Vision objective	Alignment
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	-
A Leading Employer – Health and Safety	Y
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	N
Operational Excellence – Benchmark Performance	-
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 2 enables us to address the supply and safety risk to customers effectively, and therefore aligns with our objectives of being *Customer Focussed* and being *A Leading Employer*.

However, we do not consider Option 2 represents the lowest sustainable cost of addressing the risk and therefore does not align with our objective of practicing *Operational Excellence*.

4.1.2.4 Satisfaction of NGR

Eliminating the risk associated with these aged mains is consistent with good industry practice. Option 2 as a standalone solution would also satisfy the requirements of NGR 79(1), as it reflects the actions of a prudent operator and represents a deliverable program at a sustainable cost. However, given Option 1 achieves a similar risk outcome but for a lower cost, it could be argued that Option 2 is less preferable under the Rules.

We consider it more prudent to undertake a smaller mains replacement program that sufficiently mitigates risk now (as per Option 1), and use that experience to inform a broader program in the future based on better information.

The proposed capex is justifiable under NGR 79(2)(i) and (ii) as it is necessary to maintain and improve the safety of services and maintain the integrity of services.

Option 2 satisfies NGR 74 as the forecast costs are based on the current contractual rates for work of a similar scope. Project options consider the asset management requirements as per the AGN South Australian Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

4.1.3 Option 3 – Proactively replace 130 km of the riskiest mains.

This option is essentially the same as Options 1 and 2, however, we would expand the program to proactively replace 130 km of main with the highest leak rate. Replacing these mains will eliminate approximately 40% of the currently estimated risk.

Under Option 3 we would also include the 5 km of unplanned replacement.

4.1.3.1 Risk

By eliminating these highest risk assets, Option 3 reduces the likelihood of a failure event impacting supply to >1,000 customers from occasional to remote. This will reduce the overall risk rating to low. However, it does this at a higher cost than Option 1 or 2.

4.1.3.2 Cost assessment

The estimated cost of Option 3 is [redacted] million (see Table 4.6).

Table 4.6: Cost estimate – Protected steel replacement - Option 3, $'000 January 2025

Activity	2026/27	2027/2	2028/2	2029/3	2030/3	Total
Proactively replace 130 km of main	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Unplanned replacement 5km	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Capex $('000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

4.1.3.3 Alignment with objectives

Table 4.7 shows how Option 3 aligns with our vision objectives.

Table 4.7: Alignment with vision objectives – Protected steel mains Option 3

Vision objective	Alignment
Customer Focussed - Public Safety	Y
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	-
A Leading Employer – Health and Safety	Y
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	N
Operational Excellence – Benchmark Performance	-
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 3 enables us to address the supply risk to customers and the safety risk effectively, and therefore aligns with our objectives of being *Customer Focussed* and being *A Leading Employer*.

However, we do not consider Option 3 represents the lowest sustainable cost of addressing the risk and therefore does not align with our objective of practicing Operational Excellence.

4.1.3.4 Satisfaction of NGR

Eliminating the risk associated with these aged mains is consistent with good industry practice. However Option 3 does not fully satisfy the requirements of NGR 79(1) as it does not address the risk outcome for the lowest cost. Further, immediately embarking on a high-volume, high-intensity replacement program may not represent the actions of a prudent operator given we do not have a full understanding of how this asset is currently performing.

We do not consider the additional cost to address 40% of the leaks is commensurate with the additional level of risk reduction compared to Options 1 and 2.

The proposed capex is justifiable under NGR 79(2)(i) and (ii) as it is necessary to maintain and improve the safety of services and maintain the integrity of services.

Option 3 satisfies NGR 74 as the forecast costs are based on the current contractual rates for work of a similar scope. Project options consider the asset management requirements as per the AGN South Australian Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

4.1.4 Option 4 - No proactive steel replacement – unplanned replacement mains only

Under this option we would not complete any proactive replacements. Instead, we would replace any failing protected steel mains on an unplanned basis as part of the broader 5km allowance. Based on historical unplanned replacement, we assume approximately 5 km of main would need to be replaced during the next AA period.

Sampling and testing would not be conducted.

4.1.4.1 Risk

The supply and safety risk associated with the protected steel mains in the network is rated moderate. Option 4 would do little to reduce this risk.

4.1.4.2 Cost assessment

Option 4 results in no upfront capital costs but would include the [redacted] million unplanned replacement as a minimum. However, it may give rise to a more costly mains replacement program in the future if no sampling is undertaken and we do not take the opportunity learn more about the performance and condition of the protected steel assets.

Further, unplanned replacement following mains failure is significantly more expensive than scheduled, proactive replacement.

4.1.4.3 Alignment with objectives

Table 4.8 shows how Option 4 aligns with our vision objectives.

Table 4.8: Alignment with vision objectives – Protected steel mains Option 4

Vision objective	Alignment
Customer Focussed - Public Safety	N
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	-
A Leading Employer – Health and Safety	N
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	N
Operational Excellence – Benchmark Performance	-

Vision objective	Alignment
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 4 does not align with any of our vision objectives. By taking no proactive action to manage the supply or safety risk associated with an asset class known to be deteriorating, we are not being *Customer Focussed.* Further, by taking no action to more fully understand the nature and failure mode of our assets, we are potentially exposing our employees to harm.

While Option 4 is the cheapest option in the short term, it is likely to give rise to a more expensive mains replacement program over the long term. It therefore does not align with practicing *Operational Excellence*.

4.1.4.4 Satisfaction of NGR

Option 4 does not meet the requirements of NGR 79(1), as it does not mitigate the known risk associated with protected steel mains in the network and therefore does not reflect the actions of a prudent service provider.

Similarly, Option 4 does not satisfy any of the limbs of NGR 79(2).

4.1.5 Recommended option

Option 1 is the recommended option. Option 1 reflects the most efficient balance between risk reduction and cost, addressing 10% of the identified risk at a significantly lower cost than the other options.

We consider this targeted replacement program reflects prudent asset management and is in the best interest of customers and the long term integrity of the network.

4.2 HDPE mains inspection, reinforcement and testing

Vintage HDPE mains are a focus in our DMSIP because of the known brittleness of the earlier grades. HDPE 575 is susceptible to cracking, primarily due to squeeze off failure. The failure mode and proximity of HDPE 575 to buildings means there is a risk of a safety/gas in building event upon failure, in some circumstances.

We have successfully tested a new camera to allow inspection of DN40 HDPE 575 mains. A 20 km program is planned to be completed in Port Pirie by June 2026. The 20 km were initially part of the replacement program as the existing camera could not be used in mains with a small (40mm) diameter. The new camera is able to inspect these mains which will now be inspected and reinforced instead of replaced. The remaining pre 1993 DN40 medium pressure mains and post 1993 DN40 mains in suburbs which has a history of squeeze off leaks will use this new camera and reinforcement method.

In addition to the camera inspection and reinforcement, our plan is to continue testing the efficacy of the reinforcement clamps previously installed on HDPE 575 mains (in partnership with Deakin University).

We do not propose to undertake a broad mains replacement program at this time. Rather we propose to use data from the inspection, reinforcement and testing program to extend the life of the assets and inform a prudent and efficient mains replacement program in the future. Our options analysis in this DMSIP therefore considers the appropriate volume of mains to inspect, reinforce and test during the next AA period.

4.2.1 Option 1 – No proactive HDPE inspection, reactive works only

Under this option we would not complete any replacement or proactive inspection and reinforcement campaign to reduce the safety risk in the South Australian network to address SCG at squeeze off locations. Instead, we would address leaks on a reactive basis only and monitor.

Sampling and testing would not continue.

4.2.1.1 Risk

The current risk associated with HDPE mains in South Australia is rated moderate. Ceasing inspection and sampling will not address this risk.

4.2.1.2 Cost assessment

Option 1 results in no upfront capital costs. However, it may give rise to reactive replacements following mains failure which is significantly more expensive than targeted camera inspection and reinforcement.

4.2.1.3 Alignment with objectives

Table 4.9 shows how Option 1 aligns with our vision objectives.

Table 4.9: Alignment with vision objectives – HDPE inspection, reinforcement and testing Option 1

Vision objective	Alignment
Customer Focussed - Public Safety	N
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	-
A Leading Employer – Health and Safety	N
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	N
Operational Excellence – Benchmark Performance	-
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 1 does not align with any of our vision objectives. By taking no proactive action to manage the safety risk associated with an asset class known to be deteriorating, we are not being *Customer Focussed.* Further, by taking no action to more fully understand the nature and failure mode of our assets, we are potentially exposing our employees to harm.

While Option 1 is the cheapest option in the short term, it is may give rise to more expensive reactive mains replacement It therefore does not align with practicing *Operational Excellence*.

4.2.1.4 Satisfaction of NGR

Option 1 does not meet the requirements of NGR 79(1), as it does not mitigate the known risk associated with HDPE 575 mains and therefore does not reflect the actions of a prudent service provider.

Similarly, Option 1 does not satisfy any of the limbs of NGR 79(2).

4.2.2 Option 2 - Inspect and reinforce 105 km of the riskiest HDPE mains and test ~20 reinforcement clamp samples from across the network

Option 2 targets inspections and reinforcements on the HDPE 575 mains in networks which have seen squeeze off leaks. Due to the historic leaks, there is a precedent that more of these networks are at higher risk. The mains proposed consist of 8 km of high pressure and 97 km of medium pressure post 1993 HDPE 575.

Under Option 2, the sampling and testing campaign with Deakin University would continue, taking samples of reinforcement clamps on HDPE 575 from approximately 20 sites across the network.

4.2.2.1 Risk

The current risk associated with HDPE mains in South Australia is rated moderate. Undertaking inspection and reinforcement will mitigate the risk of squeeze off failure in these areas, reducing the risk to moderate (ALARP). Note a low risk rating will not be achieved until all HDPE 575 has been inspected, however inspecting these highest risk sections will manage the risk to ALARP.

4.2.2.2 Cost assessment

The estimated cost of Option 2 is [redacted] million (see Table 4.10).

Table 4.10: Cost estimate – HDPE inspection, reinforcement and testing - Option 2, $'000 January 2025

Activity	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Inspect and reinforce 105 km of HDPE 575 main	[redacted]					
Sample ~20 sites	[redacted]					
Total Capex $('000)	[redacted]					

Further information on how costs were estimated is provided in section 5 of this DMSIP and in the Unit Rates Report.

4.2.2.3 Alignment with objectives

Table 4.11 shows how Option 2 aligns with our vision objectives.

Table 4.11: Alignment with vision objectives – HDPE inspection, reinforcement and testing Option 2

Vision objective	Alignment
Customer Focussed - Public Safety	Y
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	Y

Vision objective	Alignment
A Leading Employer – Health and Safety	Y
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	-
Operational Excellence – Benchmark Performance	Y
Operational Excellence – Reliability	Y
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 2 enables us to address the safety risk associated with HDPE 575 and therefore aligns with our objectives of being *Customer Focussed* and being *A Leading Employer*.

As Option 2 represents the lowest sustainable cost of addressing the risk, it aligns with our objective of practicing *Operational Excellence*.

4.2.2.4 Satisfaction of NGR

Option 2 meets the requirements of NGR 79(1) as eliminating the risk associated with these vintage HDPE mains is consistent with good industry practice. It also reflects the actions of a prudent service provider as it achieves the desired risk outcome for the lowest cost, while providing sufficient information to enable AGN to develop an efficient replacement program over the longer term.

The proposed capex is justifiable under NGR 79(2)(i) and (ii) as it is necessary to maintain and improve the safety of services and maintain the integrity of services.

Option 2 satisfies NGR 74 as the forecast costs are based on the current contractual rates for work of a similar scope. Project options consider the asset management requirements as per the AGN South Australian Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

4.2.3 Option 3 – Inspect and reinforce all post 1993 HDPE 575 (240 km) in South Australia, and test ~20 samples from across the network

Option 3 is similar to Option 2, however under Option 3 we would inspect and reinforce all post 1993 HDPE 575 installed in South Australia. Inspecting all mains laid post 1993 means we are targeting all assets that were subject to squeeze offs. This is approximately 240 km of main.

The sampling and testing campaign with Deakin University would continue, taking samples of reinforcement clamps on HDPE 575 from 20 sites across the network.

4.2.3.1 Risk

The current risk associated with HDPE mains in South Australia is rated moderate. Undertaking inspection and reinforcement will mitigate the risk of squeeze off failure in these areas, reducing the risk to moderate (ALARP). Note a low risk rating will not be achieved until all HDPE 575 has been inspected, however inspecting these highest risk sections will manage the risk to ALARP.

4.2.3.2 Cost assessment

The estimated cost of Option 3 is [redacted] million (see Table 4.12).

Table 4.12: Cost estimate – HDPE inspection, reinforcement and testing - Option 3, $'000 January 2025

Activity	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Inspect and reinforce 240 km of HDPE 575 mains	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sample ~20 sites	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Capex $('000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Further information on how costs were estimated is provided in section 5 of this DMSIP and in the Unit Rates Report.

4.2.3.3 Alignment with objectives

Table 4.13 shows how Option 3 aligns with our vision objectives.

Table 4.13: Alignment with vision objectives – HDPE inspection, reinforcement and testing Option 3

Vision objective	Alignment
Customer Focussed - Public Safety	Y
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	Y
A Leading Employer – Health and Safety	Y
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	Y
Operational Excellence – Benchmark Performance	Y
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 3 enables us to address the safety risk associated with HDPE 575 in South Australia and therefore aligns with our objectives of *Customer Focussed* and being *A Leading Employer*.

While Option 3 is not the lowest sustainable cost of addressing the risk, it does represent a more efficient method of addressing the overall risk associated with HDPE 575 than replacement. Inspection of all the post 1993 assets at a relatively low cost is considered a prudent Asset Management approach and therefore Option 3 can be considered to be *Sustainably Cost Efficient*.

4.2.3.4 Satisfaction of NGR

Eliminating the risk associated with these aged mains is consistent with good industry practice. However, Option 3 may not fully satisfy the requirements of NGR 79(1) as it does not address the risk outcome for the lowest sustainable cost.

The proposed capex is justifiable under NGR 79(2)(i) and (ii) as it is necessary to maintain and improve the safety of services and maintain the integrity of services.

Option 3 satisfies NGR 74 as the forecast costs are based on the current contractual rates for work of a similar scope. Project options consider the asset management requirements as per the AGN South Australian Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

4.2.4 Recommended option

Option 2 is the recommended option. Option 2 reflects the most efficient balance between risk reduction and cost, and will provide valuable information to inform prudent management of HDPE assets going forward. While Option 3 is also a credible option, the additional cost of inspecting and reinforcing all 240 km of main is not commensurate with only achieving a marginally greater risk reduction.

We consider this targeted inspection program, combined with proactive sampling and assessment of reinforcement clamps on HDPE mains reflects prudent asset management, and is in the best interest of customers and the long term integrity of the network.

4.3 Services replacement

Our services replacement program for the next AA period comprises three major components:

- Replacement of multi user sites
- Unplanned (reactive) service replacement
- Removing redundant services

Unplanned service replacement (i.e. replacing services that have failed or have been reported to be in very poor condition) is an ongoing program and therefore features in any services replacement program proposed going forward. Similarly, the risk posed by redundant services is avoidable and one that, as a prudent operator, we must address within a reasonable timeframe. We have therefore factored redundant service removals into all options.

Our options analysis for services therefore focuses on the timing of removing the highest risk MUS. We have categorised our MUS into four groups of descending priority. All priority 1 MUS have been removed from the network, while priority 3 MUS are low risk and do not require any proactive replacement at this time.

This leaves approximately 1,200 priority 2A and 2B sites, which comprise assets made from aged ferrous materials and/or installed in non-compliant locations. Based on our current delivery capability and our understanding of the complexity of MUS installation, we consider it will take 7-8 years to replace all the priority 2 assets. However, we have given consideration to whether we should accelerate our MUS program and aim to remove all priority 2 MUS within the next AA period (five years). Our options analysis is presented in the following sections.

4.3.1 Option 1 – Unplanned services replacement only

Under Option 1, we would not conduct any proactive MUS replacement. Instead, we would replace only when they fail. Unplanned replacement rates would be based on historical volumes (approx 490 per year).

We would also take no proactive measures to remove redundant services, instead only removing these services when they leak or when the customer requests that they be removed.

4.3.1.1 Risk

The current risk associated with priority group 1 MUS is rated high. Only conducting unplanned replacement will not address this risk. This option would also do little or nothing to address the risk associated with redundant services on customers' property.

4.3.1.2 Cost assessment

The estimated cost of Option 1 is [redacted] million (see Table 4.14).

Table 4.14: Cost estimate – Services replacement - Option 1, $'000 January 2025

Activity	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Replace MUS	-	-	-	-	-	-
Unplanned replacement of 2,450 standard services	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Redundant services removal (opex)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Capex $('000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Opex $('000)	-	-	-	-	-	-

Note the actual cost incurred on unplanned replacements will necessarily vary from forecast, as we cannot accurately predict how many and what type of services will fail during the period, where they will be located, and when they will fail.

4.3.1.3 Alignment with objectives

Table 4.15 shows how Option 1 aligns with our vision objectives.

Table 4.15: Alignment with vision objectives – MUS replacement Option 1

Vision objective	Alignment
Customer Focussed - Public Safety	N
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	N
A Leading Employer – Health and Safety	N
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	N
Operational Excellence – Benchmark Performance	N
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-

Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 1 does not align with any of our vision objectives. By taking no proactive action to manage these high risk assets, we are not *Customer Focussed* and are potentially exposing our employees to greater risk of harm.

While Option 1 is the cheapest option in the short term, it is likely to result in an expensive unplanned replacement program if more of the highest priority (and poorest condition) MUS fail than is anticipated. There is also the potential for financial penalties in the event of a major incident or non-compliance. Option 1 therefore is not consistent with practicing *Operational Excellence*.

There is no viable alternative to replacing standard services, which is an ongoing program of works that has been in place for multiple regulatory periods and continues to meet our vision and values.

4.3.1.4 Satisfaction of NGR

Option 1 does not meet the requirements of NGR 79(1) for MUS, as it does not mitigate the known risk associated with MUS services, and therefore does not reflect the actions of a prudent service provider.

Similarly, Option 1 does not satisfy any of the limbs of NGR 79(2) with regards to MUS.

4.3.2 Option 2 - Replace MUS at all priority 2 sites over 8 years and replace all currently known redundant services over 5 years

Under Option 2, we would proactively replace the 810 priority 2A MUS and 150 of the priority 2B MUS. We would increase monitoring and inspection of the outstanding priority 3 sites.[8] The replacement of the remainder of the priority 2B MUS would be in the following regulatory period.

We would also include provision for unplanned service replacement based on historical volumes, and would remove all 3,500 identified redundant services by the end of the AA period.

4.3.2.1 Risk

As discussed in section 0, the current risk associated with priority 2 MUS is moderate. By replacing the priority 2A MUS, the risk associated with these assets will reduce to low. The risk associated with the remaining priority 2B MUS will remain moderate, however, the additional inspection and monitoring of the assets will allow us to manage this to ALARP.

4.3.2.2 Cost assessment

The estimated cost of Option 2 is [redacted] million (see Table 4.16).

Table 4.16: Cost estimate – MUS replacement - Option 2, $'000 January 2025

Activity	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Replace 960 priority 2 MUS	[redacted]					
Unplanned replacement of 2,450 services	[redacted]					
Redundant services removal (Opex)	[redacted]					

[8] Note the increased monitoring/inspection required under this program would form part of our ongoing opex program.

Total Capex $('000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Opex $('000)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Further information on how costs were estimated is provided in the Unit Rates Report.

4.3.2.3 Alignment with objectives

Table 4.17 shows how Option 2 aligns with our vision objectives.

Table 4.17: Alignment with vision objectives – MUS replacement Option 2

Vision objective	Alignment
Customer Focussed - Public Safety	Y
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	-
A Leading Employer – Health and Safety	Y
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	Y
Operational Excellence – Benchmark Performance	Y
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-
Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 2 enables us to address the safety risk associated priority 2 MUS, and therefore aligns with our objectives of *Customer Focussed* and being *A Leading Employer*.

As Option 2 represents the lowest sustainable cost of addressing the risk and therefore aligns with our objective of being *Operational Excellence*.

4.3.2.4 Satisfaction of NGR

Option 2 meets the requirements of NGR 79(1) as eliminating the risk associated with these MUS is consistent with good industry practice. It also reflects the actions of a prudent service provider as it achieves the desired risk outcome for the lowest cost, while providing sufficient information to enable AGN to develop an efficient replacement for the remaining MUS's in the next regulatory period as required.

The proposed capex is justifiable under NGR 79(2)(i) and (ii) as it is necessary to maintain and improve the safety of services and maintain the integrity of services.

Option 2 satisfies NGR 74 as the forecast costs are based on the current contractual rates for work of a similar scope. Project options consider the asset management requirements as per the AGN South Australia Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

4.3.3 Option 3 - Replace MUS all priority 2 sites and remove all currently known redundant services over 5 years

Under Option 3, we would proactively replace all 810 priority 2A MUS sites, and all 467 priority 2B MUS sites within the next AA period.

We would also include provision for unplanned service replacement, based on historical volumes, and would remove all 3,500 identified redundant services by the end of the AA period.

4.3.3.1 Risk

As discussed in section 0, the current risk associated with priority 2 MUS is moderate. By replacing all priority 2, the risk associated with all these assets will reduce to low.

4.3.3.2 Cost assessment

The estimated cost of Option 3 is [redacted] million (see Table 4.18).

Table 4.18: Cost estimate – MUS replacement - Option 3, $'000 January 2025

Activity	2026/27	2027/28	2028/29	2029/30	2030/31	Total
Replace all priority 2 MUS (1,280)	[redacted]					
Unplanned replacement of 2,450 services	[redacted]					
Redundant services removal (opex)	[redacted]					
Total Capex $('000)	[redacted]					
Total Opex $('000)	[redacted]					

Further information on how costs were estimated is provided in Attachment 9.10 Unit Rates Report.

4.3.3.3 Alignment with objectives

Table 4.19 shows how Option 3 aligns with our vision objectives.

Table 4.19: Alignment with vision objectives – MUS replacement Option 3

Vision objective	Alignment
Customer Focussed - Public Safety	Y
Customer Focussed – Customer Experience	-
Customer Focussed – Cost Efficient	-
A Leading Employer – Health and Safety	Y
A Leading Employer – Employee Experience	-
A Leading Employer – Skills Development	-
Operational Excellence – Profitable Growth	N
Operational Excellence – Benchmark Performance	Y
Operational Excellence – Reliability	-
Sustainable Communities – Enabling Net Zero	-

Sustainable Communities – Environmentally Focussed	-
Sustainable Communities – Socially Responsible	-

Option 3 enables us to address the safety risk associated priority 2 and 3 MUS, and therefore aligns with our objectives of *Customer Focussed* and being *A Leading Employer*.

As Option 3 achieves a greater risk reduction and is a socially responsible activity, however, we consider the additional cost to deliver this in the next period is unnecessary, places greater impact on customers' costs, and therefore does not fully align with our objective of practicing *Operational Excellence*.

4.3.3.4 Satisfaction of NGR

Eliminating the risk associated with these services is consistent with good industry practice. However, Option 3 does not fully satisfy the requirements of NGR 79(1) as it does not address the risk outcome for the lowest sustainable cost.

The proposed capex is justifiable under NGR 79(2)(i) and (ii) as it is necessary to maintain and improve the safety of services and maintain the integrity of services.

Option 3 satisfies NGR 74 as the forecast costs are based on the current contractual rates for work of a similar scope. Project options consider the asset management requirements as per the AGN South Australian Asset Management Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

4.3.4 Recommended option

Option 2 is the recommended option. Option 2 reflects the most efficient balance between risk reduction and cost. Replacing the priority 2A MUS reduces the risk associated with these assets to low, while the additional inspection and monitoring of the remaining inventory of MUS will manage this to Low. While Option 3 is also credible option, the additional cost of reducing the risk more quickly is not considered prudent or necessary at this time.

5 Cost estimation method

The cost of the program for the next AA period has been estimated by multiplying the volume of mains/services to be replaced or inspected by the unit rate cost of replacing or inspecting the mains/services. The unit rate differs for asset type and inspection/replacement approach. Unit rates reflect the most relevant actual cost incurred or the price resulting from a tender process.

5.1 Mains replacement

The unit rate for mains replacement differs depending on whether the mains are replaced in a planned or unplanned fashion, whether the replacement occurs through direct bury or insertion, and the material being replaced. Directly burying mains is more costly than insertion. Replacing steel mains is more costly than HDPE due to the cost of materials, fittings and labour.

Further information on how the unit rates have been derived is included in Attachment 9.10 Unit Rates Report.

5.2 In line camera inspection

In line camera inspection will occur on the HDPE 575 DN40 mains due to the relatively low cost and the success evidenced to date for the reduction of risk associated with squeeze off failure. If we identify any squeeze offs or concerns during the course of the camera inspection program, we will undertake the necessary reinforcement work. An assumption of a reinforcement every 50 to 80 metres is built into this program.

The cost of in line camera inspection is based on the most recent costs incurred for this work. The cost of reinforcements is also based on the same work in the current program.

5.3 Multi user sites replacement

The cost of replacing MUS is developed using weighted average of historical actuals. This approach is taken because the scope and complexity of the work is subject to a high degree of variability. The cost of an individual MUS varies depending on the number of individual services, location and other site specific factors.

Further information on the MUS unit rates applied is included in Attachment 9.10 Unit Rates Report.

5.4 Forecast cost for the next AA

There are four categories of assets that will be replaced or inspected in the next AA period. The forecast for unplanned replacement costs reflects the level of unplanned replacement required in the current AA period.

Table 5.1 presents an overall summary for costs DMSIP costs for the next AA period.

Table 5.1: Mains and services program 2026/27 to 2031/32, $'000 January 2025

Project	Unit rate ($'000)	Estimated cost ($'000)	Basis of estimate
Protected steel			
Proactively replace 12.6 km of protected steel main	[redacted]	[redacted]	Estimate based on similar projects
Unplanned 5 km of general mains	[redacted]	[redacted]	Based on proactive cost (above).
HDPE			
Inspect and reinforce 105 km of HDPE 575 main	[redacted]	[redacted]	Estimated based on SA actuals
Sample ~20 sites	[redacted]	[redacted]	Estimated based on Operations actuals.
Services			
Replace 810 priority 2A and 150 2B MUS	[redacted]	[redacted]	Estimated based on SA actuals
Unplanned replacement of 2,450 services	[redacted]	[redacted]	Estimated based on SA actuals
Removal of 3,500 redundant services (opex)	[redacted]	[redacted]	Based on actuals[redacted]
Integrity			
Replacement of Leak Survey	[redacted]	[redacted]	Vendor
Total		[redacted]	

Total DMSIP costs for the next AA period are forecast to be [redacted] million.

5.4.1 Delivery capability

We have assessed our capability to deliver the program outlined for the next AA period. Given the significantly lower volume of works compared to the current AA period, we do not anticipate any deliverability constraints. The only program limited by resources is the MUS campaign, which is sized the same as the current program (when including MUS renewed as part of the current mains replacement program) and no issues are foreseen in the next AA.

We consider the program can be delivered adopting a similar delivery strategy to that used currently. Like in the current AA period, most of the work in the next AA period will be conducted by external contractors engaged to deliver in accordance with commercially negotiated unit rates agreed to as a result of a competitive tender. An internal labour crew will be maintained to ensure hands-on experience with the complexity, health, safety, and environmental requirements of our DMSIP work program.

We promote efficient delivery of the program by ensuring tenders are released to market in advance of the scheduled work execution. This ensures planning, budgeting, negotiation and execution cycles align, which helps drive a cost-effective program. Resource planning is optimised and transfer of information and knowledge between AGN, APA and any delivery contracting parties done in a

measured and controlled manner. It also ensures our contractors can be issued stages of work in a way that minimises interference between adjacent areas and minimises impact on customers.

We report regularly to OTR on progress of our mains replacement program, and a number of other measures/indicators are also available for review, including:

- **Contractor competency audit results** – competency audits are completed before a contractor commences a project, as part of the pre-start process
- **Contractor monthly key performance indicator (KPI) reports** – these KPIs cover work quality and safety (among other items) with KPIs benchmarked and compared across contractors monthly. Contractors also undergo fatal risk activity reviews, which involves a field audit tool that allows specific checks on items that impact site risk, ranging from Safe Work Method Statements to special procedure requirements (hot tap, deep excavations, etc)

We are committed to transparency of reporting on the effectiveness of our risk reduction program. We are confident we have the processes and measures in place (both internally and with our third party delivery partners) to ensure the mains and services replacement program can be delivered to appropriate standards.