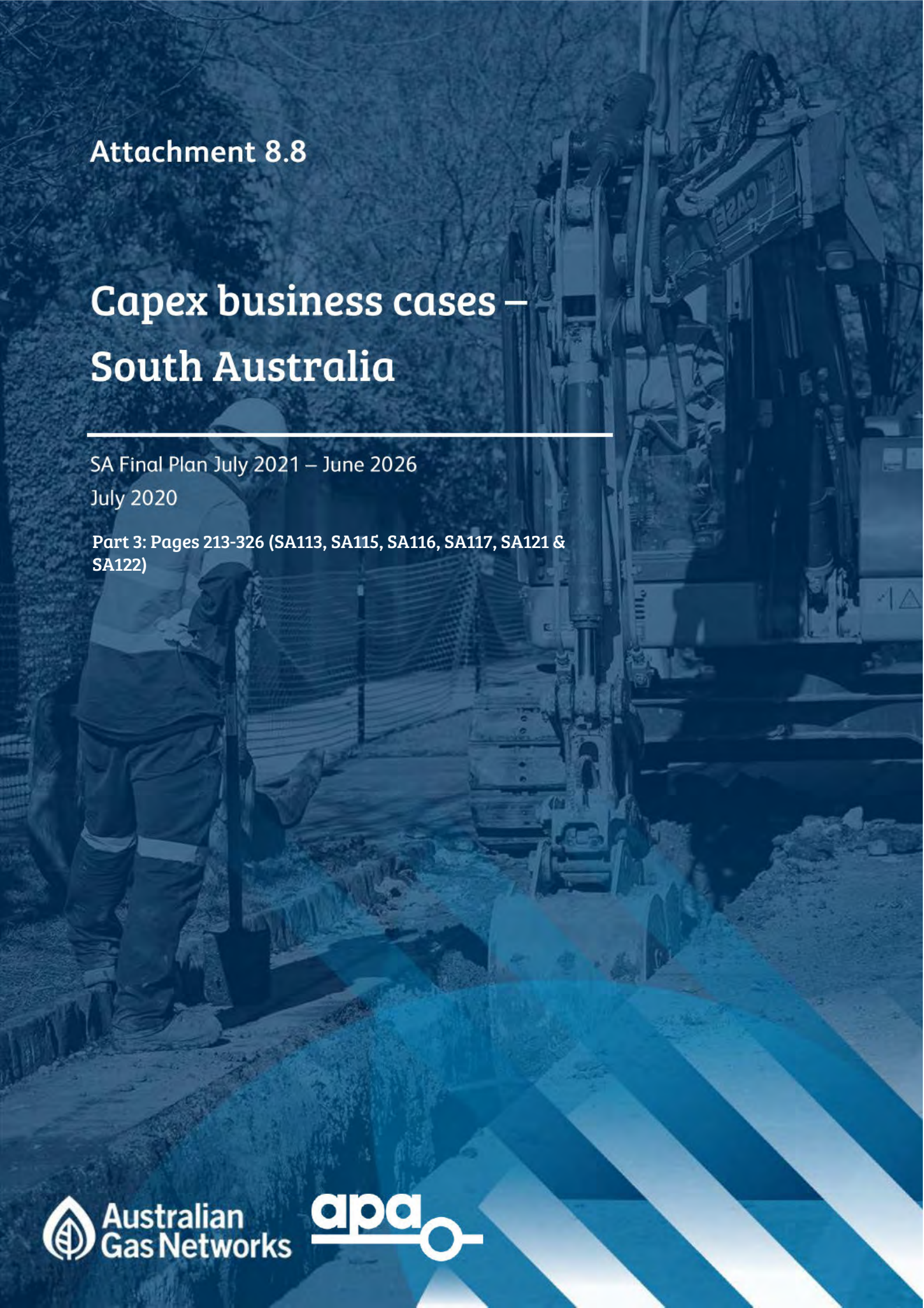

Attachment 8.8

Capex business cases – South Australia

SA Final Plan July 2021 – June 2026

July 2020

Part 3: Pages 213-326 (SA113, SA115, SA116, SA117, SA121 & SA122)

Australian Gas Networks

apa

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SA113 – Plant and equipment

1.1 Project approvals

Table 1.1: Business case SA113 – Project approvals

Prepared by	Shahram Dehbokri, Program Coordinator Field Operations SA, APA
Reviewed by	Robin Gray, State Operations Manager SA, APA
Approved by	Ken Hedley, General Manager Operations, APA Mark Beech, General Manager Network Operations, AGN

1.2 Project overview

Table 1.2: Business case SA113 – Project overview

Description of the problem / opportunity	The SA natural gas distribution networks include approximately 8,000 km of pipelines that deliver gas to over 450,000 consumers. A standard suite of plant and equipment is required on an ongoing basis to enable our workforce to conduct repair and alteration work on the pipelines and other gas asset infrastructure. This equipment is used for activities such as flow stopping, underground asset detection, gas detection, welding and fusion, and pressure testing. As existing plant and equipment age, they must be replaced before they become unfit for purpose (either due to wear or obsolescence). Technological advancements or changes in standards can also drive the need for new types of equipment. There are three key categories of plant and equipment (P&E) expenditure: • **Small P&E** – general (small value) replacement and new plant and equipment items that require ongoing purchase each year; • **Vehicles** – trucks and other vehicles, which are replaced as and when they become unsafe or it becomes inefficient to continue to use and maintain them; and • **High pressure flow stopping** – stopple equipment, which used to flow stop high pressure steel pipelines, enabling the safe isolation of the gas supply and controlled gas release. Ongoing proactive investment in new and replacement plant and equipment helps create a safe working environment for all employees and contractors by providing plant, tools and equipment that are in good working order, fit for purpose and tested/calibrated (as required) to the required standard. This business case considers the cost of continuing the current proactive replacement of plant and equipment, or whether it would be more prudent to move to a reactive 'replace on failure' approach.
Untreated risk	As per risk matrix = **High**
Options considered	• **Option 1** – Cease the proactive purchase of all plant and equipment. Replace plant and equipment reactively as and when equipment fails (no additional upfront capital cost) • **Option 2** – Continue to proactively replace plant and equipment as and when it becomes unsafe or inefficient to continue using existing equipment ($4.5 million) As there are no reasonable and practicable alternatives to the ongoing use of these plant and equipment items, no other options have been considered in this business case.
Proposed solution	Option 2 is the recommended option. We will continue of the current practice of procuring and replacing appropriate plant and equipment necessary to install, repair and maintain natural gas assets. We will replace of out-of-service hot tap and stoppling equipment, as well as replacing the anticipated number of vehicles that will become unsafe or inefficient to continue to use and maintain during the access arrangement (AA) period. Option 1 would lead to safety and reliability issues in the event of equipment failure during either planned or emergency situations, and as such, this option is not considered viable.

Estimated cost	The forecast direct capital cost (excluding overhead) during the next AA period (July 2021 to June 2026) is $4.5 million.

$'000 2019/20	21/22	22/23	23/24	24/25	25/26	Total
Plant & equipment	1,077.6	1,077.6	747.6	747.6	867.6	4,518.1

Basis of costs	All costs in this business case are expressed in real unescalated dollars at December 2019 unless otherwise stated. Some tables may not add due to rounding.
Alignment to our vision	This project aligns with the *Delivering for Customers* and A Good Employer aspects of our vision, as it will lead to employee and public safety standards being maintained. Having fit for purpose P&E readily available will also enable us to maintain reliability levels and respond quickly during an emergency. This option is also *Sustainably Cost Efficient*, as proactive purchase of P&E as part of a scheduled ongoing program is considerably more cost effective than purchasing P&E on a reactive basis. We also seek to replace P&E with new and/or improved technologies, where that new P&E allows us to operate more efficiently (without compromising safety).
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed solution is consistent with good industry practice, several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing this service. **NGR 79(2)** – proposed capex is justifiable under NGR 79(2)(c)(i), as it is necessary to maintain and improve the safety of services. **NGR 74** – the forecast costs of P&E are based on the latest market estimates, costs and operational experience. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Treated risk	As per risk matrix = **Moderate**
Stakeholder engagement	We are committed to operating our networks in a manner that is consistent with the long-term interests of our customers. To facilitate this, we conduct regular stakeholder engagement to understand and respond to the priorities of our customers and stakeholders. Feedback from stakeholders is built into our asset management considerations and is an important input when developing and reviewing our expenditure programs. Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect us to deliver a high level of public safety and are satisfied that this is current practice. The ongoing proactive purchase of P&E will help us maintain public safety and reliability of supply, and is therefore consistent with the practices customers have told us they value.
Other relevant documents	• Attachment 8.2 Strategic Asset Management Plan

1.3 Background

The SA natural gas distribution networks include approximately 8,000 km of gas mains, which deliver gas to over 450,000 consumers.

Our operational asset groups (Asset Protection, Planned Maintenance, Systems Monitoring and Field Operations) use a variety of plant and equipment and small capital items to undertake planned and reactive works to maintain and extend the network. These activities include:

- flow stopping – safely stopping the flow of gas when isolating a section of gas mains for such things as connecting new subdivisions to grow the network, to accommodate network alterations and to isolate the supply of gas in the event of an emergency;
- underground asset detection – identification and location of underground assets prior to, and during, excavation activities;

- gas detection – location and classification of asset gas leaks as well as accurate assessment of gas levels during commissioning and decommissioning activities;
- polyethylene welding and fusion – welding on fittings and joints during operational activities; and
- pressure testing – testing to ensure compliance with different operating pressures in accordance with AS/NZ S4645 and AS 2885 pressure requirements.

These tools and equipment periodically require upgrading and replacing, for the following reasons:

- general wear and tear, as the equipment becomes unserviceable and ongoing maintenance costs increase;
- community expectation that equipment is fit for purpose and meets their expectation, i.e. with respect to emissions of noise, dust, etc.;
- to upgrade to current technology, ensuring efficient work practices and minimisation of errors (e.g. digital read outs on equipment);
- to minimise the manual handling component of activities, reducing both the likelihood and consequence of workplace injuries; and
- to mitigate the risk of injury to personnel working in high risk situations such as live work on leak repairs.

Plant and equipment comprise three broad categories of items, described in the following sections.

1.3.1 Small plant and equipment

Various types of small plant and equipment are required for the network activities described above. This includes pressure testing equipment, underground services detection equipment for third party damage prevention, gas detectors and polyethylene welding equipment. A list small plant and equipment items is provided in Appendix B.

Small plant and equipment are replaced and upgraded on an ongoing basis. The rate of replacement depends on a variety of factors, including the type of equipment, degree of use, harshness of service and technological obsolescence. However, the amount of investment required has typically been relatively consistent over time, and as such, a historical expenditure trend is commonly used to guide estimates of future expenditure.

1.3.2 Vehicles

We have a fleet of 19 vehicles used to support network repair and alteration activities by internal staff. A full list of these is provided in Appendix C. The engineering design life for all these vehicles is 12 years. The majority of the vehicles (15) were purchased between September 2009 and November 2013. These 15 vehicles will therefore reach the end of their design life during the next AA period (July 2021 to June 2026).

As a good employer and prudent asset manager, we have a commitment to replace vehicles that are at in poor condition and represent a safety and/or reliability risk.

1.3.3 High pressure flow stopping

Stopple equipment is used for planned and unplanned maintenance on the network. It is used to stop the flow of gas on high pressure steel pipelines, enabling the safe isolation of the gas supply and a controlled release of gas.

The stopple equipment currently in use was purchased in the 1980s. There are no longer any replacement parts available for it and as such, it can no longer be maintained. The equipment is required to be replaced to ensure we can continue to stopple and hot tap steel pipelines safely for planned maintenance and reactive emergencies.

1.4 Risk assessment

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 1.1). 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 1.1: 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; and
- 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 AGN 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).

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 results in a risk event rated moderate or higher, we will consider investment to reduce the risk.

Seven consequence categories are considered for each type of risk:

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

A summary of our risk management framework, including definitions, has been provided in Attachment 8.10.

A risk assessment has been carried out using APA's established evaluation criteria. Failure of plant and equipment can lead to a number of risks and risk events, depending on what type of asset fails (or is unavailable). Examples include:

- failure to have appropriate gas detectors to adequately detect and classify leaks could result in fatalities and extensive property damage, especially if gas accumulates under buildings and is exposed to an ignition source;
- failure to locate underground electricity cables could result in fatality. Many high voltage cables have been hit by operators while undertaking normal activity despite the use of "dial before you dig" plans. Often plans are incorrect or incomplete and appropriate equipment is the last line of defence against electrocution and a major disruption to power supply and telecommunications;
- failure to review and purchase improved technology in excavation equipment such as vacuum excavation and air pick technology can result in a fatality or significant workplace injury due to damage to either a gas or electrical asset while using an excavator or mechanical tools such as a shovel or crowbar;
- failure to protect against manual handling risks in general can result in significant workplace injuries, especially to backs (as evidenced by the history of workplace injuries), primarily to field workers performing normal duties, including driving, digging, carrying and lifting;
- failure to provide a safe work environment around and within confined spaces could lead to fatality through asphyxiation or inadequate retrieval in a medical emergency; and
- failure to provide correct storage of material stocks and tools and equipment can result in hazardous store situations. Good housekeeping and a tidy workplace contribute to a fit for purpose working environment for personnel, minimising health and safety incidents.

There are also potential high financial risks such as exposure to legislative penalties for failing to provide a safe place of work and litigation if injuries are incurred.

Additionally, there is a risk to efficiency if available and emerging technology is not pursued to address specific network issues and opportunities. For example:

- private properties increasingly do not provide appropriate access to gas infrastructure. Gas detection improvements in technology using SELMA and portable gas detectors with infrared enables gas survey work to be undertaken more efficiently than a traditional foot survey; and

- electrical cable is not always installed to electrical standards, and often embedded in concrete paths around the customer's house. Underground radar technology can be used to improve the accuracy of locating underground cable prior to mechanical excavation.

For the purpose of conducting a risk assessment, primary risk event considered is that equipment fails or is unavailable, leading to an uncontrolled/undetected gas escape, resulting in fatality or permanent injury and/or loss of supply to >10,000 customers or a demand customer >1 TJ p.a.

The primary consequence category affected by this risk is Health & Safety, as failure or unavailability of fit for purpose plant and equipment can lead to serious injury or fatality in certain circumstances. There is also a moderate risk to all other consequence categories (except *Environment*).

The untreated risk[61] rating is presented in Table 1.3.

Table 1.3: Risk rating – untreated risk

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Major	Minor	Significant	Significant	Significant	Significant	Significant	
Risk Level	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	

1.5 Options considered

We have identified the following options to address the risks associated with having plant and equipment that is obsolete or not fit for purpose:

- **Option 1 –** Cease proactive purchase of all plant and Equipment. Replace all plant and equipment reactively as and when equipment fails; or
- **Option 2 –** Continue to proactively replace plant and equipment as and when it becomes unsafe or inefficient to continue using existing equipment.

These options are discussed in the following sections.

1.5.1 Option 1 – Move to reactive replacement of plant and equipment

This option is to discontinue the current practice of proactively keeping plant and equipment fit for purpose and up to date. We will continue to use existing vehicles, stoppling equipment and small plant and equipment until each item is no longer able to be used due to obsolescence, breakdown or loss of function. Once this equipment becomes unusable or is no longer able to be maintained, it would need to be replaced on a reactive basis.

1.5.1.1 Cost assessment

The primary benefit of this option is the deferral of capex to a reactive environment.

The costs of this option are:

- increasing wear and tear on plant and equipment, with assets not able to be maintained in an appropriate manner, and therefore a gradually degrading and reducing equipment pool;

[61] Untreated risk is the risk level assuming there are no risk controls currently in place. Also known as the 'absolute risk'.

- increased operating expenditure (opex) for additional maintenance activities to 'keep tools and equipment going';
- loss of productivity, loss of purchasing power, less economies of scale and increased timeframe pressures during the procurement process;
- sharing of functional equipment between operational crews, resulting in decreased productivity associated with inefficient operation; and
- additional costs could be expected to be incurred under a reactive replacement scenario, including costs associated with the potential requirement to stop work and then restart once new plant and equipment items have been procured.

1.5.1.2 Risk assessment

The risk outcome of this option is high. This is driven by a high health and safety risk, because if appropriate tools and equipment for the tasks performed are not provided then it will expose operators, customers and the surrounding environment to health and safety risks.

The residual risk associated with Option 1 is essentially the same as the untreated risk rating (see Table 1.4.)

Table 1.4: Risk assessment – Option 1

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Major	Minor	Significant	Significant	Significant	Significant	Significant	
Risk Level	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	

1.5.1.3 Alignment with vision objectives

Table 1.5 shows how Option 1 aligns with our vision objectives.

Table 1.5: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	N
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	-
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

Option 1 would not align with our objectives of *Delivering for Customers* or *A Good Employer*, due to increased employee health and safety risks as well as public safety risks. Failing to provide our employees with fit for purpose equipment in a timely manner is not *Sustainably Cost Efficient*, as we would likely incur a premium if equipment is required in an emergency, as well as running the risk of supply interruption if replacement parts are not accessible quickly (for example emergency gas).

There is also potential for high financial risks such as exposure to legislative penalties for failing to provide a safe place of work and litigation if injuries are incurred.

1.5.2 Option 2 – Proactively replace plant & equipment as and when it becomes unsafe or inefficient to continue using existing equipment.

Under this option we would continue the current proactive replacement strategy. This would involve:

- continuing to purchase small plant and equipment items at a level consistent with historical trend;
- replacement of out-of-service hot tap and stoppling equipment during the next AA period (July 2021 to June 2026); and
- replacing an estimated 75% of vehicles that will reach their engineering design life during the next AA period.

1.5.2.1 Cost assessment

The estimated direct capital cost of this option is $4.5 million as shown in Table 1.6.

Table 1.6: Cost assessment – Option 2 ($'000 2019/20)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Total	1,077.6	1,077.6	747.6	747.6	867.6	4,518.1

This option has the following benefits:

- productivity will be maintained or improved, as newer tools and emerging technologies may promote more efficient ways of carrying out the work;
- health and safety performance will be maintained by making sure we continue to utilise current technologies, equipment design and work methodologies;
- procurement of items can be effectively and efficiently planned and executed, for example purchasing tools in bulk where applicable to capture volume discounts, or competitively tendering larger items; and
- we will align to good industry practice and continues to fulfil its obligations to maintain a safe working environment and will continue to reduce the impact of its operations on the public.

1.5.2.2 Risk assessment

This option reduces the risk from high to moderate. This is due to a change in the likelihood of the risk event from possible to rare. The residual risk outcomes are shown in Table 1.7.

Table 1.7: Risk assessment – Option 2

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Remote	Remote	Remote	Remote	Remote	Remote	Remote	Moderate
Consequence	Major	Minor	Significant	Significant	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	Low	Low	Low	Low	Low	

1.5.2.3 Alignment with vision objectives

Table 1.8 shows how Option 2 aligns with our vision objectives.

Table 1.8: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	Y
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	-
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Option 2 would align with the *Delivering for Customers* and *A Good Employer* aspects of our vision, as having fit for purpose plant and equipment will allow us to maintain employee and public safety standards. Having fit for purpose plant and equipment readily available will also enable us to maintain reliability levels and respond quickly during an emergency.

This option is also *Sustainably Cost Efficient*, as proactive purchase of plant and equipment as part of a scheduled ongoing program is considerably more cost effective than purchasing it on a reactive basis. We also seek to replace plant and equipment with new and/or improved technologies, where that new technology allows us to operate more efficiently (without compromising safety). Additionally, this option mitigates potential financial risks associated with unsafe workplace legislative penalties or litigation.

1.6 Summary of costs and benefits

Table 1.9 presents a summary of how each option compares in terms of the estimated cost, the residual risk rating, and alignment with our objectives.

Table 1.9: Comparison of options

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives
Option 1	0	High	Does not align with *Delivering for Customers*, *A Good Employer* or *Sustainably Cost Efficient*
Option 2	4.5	Moderate	Aligns with *Delivering for Customers, A Good Employer* and *Sustainably Cost Efficient*

1.7 Recommended option

The proposed solution is Option 2. This option provides for necessary expenditure to replace aged and damaged tools and equipment in each year of the next AA period.

1.7.1 Why is the recommended option prudent?

Option 2 is proposed because:

- small plant and equipment, stoppling equipment and vehicles are required for maintaining the gas network. This option ensures existing equipment is appropriate and up to date and that new equipment technology is reviewed and utilised where appropriate to improve safety and efficiency;
- it is the only option that reduces risks to an acceptable level. Option 1 could result in safety and reliability impacts in the event of equipment failure during either planned or emergency situations, and as such, this option is not considered prudent;
- additional costs could be expected to be incurred under a reactive replacement scenario, including costs associated with the potential requirement to stop work and then restart once new plant & equipment items have been procured;
- it is consistent with stakeholder requirements and our vision; and
- the delivery of the scope of works is achievable in the time frame envisaged.

1.7.2 Estimating efficient costs

Figure 1.2 shows historical and forecast expenditure over time for the three types of plant and equipment. This is summarised by AA period in Table 1.10.

Figure 1.2: Expenditure by category and period (capex - 2019 $)

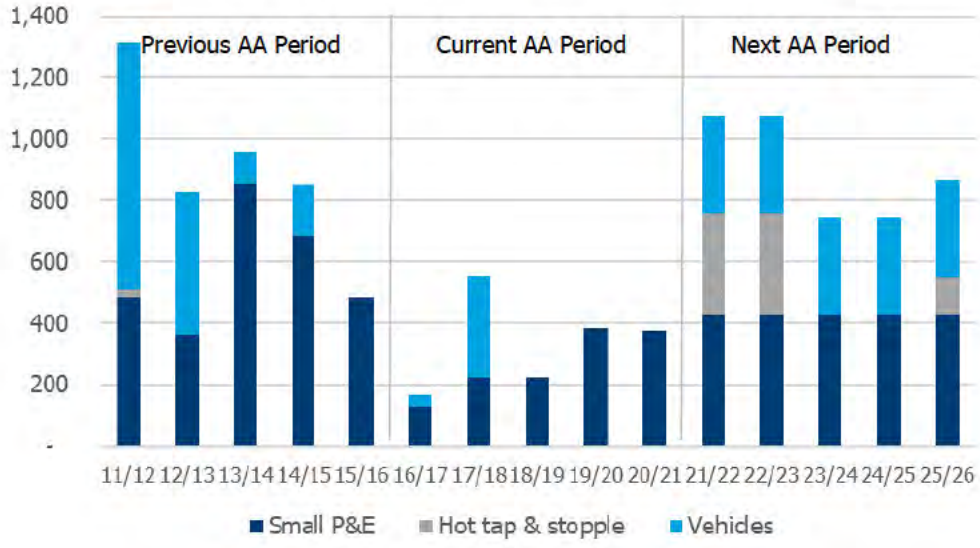


Table 1.10: Expenditure by category and period, $'000 2019/20

	Actual Previous AA Period (July 11 to June 16)	Forecast Current AA Period (July 16 to June 21)	Forecast Next AA Period (June 21 to July 26)
Small P&E	[redacted]	[redacted]	[redacted]
Vehicles	[redacted]	[redacted]	[redacted]
High pressure flow stopping	[redacted]	[redacted]	[redacted]
Total	**4,427.7**	**1,699.0**	**4,518.1**

As shown above, the expenditure on plant and equipment in the current AA period is forecast to be $1.7 million[62], compared with $4.4 million spent in the previous AA period. This is largely the result of only minor expenditure incurred on vehicles purchases during the current AA period.

The approach for estimating each of the three plant and equipment activities is described in the following sections.

1.7.2.1 Small P&E

We expect to continue investment at historical levels. Continued investment at historical trend levels will allow for maintaining the quantity and performance of plant, equipment and tools at current levels. This includes an expectation that the functionality of some equipment will improve to provide a greater range of applicability and therefore greater risk reduction for the same cost.

The estimate has therefore been determined based on the average actual expenditure seen in the current and prior regulatory periods.

Table 1.11: Small plant and equipment historical expenditure, $'000 2019/20

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	Average Annual
Small P&E	482.8	360.5	853.8	684.8	481.7	126.3	225.1	221.9	429.6

1.7.2.2 Vehicles

Continued investment in fleet at long term levels (greater than single AA periods). Fifteen vehicles will reach the end of their design life during the next AA period. However all vehicles are individually assessed on an ongoing basis and will be extended past their design life if safe and efficient to do so. Despite this, even with our good maintenance practices and maximising the asset life, it is expected that the majority will require replacement within the period.

In order to determine the number of vehicles that are likely to require replacement, we have estimated the expected kilometres for each vehicle at the end of the AA period. This is based on an extrapolation of the average annual kilometres travelled by the vehicle over its life to date.

This analysis indicates there are three vehicles that would be expected to have travelled a comparatively low number of kilometres (less than 115,000), by the end of the period. We have therefore assumed that replacement of these three vehicles will be able to be deferred into the subsequent AA period (July 2026 to June 31). The remaining twelve vehicles (expected to have travelled more than 140,000 kilometres by the end of the period) are included in the estimate. This comprises four Medium Pantech trucks, three Long premium Pantech trucks, three long tipper trucks and two long premium tipper trucks.

The cost of each of these vehicles has been determined based on a combination of quotes and recent actual purchase costs. The vehicle forecast is provided in Table 1.12 based on this and the expected number of replacements.

[62] Business Case SA30, from the current AA period determination, endorsed expenditure of $4.4 million on plant and equipment. The $4.4 million incorporated an expected change in the sourcing strategy which would have resulted in a significant amount of work being insourced that had previously been outsourced, therefore requiring the purchase of eighteen additional vehicles (six Pantech trucks, six tippers and six excavators & trailers). However, this sourcing change did not materialise.

Table 1.12: Vehicle replacement forecast, $'000 2019/20

	Number	Rate ($'000)	Cost ($'000)
Medium Pantech trucks	4	[redacted]	[redacted]
Long premium Pantech trucks	3	[redacted]	[redacted]
Long tipper trucks	3	[redacted]	[redacted]
Long premium tipper trucks	2	[redacted]	[redacted]
Total			**1,590.0**

1.7.2.3 High pressure flow stopping

We will replace critical high-pressure flow stopping equipment that is at or is expected to reach end of life during the next AA period. The cost estimate for this stoppling equipment is $660,000. This estimate is based on a recently obtained supplier quotation.

Two new cranes are required for handling the stoppling equipment. The estimated cost for these $[redacted] each.

The hot tap and stoppling estimate is shown in Table 1.13.

Table 1.13: Hot tap and stoppling cost estimate, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Stoppling equipment	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Cranes	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**330.0**	**330.0**	**-**	**-**	**120.0**	**780.0**

The combined cost estimate for all plant and equipment items is provided in Table 1.14.

Table 1.14: Project cost estimate by category, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Small P&E	429.6	429.6	429.6	429.6	429.6	2,148.1
Vehicles	318.0	318.0	318.0	318.0	318.0	1,590.0
Hot tap and stoppling, including cranes	330.0	330.0	-	-	120.0	780.0
Total	**1,077.6**	**1,077.6**	**747.6**	**747.6**	**867.6**	**4,518.1**

Replacement equipment is sourced through various suppliers. Quotes are collected and reviewed for factors such as compatibility with current equipment and any additional training required.

The following table shows the costs escalated to June 2021 dollars.

Table 1.15: Escalated Small P&E cost estimate ($'000)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Total unescalated ($ Dec 19)	1,077.6	1,077.6	747.6	747.6	867.6	4,518.1
Escalation	36.3	41.7	33.5	37.8	48.3	197.6
Total escalated ($ Jun 21)	**1,113.9**	**1,119.3**	**781.1**	**785.4**	**915.9**	**4,715.6**

1.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 and Rule 74 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

NGR 79(1)

The proposed solution is prudent, efficient, consistent with accepted and good industry practice and will achieve the lowest sustainable cost of delivering pipeline services:

- **Prudent** – the expenditure is necessary to ensure there are adequate and appropriate tools, plant and equipment necessary to perform the required functions. The expenditure will allow the continued safe, reliable supply of gas to consumers, services to be maintained and improved and the integrity of the network to be maintained.
- **Efficient** – cost estimates are based on historical spend and will follow robust procurement practices. The estimate allows for maintaining the quantity of plant, equipment and tools at current levels with the expectation that the functionality of some equipment will improve to provide a greater range of applicability and therefore greater risk reduction for the same cost. On that basis, we consider the expenditure to be efficient.
- **Consistent with accepted and good industry practice –** the tools and equipment already in use and planned under this program are an essential part of performing the work. Equipment such as large diameter squeeze off and stoppling equipment are essential for emergency response.
- To **achieve the lowest sustainable cost of delivering pipeline services** - tools, plant and equipment are necessary to deliver pipelines services in a safe and cost effective manner, and there is no suitable alternative to this investment. The chosen option is therefore consistent with the objective of achieving the lowest sustainable cost of service delivery.

NGR 79(2)

The proposed capex is justifiable under NGR 79(2)(c)(i), as it is necessary to maintain and improve the safety of services. The absence of appropriate and reliable tools, plant and equipment would mean that gas services could not be maintained safely, resulting in risk to both maintenance personnel and the general public.

NGR 74

The forecast costs are based on the latest market rate testing and project options consider the asset management requirements as per the Strategic Asset Management Plan. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Appendix A – Comparison of risk assessments for each option

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Major	Minor	Significant	Significant	Significant	Significant	Significant	
Risk Level	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Major	Minor	Significant	Significant	Significant	Significant	Significant	
Risk Level	High	Low	Moderate	Moderate	Moderate	Moderate	Moderate	

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Remote	Remote	Remote	Remote	Remote	Remote	Remote	Moderate
Consequence	Major	Minor	Significant	Significant	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	Low	Low	Low	Low	Low	

Appendix B – Examples of equipment and improving technology

Examples of equipment items purchased during the current AA period include:

- self-contained breathing apparatus for personnel working on leak repair or working in confined spaces;
- large diameter PE stopple equipment (for emergency response and routine activity);
- PE squeeze-off equipment (for emergency response and routine activity);
- low noise power generators to alleviate noise created during 24/7 activity;
- compaction tools;
- DCVG equipment;
- concrete cutting devices;
- underground cable location equipment; and
- hydraulic flange spreaders.

Recent examples of such continuous improvement include vacuum trucks/trailers and air picks that reduce damage to underground assets and new corrosion detection and monitoring equipment to improve the integrity of the assets.

Another example of new technology purchased in the current AA period, which has improved our leak detection capability, is the Street Evaluating Laser Methane Analyser (SELMA). The SELMA is fitted to a vehicle, and that vehicle can then be driven along a route where gas mains are laid and scan for gas leaks. The SELMA uses infrared technology connected to a computer. The computer maps the survey route and the location of the gas leak.

We have SELMAs fitted to two vehicles. SELMA is a significant improvement on previous practices whereby leak detection was carried out on foot, requiring personnel to walk an average of eight kilometres per day. The benefits of the SELMA vehicles are:

- more efficient leak detection, covering large amounts of the network and enabling detection of gas leaks that the public has not reported or are undetectable by the public;
- faster emergency response, as leaks can be located quicker than by foot; and
- more effective and consistent data capture, as the SELMA allows faster and more accurate leak mapping.

SELMA equipment

Appendix C – Vehicle list

Registration plate	Make	Model	Series / description	Body Type2	Odometer 31/03/19	Purchase date	End of design life
SB74EF	ISUZU	FRR600	600 MEDIUM	PANTECH	56,194	Sep-09	Aug-21
SB77EF	ISUZU	FRR600	600 MEDIUM	PANTECH	83,301	Sep-09	Aug-21
SB84EE	ISUZU	FRR600	600 MEDIUM	PANTECH	203,953	Sep-09	Aug-21
SB85EF	ISUZU	FRR600	600 MEDIUM	PANTECH	81,728	Sep-09	Aug-21
SB37DQ	ISUZU	FSR700	700 LONG AMT	TIPPER	123,968	Apr-10	Mar-22
SB87ET	ISUZU	FSR700	700 LONG AMT	TIPPER	203,474	May-11	Apr-23
SB88ET	ISUZU	FSR700	700 LONG AMT	TIPPER	114,517	May-11	Apr-23
SB15FQ	ISUZU	FRR600	600 LONG PREMIUM	PANTECH	86,650	Oct-11	Sep-23
SB16FQ	ISUZU	FRR600	600 LONG PREMIUM	PANTECH	119,186	Oct-11	Sep-23
SB95FN	ISUZU	FRR600	600 LONG PREMIUM	PANTECH	57,105	Oct-11	Sep-23
SB96FN	ISUZU	FRR600	600 LONG PREMIUM	PANTECH	96,005	Oct-11	Sep-23
SB39FU	ISUZU	FRR600	600 MEDIUM	PANTECH	77,498	Apr-12	Mar-24
SB41GV	ISUZU	FSR700	700 LONG PREMIUM	TIPPER	103,751	Mar-13	Feb-25
SB42GV	ISUZU	FSR850	850 LONG PREMIUM	TIPPER	107,367	Mar-13	Feb-25
S318AZJ	ISUZU	NLR200	200 SHORT	TRAY	25,644	Nov-13	Oct-25
SB50JS	ISUZU	FSR700	700 LONG PREMIUM	TIPPER	69,536	Sep-14	Aug-26
SB15ME	ISUZU	FRR	110-260 MWB AUTO	VACCUUM EXCAVAT	6,792	Jun-16	May-28
SB46NL	ISUZU	FRR	107-210 MWB AMT	TRAY	6,821	Aug-17	Jul-29
SB47NL	ISUZU	FRR	107-210 MWB AMT	TRAY	8,900	Aug-17	Jul-29

SA115 – Gawler gate station

1.1 Project approvals

Table 1.1: Business case SA115 – Project approvals

Prepared by	Sarah Donnelly, Asset Engineer, APA
Reviewed by	Martijn Vlugt, National Manager Asset Strategy and Planning, APA
Approved by	Craig Bonar, Head of Engineering and Planning, APA Mark Beech, General Manager Network Operations, AGN

1.2 Project overview

Table 1.2: Business case SA115 – Project overview

Description of the problem / opportunity	The northern suburbs of metropolitan Adelaide, in and around Gawler, continue to be one of the major residential growth (greenfield and infill) areas in South Australia. Three large residential and commercial developments near the Gawler region (Springwood, Roseworthy and Concordia) are expected to connect to the SA natural gas distribution networks within the next five years. These new developments will significantly increase load in the region and exhaust network capacity. This load increase will have the greatest impact on the northern extremity of the Gawler area network, particularly in and around Willaston. Willaston is located 11 km from the nearest transmission pressure/high pressure (TP/HP) regulator at Munno Para, and is home to around 3,200 customers. The pressure drop over the 11 km trunk main means the Willaston area is sensitive to load growth. A relatively minor increase in load can rapidly draw down spare capacity within the network, leading to substandard pressures and potential loss of supply. Network augmentation is therefore required to ensure pressures do not drop below minimum acceptable levels in the Willaston area when the new residential and commercial developments commence supply. Without augmentation, we expect extremity pressures to fall below the minimum acceptable pressure of 90 kPa in 2023. This business case therefore considers options to augment the Gawler northern area network during 2022/23, in order to maintain network integrity and supply.
Untreated risk	As per risk matrix = **High**
Options considered	• **Option 1** – Install a new gate station off the SEA Gas pipeline and lay 1.3 km of steel DN250 high pressure main ($7.1 million) • **Option 2** – Duplicate the trunk main from the existing TP/HP regulator at Munno Para, laying 7.4 km of DN280 polyethylene main ($6.6 million) • **Option 3** – Maintain status quo (no upfront costs, but reactive augmentation will be required post 2023 upon supply/pressure failure)
Proposed solution	Option 1 is the proposed solution, as it will enable the new development to connect without adversely affecting customers in the Willaston area, while supporting growth for more than 20 years. Though Option 1 is marginally more expensive than Option 2, it has the best net present value (NPV). Option 2 would only support load growth for another ten years, after which time a new gate station would be required off the SEA Gas pipeline anyway. Option 1 also has the added benefit that it would provide a second source of supply into the Gawler area, thereby increasing security of supply to the 9,600 customers in the region.
Estimated cost	The forecast direct capital cost (excluding overhead) during the next access arrangement (AA) period (July 2021 to June 2026) is $7.1 million. The Gawler gate station would be installed by 2023.

$'000 2019/20	21/22	22/23	23/24	24/25	25/26	Total
Gawler gate station	1,836.0	5,294.8	-	-	-	7,130.8

Basis of costs	All costs in this business case are expressed in real unescalated dollars at December 2019 unless otherwise stated. Some tables may not add due to rounding.
Alignment to our vision	This investment aligns with Delivering for Customers as it will ensure around 3,200 customers in the Willaston area will continue to receive a reliable natural gas supply. The proposed solution will also increase security of supply to approximately 9,600 in the wider region. The proposed solution is also Sustainably Cost Efficient, as it has the best NPV of the viable solutions and offsets the need for additional investment in network augmentation in the future.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed solution is consistent with good industry practice, as the injection of additional gas into the distribution network will ensure pressures do not drop below minimum acceptable levels. Several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing this service. **NGR 79(2)** – proposed capex is justifiable under NGR 79(2)(c)(ii), as it is necessary to maintain the integrity of services. **NGR 74** – the forecast costs and are based on the latest market rate testing and project options consider the current TP pipeline condition and priority as per the Strategic Asset Management Plan. NPV assessments have been conducted for the viable options. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Treated risk	As per risk matrix = **Moderate**
Stakeholder engagement	We are committed to operating our networks in a manner that is consistent with the long-term interests of our customers. To facilitate this, we conduct regular stakeholder engagement to understand and respond to the priorities of our customers and stakeholders. Feedback from stakeholders is built into our asset management considerations and is an important input when developing and reviewing our expenditure programs. Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect us to deliver a high level of public safety. Consistent with our customers' priorities, the Gawler gate station project is essential to ensure customers continue to receive a reliable natural gas supply above the minimum acceptable pressure. We have looked at several options to address the pressure drop risk in Willaston and have selected the solution that has the lowest cost impact on customers over the long term.
Other relevant documents	• Attachment 8.2 Strategic Asset Management Plan • Supporting Information 8.8.2 SA115 NPV & Options Analysis

1.3 Background

The northern suburbs of Metropolitan Adelaide, in and around Gawler, is a major residential growth area in South Australia. Three large residential and commercial developments near Gawler (Springwood, Roseworthy and Concordia) will connect to the natural gas distribution network within the next five years. These new developments comprise more than 15,000 new homes and business (see Table 1.3.).

Table 1.3: Forecast new homes and commercial properties

	Springwood	Roseworthy	Concordia	Total
Residential properties	1,800	3,900	9,530	15,200
Commercial properties	12	36	50	98
Total	**1,812**	**3,936**	**9,580**	**15,298**
Construction/expansion period	2019 to 2030+	2020 to 2030+	2025 to 2030+	

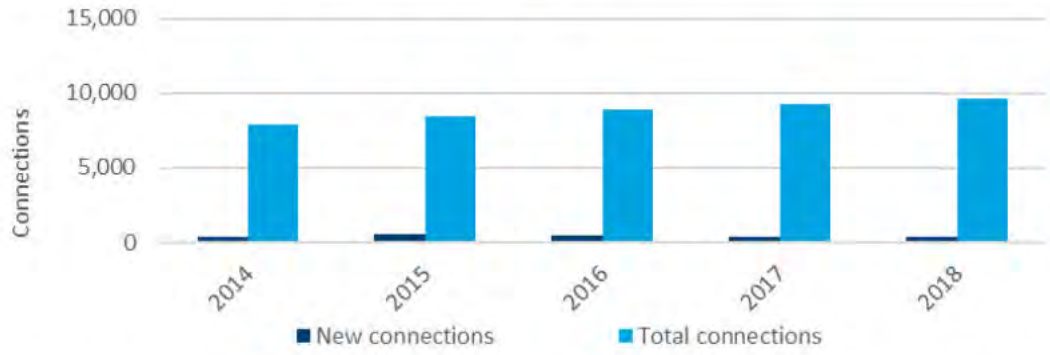
The Springwood and Roseworthy developments are the most advanced. Development is well underway and gas supply is expected to commence within the next AA period (July 2021 to June 2026). Concordia will connect soon afterwards. These developments are being delivered in stages, and all are expected to continue to grow and expand beyond 2030. Based on recent penetration rates for new residential developments (typically 95% or more), we estimate around 14,440 of the proposed 15,200 new residential properties will require natural gas supply. Up to 98 commercial properties are also likely to require a connection.

In addition to the increased load generated by these residential and commercial development projects, two additional major projects are likely to give rise to further demand in the Gawler region:

- a new school is being constructed in Angle Vale, which will accommodate 1,675 students. The school is set to open at the start of the 2022 school year and is constructed to meet projected enrolment demand driven by population growth in the Angle Vale and Gawler region; and
- the Northern Connector project is a new six lane, 15.5 km motorway providing a vital freight and commuter link between the Northern Expressway, South Road Superway, and Port River Expressway. The motorway opened to traffic 7 March 2020.[63] The Northern Connector is expected to increase economic and population growth in the region (refer to Appendix D for a map showing the Northern Connector proximity to Gawler).

Over the past four years, customer connections in the Gawler region have grown by on average 425 new residential connections per year (See Figure 1.1). The suburbs included in the growth analysis are Blakeview, Evanston, Evanston Gardens, Evanston Park, Evanston South, Gawler, Gawler Belt, Gawler East, Gawler South, Gawler West, Hewett, Hillier, Kudla, Reid and Willaston.

Figure 1.1: Historical connections growth in the Gawler region

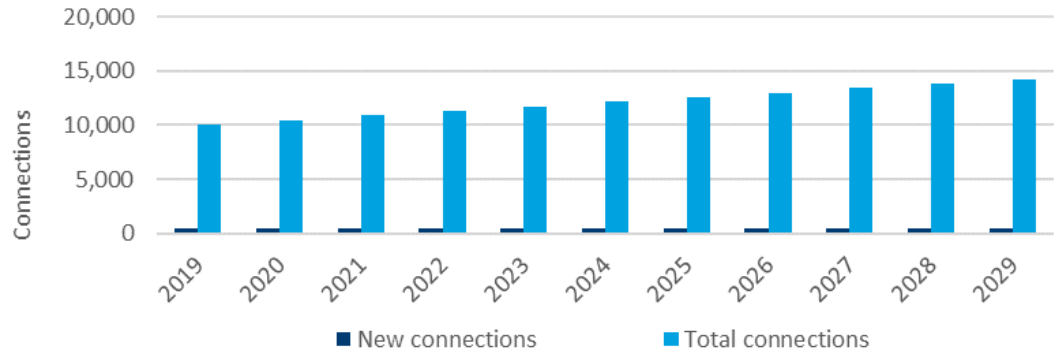


Notwithstanding the impact of the new Springwood, Roseworthy and Concordia developments, using the historical load growth trend as a conservative estimate, the number of customer

[63] Department of Planning, Transport and Infrastructure, SA, March 2020: https://dpti.sa.gov.au/nsc/northern_connector

connections to the Gawler network will increase by at least 4,250 within the next ten years (see Figure 1.2). We expect growth will continue beyond 2030.

Figure 1.2: Gawler network forecast customer growth

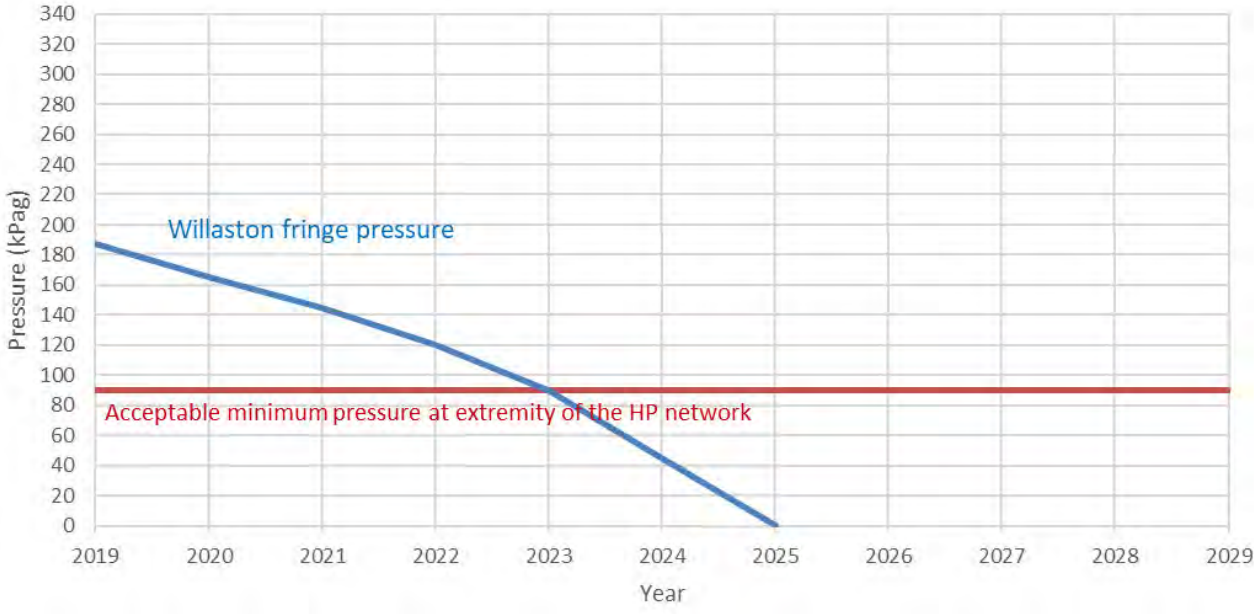


This historical load growth alone will impact the capacity of the Gawler distribution network. As more customers connect and spare capacity is drawn down, this can lead to a fall in supply pressures and a potential loss of supply. The connection of Springwood, Roseworthy and Concordia will exacerbate the risk.

The northern extremity of the Gawler network, in and around Willaston, is particularly susceptible to pressure drop. Willaston is connected to the TP/HP regulator at Munno Para by a single 11 km trunk main, and is home to around 3,200 customers. Due to the length of the pipeline and limited spare capacity in the network, a relatively minor increase in load can lead to substandard pressures and supply issues.

Based on current spare capacity and forecasted load growth, unless the Gawler network is augmented, we expect extremity pressures to fall below the minimum acceptable pressure of 90 kPa in 2023 (See Figure 1.3).

Figure 1.3: Estimated impact on pressures in Willaston if the network is not augmented



If pressures fall below 90 kPa, this has an impact on the downstream pressure at the customers' gas meter and gas appliances, and means we may not be able to supply gas to each customer's premises at the minimum level required to fuel appliances. Substandard pressures can result in gas appliances becoming inoperable and potentially dangerous.

This business case therefore looks at options for a second transmission pressure connection point for the Gawler distribution network, in order to maintain integrity of gas supply in the region as the load increases.

1.4 Risk assessment

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 1.4). 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 1.4: 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.

AGN's risk management framework is based on:

- AS/NZS ISO 31000 Risk Management – Principles and Guidelines;
- AS 2885 Pipelines-Gas and Liquid Petroleum; and
- 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 AGN 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).

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.

Seven consequence categories are considered for each type of risk:

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

A summary of our risk management framework, including definitions, has been provided in Attachment 8.10.

The risk identified for the natural gas distribution network in Willaston is that load growth in the region will cause pressures to drop, leading to substandard supply or loss of supply to up to 3,200 customers and potential for a gas in building event.

The primary consequence category affected by this risk is operations (supply), as a pressure drop can cause outages to >1,000 customers, thereby carrying a significant consequence rating under our risk matrix. Given load growth is ongoing, if the risk is left untreated the likelihood of a pressure drop impacting >1,000 customers is rated frequent, as it is likely to occur on a regular basis (many times in one year), and will worsen as growth continues.

Any significant customer outage would then give rise to a moderate reputational and compliance risk. There is also a moderate health and safety risk, as pressure fluctuations may cause appliances to stop working correctly. For example, a pilot light on a stove or heater could go out due to the low pressure, but then the appliance could continue to release gas if the pressure returns and the user has not noticed the flame is out. In certain circumstances this could result in injury or illness.

The untreated risk[64] rating is presented in Table 1.4.

Table 1.4: Loss of supply risk in Gawler region – Untreated risk

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

1.5 Options considered

We have considered the following options to address the pressure drop risk in the Gawler distribution network:

- **Option 1** – Install a new gate station off the SEA Gas pipeline and lay 1.3 km of steel DN250 high pressure main;
- **Option 2** – Duplicate the trunk main from the existing TP/HP regulator at Munno Para, laying 7.4 km of DN280 polyethylene main; or
- **Option 3 –** Maintain status quo.

These options are discussed in the following sections.

1.5.1 Option 1 – Install a new gate station off the SEA Gas pipeline and lay 1.3 km of steel DN250 high pressure main

Under this option, we would install a new gate station off the SEA Gas natural gas transmission pipeline to the east of the Gawler distribution network. The SEA Gas pipeline traverses the northern

[64] Untreated risk is the risk level assuming there are no risk controls currently in place. Also known as the 'absolute risk'.

section of the Springwood development in close proximity to a DN280 high pressure trunk main, which is part of the Gawler network. We would connect the new gate station to the Gawler trunk main by installing 1.3 km of DN250 steel pipe.

Refer to Appendix A for a map showing the location of the various pipelines.

Injecting gas into the Gawler network at this location will significantly improve extremity pressures and will provide capacity to service the Springwood, Roseworthy and Concordia developments. We expect the gate station will service growth for at least the next 20 years.

As an additional benefit, having a second source of supply to the Gawler network will increase security of supply to around 9,600 customers. This is because if the trunk system south of Gawler River (the current single source of supply to the region) is interrupted, supply can be maintained from the new SEA Gas connection, thus reducing the likelihood of outages.

1.5.1.1 Cost assessment

The direct cost of this option is $7.1 million (see Table 1.5).

Table 1.5: Cost estimate – Option 1, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Scope	FEED + procurement of long lead items	Install Gawler Gate Station	-	-	-	
Material	1,511.0	436.0	-	-	-	1,947.0
Labour	325.0	4,858.8	-	-	-	5,183.8
Total	**1,836.0**	**5,294.8**	**-**	**-**	**-**	**7,130.8**

Cost estimates for the gate station installation have been acquired from SEA Gas. Our aim would be to design, procure and install the new gate station and connecting pipeline by 2023.

Refer to Appendix B for a more detailed cost breakdown.

1.5.1.2 Risk assessment

Option 1 would reduce the loss of supply (operations) risk from high to low. This is because having a second source of supply would reduce the likelihood of a pressure drop impacting >1,000 people from frequent to remote. The risk consequence rating remains unchanged.

Table 1.6: Loss of supply risk in Gawler region – Option 1

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

While Option 1 achieves the same risk rating as Option 2, the solution under Option 1 also increases system security for more than 9,600 customers in the Gawler region, as it provides a second source of supply to the distribution network.

1.5.1.3 Alignment with vision objectives

Table 1.7 shows how Option 1 aligns with our vision objectives.

Table 1.7: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 1 aligns with our objective of *Delivering for Customers*, as it will ensure the supply pressure to existing customers will continue to operate at acceptable levels, despite the ongoing growth in the network. It will also help improve reliability as the second transmission connection will enhance security of supply in the region. Option 1 also mitigates the risk of low appliance pressure leading to a public health and safety incident.

Option 1 also aligns with our objective of being *Sustainably Cost Efficient*, as connecting a new gate station to the SEA Gas pipeline will support long term growth in the area and has a better NPV than Option 2 (constructing a second trunk pipeline from the existing Munno Para TP/HP regulator).

1.5.2 Option 2 – Duplicate the trunk main from the existing TP/HP regulator at Munno Para, laying 7.4 km of DN280 polyethylene main

The Gawler network is currently supplied from the south, via a trunk main connected to the Munro Parra TP/HP regulator. The existing trunk main infrastructure ranges in size from DN100 up to DN280 and is duplicated from Munno Para to Adelaide Road, Gawler South, where the trunk system merges into a single DN100 trunk main at the Gawler River crossing before branching off to extremities of the network. A pressure telemetry point located at Willaston is used to monitor the performance of the network.

Under Option 2, we would build a second trunk main, connecting to the Munno Para regulator. This would involve installing 7.4 km of DN280 polyethylene main along Coventry Road towards the Northern Express Way, partly duplicating the DN180 polyethylene trunk.

Having this second trunk will ensure pressures in the Gawler network do not drop below the minimum acceptable levels as load growth continues, and will address the current supply risk in and around Willaston.

The trunk duplication would service additional growth for the next ten years. After ten years, we estimate capacity constraints on the Adelaide metropolitan area TP network will require a gate station off the SEA Gas pipeline at Kudla. The Kudla gate station would feed into the Adelaide metropolitan area TP network, and would increase fringe pressures at the Munno Para regulator.

Refer to Appendix A for a map of the proposed solution under Option 2.

1.5.2.1 Cost assessment

The direct cost of this option is $6.6 million (see Table 1.8).

Table 1.8: Cost estimate – Option 2, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Scope	Procure long lead items	Lay trunk main				
Material	982.0	-	-	-	-	982.0
Labour	-	5,640.0	-	-	-	5,640.0
Total	**982.0**	**5,640.0**	**-**	**-**	**-**	**6,622.0**

Our aim would be to design, procure and install the new main by 2023. Note that with Option 2, we estimate a new gate station connection to the SEA Gas pipeline at Kudla would be required after ten years.

The cost of the Kudla gate station has not been estimated at this time, however, it will be an additional future cost if Option 2 is undertaken.

1.5.2.2 Risk assessment

Option 2 would reduce the loss of supply (operations) risk from high to low. This is because the increase pipeline capacity would reduce the likelihood of a pressure drop impacting >1,000 people from frequent to remote. The risk consequence rating remains unchanged.

Table 1.9: Loss of supply risk in Gawler region – Option 2

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

Option 2 achieves the same risk rating as Option 1. However, it should be noted that the additional security of supply benefits provided by Option 1 will not be achieved with Option 2, as there will remain only one supply connection[65] into the Gawler network.

1.5.2.3 Alignment with vision objectives

Table 1.10 shows how Option 2 aligns with our vision objectives.

Table 1.10: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	Y

[65] Until a new gate station is built in Kudla after ~10 years.

Vision objective	Alignment
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 2 aligns with our objective of *Delivering for Customers*, as it will ensure the supply pressure to existing customers will continue to operate at acceptable levels, despite the ongoing growth in the network. Option 2 also mitigates the risk of low appliance pressure leading to a public health and safety incident.

However, Option 2 does not align with our objective to be *Sustainably Cost Efficient*. While it will support growth in the medium term, Option 2 has a higher long term cost than Option 1, and also results in the need for additional investment in the form of a new gate station in around ten years' time. Though duplicating the pipeline is a lower cost option in the short term, it will not support load growth for as long as a new SEA Gas gate station would.

1.5.3 Option 3 – Maintain status quo

Under this option we would not incur any proactive capacity expansion capex to reduce the loss of supply risk in the Gawler region. Instead, we would operate the network as per current practice, and address any supply issues as and when they occur.

Given the current growth forecasts and the additional load that will arise from the new housing and commercial developments in the region, it is highly likely capital costs to address supply shortfall will be incurred reactively as minimum pressure limits are reached post 2023.

We consider maintaining the status quo is not a viable solution, as it simply defers capacity expansion expenditure, as well as potentially resulting in high-cost reactive works.

1.5.3.1 Cost assessment

While there are no additional upfront costs associated if we maintain the status quo, as mentioned above, we are likely to incur greater reactive maintenance costs as pressure issues emerge.

While it is not possible to quantify the reactive costs we would incur at this time, in our experience a project conducted reactively is around 3.2 times more expensive than one conducted proactively.[66] This assumption is consistent with the commonly accepted asset management principle that reactive asset maintenance can be around two to five times higher than proactive planned maintenance.[67]

Following the reactive works, if the network continually experiences substandard pressures, one of the solutions described under Option 1 or 2 would need to be applied.

1.5.3.2 Risk assessment

Under Option 3, the risk level would remain the same as the untreated risk as there are no controls in place to mitigate the pressure drop risk (other than not connecting new customers, which is not a viable option). Table 1.11 shows the risk level if were to maintain the status quo.

[66] For example, this is typically due to the additional premia for faster acquisition of long lead time materials, emergency response, labour costs, additional traffic management/permit costs, resource scheduling, etc.

[67] Marshall Institute, Omega engineering, ARMS reliability.

Table 1.11: Loss of supply risk in Gawler region – Option 3

Option 3	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

Option 3 is therefore not consistent with our risk management framework, which requires action must be taken to reduce any high risks to low or ALARP.

1.5.3.3 Alignment with vision objectives

Table 1.12 shows how Option 3 aligns with our vision objectives.

Table 1.12: Alignment with vision – Option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 3 would not align with *Delivering for Customers*, as it would allow up to 3,200 customers' supply pressures to drop and/or be interrupted. Maintaining the status quo would also not be *Sustainably Cost Efficient*, as it would likely result in us incurring costly reactive works, while merely deferring necessary capacity expansion works to into the future.

1.6 Summary of costs and benefits

Table 1.13 presents a summary of how each option compares in terms of the estimated cost, the residual risk rating, and alignment with our objectives.

To assess which solution is likely to cost the most over time, we have conducted a net present value assessment of Options 1 and 2. We have not included Option 3 (maintaining the status quo) in the NPV assessment as we do not consider this to be a prudent option.

Table 1.13: Comparison of options

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives	NPV ($ million)
Option 1 – new gate station	7.1	Moderate - ALARP	Aligns with Delivering for Customers and Sustainably Cost Efficient	-10.3
Option 2 – duplicate trunk	6.6	Moderate - ALARP	Aligns with Delivering for Customers but is less Sustainably Cost Efficient than Option 1.	-11.6

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives	NPV ($ million)
Option 3 – status quo	No upfront capital costs	High	Does not align with Delivering for Customers or Sustainably Cost Efficient	n/a

1.7 Recommended option

Option 1, installing a new gate station connection to the SEA Gas pipeline, is the recommended option.

1.7.1 Why is the recommended option prudent?

Installing a second point of supply for the Gawler network is the most prudent option because it addresses the risk of pressure drop for the 3,200 customers in Willaston, while also improving security of supply for the 9,600 customers supplied by the broader Gawler network. We consider Option 1 is more prudent and efficient than Option 2 because it offers this additional security of supply benefit at a lower net present cost than Option 2, which also does not enhance security in the same way.

More importantly, installing a new connection to the SEA Gas pipeline to the east of the Gawler network will support ongoing growth in the area for a longer period (at least 20 years). Duplicating the existing trunk to the south will support growth for the next ten years, after which time a new gate station to the SEA Gas pipeline in Kudla would be required.

Connecting to the SEA Gas pipeline further north (as per Option 1) will negate the need for the additional Kudla gate station.

1.7.2 Estimating efficient costs

Key assumptions made in the cost estimation include:

- the cost estimate is based on costing the activities that comprise the work breakdown structure;
- the rates utilised in costing these activities are based on current vendor and contractor rates in 2019 and historical costing; and
- the costs for installing the gate station have been provided by SEA Gas.

The forecast cost breakdown is shown in the table below.

Table 1.14: Cost estimate – $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Scope	FEED + procurement of long lead items	Install Gawler Gate Station	-	-	-	
Material	1,511.0	436.0	-	-	-	1,947.0
Labour	325.0	4,858.8	-	-	-	5,183.8
Total	**1,836.0**	**5,294.8**	**-**	**-**	**-**	**7,130.8**

The following table shows the costs escalated to June 2021 dollars.

Table 1.15: Escalated cost estimate ($'000)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Total unescalated ($ Dec 19)	1,836.0	5,294.8	-	-	-	7,130.8
Escalation	61.9	204.7	-	-	-	266.6
Total escalated ($ Jun 21)	**1,897.9**	**5,499.5**	**-**	**-**	**-**	**7,397.4**

1.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 and Rule 74 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

Rule 79(1)

The proposal to connect the Gawler distribution network to the SEA Gas pipeline near Gawler is consistent with the requirements of NGR 79(1). Specifically, we consider that the capital expenditure is:

- **Prudent** – the expenditure is necessary in order to maintain supply pressure in the Gawler network at operable levels as load in the area grows. The proposed solution also improves security of supply in the region. The proposed risk treatment is consistent with accepted industry practice and current design standards, and is proven to address the risk associated with substandard pressures. Practicable options have been considered. The proposed expenditure is therefore consistent with that which would be incurred by a prudent service provider.
- **Efficient** – the forecast expenditure is based on rates applied in similar projects, with costs for the gate station provided by SEA Gas. The preferred option has the best NPV of viable options, and will support continued load growth over the next 20 years.
- **Consistent with accepted industry practice** – the proposed gate station configuration is consistent with current standards, and having a second TP connection to the distribution network in order to improve system security is consistent with good practice.
- To achieve **the lowest sustainable cost of delivering pipeline services** –the proposed option has the lowest net present cost and will defer the requirement for an additional SEA Gas connection at Kudla in ten years' time. The selected Option 1 requires considerably less pipeline to be constructed, offers additional security of supply benefits, and has only a marginally higher upfront cost than Option 2.

NGR 79(2)

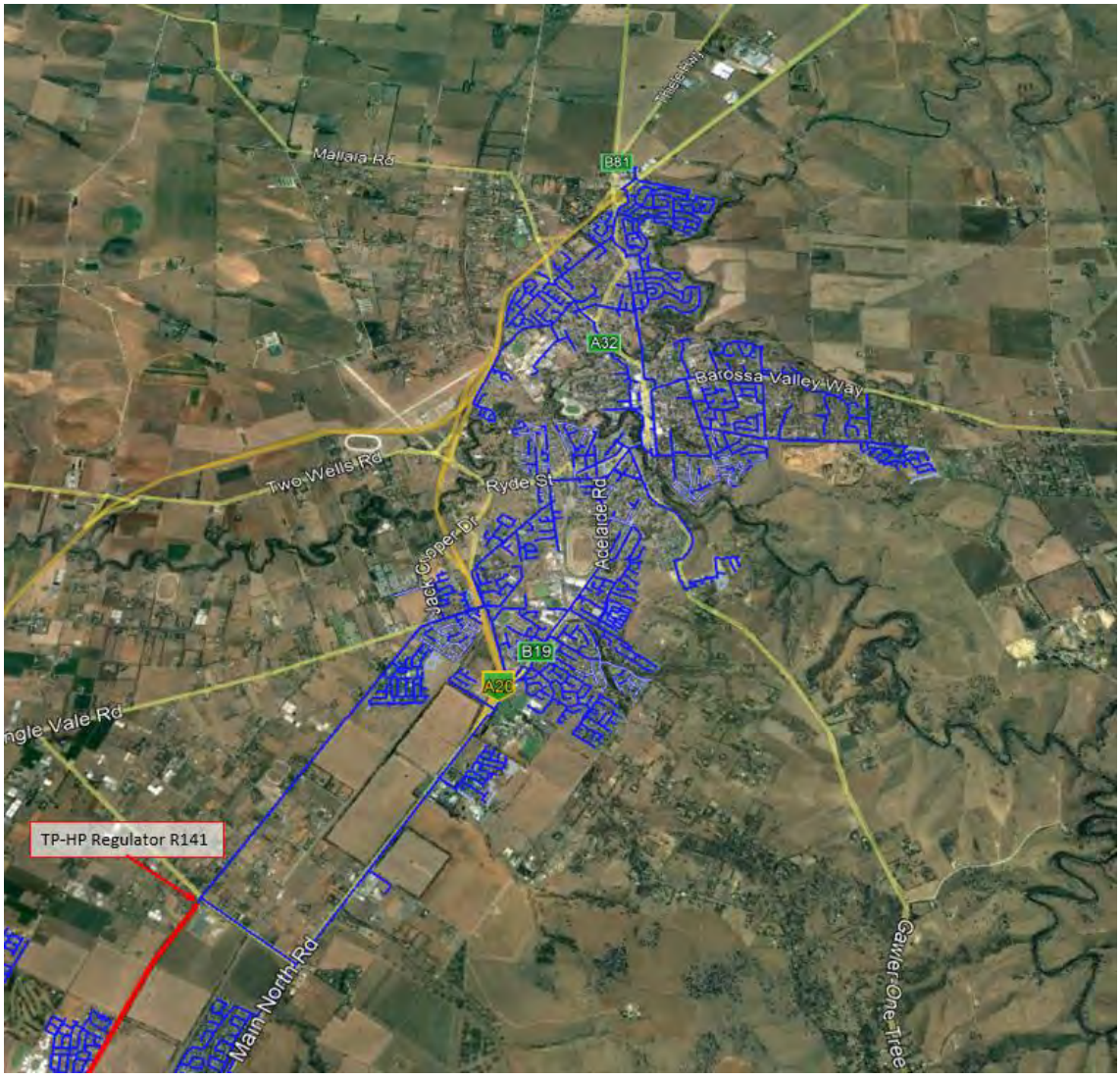
The proposed capex is justifiable under 79(2)(c)(ii), as it is necessary to maintain the integrity of services. Allowing pressure at the extremities of the Gawler network to drop below the minimum allowable level will interrupt the natural gas supply of up to 3,200 customers.

NGR 74

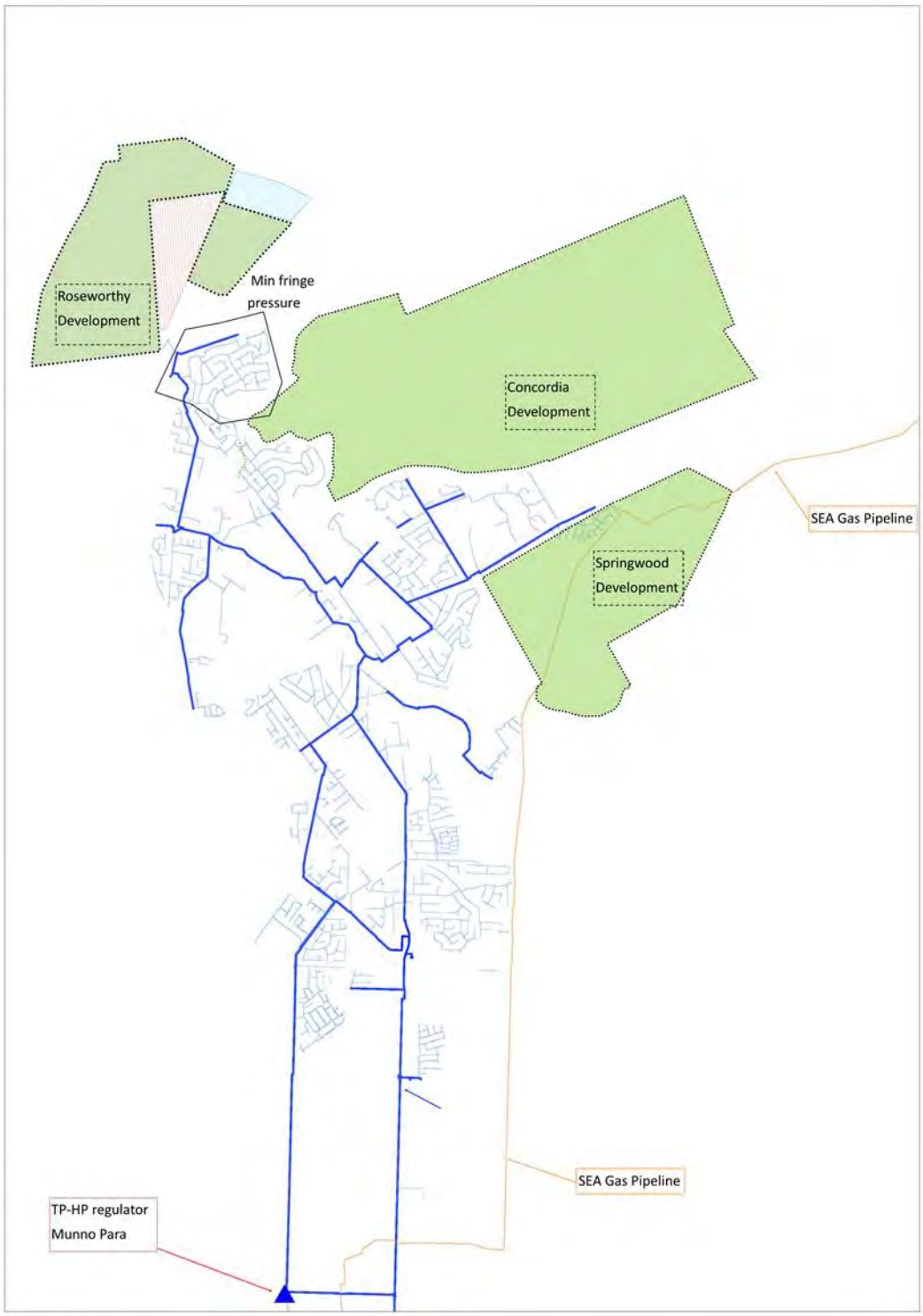
The forecast costs are based on the latest market rate testing and project options consider asset management requirements as per the Strategic Asset Management Plan. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstance.

Appendix A – Asset location maps and configuration drawings

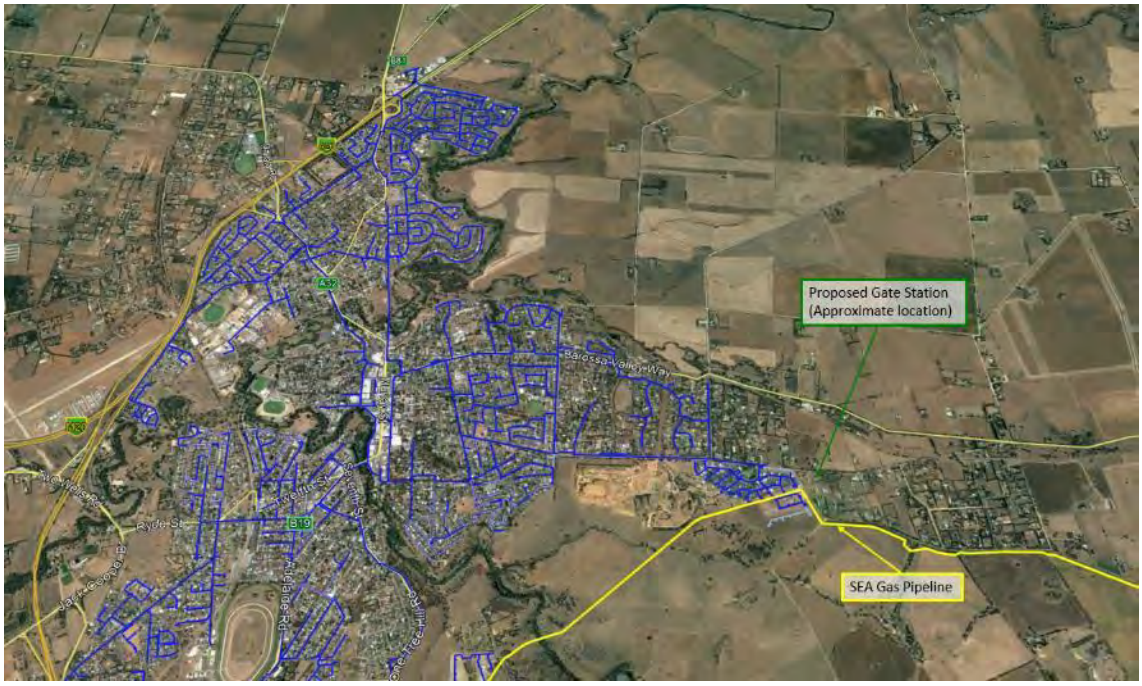
A.1: Gawler high pressure network map



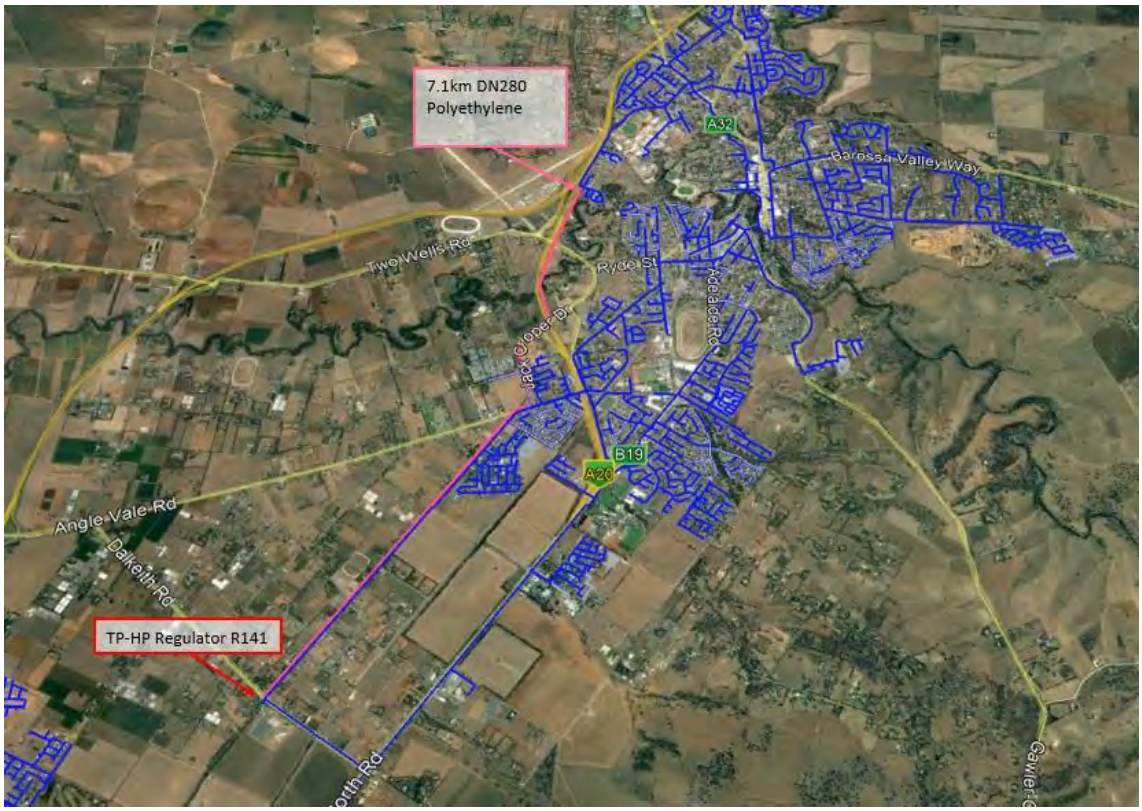
A.2: New residential developments in the Gawler area (Roseworthy, Concordia, Springwood).



A.3: Gawler high pressure network map – Option 1



A.4: Gawler high pressure network – Option 2



Appendix B – Cost estimates

Cost Estimate - Option 1

Category	Description	Units	Units QTY	Number of sites	Unit cost $/ unit	City gate $'000	Trunk main $'000	Total $'000
Materials								
Gate station materials	Gas filtration facilities	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Ultrasonic custody transfer metering facilities	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Gas chromatograph	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Water bath heater (100kW to 150kW) facilities	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Two stage pressure reduction and overpressure protection	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	SCADA and instrumentation facilities	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Manual and activated valves	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Site control hut	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Hot tap fittings & MIJ	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Spares and miscellaneous	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
Trunk main DN250 (1.3 Km)	DN250 steel pipe, valves and fittings	metres	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]
	Freight, storage, and handling	each	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]
Total materials						[redacted]	[redacted]	**1,947.0**
Gate station labour and construction	FEED	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Engineering, procurement, construction management	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	Fabrication and construction							
	- Civil structural	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]

Category	Description	Units	Units QTY	Number of sites	Unit cost $/ unit	City gate $'000	Trunk main $'000	Total $'000
	- Mechanical	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	- E&I	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	- SCADA	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	- Utilities	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	City gate – Owner's cost	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
	City gate – Land	each	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]
Trunk main DN250 (1.3 km)	Contractor rate (including traffic, reinstatement and pressure testing and commissioning)	meters	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]
	Design, planning and permits				[redacted]		[redacted]	[redacted]
Total labour						[redacted]	[redacted]	**5,183.8**
Total						[redacted]	[redacted]	**7,130.8**

Appendix C – Comparison of risk assessments for each option

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

Option 3	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

Appendix D – Northern Connector route

SA116 – Seaford Aldinga high pressure augmentation

1.1 Project approvals

Table 1.1: Business case SA116 – Project approvals

Prepared by	Sarah Donnelly, Asset Engineer, APA
Reviewed by	Martijn Vlugt, National Manager Asset Strategy and Planning, APA
Approved by	Craig Bonar, Head of Engineering and Planning, APA Mark Beech, General Manager Network Operations, AGN

1.2 Project overview

Table 1.2: Business case SA116 – Project overview

Description of the problem / opportunity	The southern suburbs of metropolitan Adelaide, from Noarlunga down to Sellicks Beach, is a major residential growth area. Over the past five years, the number of customer connections in the region has grown by an average of 498 new residential connections per year. We expect growth to continue at this rate (as a minimum) over the next access arrangement (AA) period (July 2021 to June 2026). This historical growth in residential connections has decreased the amount of spare capacity in the Seaford Aldinga high pressure (HP) network, and we are reaching the point where augmentation is required in order to maintain customer supply pressures. Several infrastructure projects such the Main South Road duplication, and construction of a new school in Aldinga, combined with forecast residential growth in the City of Onkaparinga[68], indicates that residential growth will continue to be strong and natural gas demand in the region will continue to increase. Continued load growth in the region increases the risk of pressures dropping below 90 kPa, which is the minimum level necessary to maintain a safe and reliable customer supply. Based on the historical growth rates alone, we estimate that unless action is taken to augment the southern network, pressures will fall below 90 kPa before 2023. The load increase will have the greatest impact on the southern extremity of the Seaford Aldinga HP network, particularly in and around Aldinga itself, which is home to around 2,400 customers. Network augmentation is therefore required before 2023 to ensure customers' supply is not affected. This business case considers options to augment the Seaford Aldinga HP network during 2021/22.
Untreated risk	As per risk matrix = **High**
Options considered	• **Option 1** – Duplicate 2.8 km of DN280 trunk main from McLaren Vale to Aldinga ($3.1 million) • **Option 2** – Build loop and then duplicate the DN280 trunk main from McLaren Vale to Aldinga ($5.0 million) • **Option 3** – Maintain status quo (no upfront costs, but reactive augmentation will be required post 2023 upon supply/pressure failure)
Proposed solution	**Option 1** is the proposed solution, as it will support continued load growth in the southern metropolitan area without impacting existing customers' supply. **Option 1** is the lowest direct cost option and has the lowest net present cost.
Estimated cost	The forecast direct capital cost (excluding overhead) during the next AA period (July 2021 to June 2026) is $3.1 million. The project would be delivered during 2021/22.

[68] Projections from .id, see: https://forecast.id.com.au/onkaparinga/residential-development?WebID=10

	$'000 2019/20	21/22	22/23	23/24	24/25	25/26	Total
	Seaford Aldinga HP augmentation	3,074.2	-	-	-	-	3,074.2
Basis of costs	All costs in this business case are expressed in real unescalated dollars at December 2019 unless otherwise stated. Some tables may not add due to rounding.						
Alignment to our vision	This investment aligns with Delivering for Customers as it will ensure around 2,400 customers in the Aldinga area will continue to receive a reliable natural gas supply. It will also allow for expansion of the network to Sellicks Beach and other growth areas in the future. The proposed solution is also Sustainably Cost Efficient, as it has the best net present value (NPV) of the viable solutions.						
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed solution is consistent with good industry practice, as the trunk main duplication will ensure pressures do not drop below minimum acceptable levels. Several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing this service. **NGR 79(2)** – proposed capex is justifiable under NGR 79(2)(c)(ii), as it is necessary to maintain the integrity of services. **NGR 74** – the forecast costs and are based on the latest market rate testing and project options consider the current TP pipeline condition and priority as per the Strategic Asset Management Plan. NPV assessments have been conducted for the viable options. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.						
Treated risk	As per risk matrix = **Low**						
Stakeholder engagement	We are committed to operating our networks in a manner that is consistent with the long-term interests of our customers. To facilitate this, we conduct regular stakeholder engagement to understand and respond to the priorities of our customers and stakeholders. Feedback from stakeholders is built into our asset management considerations and is an important input when developing and reviewing our expenditure programs. Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect us to deliver a high level of public safety. Consistent with our customers' priorities, the Seaford Aldinga HP augmentation project is essential to ensure customers continue to receive a reliable natural gas supply above the minimum acceptable pressure. We have looked at several options to address the pressure drop risk in Aldinga and have selected the solution that has the lowest cost impact on customers over the long term.						
Other relevant documents	• Attachment 8.2 Strategic Asset Management Plan • Supporting Information 8.8.3 SA116 NPV & Options Analysis						

1.3 Background

The southern suburbs of metropolitan Adelaide, from Noarlunga down to Sellicks Beach, is a major residential growth area. Over the past five years, the number of customer connections in the region has grown by an average of 498 new residential connections per year, and we expect this growth to continue at this rate (as a minimum) over the next AA period.

The HP network in the southern suburbs (comprising most of the City of Onkaparinga local government area) supplies more than 15,000 customers. Refer to Appendix A for a network map.

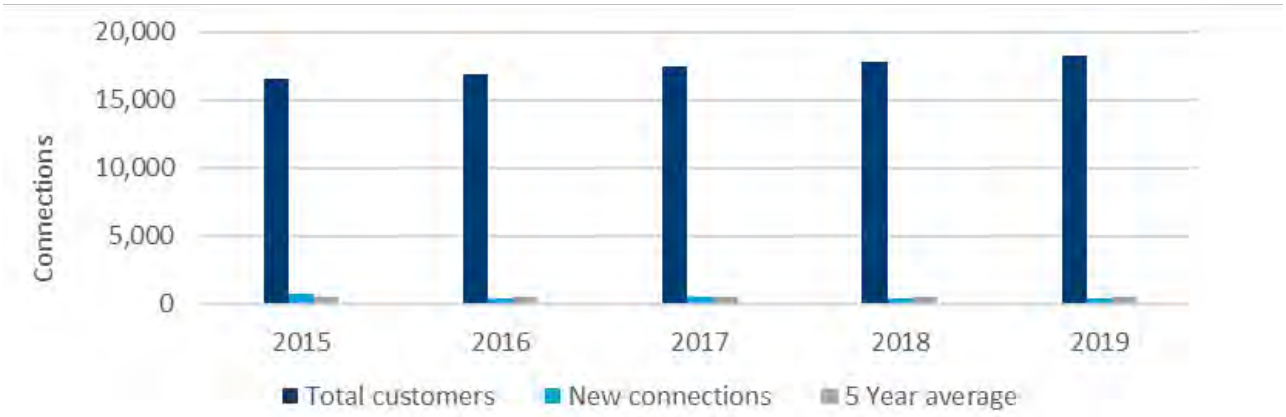
1.3.1 Impact of historical growth

Historical growth in residential connections has decreased the amount of spare capacity in the Seaford Aldinga network. We are reaching the point where augmentation is required in order to maintain customer supply pressures above minimum acceptable levels. The southern extremity of the network, in and around Aldinga, is particularly susceptible to pressure drop.

Aldinga is connected to the nearest district regulator by a single 15 km trunk main, and is home to around 2,400 customers. A DN80 / DN100 nominal diameter trunk main delivers gas to the area. The first 4 km of this trunk main is duplicated with a DN280 polyethylene trunk main along Commercial Road. One pressure telemetry point at the Aldinga fringe location is used to monitor the performance of the network. Due to the length of the pipeline and limited spare capacity in the network, a relatively minor increase in load can lead to substandard pressures and supply issues.

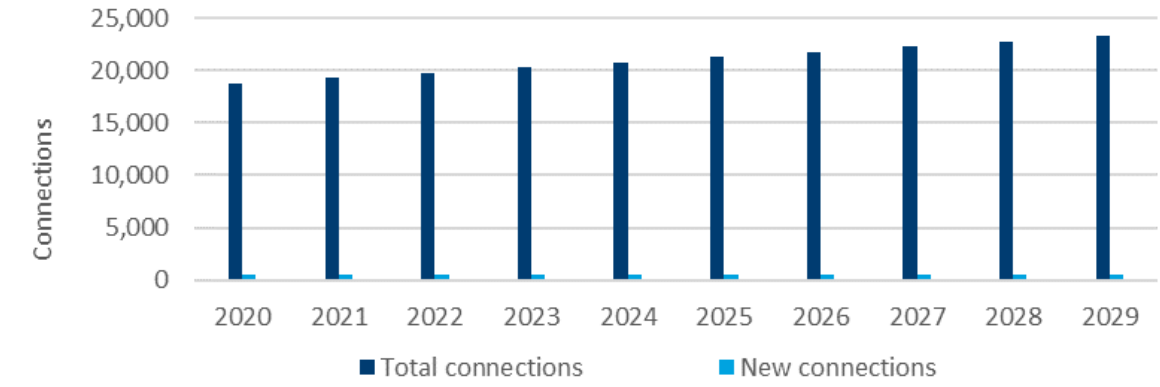
Figure 1.1 shows the historical growth in new connections in the region[69] since 2014.

Figure 1.1: Historical connection growth in southern HP network, 2014 to 2018



Based on this historical growth, Figure 1.2 shows the estimated increase in connections over the next ten years.

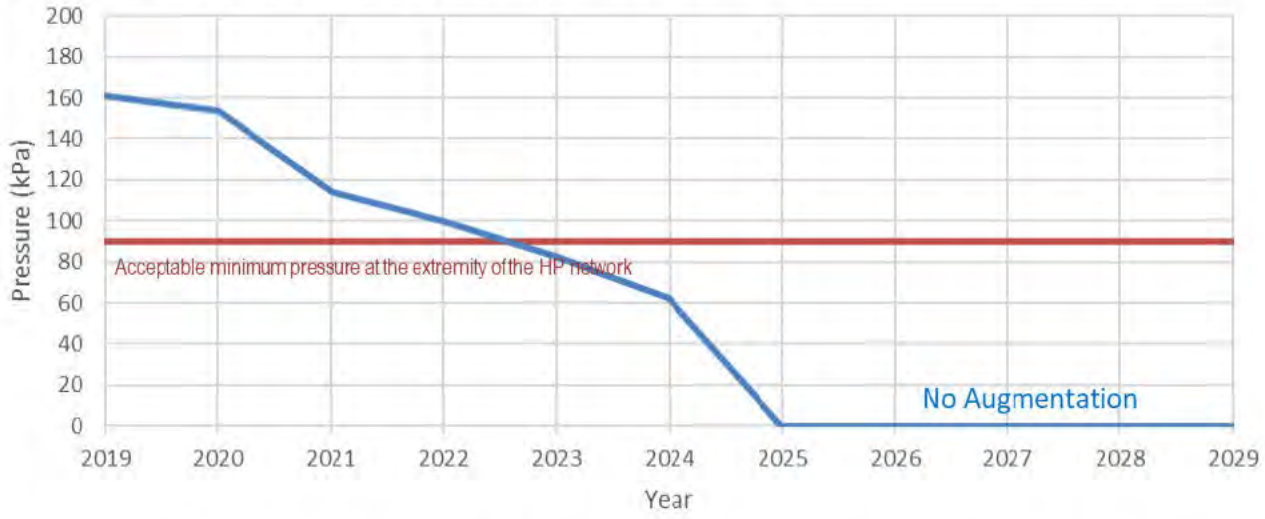
Figure 1.2: Estimated growth in new connections in the southern suburbs, based on historical connections



If we assume the historical average connection rate of 498 new connections per year continues, we estimate pressure levels in the Seaford Aldinga HP network will fall below the minimum acceptable pressure of 90 kPa before 2023 if the network is not augmented (See Figure 1.3).

[69] This analysis covers Noarlunga, Hackham, Huntfield Heights, Old Noarlunga, Seaford, Moana and Aldinga.

Figure 1.3: Estimated impact on pressures in Aldinga if the network is not augmented



If pressures fall below 90 kPa, this has an impact on the downstream pressure at the customers' gas meter and gas appliances, and means we may not be able to supply gas to each customer's premises at the minimum level required to fuel appliances. Substandard pressures can result in gas appliances becoming inoperable and potentially dangerous.

1.3.2 Future growth

There is evidence to suggest future growth in connections may be higher than the historical rate.

For example, the Department of Planning, Transportation and Infrastructure (DTPI) South Australia is developing detailed designs and undertaking preliminary works for Stage 1 of the Main South Road duplication from Seaford to Aldinga.[70] Consideration is also being given to a rail extension from Seaford to Aldinga. These projects are likely to stimulate growth and generate infill connections in these suburbs and along the road duplication. Stage 2 of the Main South Road duplication proposes to extend the highway further into Sellicks Beach (approximately 5 km south of Aldinga). Our market research indicates this will provide opportunity to extend natural gas supply to Sellicks Beach, with potential for another 2,000 residential connections over the next 20 years.

A new school is also being constructed along Port Road in Aldinga, using a public/private partnership (PPP). The PPP school will host 1,675 students and is set to open at the start of the 2022 school year.[71] It is being built to meet projected enrolment demand coming from strong population growth in Aldinga Beach, Sellicks Beach and surrounding areas.

Dwelling increase estimates by forecast.iD for the City of Onkaparinga also indicate a growth rate above the historical average.[72] Table 1.3 shows the forecast change in the number of dwellings in areas supplied by the southern gas distribution network from 2016 to 2036.

Table 1.3: Forecast residential development, 2016 to 2036, City of Onkaparinga

City of Onkaparinga area	Forecast change in dwellings between 2016 and 2036	
	Number	%
Aldinga - Port Willunga	+997	+75.9

[70] https://dpti.sa.gov.au/infrastructure/road_projects/main_south_road_duplication

[71] https://www.education.sa.gov.au/sites-and-facilities/upgrades-and-new-schools/new-school-south

[72] https://forecast.id.com.au/onkaparinga/residential-development?WebID=10

City of Onkaparinga area	Forecast change in dwellings between 2016 and 2036	
	Number	%
Aldinga Beach	+1,137	+23.3
Hackham	+2,281	+135.4
Hackham West	+218	+12.8
Huntfield Heights	+226	+13.1
Maslin Beach	+61	+10.9
McLaren Vale	+204	+11.6
Moana	+741	+59.4
Noarlunga Centre - Noarlunga Downs	+1,595	+87.9
Old Noarlunga	+25	+4.0
Port Noarlunga	+411	+29.2
Port Noarlunga South	+484	+39.4
Port Willunga and surrounds	+254	+16.7
Seaford	+483	+24.6
Seaford Heights	+1,325	+5412.6
Seaford Meadows	+685	+44.6
Seaford Rise	+145	+6.0
Sellicks Beach	+1,456	+108.9
Total growth	**+12,728**	
Growth per year	**+636**	

Source: forecast.id, 2020 see: https://forecast.id.com.au/onkaparinga/residential-development?WebID=10

Even if we apply a conservative estimate of 74%[73] gas penetration for brownfield developments (noting that the historical average penetration rate for new developments is 95%), this will result in around 659 new gas connections per year.

Given this forecast load increase, network augmentation is required to ensure customers' supply is not affected. This business case therefore considers options to augment the Seaford to Aldinga network during 2021/22.

[73] Note 74% is the historical average penetration rate for brownfield developments.

1.4 Risk assessment

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 1.4). 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 1.4: 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; and
- 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 AGN 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).

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.

Seven consequence categories are considered for each type of risk:

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

A summary of our risk management framework, including definitions, has been provided in Attachment 8.10.

The risk identified for the natural gas distribution network in the Aldinga region is that load growth will cause pressures to drop, leading to substandard supply or loss of supply to up to 2,400 customers and potential for a gas in building event.

The primary consequence category affected by this risk is supply (operations) as a pressure drop can cause outages to >1,000 customers, thereby carrying a significant consequence rating under the risk matrix. Given load growth is ongoing, if the risk is left untreated the likelihood of a pressure drop impacting >1,000 customers is rated frequent, as it is likely to occur on a regular basis (many times in one year), and will worsen as growth continues.

Any significant customer outage would then give rise to a moderate reputational and compliance risk. There is also a moderate health and safety risk, as pressure fluctuations may cause appliances to stop working correctly. For example, a pilot light on a stove or heater could go out due to the low pressure, but the appliance could continue to release gas if the pressure returns and the user has not noticed the flame is out. In certain circumstances this could result in injury or illness.

The untreated risk[74] rating is presented in Table 1.4

Table 1.4: Loss of supply risk in Aldinga region – Untreated risk

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

1.5 Options considered

We have considered the following options to address the pressure drop risk in the Seaford Aldinga HP distribution network:

- **Option 1** – Duplicate 2.8 km of DN280 trunk main from McLaren Vale to Aldinga;
- **Option 2** – Build loop and then duplicate DN280 trunk main from McLaren Vale to Aldinga; or
- **Option 3** – Maintain status quo, take no action.

These options are discussed in the following sections.

1.5.1 Option 1 – Duplicate 2.8 km of DN280 trunk main from McLaren Vale to Aldinga

Under this option, we would install a duplicate DN280 HP trunk main, tying into the end of the existing DN280 trunk on Commercial Road at the McLaren Vale offtake, and then extending approximately 2.8 km south to Aldinga (refer to Appendix A for map). This option would augment the Aldinga network to mitigate the pressure drop risk, and would sustain forecast growth for five-to-six years.

A further 2.2 km of trunk duplication along Main South Road will be required to support expected growth in Sellicks Beach. This additional trunk main and will also support neighbouring Aldinga and

[74] Untreated risk is the risk level assuming there are no risk controls currently in place. Also known as the 'absolute risk'.

Aldinga Beach, where growth is expected to be strong. However, this can be deferred to 2028 if we install the initial 2.8 km of trunk main in 2021/22.

The advantage of this option is that it reduces the amount of capital expenditure required for the forthcoming AA, and sets an efficient platform for further augmentation when the forecast growth occurs in Sellicks Beach.

Once the 2.2 km Sellicks Beach extension has been delivered, there should be sufficient capacity to support further growth for at least 12-15 years. Based on current projections, no further HP augmentation is currently forecast for the Seaford Aldinga HP network until beyond 2040.

1.5.1.1 Cost assessment

The direct cost of this option during the next AA period is $3.1 million (see Table 1.5).

Table 1.5: Cost estimate – Option 1, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Scope	Install 2.8 km of DN280					Install 2.8 Km of DN280
Labour	2,690.3	-	-	-	-	2,690.3
Material	384.0	-	-	-	-	384.0
Total	**3,074.2**	-	-	-	-	**3,074.2**

Note an additional $2.4 million would be required in 2027/28 to accommodate growth in Sellicks Beach. This is captured in the 25-year NPV analysis, summarised in section 1.6.

Refer to Appendix B for a more detailed cost breakdown.

1.5.1.2 Risk assessment

Option 1 would reduce the loss of supply risk from high to low. This is because having a second source of supply would reduce the likelihood of a pressure drop impacting >1,000 people from frequent to remote. The risk consequence rating remains unchanged. Option 1 also reduces the likelihood of a pressure drop leading to safety incidents for customers.

Table 1.6: Loss of supply risk in Aldinga region – Option 1

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

While Option 1 achieves the same risk rating as Option 2, the solution under Option 1 provides this risk reduction at a lower overall cost.

1.5.1.3 Alignment with vision objectives

Table 1.7 shows how Option 1 aligns with our vision objectives.

Table 1.7: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 1 aligns with our objective of *Delivering for Customers*, as it will ensure the supply pressure to existing customers will continue to operate at acceptable levels, despite the ongoing growth in the network. It also mitigates the risk of low appliance pressure leading to a public health and safety incident.

Option 1 also aligns with our objective of being *Sustainably Cost Efficient*, as it results in a better NPV than Option 2, while allowing further network augmentation to be deferred to the subsequent AA period (2026/7 to 2030/31).

Though Option 2 allows network augmentation to support Sellicks Beach to be deferred by an additional ten years, it does this at a higher overall cost than Option 1. Therefore, if we assume the forecast growth in Sellicks Beach will materialise, Option 1 is the most cost efficient.

1.5.2 Option 2 – Build loop and then duplicate DN280 trunk main from McLaren Vale to Aldinga

Option 2 has two stages. The first is stage is to install 1.7 km of DN280 HP trunk main to create a loop between How Road and Aldinga Beach Road (refer to the map in Appendix A). This initial investment will resolve the immediate pressure drop risk, and will be delivered during the first year of the forthcoming AA period (2021/22)

The second stage is to duplicate 2.8 km of DN280 main between the McLaren Vale offtake at Commercial Road and extend it south to Aldinga as per Option 1. This would be delivered in the last year of the AA period (2025/26).

The advantage of this option is that it addresses the immediate pressure drop risk at a lower initial cost, and will defer the need for further augmentation to accommodate growth in Sellicks Beach until 2037/38, at which point the 2.2 km DN280 main duplication will be required.

1.5.2.1 Cost assessment

The direct cost of this option is $5 million (see Table 1.8).

Table 1.8: Cost estimate – Option 2, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Scope	Install 1.7 km loop	-	-		Install 2.8 Km of DN280 trunk	Install 1.7 km loop and 2.8

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
						km DN280 trunk
Labour	1,662.8		-	-	2,690.3	4,353.2
Material	241.0		-	-	384.0	625.0
Total	**1,903.8**		**-**	**-**	**3,074.3**	**4,978.1**

Note an additional $2.4 million would be required in 2037/38 to accommodate growth in Sellicks Beach. This is captured in the 25-year NPV analysis, summarised in section 1.6.

1.5.2.2 Risk assessment

Option 2 would reduce the loss of supply risk from high to low. This is because having a second source of supply would reduce the likelihood of a pressure drop impacting >1,000 people from frequent to remote. The risk consequence rating remains unchanged. Option 2 also reduces the likelihood of a pressure drop leading to safety incidents for customers.

Table 1.9: Loss of supply risk in Aldinga region – Option 2

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

While Option 2 achieves the same risk rating as Option 1, the solution under Option 2 provides this risk reduction at a higher overall cost.

1.5.2.3 Alignment with vision objectives

Table 1.10 shows how Option 2 aligns with our vision objectives.

Table 1.10: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 2 aligns with our objective of *Delivering for Customers*, as it will ensure the supply pressure to existing customers will continue to operate at acceptable levels, despite the ongoing growth in the network. It also mitigates the risk of low appliance pressure leading to a public health and safety incident.

However, Option 2 does not align with our objective to be *Sustainably Cost Efficient*. Option 2 has a worse NPV than Option 1. Option 2 results in a greater cost during the next AA period and though it defers the need for further augmentation to support growth in Sellicks Beach for an additional ten years, it achieves this at a higher overall cost.

Construction of the loop is also very much a temporary solution. Assuming the growth in Sellicks Beach occurs as forecast, Option 2 would not be the most cost efficient option.

1.5.3 Option 3 – Maintain status quo

Under this option we would not incur any proactive capacity expansion capex to reduce the loss of supply risk in Aldinga. Instead, we would manage the network as per current practice, and address any supply issues as and when they occur.

Given the current load growth forecasts, it is highly likely capital costs to address supply shortfall will be incurred reactively as minimum pressure limits are reached post 2023. As the network is already operating at its maximum allowable operating pressure (MAOP) no further network capacity can be enabled through pressure increases.

We consider maintaining the status quo is not a viable solution, as it simply defers capacity expansion expenditure, as well as potentially resulting in high-cost reactive works.

1.5.3.1 Cost assessment

While there are no additional upfront costs associated if we maintain the status quo, as mentioned above, we are likely to incur greater reactive maintenance costs as pressure issues emerge.

While it is not possible to quantify the reactive costs we would incur at this time, in our experience a project conducted reactively is around 3.2 times more expensive than one conducted proactively.[75] This assumption is consistent with the commonly accepted asset management principle that reactive asset maintenance can be around two to five times higher than proactive planned maintenance.[76]

Following the reactive works, if the network continually experiences substandard pressures, one of the solutions described under Option 1 or 2 would need to be applied.

1.5.3.2 Risk assessment

Under Option 3, the risk level would remain the same as the untreated risk as there are no controls in place to mitigate the pressure drop risk (other than not connecting new customers, which is not a viable option). Table 1.11 shows the risk level if were to maintain the status quo.

Table 1.11: Loss of supply risk in Aldinga region – Option 3

Option 3	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

Option 4 is therefore not consistent with our risk management framework, which requires action must be taken to reduce any high risks to low or ALARP.

[75] For example, this is typically due to the additional premia for faster acquisition of long lead time materials, emergency response, labour costs, additional traffic management/permit costs, resource scheduling, etc.

[76] Marshall Institute, Omega engineering, ARMS reliability.

1.5.3.3 Alignment with vision objectives

Table 1.12 shows how Option 3 aligns with our vision objectives.

Table 1.12: Alignment with vision – Option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 3 would not align with *Delivering for Customers*, as it would allow up to 2,400 customers' supply pressures to drop and/or be interrupted. It would also fail to result the potential for safety incidents resulting from pressure drop.

Maintaining the status quo would also not be *Sustainably Cost Efficient*, as it would likely result in us incurring costly reactive works, while merely deferring necessary capacity expansion works to into the future or by inefficiently constraining our ability to connect additional customers in growing areas.

1.6 Summary of costs and benefits

Table 1.13 presents a summary of how each option compares in terms of the estimated cost, the residual risk rating, and alignment with our vision objectives. To assess which solution is likely to cost the most over time, we have conducted a net present value assessment of Options 1 and 2. We have not included Option 3 (maintaining the status quo) in the NPV assessment as we do not consider this to be a prudent option.

Table 1.13: Comparison of options

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives	NPV ($ million)
Option 1 – duplicate trunk	3.1	Low	Aligns with *Delivering for Customers* and *Sustainably Cost Efficient* Allows deferral of further augmentation to 2027/28. No additional HP augmentation would be required after 2028 to accommodate forecast load growth in the study period (to 2040).	-5.2
Option 2 – install loop and then duplicate trunk	5.0	Low	Aligns with *Delivering for Customers* but is less Sustainably Cost Efficient than Option 1. Higher overall cost within the AA period, and a worse NPV than Option 1 but allows augmentation to accommodate Sellicks Beach to be deferred to 2037/38.	-6.4

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives	NPV ($ million)
Option 4 – Maintain status quo	0 upfront capital costs	High	Does not align with *Delivering for Customers* or *Sustainably Cost Efficient*	n/a

In the NPV analysis over the 25 years to 2045, Option 1 includes costs of $2.4 million for further HP augmentation in 2027/28. These 2027/28 costs would accommodate expansion of the network to meet load growth in Sellicks Beach. No further HP augmentation is forecast to 2040.

In the NPV for Option 2, the $2.4 million for augmentation to accommodate Sellicks Beach is included in 2037/38. No further HP augmentation is forecast for the two years following this to 2040.

1.7 Recommended option

Option 1, duplicating the trunk main from the McLaren Vale offtake to Aldinga, is the recommended option.

1.7.1 Why is the recommended option prudent?

Duplicating the 2.8 km DN280 trunk by 2022/23 is the most prudent option as it addresses the pressure drop risk before the minimum acceptable levels arise, while setting an efficient platform for further augmentation when the forecast growth occurs in Sellicks Beach and the regions around Aldinga.

Option 1 provides sufficient capacity to support the forecast organic growth over the remainder of the next AA period, enabling us to defer additional augmentation until 2027/28. No additional augmentation is forecast after 2027/28. This means Option 1 has the effect spreading the costs of augmenting the Seaford Aldinga HP network over two AA periods, therefore reducing the impact on customer's bills. Though Option 2 spreads the cost over three AA periods, it does so at a greater overall cost.

As well as being a lower cost than Option 2, Option 1 has the benefit of offering more flexibility than Option 2 if actual growth varies from forecast. Installing the 2.8 km trunk in the first instance will provide sufficient capacity in the HP network for at least 5-6 years, which will provide sufficient time for us to reassess long term requirements before committing to the next phase of augmentation. The 2.8 km trunk duplication is a critical component in all options to augment the network and will almost certainly be required within the next five years irrespective of what growth occurs. Having the trunk in place will allow us to scale up or scale down our forecast capital expenditure depending on how much growth materialises.

Option 2 affords less room for manoeuvre. While installing the loop is a relatively inexpensive short term fix, it would not provide sufficient additional capacity to enable us to defer further augmentation for a significant amount of time. The 2.8 km trunk duplication would still be required during the next AA period. Option 2 only becomes a prudent option if forecast growth is lower than expected and/or the Aldinga and Sellicks Beach demand does not arise. We consider there is sufficient evidence to suggest load growth in the Seaford Aldinga HP network will be greater than historical levels.

1.7.2 Estimating efficient costs

Key assumptions made in the cost estimation include:

- the cost estimate is based on costing the activities that comprise the work breakdown structure;

- the rates utilised in costing these activities are based on current vendor and contractor rates in 2019 and historical costing; and
- load growth will occur at or above the historical level.

The forecast cost breakdown is shown in the following table.

Table 1.14: Cost estimate – $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Scope	Install 2.8 km of DN280	-	-	-	-	Install 2.8 Km of DN280
Labour	2,690.3	0	0	0	0	2,690.3
Material	384.0	0	0	0	0	384.0
Total	**3,074.2**	**0**	**0**	**0**	**0**	**3,074.2**

The following table shows the costs escalated to June 2021 dollars.

Table 1.15: Escalated cost estimate ($'000)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Total unescalated ($ Dec 19)	3,074.2	-	-	-	-	3,074.2
Escalation	103.6	-	-	-	-	103.6
Total escalated ($ Jun 21)	**3,177.8**	**-**	**-**	**-**	**-**	**3,177.8**

1.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 and Rule 74 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

Rule 79(1)

The proposal to duplicate 2.8 km of trunk main from the McLaren Vale offtake to Aldinga is consistent with the requirements of NGR 79(1). Specifically, we consider that the capital expenditure is:

- **Prudent** – the expenditure is necessary in order to maintain supply pressure in the Aldinga network at operable levels as load in the area grows. The proposed solution also provides flexibility to meet future growth and defer additional augmentation until at least the subsequent AA period. The proposed risk treatment is consistent with accepted industry practice and current design standards, and is proven to address the risk associated with substandard pressures. Practicable options have been considered. The proposed expenditure is therefore consistent with that which would be incurred by a prudent service provider.
- **Efficient** – the forecast expenditure is based on rates applied in similar projects. The preferred option has the lowest net present value of viable options, and will support continued load growth over the next 20 years.

- Consistent with accepted industry practice – the trunk duplication is an accepted industry practice and is consistent with augmentation works undertaken in the southern networks during the current AA period (and prior).

- To achieve the lowest sustainable cost of delivering pipeline services – the proposed option has the lowest net present value and will defer the requirement for additional augmentation into the next AA period. The selected Option 1 requires considerably less pipeline to be constructed, and has a lower overall cost based on forecast load growth requirements over the next 20 years.

NGR 79(2)

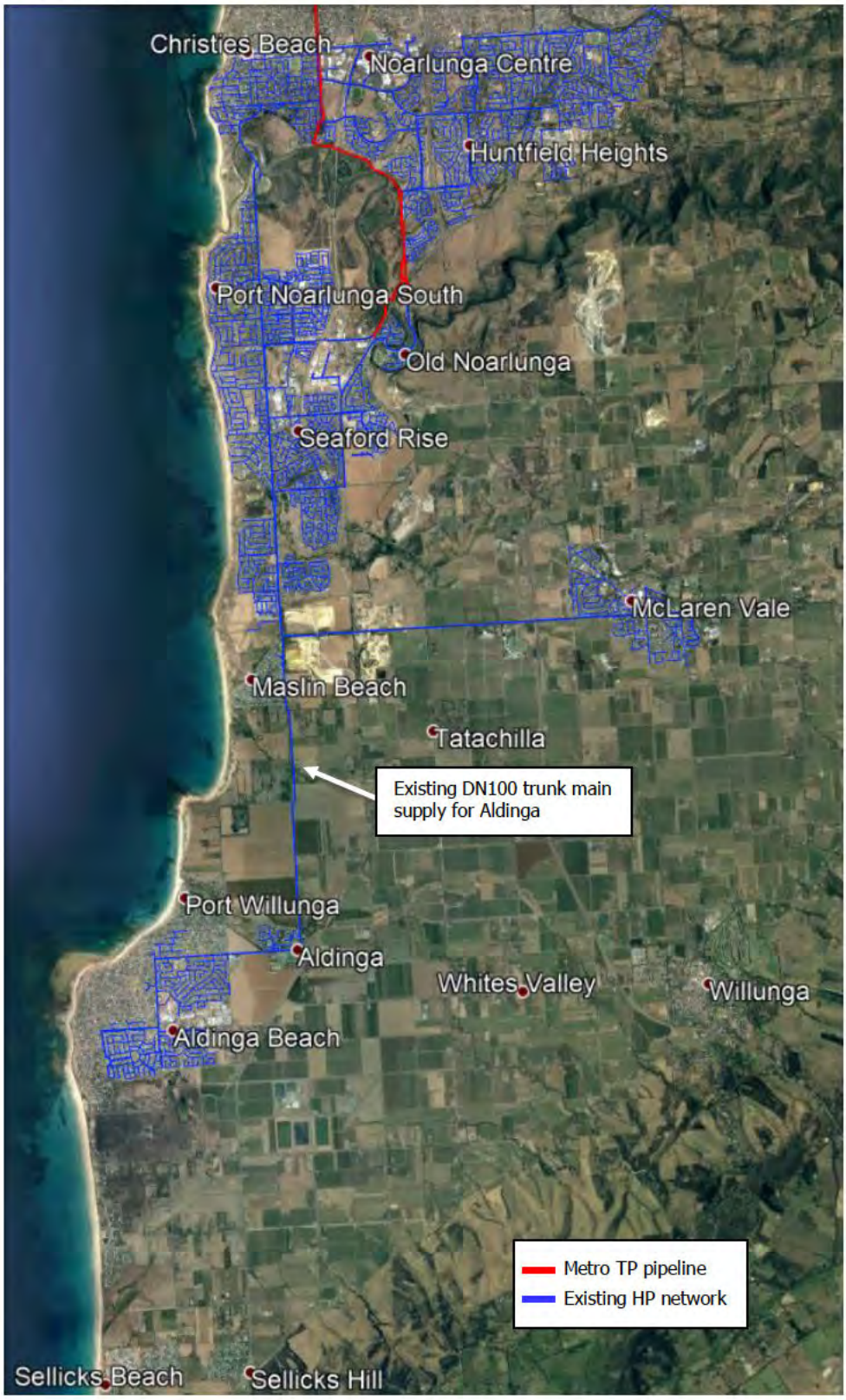
The proposed capex is justifiable under 79(2)(c)(ii), as it is necessary to maintain the integrity of services. Allowing pressure at the extremities of the Seaford Aldinga network to drop below the minimum allowable level will interrupt the natural gas supply of up to 2,400 customers.

NGR 74

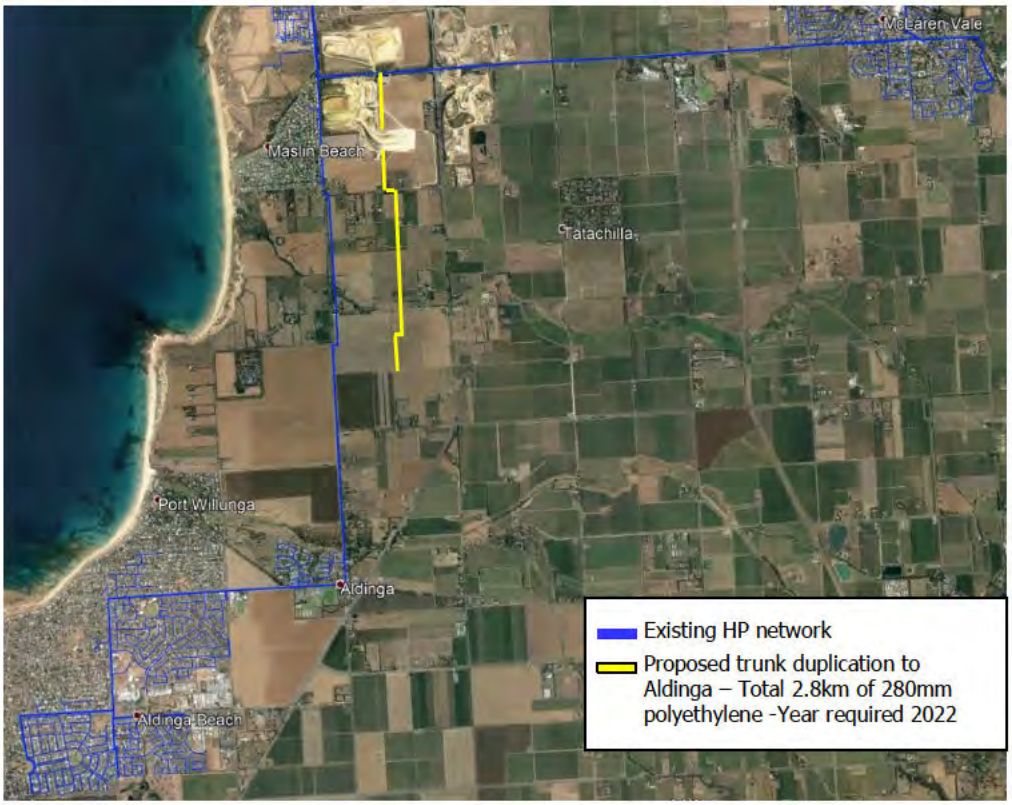
The forecast costs are based on the latest market rate testing and project options consider asset management requirements as per the Strategic Asset Management Plan. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Appendix A – Asset location maps and configuration drawings

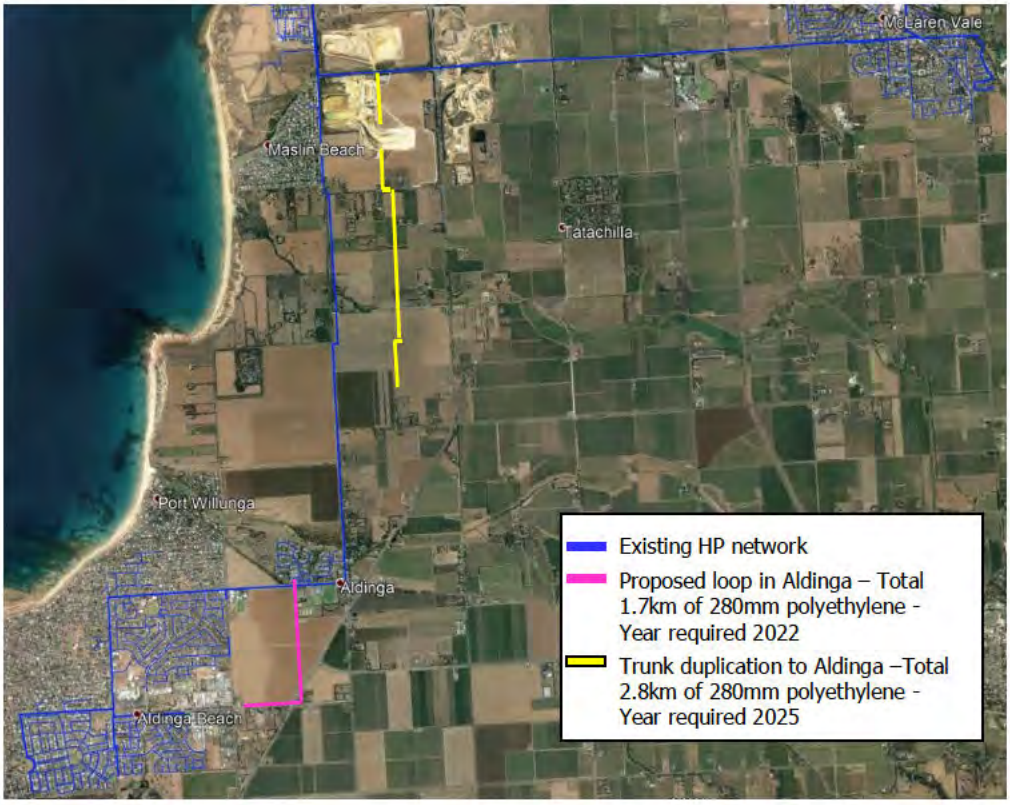
A.1 HP southern network map



A.2 HP Southern Network MAP – Option 1



A.3 HP Southern Network MAP – Option 2



Appendix B – Cost estimates

Cost estimate - Option 1

Category	Description	Units	Units QTY	Number of sites	Unit Cost $/ unit	Total $'000
Materials						
Pipe, valves and fittings	DN280 Polyethelyne Pipe, valves and fittings	metres	[redacted]	[redacted]	[redacted]	[redacted]
Other	Freight, storage, and handling	each	[redacted]	[redacted]	[redacted]	[redacted]
Total Materials						**384.0**
Project management, design and initiation	Project manager	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Project engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Planning engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	GIS technician	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Draftsperson	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Site Supervisor	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Compliance and communication officer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	HSE representative	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Survey Alignment, land acquisition and third party permits	each	[redacted]	[redacted]	[redacted]	[redacted]
Project site labour and delivery	Contractor rate (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Reinstatement (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Reinstatement (DPTI Road Profiling)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Traffic Control (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Pressure Testing (Hydro test)	each	[redacted]	[redacted]	[redacted]	[redacted]

Category	Description	Units	Units QTY	Number of sites	Unit Cost $/ unit	Total $'000
	Non Destructive Testing	each	[redacted]	[redacted]	[redacted]	[redacted]
	Commissioning	each	[redacted]	[redacted]	[redacted]	[redacted]
Total Labour						**2,690.3**
Total Project						**3,074.2**

Cost estimate - Option 2

Category	Description	Units	Units QTY	Number of sites	Unit Cost $/ unit	Total $'000
Materials						
For the 1.7 Km Loop						
Pipe, valves and fittings	DN280 Polyethylene Pipe, valves and fittings (1.7km)	metres	[redacted]	[redacted]	[redacted]	[redacted]
Other	Freight, storage, and handling	each	[redacted]	[redacted]	[redacted]	[redacted]
For the 2.8 Km of DN280 Trunk Main						
Pipe, valves and fittings	DN280 Polyethylene Pipe, valves and fittings (2.8km)	metres	[redacted]	[redacted]	[redacted]	[redacted]
Other	Freight, storage, and handling	each	[redacted]	[redacted]	[redacted]	[redacted]
Total Materials						**625.0**
Labour						
For the 1.7 Km Loop						
Project management, design and initiation	Project manager	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Project engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Planning engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	GIS technician	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Draftsperson	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Site Supervisor	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Compliance and communication officer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	HSE representative	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Survey Alignment, land acquisition and third party permits	each	[redacted]	[redacted]	[redacted]	[redacted]
Project site labour and delivery	Contractor rate (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]

Category	Description	Units	Units QTY	Number of sites	Unit Cost $/ unit	Total $'000
	Reinstatement (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Reinstatement (DPTI Road Profiling)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Traffic Control (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Pressure Testing (Hydro test)	each	[redacted]	[redacted]	[redacted]	[redacted]
	Non Destructuve Testing	each	[redacted]	[redacted]	[redacted]	[redacted]
	Commissioning	each	[redacted]	[redacted]	[redacted]	[redacted]
For the 2.8 Km of DN280 Trunk Main						
Project management, design and initiation	Project manager	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Project engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Planning engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	GIS technician	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Draftsperson	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Site Supervisor	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Compliance and communication officer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	HSE representative	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Survey Alignment, land acquisition and third party permits	each	[redacted]	[redacted]	[redacted]	[redacted]
Project site labour and delivery	Contractor rate (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Reinstatement (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Reinstatement (DPTI Road Profiling)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Traffic Control (based on historical rates)	metres	[redacted]	[redacted]	[redacted]	[redacted]
	Pressure Testing (Hydro test)	each	[redacted]	[redacted]	[redacted]	[redacted]
	Non Destructive Testing	each	[redacted]	[redacted]	[redacted]	[redacted]

Category	Description	Units	Units QTY	Number of sites	Unit Cost $/ unit	Total $'000
	Commissioning	each	[redacted]	[redacted]	[redacted]	[redacted]
Total Labour						**4,353.2**
Total Project						**4,978.1**

Appendix C – Comparison of risk assessment for each option

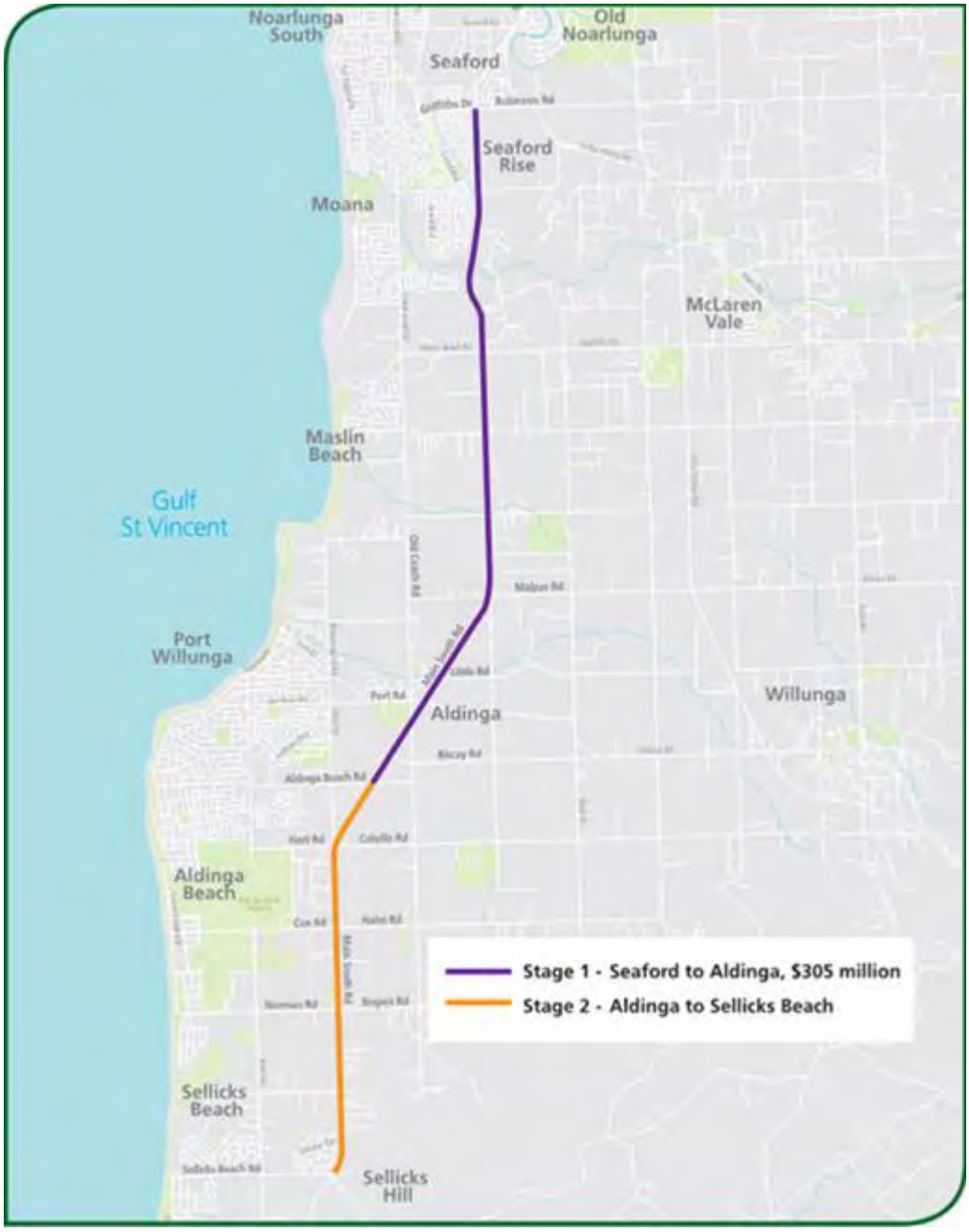
Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Rare	Rare	Remote	Rare	Remote	Remote	Remote	Low
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Negligible	Negligible	Low	Negligible	Low	Low	Negligible	

Option 3	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Rare	Frequent	Rare	Occasional	Occasional	Occasional	High
Consequence	Minor	Minimal	Significant	Minimal	Significant	Significant	Minor	
Risk Level	Low	Negligible	High	Negligible	Moderate	Moderate	Low	

Appendix D – Main South Road duplication project



SA117 – Applications renewal and upgrades

1.1 Project approvals

Table 1.1: Business case SA117 – Project approvals

Prepared by	Damian La Pia, Project Management Lead, APA
Reviewed by	Peter Butler, Business Improvement Manager, APA
Approved by	Trevor Coles, Business Relationship Manager, APA Andrew Staniford, Chief Customer Officer, AGN

1.2 Project overview

Table 1.2: Business case SA117 – Project overview

Description of the problem / opportunity	There a number of critical Information Technology (IT) systems that are integral to the efficient and effective management of the South Australian (SA) natural gas distribution networks. The systems include: • Dial Before You Dig system; • metering & billing system; • enterprise asset management; • geospatial information system; • enterprise historian including national interval metering system; • FRC market gateway; • middleware; and • field data / mobility applications. IT systems are updated on a continual basis. This includes applying software patches that upgrade applications to the latest version as per the vendors' recommendations. Renewing and upgrading applications ensures the continued provision of ongoing support and maintenance of our key IT systems, and that any known issues, including security vulnerabilities, can be addressed. Prior to the current access arrangement (AA) period, the majority of our core IT applications had not been updated for many years. Over the past five years we moved to the standard industry practice of applying version upgrades to business systems every three years. Our IT upgrade strategy is being delivered via a nationwide program that crosses all of the jurisdictions in which AGN's businesses reside. The program was approved by the AER in the prior AGN South Australia determination and in the most recent AGN Victoria & Albury determination. This business case considers whether it is prudent to continue with the current proactive upgrade strategy, or to revert to a replace on obsolescence/failure strategy.
Untreated risk	As per risk matrix = **High**
Options considered	• **Option 1** – Do not upgrade IT applications on a regular basis (no additional upfront capital cost) • **Option 2** – Upgrade critical IT applications on a regular basis, consistent with our application lifecycle management methodology ($14 million) Other options considered as part of this business case but dismissed as not prudent included: • strategic deferral of some upgrades into future periods. While it may be technically possible to defer some upgrades, this will result in the business not receiving any benefits of upgrading in the ensuing period and incurs an inappropriate and ever-increasing level of risk. Additionally, experience indicates that this does not result in lower costs - it simply results in adding the deferred investment amounts into the cost of the following upgrade;

- purchasing extended support for applications where support periods have expired. Extended vendor support can be purchased, however this comes at a significant cost premium. This would also result in continued acceptance of many of the risks associated with not upgrading; and
- full replacement of existing IT systems with new systems. While full system replacement would adequately mitigate risk, it would be completely cost prohibitive. In addition, these new systems would still require ongoing upgrades of similar scale to the ones proposed.

Proposed solution

Option 2 has been selected because it is the most efficient way to reduce the risks associated with outdated and unsupported IT applications to an acceptable level, and is consistent with good industry practice.

This option involves systematically upgrading the software and applications that manage AGN's operational business in South Australia, ensuring that these critical applications are kept up-to-date over the forthcoming access arrangement (AA) period (2021/22 to 2025/26).

The work proposed in this business case forms part of the AGN Applications Renewal roadmap across all jurisdictions AGN operates in.

Estimated cost

The forecast direct capital cost (excluding overhead) during the next AA period (July 2021 to June 2026) is $14 million.

$'000 2019/20	21/22	22/23	23/24	24/25	25/26	Total
Apps renewal	978.7	2,775.2	2,829.6	4,044.8	3,195.1	13,824.2

Basis of costs

All costs in this business case are expressed in real unescalated dollars at December 2019 unless otherwise stated. Some tables may not add due to rounding.

Alignment to our vision

This project aligns with the *Delivering for Customers* aspect of our vision. It delivers for customers by addressing the substantial risks associated with failure or security breaches of key systems. This could result in safety risks to customers and employees, as well as unplanned outages and disruption of supply for customers.

It also links to the *Sustainably Cost Efficient* aspect of our vision. Sizeable additional costs could result from the risks associated with not upgrading systems. This includes significant litigation costs due to compromised staff and customer data, hire of expensive IT specialists for urgent work to correct system issues, and financial penalties imposed for not complying with the RMP or other regulatory obligations.

Consistency with the National Gas Rules (NGR)

This project complies with the following National Gas Rules (NGR):

NGR 79(1) – the proposed solution is consistent with good industry practice, several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cos of providing this service.

NGR 79(2) – proposed capex is justifiable under NGR 79(2)(c)(i), (ii) and (iii), as it is necessary to maintain and improve the safety of services, maintain the integrity of services and comply with regulatory obligations.

NGR 74 – the forecast costs are based on the latest market rate testing and reflect the lifecycle management and estimation approach described in the IT Plan. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Treated risk

As per risk matrix = **Moderate**

Stakeholder engagement

We are committed to operating our networks in a manner that is consistent with the long-term interests of our customers. To facilitate this, we conduct regular stakeholder engagement to understand and respond to the priorities of our customers and stakeholders. Feedback from stakeholders is built into our asset management considerations and is an important input when developing and reviewing our expenditure programs.

Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect us to deliver a high level of public safety and are satisfied that this is current practice.

	The proposed applications renewal program applies to systems that contribute to the management of public safety risk. It is therefore important these systems remain up to date and fully functioning if we are to maintain current safety levels. Avoiding significant higher operational costs of system failure or security breaches, along with non-compliance financial penalties, will also help maintain reliability of supply at the lowest sustainable cost and minimise impact on customers' gas bills.
Other relevant documents	• Attachment 8.2 Strategic Asset Management Plan • Attachment 8.6 IT Investment Plan

1.3 Background

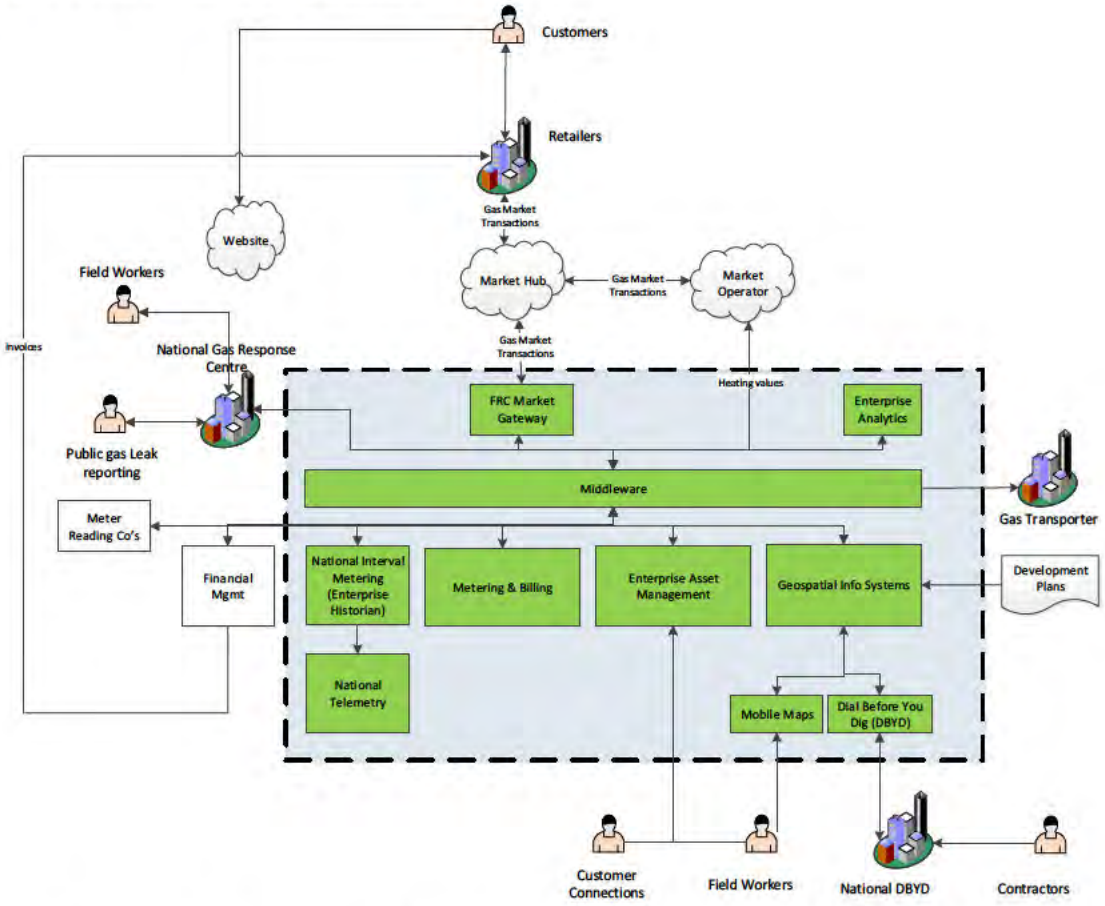
IT systems are an important component of the SA natural gas distribution network. We use a range of IT systems to operate and monitor our network assets, as well as to schedule tasks, aid planning, issue bills, measure consumption, maintain records and promote safety. Like any asset, the applications that support these systems must be maintained and upgraded to ensure they are functioning properly and support the safe and efficient operation of the network.

During the next AA period (July 2021 to June 2026), several critical IT systems are due to be upgraded. These are:

- Dial Before You Dig system;
- metering & billing system;
- enterprise asset management;
- geospatial information system;
- enterprise historian including national interval metering system;
- FRC market gateway;
- middleware; and
- field data / mobility applications.

Figure 1.1 below shows these systems fit into the broader IT architecture that supports the SA networks. The systems are represented by green boxes.

Figure 1.1: AGN SA networks IT architecture



These systems are integral to the efficient and effective management of the South Australian network and are required to meet a range of legal and regulatory obligations, including those prescribed in the National Gas Law (NGL) and National Gas Rules (NGR), and the Retail Market Procedures (RMP)[77].

The applications that underpin these key IT systems must be periodically updated. Typically, this involves installing a software patch or renewing the application as per each vendor's recommendations. Upgrading/renewing the applications ensure the IT systems operate correctly and that as an organisation we can:

- maintain current levels of functionality, integration, systems security and vendor support;
- ensure continued compliance with legal, regulatory and safety obligations; and
- maintain current levels of IT services.

Software patches and version upgrades are provided by vendors. Standard industry practice is to apply version upgrades to business systems every three years, with vendors typically providing at least one major and several minor upgrades (or patches) over that period. Upgrades are typically required to:

- correct technology defects;
- address security concerns;

[77] AEMO, "Retail Market Procedures (South Australia) v17.0", 10 Feb 2020, https://www.aemo.com.au/-/media/files/gas/retail_markets_and_metering/market-procedures/sa/2020/retail-market-procedures-sa-version-170.pdf?la=en

- ensure ongoing support and maintenance contracts;
- mitigate any risks associated with incompatibility between applications; and
- enable high volumes of transactions to flow between systems as necessary.

Prior to the current AA period (which commenced in July 2016), many of our core IT applications had not been updated for many years. This includes, for instance, the geospatial information system (GIS) and the metering and billing system, where the most recent upgrade was 2001.

During the previous AA period (July 2011 to June 2016) we commenced an IT upgrade strategy to bring our IT applications renewal approach in line with accepted industry standards. Significant progress has been made during the current AA period (July 2016 to June 2021), and by the end of the period we will have delivered significant upgrades to the GIS system, metering and billing and enterprise asset management systems.

Applications renewal is an ongoing process, which means upgrades to these and other systems must continue over the next AA period. However, we estimate the cost of ongoing program will be significantly lower (around $10 million less) than that incurred during the current AA period.

This is due largely to the work conducted recently to bring the GIS system up to standard. As mentioned above, the GIS system had not been upgraded since 2001 and therefore had to undergo major renewal (at a cost of around $14 million). However, the GIS system is now up to date and can revert to a modest ongoing recurrent level of expenditure over the next and future AA periods. Investment on the metering and billing systems and enterprise asset management system has also reached recurrent levels.

The focus for the next AA period is to maintain recurrent investment in these systems, as well as upgrade and renew the other applications to bring them up to industry standard. This strategy is part of our ongoing nationwide alignment program, whereby the necessary upgrades are being delivered to IT applications across all the AGN networks.

Undertaking these application renewal/upgrades as part of an AGN-wide program[78] allows us to achieve economies of scale, and efficiencies by replacing local systems with enterprise applications, ensuring all AGN networks nationwide are using the same systems (to the extent practicable). It is therefore important that the applications renewal program continues in SA to ensure the efficiencies achieved to date can be maintained.[79]

This business case considers the costs and benefits of continuing with our current proactive applications upgrade strategy, or to revert to a reactive replace on obsolescence/failure approach.

[78] Note the AGN-wide program was approved by the AER in the previous SA determination and more recently in the AGN Victoria & Albury determination.

[79] The process for allocating costs between each AGN business is discussed in section 1.7.2.

1.4 Risk assessment

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 1.2). 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 1.2: 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; and
- 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 AGN 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).

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.

Seven consequence categories are considered for each type of risk:

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

A summary of our risk management framework, including definitions, has been provided in Attachment 8.10.

The primary risk event being assessed is that as IT systems age, it becomes increasingly difficult to address security weaknesses and implement the remedial actions required to resolve a system failure. In a worst-case scenario, the application or technology platform may have a catastrophic failure and cannot be recovered, resulting in an urgent need to implement either an upgrade or replacement of that system to restore network operations. The likelihood of this risk event occurring will increase with time if a suitable ongoing upgrade program is not completed.

Security breaches, and unavailability of operational and corporate systems gives rise to safety, operations, customer/reputational, compliance and financial consequences, as described below.

- *Health and Safety* – failure of the critical IT systems will have adverse effects across the business as the true state of the network will not be known reliably, thereby creating public safety risks. For example, if the GIS fails it could result in the Dial Before You Dig (DBYD) service not providing the latest gas location information to the public. This could result in a significant public safety issue if excavation is carried out in an area containing natural gas network assets.

- *Operations* – uncorrected deficiencies or poor integration between systems may result in inefficient work order processing, an inability to make spatial and logical queries, an inability to carry out timely repairs and maintenance. This can result in longer supply outages.

- *Compliance* – unsupported and poorly integrated systems and compromised customer information may result in AGN not complying with a range of legal and regulatory obligations, for example the RMP.

- *Reputation and customer* – poorly performing IT systems and inaccurate data may result in breaches of the service standards, set out in the South Australian Gas Distribution Code[80]. In addition, security breaches may result in confidential customer data being compromised. This in turn can impact AGN's reputation.

- *Finance* – non-compliance with the RMP, or other obligation relating to data management can result in financial penalties. There is also the risk of having to pay a premium to resolve compatibility issues with unsupported/obsolete applications if the necessary upgrades are not installed.

A summary of the untreated risk[81] assessment is provided in Table 1.3.

Table 1.3: Risk rating – untreated risk

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Significant	Minimal	Major	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	High	Low	Moderate	Moderate	Moderate	

1.5 Options considered

We have considered the following options relating to upgrading critical IT applications:

- **Option 1** – Do not upgrade IT applications on a regular basis; or

[80] https://www.escosa.sa.gov.au/ArticleDocuments/580/130905-GasDistributionCode-GDC06.pdf.aspx?Embed=Y

[81] Untreated risk is the risk level assuming there are no risk controls currently in place. Also known as the 'absolute risk'.

- **Option 2** – Upgrade critical IT applications on a regular basis consistent with good industry practice and our application lifecycle management methodology.

These options are discussed in the following sections.

1.5.1 Option 1 – Do not upgrade IT applications on a regular basis

This option would entail critical IT systems being repaired or replaced on failure/obsolescence. Vendor software patches would not be applied. The only maintenance performed would be critical system bug fixes required to keep the systems running.

1.5.1.1 Cost assessment

The benefit of this option is that no upfront capital investment is required. However experience indicates that this does not result in lower overall costs over time - it simply results in adding the deferred investment amounts into the cost of later upgrades.

Additionally, the high operational risks associated with this option are likely to result in significantly higher operating costs over future AA periods if IT systems become unstable, fail or are subject to security breaches. There is also the potential for the imposition of financial penalties for non-compliance with the RMP or other regulatory obligations.

1.5.1.2 Risk assessment

As described in section 1.4, the risk of not upgrading IT systems has been assessed as high. This is primarily driven by high operational and financial risks. The overall risk of this option would rise to extreme in the subsequent AA period if critical business IT applications are not upgraded.

Table 1.4: Risk assessment – Option 1

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Significant	Minimal	Major	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	High	Low	Moderate	Moderate	Moderate	

Specifically, the following issues could arise:

- core applications will no longer be supported by IT vendors;
- applications will become unstable and failure in older applications may occur, resulting in lengthy and unplanned network outages;
- applications will be vulnerable to security breaches, which would put the safety of network services at considerable risk and may allow staff and customer data to be compromised;
- in the event of a failure of key IT systems, we will be non-compliant with a range of legal and regulatory obligations, for example the RMP;
- the IT systems will be unable to support our strategic objectives, particularly in regard to the national alignment of IT systems;
- a missed opportunity for 'change out' of inefficient/obsolete technologies, locking us into old technology and another full license payment for the duration of the of the license agreement period. This could also result in an increase in maintenance and support agreement costs, with systems placed out of the prescribed vendor maintenance cycle;

- a failure of critical IT systems could have adverse effects across the business due to not reliably knowing the true state of the network;
- the inability of transactions to flow from one IT system to another. Any system failure would have a significant impact across all network operations for an extended period of time while the remediation work was completed. For example, a failure in the metering and billing application will impact the enterprise asset management (EAM) application. This would resulting in public leak reports or requests to turn meters on or off having to be manually entered into EAM rather than being electronically transferred. This would delay the information getting to the operators in the field to do the work and significantly increase the risk of non-compliance with the RMP and the service standards set out in the South Australian Gas Distribution Code[82]; and
- significant additional time and cost to implement remedial actions, resulting in an increased risk of error due to pressure to recover functionality quickly.

1.5.1.3 Alignment with vision objectives

Table 1.5 shows how Option 1 aligns with our vision objectives.

Table 1.5: Alignment with vision – option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	N
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	N
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	N

Option 1 would not align with our objective of *Delivering for Customers*. It would fail to address the substantial risks associated with failure or security breaches of the key IT systems, potentially resulting in safety risks to customers and employees, as well as unplanned outages and disruption of supply for customers.

Consequences resulting from the health and safety, operational, customer and compliance risks noted above could also result in sizeable additional costs, including:

- additional operating costs over the next and future AA periods if IT systems become unstable, fail or are subject to security breaches;
- litigation costs due to compromised staff and customer data, hire of expensive IT specialists for urgent work to correct system issues; and
- financial penalties imposed for not complying with the National Energy Retail Rules or other regulatory obligations.

[82] https://www.escosa.sa.gov.au/ArticleDocuments/580/130905-GasDistributionCode-GDC06.pdf.aspx?Embed=Y

This option is therefore also not *Sustainably Cost Efficient*.

1.5.2 Option 2 – Upgrade critical IT applications

This option is to systematically upgrade the national consolidated software and applications that manage our operational business in South Australia, in accordance with the current approach and good industry practice.

Application upgrades typically involve:

- the application upgrade itself;
- upgrades to the underlying associated technology platform components;
- assessment, design and implementation of changes to configuration, customisations and integrations associated with the upgrades; and
- complete testing of all impacted end-to-end processes.

1.5.2.1 Cost assessment

The estimated direct capital cost of this option is $14 million. This estimate is based on current material and labour rates and reflects the AGN South Australia component of the national applications renewal project across all AGN networks.

Table 1.6: Cost estimate – Option 2, $ real 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
AGN SA allocation	978.7	2,775.5	2,829.6	4,044.8	3,195.6	13,824.2

The key benefits of this option are:

- maintaining the security and integrity of the IT environment and business information;
- satisfaction of our operating requirements as well as meeting regulatory obligations, including the RMP;
- consistency with good industry practice;
- alignment with other co-existing applications, including in other states where we operate;
- protecting information assets from confidentiality, integrity and availability risks;
- improvement to software performance, efficiency and stability of IT systems over time;
- continued vendor support, which requires movement to a recent version of the software; and
- embedding the benefits of the IT systems national application consolidation program.

1.5.2.2 Risk assessment

This option reduces the overall risk level from high to moderate. The consequence of an event occurring remains the same as in Option 1. However, the likelihood of the event happening over the next AA period is reduced to remote. This is due to the ongoing stay-in-business cycle of upgrades reducing the likelihood of system(s) failure, system integration issues and compromises to staff and customer data. We do not consider the likelihood of the operational risk caused by an

application breach can be reduced to rare, and the risk consequence will remain major. We therefore consider a moderate risk rating is ALARP.

Table 1.7: Risk assessment – Option 2

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Remote	Remote	Remote	Remote	Remote	Remote	Remote	Moderate
Consequence	Significant	Minimal	Major	Minor	Significant	Significant	Minor	
Risk Level	Low	Negligible	Moderate	Negligible	Low	Low	Negligible	

1.5.2.3 Alignment with vision objectives

Table 1.8 shows how Option 2 aligns with our vision objectives.

Table 1.8: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	Y
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	Y

Option 2 aligns with our objectives of *Delivering for Customers*, as it would address the substantial risks associated with failure or security breaches of the key AGN operations and management systems which could potentially result in safety risks to customers and employees, as well as unplanned outages and disruption of supply for customers.

This option is also *Sustainably Cost Efficient*, as it avoids consequences resulting from the health and safety, operational, customer and compliance risks that could also result in sizeable additional costs. This includes:

- additional operating costs over the next and future AA periods if IT systems become unstable, fail or are subject to security breaches;
- litigation costs due to compromised staff and customer data, hire of expensive IT specialists for urgent work to correct system issues; and
- financial penalties imposed for not complying with the RMP or other regulatory obligations.

1.6 Summary of costs and benefits

The key costs and benefits of the identified options are presented in Table 1.9 below.

Table 1.9: Comparison of options

Option	Estimated cost ($ million)	Treated residual risk rating	Alignment with vision objectives
Option 1	0	High	Does not align with Delivering for Customers, A Good Employer or Sustainably Cost Efficient
Option 2	13.8	Moderate	Aligns with Delivering for Customers, A Good Employer and Sustainably Cost Efficient

1.7 Recommended option

The proposed solution is Option 2. This solution involves systematically and periodically upgrading the software and applications based on a review of application suitability, vendor support, security and technical stability of the applications. The timing of upgrades are prioritised by the issue and availability of patches from vendors, as well as criticality of the system to overall network/asset management.

Project delivery will be spread across next AA period. The work effort, cost and timing of projects are monitored throughout the project lifecycle to ensure on time and on budget delivery. The applications upgrade plan is shown in Table 1.10.

1.7.1 Why is the recommended option prudent?

Option 2 is the most prudent option because:

- it is the most cost-effective way of dealing with risks posed by outdated and unsupported applications, removing the high risk of potential IT system failure;
- it is consistent with good industry practice. Version upgrades are applied every three years, ensuring that we can continue to maintain reliable, secure, compliant and efficient business processes and systems; will preserve the ongoing integrity of the services; and will continue to meet its obligations under the RMP and other relevant regulatory and customer obligations;
- it will deliver increased scalability, flexibility and reliability. This will provide the core foundation to leverage efficiencies in business operations through data consolidation, streamlined and scaled applications and processes, and improved risk mitigation;
- it is the only option that reduces risks to an acceptable level. Option 1 is not considered feasible as these IT applications are integral to providing our services, and there is a significant (and unacceptable) increasing risk to these services associated with not upgrading the applications. This option does not meet NGR 79(2)(c) as it results in an outcome where our operational and management IT systems will not comply with legal and regulatory obligations;
- it is consistent with stakeholder requirements and our vision; and
- the delivery of the scope of works is achievable in the time frame envisaged.

1.7.2 Estimating efficient costs

Applications renewal is delivered through a national portfolio of projects. We use an industry-standard application lifecycle management methodology and a practical framework to determine upgrade timelines and priorities. It should be noted that all of the application upgrades reflect maintenance of current system capability, i.e. there is no increase in functionality.

The applications upgrade plan sets out the frequency and prioritisation of application upgrades. The plan reflects a 'stay in business' program of work that ensures compliance with an underlying

principle of staying at a minimum of N-1[83] for application upgrades. The total cost of the national application upgrade plan has been estimated based on the work required for all AGN networks in Australia and this cost is shown in Table 1.10 by application.

Table 1.10: National AGN application upgrade plan, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Geospatial information system		1,054.7		1,054.7		2,109.4
Dial Before You Dig	604.2			604.2		1,208.4
Metering & billing system		1,895.8		7,825.6		9,721.4
Enterprise asset management			5,253.4		1,969.0	7,222.4
Enterprise historian system	286.9		1,577.1			1,864.0
FRC market gateway	1,331.2			1,331.2		2,662.4
Middleware – BizTalk		1,109.1			3,169.2	4,278.3
Field data / mobility		3,272.8			3,272.8	6,545.6
Licence growth	397.4	419.5	447.1	481.2	514.3	2,259.5
Total	**2,619.7**	**7,751.9**	**7,277.6**	**11,296.9**	**8,925.3**	**37,871.4**

All of the identified systems will require updating in the next AA period to achieve our N-1 requirement. For larger systems, this can often be achieved using a combination of major and minor upgrades. This is in compliance with vendor roadmaps and reflects the learnings from executing the current AA plan. Major upgrades include:

- major vendor technical version upgrade e.g. version 7.6 to 7.7;
- architecture design requirements;
- upgrade of infrastructure stack;
- end-to-end testing for existing / updated interfaces and existing functionality;
- testing of new functionality which automatically becomes available as part of new version and impacts existing business processes;
- security penetration testing; and
- change management.

[83] N-1 refers to the specific software version number associated with a specific vendor software, where "N" represents the current version of the released and supported software, and -1 refers to an older version of the same vendor software which would still be supported. This ensures ongoing vendor support and mitigates the risk of security breaches, system outages and potential regulatory non-compliance. This enables appropriate levels of operation, data integrity and inter-operability between various vendor-provided technologies

In particular, the following systems require major application upgrades for the following reasons:

- Enterprise Historian System (2023/24): Major version upgrade based on Osisoft's version roadmap, including upgrade of the infrastructure stack
- Enterprise Asset Management (2023/24): Major Technical version upgrade i.e. version 7.6 to 7.7 and includes significant upgrade of infrastructure stack such Oracle database upgrade, websphere version upgrade and windows operating system upgrade for VM
- Metering & Billing (2024/25): Follows Oracle's roadmap which identifies a move to a major version upgrade by replacing Java with Groovy code to maintain full vendor support and provide a high level of security
- Geospatial Information System (2024/25): Major version upgrade based on GE version roadmap, including upgrade of infrastructure stack and significant data testing requirements
- Middleware - Biztalk (2025/26): Major version upgrade, including upgrade of the infrastructure stack

In contrast, minor upgrades are for minor vendor technical version upgrades (e.g. version 7.6.0 to 7.6.1). These upgrades include end-to-end testing for existing interfaces and existing functionality, security penetration testing and change management. They do not include upgrade of infrastructure stack.

The majority of systems are used by AGN businesses in multiple Australian jurisdictions (SA, Victoria, etc.). The national cost of undertaking application upgrades is allocated to each network every year on the basis of customer numbers in the respective networks. This ensures no cross-subsidisation, with the cost to each business reflecting the volume of customers that it serves. As at 31 December 2019, South Australia accounted for 35.8% of AGN's total customer numbers.

The exception to this the Historian, where the allocation is based on the number of telemetered customers data points. The AGN SA allocation for this system is 50%.[84]

The estimated total cost allocation to AGN SA is shown in Table 1.11.

Table 1.11: AGN SA cost allocation, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
National program excl. Historian	2,332.8	7,751.9	5,700.5	11,296.9	8,925.3	36,007.4
National program excl. Historian allocation %	35.8%	35.8%	35.8%	35.8%	35.8%	35.8%
National program excl. Historian allocation	835.2	2,775.5	2,041.0	4,044.8	3,195.6	12,892.2
Enterprise Historian	286.9	-	1,577.1	-	-	1,864.0
Enterprise Historian allocation %	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Enterprise Historian allocation	143.5	-	788.6	-	-	932.0

[84] For Historian there is no allocation of costs to the Victorian and Albury networks, as the Australian Energy Regulator receives data directly from the SCADA system and the Historian system is not utilized. The AGN SA allocation for this system is therefore higher than for our other systems.

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Total	**978.7**	**2,775.5**	**2,829.6**	**4,044.8**	**3,195.6**	**13,824.2**

As these costs represent recurrent expenditure, we have assessed this spend level against recent historical actual costs in Table 1.12. Forecast expenditure on IT applications renewal and upgrade in the next AA period is $10 million lower than the expected spend in the current period. Key reasons for this decrease include:

- significantly lower spend on the GIS. The high upgrade cost during the current AA period was necessary to reach the N-1 status, as the application had not been upgraded for several years beforehand; and
- lower costs of SA NIMDS & ClearSCADA. This application is being integrated into the APA cost base moving forward and therefore becoming a component of the IT shared cost allocation (opex) for AGN.

These decreases are offset to some extent by an increase in expenditure on field data/mobility systems following the completion of the mobility integration project scheduled for 2021 (business case SA59). See Table 1.12.

Table 1.12 Recurrent spend by application, $'000 2019/20

Application	Current AA period forecast	Next AA period forecast
Geospatial information system	13,787.1	755.3
SA NIMDS, ClearSCADA	2,920.4	-
Billing estimation model	152.5	-
Dial Before You Dig	55.0	432.7
Metering & billing system	3,786.7	3,480.7
Enterprise asset management	1,201.6	2,585.9
Historian system	201.7	932.0
FRC market gateway	375.9	953.3
Middleware - BizTalk	496.9	1,531.8
Field data / Mobility systems	-	2,343.6
Licence growth	501.9	809.0
Total	**23,479.6**	**13,824.2**

Table 1.13 splits the forecasts by expense type. This is based on the following assumptions:

- a combination of internal and external resources will be used to deliver the program of work;
- material and direct labour costs, and applicable planning, design and commissioning charges, are based on historical actual costs of similar projects; or on vendor quotes that are subject to a competitive tendering process[85];
- resource unit costs (both internal and external) are based on 2019 resourcing rates and historical project resource rates where applicable; and

[85] In accordance with the APA Procurement Policy and guidelines (available upon request)

- inclusion of a 5% per unit real increase in the cost of software licences. This is the combined impact of a growth in users of the metering and billing system, as well as the average estimated growth in licensing costs from vendors.

Table 1.13: Cost estimate by expense type, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Direct labour	561.3	1,652.1	1,529.9	2,069.8	2,249.3	8,062.5
Contracted labour	161.2	750.8	772.9	1,527.6	456.0	3,668.5
Hardware, software and maintenance	234.2	226.4	289.4	364.5	344.1	1,458.6
Travel, sundry, other	22.0	146.2	237.3	82.9	146.3	634.6
Total	**978.7**	**2,775.5**	**2,829.6**	**4,044.8**	**3,195.6**	**13,824.2**

The following table shows the costs escalated to June 2021 dollars.

Table 1.14: Escalated applications renewals cost estimate ($'000)

	2021/22	22/23	23/24	23/25	25/26	Total
Total unescalated ($ Dec 19)	978.7	2,775.5	2,829.6	4,044.8	3,195.6	13,824.2
Escalation	33.0	107.3	126.8	204.5	178.1	649.7
Total escalated ($ Jun 21)	**1,011.7**	**2,882.8**	**2,956.4**	**4,249.3**	**3,373.7**	**14,473.9**

1.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 and Rule 74 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

NGR 79(1)

The proposed solution is prudent, efficient, consistent with accepted and good industry practice and will achieve the lowest sustainable cost of delivering pipeline services:

- **Prudent** – Consistent upgrading of software applications is necessary to mitigate the high risks associated with operating outdated software, including non-compliance with the RMP and other relevant regulations and legislation, potential customer and business interruptions and corresponding adverse financial and reputation impacts.

- **Efficient** – Upgrades will be delivered using a combination of internal and external resources and using the Project Management Office to provide guidance and governance to the project. This is consistent with good industry practice and can be considered efficient. The expenditure can therefore be considered consistent with the expenditure that a prudent service provider acting efficiently would incur.

- **Consistent with accepted and good industry practice** – Version upgrades will be applied to business systems every three years, consistent with will Standard industry practice. This will result in all critical systems being up to date, secure and supported by vendors, consistent with good industry practice.

- To achieve the lowest sustainable cost of delivering pipeline services – Upgrading our AGN IT systems is the lowest sustainable cost for suitable long-term mitigation of the risks discussed. The only other viable option for risk mitigation would be full replacement of existing IT systems with new systems which would be completely cost prohibitive. The chosen option is therefore consistent with the objective of achieving the lowest sustainable cost of service delivery.

NGR 79(2)

The proposed capex is justifiable under NGR 79(2)(c)(i), 79(2)(c)(ii) and 79(2)(c)(iii), as it is necessary to maintain the safety and integrity of services and to comply with regulatory obligations. Failure or non-availability of critical IT systems, for example due to a security breach, may affect safety or integrity of services, or result in non-compliance with regulatory obligations (e.g. RMP requirements for processing timeframes).

NGR 74

The forecast costs are based on the latest market rate testing and reflect the lifecycle management and estimation approach described in the IT Plan. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Appendix A – Comparison of risk assessments for each option

Untreated risk	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Significant	Minimal	Major	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	High	Low	Moderate	Moderate	Moderate	

Option 1	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	High
Consequence	Significant	Minimal	Major	Minor	Significant	Significant	Significant	
Risk Level	Moderate	Negligible	High	Low	Moderate	Moderate	Moderate	

Option 2	Health & Safety	Environ-ment	Operations	People	Compliance	Rep & Customer	Finance	Risk
Likelihood	Remote	Remote	Remote	Remote	Remote	Remote	Remote	Moderate
Consequence	Significant	Minimal	Major	Minor	Significant	Significant	Minor	
Risk Level	Low	Negligible	Moderate	Negligible	Low	Low	Negligible	

SA121 – Asset investment planning & management tool

1.1 Project approvals

Table 1.1: Business case SA121 – Project approvals

Prepared by	Susan O'Neill, Business Systems Delivery Manager, APA
Reviewed by	Peter Butler, Business Improvement Manager, APA
Approved by	Craig Bonar, Head of Planning and Engineering, APA Andrew Staniford, Chief Customer Officer, AGN

1.2 Project overview

Table 1.2: Business case SA121 – Project overview

Description of the problem / opportunity	The asset investment and planning process for the SA natural gas distribution network involves a large number of manual activities. These include: • manual collation and input of data from a number of disparate sources with various levels of granularity; • manual cleansing and consolidating of data using multiple spreadsheets; • subjective asset deterioration assumptions and asset capex/opex trade-off assumptions; • many budget iterations to optimise the investment plan; and • reliance on the expertise of a number of specific individuals. Though the existing investment process is fit for purpose and gives due consideration to risk, quality, customer expectations and service delivery capabilities, there is an opportunity to improve the process by leveraging the data provided by some of our national IT systems and reduce the amount of manual intervention. In recent years we have upgraded the Geographical Information System (GIS), our field mobility system and have developed our business intelligence capabilities. As a result, we have single source of truth for asset data and capability, as well as the ability to gather large volumes of field data quickly. We therefore propose to leverage the improved data and greater consistency provided by these and other systems by developing an advanced asset investment planning and management (AIPM) tool. The AIPM tool will be an IT system that consolidates our asset management information in one place, and provides visibility of asset lifecycle stages (concept, planning, approval and delivery). It will allow us to model investment scenarios based on historical and contemporary data, and match these to business and customer values. Having an AIPM will help eliminate some of the manual data handling requirements in the existing asset investment and planning process. It will also promote faster and more transparent asset investment decision making, by: • enabling development of the most optimal investment plan; • enabling more robust risk-based decisions; and • making it easier to evaluate investments and their associated risk mitigation. Development of similar tools is now standard practice in comparable Australian and international energy utilities. This business case considers the benefits of developing an AIPM tool and the level of functionality to build into such a tool (core or advanced).
Untreated risk	Not applicable. This project is not addressing an existing asset risk. The AIPM is driven by continuous improvement in asset management practices and is justified on the basis that it will return the best net present value (NPV) and help optimise the forward asset investment program.
Options considered	• **Option 1** - Develop core AIPM functionality ($1.8 million) • **Option 2** - Develop core plus advanced AIPM functionality ($2.4 million)

	• **Option 3** - Do nothing (no additional upfront capital cost)
Proposed solution	Option 2 is the proposed solution because it provides the highest economic benefit to AGN's customers, with a $2.6 million NPV over a ten year period. Option 2 will deliver an advanced tool that provides additional predictive analytics and portfolio management capabilities, as well as the core AIPM functionality of asset data management and scenario planning. We estimate the additional functions of the advanced tool will deliver an additional ~$4 million of savings over the next ten years compared with Option 1. The solution will entail the implementation and customisation of a full suite of AIPM tools from a third party vendor.
Estimated cost	The forecast direct capital cost (excluding overhead) over the next access arrangement (AA) period (July 2021 to June 2026) is $2.4 million.

$'000 2019/20	21/22	22/23	23/24	24/25	25/26	Total
AIPM development	-	-	2,361.3	-	-	2,361.3

Basis of costs	All costs in this business case are expressed in real unescalated dollars at December 2019 unless otherwise stated. Some tables may not add due to rounding.
Alignment to our vision	This project aligns with the *Delivering for Customers* aspect of our vision. It delivers for customers by improving the visibility and mitigation of safety and reliability risks and enable managing the business to an agreed risk profile. It will also allow for targeted maintenance on specific asset components identified as showing signs of deteriorating reliability. It also links to the *Sustainably Cost Efficient* aspect of our vision. It will generate process efficiencies by reducing time and effort across the planning process, will enable us to generate higher value investment portfolios, and will ensure asset design and timing of construction is optimised.
Consistency with the National Gas Rules (NGR)	This project complies with the following National Gas Rules (NGR): **NGR 79(1)** – the proposed solution is consistent with good industry practice, several practicable options have been considered, and market rates have been tested to achieve the lowest sustainable cost of providing this service. **NGR 79(2)** – the proposed capex is justifiable under NGR 79(2)(a), as the overall economic value of the expenditure is positive. **NGR 74** – the forecast costs are based on the latest market rate testing and project options consider the asset management requirements as per the latest Strategic Asset Management Plan. The estimate has been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Treated risk	Not applicable.
Stakeholder engagement	We are committed to operating our networks in a manner that is consistent with the long-term interests of our customers. To facilitate this, AGN conducts regular stakeholder engagement to understand and respond to the priorities of our customers and stakeholders. Feedback from stakeholders is built into our technology planning considerations and is an important input when developing and reviewing our expenditure programs. Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect AGN to deliver a high level of public safety and are satisfied that this is current practice. The proposed AIPM tool suite will support customer values by allowing for a portfolio of network projects that maximises risk reduction for the investment incurred. This will contribute to the management of public safety risk and is therefore consistent with the current safety practices customers have told us they value. It will also help maintain reliability of supply at the lowest sustainable cost and minimise impact on customers' gas bills.
Other relevant documents	• Attachment 8.2 Strategic Asset Management Plan

- Attachment 8.6 IT Investment Plan
- Supporting Information 8.8.4 SA121 NPV & Options Analysis

1.3 Background

The SA natural gas distribution networks include approximately 200 km of metropolitan steel TP pipelines, and 8,000 km of distribution pipelines, which deliver gas to over 450,000 customers. In addition to the pipelines, the gas distribution network includes many other assets such as regulators, values, meters, and telemetry and communications equipment.

As asset condition degrades, the probability of failure increases, along with the associated risks. This can be depicted by the traditional lifecycle cost analysis shown in Figure 1.1.

Figure 1.1: Asset lifecycle cost analysis

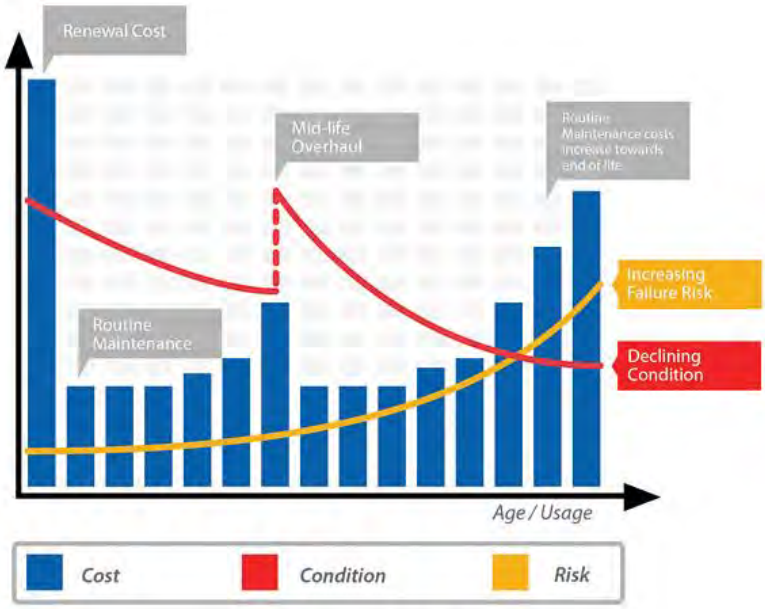


Figure 1: Asset Life Cycle Cost Analysis
(Source: The Institute of Asset Management, Asset Management - An Anatomy,' Version 2, July 2014, Page 27, ISBN 9781908891044.)

ISO 55000 stresses the importance of asset-related risks as a key factor in asset investment decision making, noting that such risks should typically be mitigated before they compromise asset performance and/or result in failures that negatively impact on customers. The underlying goal is an assurance that asset risk and service delivery are being managed to acceptable levels.

Our current asset investment and planning process balances cost, risk, service and financial and resourcing constraints. While our current practice is fit-for-purpose, it is a complex process that relies on a significant amount of manual intervention, for example:

- manual collation and input of data from a number of disparate sources with various levels of granularity;
- manual cleansing and consolidating of data using multiple spreadsheets;
- subjective asset deterioration assumptions and asset capex/opex trade-off assumptions;
- requirement for many budget iterations to optimise the investment plan; and
- reliance on the expertise of a number of specific individuals.

In recent years, AGN has embarked on a program to upgrade its national IT systems. For example, we have recently upgraded our GIS to create a single source of the truth for asset data and capability. We have also upgraded our field mobility system, which enables us to gather large volumes of asset data from the field quickly and efficiently.

These improvements in the robustness and availability of asset data, as well as the development of our core business intelligence functionality, have provided the opportunity to develop an AIPM tool.

The AIPM tool is an IT system that consolidates our asset management information in one place, and provides visibility of asset lifecycle stages (concept, planning, approval and delivery). It will allow us to model investment scenarios based on historical and contemporary data, and match these to business and customer values.

Having an AIPM tool and associated methodology will help eliminate some of the manual data handling requirements in the existing asset investment and planning process. It will also promote faster and more transparent asset investment decision making, by allowing us to answer the following questions more quickly and consistently:

- What is the risk profile associated with our asset portfolio and how will this change over time?
- What are the business consequences of reducing or increasing our capital investment or maintenance budgets over the next five to ten years?
- How can planned asset expenditures be justified to external stakeholders?
- Which investment projects offer the highest business value?

AIPM tools that help businesses answer these questions and develop optimised investment plans are commonplace in Australian and international energy utilities. This business case considers the benefits of developing an AIPM for AGN's assets[86], and the level of functionality to build into such a tool (core or advanced).

1.4 Risk assessment

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 1.2).

Figure 1.2: Risk management principles

The AIPM tool is not driven by a specific asset risk, therefore no asset risk assessment has been conducted as part of this business case. The requirement for an AIPM tool is driven by continuous improvement in asset management capabilities, and is justified by an NPV assessment. More importantly, the AIPM tool is designed to help us to optimise our investment plans and manage asset more efficiently, leading to lower network capex requirements and cost savings for customers.

1.5 Options considered

We have identified the following potential options associated with the asset investment planning and optimisation process:

[86] The AIPM tool would be developed for use by all AGN's businesses in Australia, with the costs of the tool apportioned to each business as per the standard IT cost allocation method.

- **Option 1** – Develop core AIPM functionality;
- **Option 2** – Develop core plus advanced AIPM functionality; or
- **Option 3** – Maintain status quo. Continue performing the current manual asset investment planning process and do not develop an AIPM tool.

These options are discussed in the following sections.

1.5.1 Option 1 – Develop core AIPM functionality

Contemporary asset management allows for line of sight between strategic objectives and imperatives, the actual condition and risks attached to each asset, and the investments planned to mitigate risks as those assets degrade. This is the core function of any asset management system.

Option 1 involves development of an AIPM tool and methodology that will support this core function. Leveraging the data captured by our core IT systems (GIS, field mobility, etc.), the AIPM developed under Option 1 will provide:

- visibility of asset lifecycle stages of concept, planning, approval and delivery in a single source;
- functionality to model multi-constraint scenarios based on historical data;
- functionality to conduct 'what-if' scenarios driven by business value criteria.

The AIPM will deliver improved investment decisions by promoting use of consistent data drawn from enterprise-wide systems, and helping us base our investment portfolio on business-specific values and risk modelling. It will also allow us to develop and maintain a defensible, well-documented asset investment plan built around more robust asset, risk and financial data.

AIPM will also help reduce our reliance on manual intervention, as it will present objective information on risk and investment value, drawn from consistent sources. Having an AIPM will bring AGN into line with accepted asset management practices.

The costs and activities associated with Option 1 includes:

- selection and implementation of the AIPM tool;
- cleansing of data to align with the AIPM methodology;
- standardisation of asset investment and planning processes; and
- change management and training to introduce users to the AIPM application.

1.5.1.1 Cost assessment

The estimated direct capital cost of this option is $1.8 million.

Table 1.3: Cost estimate – Option 1 $'000 2019/20

Option 1	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Labour	-	-	1,308.9	-	-	1,308.9
Materials	-	-	503.6	-	-	503.6
Total	**-**	**-**	**1,812.5**	**-**	**-**	**1,812.5**

The key benefit from implementing the core AIPM modules is the ability to reprioritise and potentially avoid low value investments. Having a more consistent business value and risk criteria founded on more robust data, means we should have more opportunity to identify projects that we do not need to undertake, or can defer into future periods.

We estimate this will provide savings of 0.5% on the annual non-growth network capex over the ten year period following implementation, equating to around $4 million in total benefits.

Further (non-quantified) benefits include:

- process efficiencies, through reducing time and effort across the planning process, thus improving customer service; and
- enhanced risk management, for example, improving the visibility and mitigation of risks and managing the business to an agreed risk profile.

1.5.1.2 Alignment with vision objectives

Table 1.4 shows how Option 1 aligns with our vision objectives.

Table 1.4: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 1 would align with the *Delivering for Customers* aspect of our vision, as it will improve the visibility and mitigation of safety and reliability risks and enable managing the business to an agreed risk profile. It will also allow for targeted maintenance on specific asset components identified as showing signs of deteriorating reliability.

The proposed solution is *Sustainably Cost Efficient* as is will generate process efficiencies by reducing time and effort across the planning process; will enable us to generate higher value investment portfolios while ensuring asset design and timing of construction is optimised.

1.5.2 Option 2 – Develop core plus advanced AIPM functionality

Option 2 will see the same suite of core functions outlined in Option 1, with the addition of:

- predictive analytics – this allows scenario modelling to be more dynamic, using patterns found in historical and transactional data to predict the most optimal maintenance and replacement timeframes. Whereas the core functionality under Option 1 remains reliant on existing (and static) business assumptions such as maintenance cycles, including predictive analysis functionality allows us to model changes to key maintenance assumptions and identify a more efficient asset class plan; and

- project performance management – this add-on allows us to manage our project portfolio more stringently and allows an agile approach to optimising portfolio delivery as projects are completed.

As with Option 1, the development process for Option 2 includes:

- selection and implementation of the AIPM tool;
- cleansing of data to align with the AIPM methodology;
- standardisation of asset investment and planning processes; and
- change management and training to introduce users to the AIPM application.

1.5.2.1 Cost assessment

The estimated direct capital cost of this option is $2.4 million.

Table 1.5: Cost estimate – Option 2 $'000 2019/20

Option 2	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Labour	-	-	1,783.1	-	-	1,783.1
Materials	-	-	578.2	-	-	578.2
Total	-	-	**2,361.3**	-	-	**2,361.3**

Option 2 will offer the same ability to avoid low value investments as per Option 1. As discussed, this will allow ~0.5% of annual non-growth network capex to be avoided over the next ten years ($4 million).

However, the additional predictive analytics and project performance management functions to be installed under Option 2 will also allow us to reprioritise and optimise the entire portfolio of higher value projects. This will provide greater opportunity to defer projects into future periods, as well as managing resources more efficiently. We estimate this will allow us to defer a further ~0.5% of non-growth network capex over the next ten years, giving rise to **an additional** $4 million of savings.

Further benefits of the advanced functionality (that have not been quantified) include:

- enabling maintenance frequencies to be optimised;
- targeted maintenance on specific asset components identified as showing signs of deteriorating reliability; and
- improved plan execution and performance management using actuals from delivery.

1.5.2.2 Alignment with vision objectives

Table 1.6 shows how Option 2 aligns with our vision objectives.

Table 1.6: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	Y
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	Y

Vision objective	Alignment
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 2 would align with the *Delivering for Customers* aspect of our vision, as it will improve the visibility and mitigation of safety and reliability risks and enable managing the business to an agreed risk profile. It will also allow for targeted maintenance on specific asset components identified as showing signs of deteriorating reliability.

The proposed solution is *Sustainably Cost Efficient* as is will generate process efficiencies by reducing time and effort across the planning process; will enable us to generate higher value investment portfolios while ensuring asset design and timing of construction is optimised.

1.5.3 Option 3 – Maintain status quo

This option involves the continued performance of the current manual asset investment planning process. New AIPM tools will not be developed.

1.5.3.1 Cost assessment

There are no upfront costs associated with this option.

AGN and its customers will not realise benefits of the IT solution, including:

- process efficiencies, through reducing time and effort across the planning process, thus improving customer service;
- enhanced portfolio optimisation and delivery;
- improved information management, data architecture and governance, data quality and integrity and reporting;
- enhanced risk management;
- ability to optimise maintenance frequencies;
- targeted maintenance on specific asset components identified as showing signs of deteriorating reliability; and
- improved plan execution and performance management using actuals from delivery.

1.5.3.2 Alignment with vision objectives

Table 1.7 shows how Option 3 aligns with our vision objectives.

Table 1.7: Alignment with vision – Option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	Y

Vision objective	Alignment
Delivering for Customers – Reliability	Y
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	-
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 3 would only partially align with the *Delivering for Customers* aspect of our vision. While maintaining the current manual asset investment planning and management processes will still enable us to deliver a safe and reliable services, the opportunities to achieve efficiencies and deliver a better service to customers would be foregone.

The continuation of the largely manual investment planning process is not consistent with accepted good asset management practice across the industry. It also retains the potential for duplication of effort and subjectivity, and is therefore not *Sustainably Cost Efficient*. This option will also not benefit from the process efficiencies that could be generated by a modern appropriate IT system and process.

1.6 Summary of costs and benefits

Table 1.8 presents a summary of how each option compares in terms of the estimated cost, the residual risk rating and alignment with AGN's objectives

To assess which solution is likely to cost the most over time, we have conducted a net present value assessment of Options 1 and 2. We have not included Option 3 (maintaining the status quo) in the NPV assessment as this option provides no economic benefits to customers.

Table 1.8: Comparison of options

Option	Estimated cost ($ million)	Alignment with vision objectives	NPV ($ million)
Option 1	1.8	Aligns with Delivering for Customers and Sustainably Cost Efficient	0.4
Option 2	2.4	Aligns with Delivering for Customers and Sustainably Cost Efficient	2.6
Option 3	No additional upfront capital cost	Does not align with Delivering for Customers or Sustainably Cost Efficient	n/a

The NPV has been calculated on the basis of the following assumptions:

- Measurement period - a ten-year period has been used to measure the benefits associated with this project, reflecting the ongoing and long-term nature of the project's benefits. It is also in keeping with the measurement period used by other regulated entities when carrying out similar analysis.[87]

[87] See for example, SAPN, "IT Field Force Mobility Business Case Addendum 1", Attachment G.15, 3 July 2015; and AGN Victoria & Albury, "Attachment 8.6 – Business Cases – December 2016 – Public"

- Benefit amount – tangible benefits included are:
  - capex cost savings: reduction of 0.5% of the total network non-growth business capex per annum; and
  - capex related avoided costs: deferral of 0.5% of total network non-growth capex per annum.

As described in section 1.5.2.1 there are additional unquantified benefits. The NPV analysis is therefore conservative and likely understates the economic value of the project.

- Renewal & upgrade costs – in addition to the cost of implementing the IT infrastructure, the proposed capex includes the costs of ongoing renewals of the newly implemented AIPM solution in periods following implementation. This is based on a standard assumption of 20% of the capital development cost every three years ($480k each). Note these costs are not included in the allowance being sought for this project because they will only commence in the following AA period (July 2026 to June 2031).

- Discount rate – a discount rate of 2.21% has been used, which is AGN's proposed real pre-tax Weighted Average Cost of Capital (WACC).

1.7 Recommended option

Option 2 is the preferred option. This option involves development of core capabilities that support the development of asset investment plans built around actual asset, risk and financial data. In addition, the advanced functionality to be developed will assist with efficient capacity and risk modelling, provide predictive analytics and provide improved plan execution via robust performance management.

The project approach will follow the Business and Technology project delivery framework described the IT Investment Plan. Internal and external subject matter resources will be engaged during different stages of the project. A selected tender will be issued to obtain competitive pricing at inception. The solution will be run in two phases with phase one implementing the core modules and then the remaining modules implemented as phase two.

1.7.1 Why is the recommended option prudent?

Option 2 is proposed because it:

- provides the highest economic benefit to AGN's customers, with a $2.6 million NPV over a ten year period;

- will make use of the large volume of robust asset, risk and financial data now available to the business, allow us to develop an optimised asset investment plan;

- will provide a line of sight between strategic objectives and imperatives, the actual condition and risks attached to each asset, and the investments planned to mitigate risks as those assets degrade;

- aligns with ISO 55000 asset management standards and assists in extracting maximum value from our assets across all time horizons;

- results in more robust risk-based investment decisions, with scarce funding able being more efficiently allocated between competing activities;

- ultimately results in improvements in customer service and better value for money for customers;

- is consistent with stakeholder requirements and AGN's vision; and
- is deliverable in the time frame envisaged.

1.7.2 Estimating efficient costs

The AIPM will be delivered through a national project for all AGN businesses across Australia. The estimate therefore benefits from the inclusion of enterprise economies of scale through utilising standardised business processes, data models and data migration techniques. Further discussion of this is provided in the AGN IT Plan[88].

The project cost will be allocated to each network every year on the basis of customer numbers of the respective networks. This ensures no cross-subsidisation, with the cost to each business reflecting the volume of customers that it serves. As at 31 December 2019, South Australia accounted for 35.8% of AGN's total customer numbers. The estimated total cost allocation to AGN SA based on this is shown in Table 1.9.

Table 1.9: AGN SA cost allocation, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
National	-	-	6,595.7	-	-	6,595.7
AGN SA allocation	-	-	2,361.3	-	-	2,361.3

The project requires a mix of external and internal IT resources. In order to provide an estimate of the external IT resource requirement, a vendor project estimate was obtained from a leading global AIPM provider with extensive experience in AIPM software and implementation. The estimate provided includes external project management, system design, system build and system implementation. Based on vendor discussions and demonstrations, we consider the quote to be reasonable.

Internal resource costs have been estimated by splitting the project into stages and tasks and considering the requirements (skill set and time) for each task. The hourly rates are differentiated by resource types and are based on the current market rates for these roles. The internal labour costs include internal project management, change management, business process re-design, business analyst and subject matter expert (SME) support, supporting the conflation data assessment and cleansing and training.

The project is expected to take 12 months from initiation to completion.

The following table shows the costs escalated to June 2021 dollars.

Table 1.10: Escalated cost estimate ($'000)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Total unescalated ($ Dec 19)	-	-	2,361.3	-	-	2,361.3
Escalation	-	-	105.8	-	-	105.8
Total escalated ($ Jun 21)	-	-	**2,467.1**	-	-	**2,467.1**

[88] Attachment 806 IT Investment Plan

1.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 and Rule 74 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

NGR 79(1)

The proposed solution is prudent, efficient, consistent with accepted and good industry practice and will achieve the lowest sustainable cost of delivering pipeline services:

- Prudent – The proposed expenditure yields a positive economic value. It will enable us to develop and maintain a defensible, well-documented asset investment plan, taking advantage of the large volume of robust asset, risk and financial data now available. It will also provide significant other benefits such as improved information management, data architecture and governance, data quality and integrity, reporting, safety, compliance, and customer service opportunities.

- Efficient – The AIPM project will enable AGN to improve processes, reducing time and effort across the planning process. Enhanced portfolio optimisation and delivery will enable AGN to generate higher value investment portfolios while reducing expenditures that do not deliver value. Where contractors are engaged, this will be based on a competitive tender process. The expenditure is therefore consistent with what a prudent service provider acting efficiently would incur.

- Consistent with accepted and good industry practice – Our information management capabilities currently lag many of our counterparts, for whom investment in similar tools has had regulatory approval over the last five years. Systemised asset optimisation and enabling the ability to manage the business to an agreed risk profile are both standard industry practice. Development of an asset investment planning tool therefore brings us into line with what is considered accepted and good industry practice.

- To achieve the lowest sustainable cost of delivering pipeline services – The AIPM project will enable more informed decision making in relation to portfolio optimisation. This will allow for network capital projects to be avoided or deferred, and minimization of maintenance costs, enabling AGN to deliver the lowest sustainable cost of delivering pipeline services.

NGR 79(2)

The proposed capex is justifiable under 79(2)(a), as the overall economic value of the expenditure is positive and provides the highest net present value of potential options.

NGR 74

The forecast costs are based on the latest market rate testing and project options consider asset management requirements as per the latest IT Strategy. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Appendix A – Cost estimates

Cost estimate - Option 1

Category and description	Total ($'000)
Materials	
Hardware, Software & Maintenance	[redacted]
Travel, Sundry & Other	[redacted]
Total Materials	**503.6**
Labour	
Project Management	[redacted]
Requirements Definition & Mgmt	[redacted]
Change Management	[redacted]
Architecture	[redacted]
Application Design & Support	[redacted]
Testing	[redacted]
Infrastructure & Support	[redacted]
Professional services	[redacted]
Total Labour	**1,308.9**
Total Project	**1,812.5**

Cost estimate - Option 2

Category	Total ($'000)
Materials	
Hardware, Software & Maintenance	[redacted]
Travel, Sundry & Other	[redacted]
Total Materials	**578.2**
Labour	
Project Management	[redacted]
Requirements Definition & Mgmt	[redacted]
Change Management	[redacted]
Architecture	[redacted]
Application Design & Support	[redacted]
Testing	[redacted]
Infrastructure & Support	[redacted]
Professional services	[redacted]
Total Labour	**1,783.1**
Total Project	**2,361.3**

SA122 – Concordia reticulation project

1.1 Project approvals

Table 1.1: Business case SA122 – Project approvals

Prepared by	David Holden, Senior Stakeholder Engagement Representative, APA
Reviewed by	Jason Morony, Manager Capital Delivery SA, APA
Approved by	Grant Macauley, Manager Business Development and Contracts, APA Mark Beech, General Manager Network Operations, AGN

1.2 Project overview

Table 1.2: Business case SA122 – Project overview

Description of the problem / opportunity	Greenfield growth in Concordia, a rural area north of Adelaide, is forecast to commence in 2021/22. The Concordia Growth Area is a master planned community that will form a natural extension of the existing Gawler Township, and is expected to result in an additional 10,000 connections to the South Australian gas distribution network over 25 years. To provide gas supply to the region and allow new customers to connect, we propose to expand the network to the new Concordia development and conduct reticulation works within the next access arrangement (AA) period (July 2021 to 2026). This business case considers technical solutions to connect the Concordia development, and the cost and benefits of conducting the work as part of a greenfield project (rather than brownfield).
Untreated risk	Not applicable. This project is not addressing an existing asset risk. The Concordia Reticulation Project is entirely growth-driven and is justified by a net present value (NPV) calculation.
Options considered	• **Option 1** – Connect Concordia to the Gawler high pressure network, and reticulate the Concordia site using common trenches as part of the greenfield development ($3.1 million) • **Option 2** – Connect Concordia to the SEA Gas transmission pipeline, install pressure regulating equipment at Concordia site, and reticulate the Concordia site using common trenches as part of the greenfield development ($15 million) • **Option 3** – Maintain status quo, do not offer a gas supply to the area (no upfront capital costs, however the potential incremental revenue will be foregone) An option initially considered but not pursued further was to wait and connect the Concordia development as a brownfield project. We dismissed this option as imprudent. Although building the mains extension and reticulation after the estate has been built will provide greater certainty of connections/demand, the costs of developing a brownfield site are considerably higher (typically 2-3 times more expensive) than greenfield developments.
Proposed solution	Option 1 is the proposed solution. Connecting to the existing Gawler network and reticulating the site as a greenfield project will enable new homes and businesses to connect immediately and at a lower overall cost than if the Concordia development were to be constructed as a brownfield project. Developers and potential customers have expressed a desire for gas in the area, and there is sufficient evidence that the forecasted number of connections will arise if the necessary gas infrastructure is installed. Constructing the necessary trunk main and reticulation while Concordia is under development means common trenches can be used. The costs of connection will be around 2-3 times higher if we wait until the development is already constructed and miss the greenfield opportunity.

	Connecting Concordia to the existing Gawler network (Option 1) is more efficient than a direct connection to the SEA Gas pipeline (Option 2), as it takes advantage of the new SEA Gas connection proposed for Gawler (refer to business case SA115), which is necessary to address existing pressure issues in the Gawler and Willaston networks. While Option 2 would increase security of supply in the northern networks, it would not address the Gawler and Willaston pressure issues quickly enough. If the new SEA Gas connection at Gawler goes ahead as planned, it would not be economically efficient to have a second SEA Gas connection to Concordia. Option 3 (not supplying the Concordia growth area) is not recommended, as the opportunity for new connections and incremental revenue will be foregone. Increasing the number of gas connections benefits all customers connected to the gas distribution network, as it means the total network costs are spread across a larger customer base.
Estimated cost	The forecast direct capital cost (excluding overhead) during the next AA period (July 2021 to June 2026) is $3.1 million.

$'000 2019/20	21/22	22/23	23/24	24/25	25/26	Total
Concordia reticulation project	2,040.0	255.0	255.0	255.0	253.6	3,058.6

Basis of costs	All costs in this business case are expressed in real unescalated dollars at December 2019 unless otherwise stated. Some tables may not add due to rounding.
Alignment to our vision	This investment aligns with *Delivering for Customers* as it will ensure new homes and business in the Concordia growth area will have access to natural gas supply. The proposed solution is also *Sustainably Cost Efficient*, as it returns the best NPV within 16 years, and increases the number of connections to the SA network, thereby helping spread costs across a larger customer base.
Consistency with the National Gas Rules (NGR)	**NGR 79(1)** – the proposed option is prudent as there is evidence of natural gas demand in the area and ongoing growth over the next 25 years. Installing gas infrastructure as part of a greenfield development is 2 to 3 times more cost efficient than brownfield developments, and historically has resulted in a larger penetration rate (~95%). The increased number of connections means total network costs are spread over a larger customer base, which helps achieve the lowest sustainable cost of providing services. **NGR 79(2)** – proposed capex is justifiable under NGR 79(2)(b), as the present value of the expected incremental revenue generated as a result of the network expansion and reticulation into Concordia exceeds the present value of the capital expenditure, returning the best NPV over 16 years. **NGR 74** – the forecast costs and are based on the latest market rate testing and estimated demand in the region is based on evidence provided by developers and prospective customers. We have also used precedent set in similar network expansions to inform the forecast number of connections and penetrations rates. An NPV assessment has been conducted for the recommended option. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.
Treated risk	Not applicable.
Stakeholder engagement	We are committed to operating our networks in a manner that is consistent with the long-term interests of our customers. To facilitate this, AGN conducts regular stakeholder engagement to understand and respond to the priorities of our customers and stakeholders. Feedback from stakeholders is built into our asset management considerations and is an important input when developing and reviewing our expenditure programs. Our customers have told us their top three priorities are price/affordability, reliability of supply, and maintaining public safety. They also told us they expect us to deliver a high level of public safety.

	Making natural gas available to new customers in Concordia is consistent with our customers' priorities. Increasing the number of connections and maintaining the viability of natural gas as a complementary (and alternative) energy source to electricity helps spread network costs and keep gas affordable. More significantly, customers continually tell us during our engagements that they value natural gas and see it as an important part of the energy mix. It is therefore in keeping with customers' expectations for us to expand the network to areas where there is a clear demand for natural gas.
Other relevant documents	• Attachment 8.2 Strategic Asset Management Plan • Supporting Information 8.8.5 SA122 NPV & Options Analysis

1.3 Background

The northern suburbs of metropolitan Adelaide is a major residential growth area in South Australia. Concordia is one of three large residential and commercial developments in the region surrounding the existing Gawler distribution network, the others being Springwood and Roseworthy. Springwood and Roseworthy are already under construction, with Concordia expected to follow in 2022/23.

Concordia is an area of rural land adjoining the eastern boundary of Gawler, located about 42 km north of Adelaide. It is a future urban growth area, forming part of the South Australian Government's 30-year growth strategy[89]. Concordia is a gateway to the Barossa Valley and is close to the Northern Expressway (and new Northern Connector project) and the Gawler East Link Road.

Land developer Concordia Land Management (CLM) plans to transform the 935 hectare site into a master planned community that will form a natural extension of the existing Gawler Township. The Concordia development will contribute to the physical and social infrastructure of Gawler and Barossa districts, whilst providing a critical mass to support and underpin the economic strength and viability of local businesses, services and institutions. Detailed market research undertaken by Holmes Dyer on behalf of CLM indicates Concordia would need to come on line from 2022/23 to meet Adelaide's housing needs.[90]

1.3.1 Expected demand for natural gas

By 2047, Concordia is expected to include approximately 10,000 homes, plus schools, community facilities and shopping centres to support a population of around 24,000 residents. CLM has signalled its intent to include provision of natural gas to the development, stating that it *sees natural gas as an important part of the provision of sustainable and affordable fuels options for the Concordia development*.[91]

The Concordia development is being constructed over 20-25 years, with approximately 1,480 allotments being created by 2027 (see Table 1.3).

Table 1.3: Concordia residential allotment yield and estimated growth rate

Year	Average annual allotment creation	Allotments created (cumulative)	Dwellings occupied	Population (new residents per annum)	Population (cumulative at 2.5 people per household)
2022	-	100	0	0	0
2027	276	1,480	1,130	565	2,825
2032	400	3,480	3,030	950	7,575

[89] https://livingadelaide.sa.gov.au/

[90] CLM, Letter to APA *Business case – Gas Provision for Concordia*, 20 August 2019 (See Appendix C).

[91] Ibid.

Year	Average annual allotment creation	Allotments created (cumulative)	Dwellings occupied	Population (new residents per annum)	Population (cumulative at 2.5 people per household)
2037	480	5,880	5,380	1,175	13,450
2042	410	8,330	7,930	1,1275	19,825
2047	290	9,780	9,580	825	23,950

Source: Concordia Land Management August 2019.

Around 40 commercial connections are expected in addition to the 9,580 residential connections indicated above.

1.3.1.1 Gas penetration rates and estimated growth

Historically, more than 8,000 new residential dwellings are connected to the natural gas distribution network in greater Adelaide each year. The average gas penetration rate for greenfield residential developments is 95%. This means that around 95% of new dwellings that have a natural gas supply passing the property will connect. This compares to the typical penetration rate for established suburbs (or brownfield developments) of between 50-75%[92].

A June 2018 study into penetration rates in the SA network[93] shows that new suburbs typically experience a higher penetration rate than established suburbs, and new subdivisions of a comparable size to Concordia have a 95% penetration rate (see Table 1.4).

Table 1.4: South Australia, new subdivisions

Suburb	Total gas customers^	New gas customers 2011/12 – 2016/17	Total homes*	Penetration
Andrews Farm	2,838	544	2,892	98%
Blakeview	2,909	822	3,021	96%
Munno Para	1,690	426	1,715	96%
Northfield	1,489	344#	1,713	87%
Northgate	1,122	1,150#	1,169	96%
Seaford Meadows	1,626	886	1,702	96%
St Clair	861	385	992	87%
Whyalla Jenkins	768	252	818	94%
Total	**13,303**	**4,809**	**14,022**	**95%**

^Number of residential gas connections as at March 2018

*Number of residential electricity connections as at March 2018

[92] The average penetration rate for residential gas connections in suburbs and towns where our network is already present is 74% (further discussion on penetration rates in our network is provided in the Mount Barker Natural Gas Extension Business Case, June 2018.

[93] See Mount Barker Natural Gas Extension Business Case, attachment 6A: Penetration Data, June 2018.

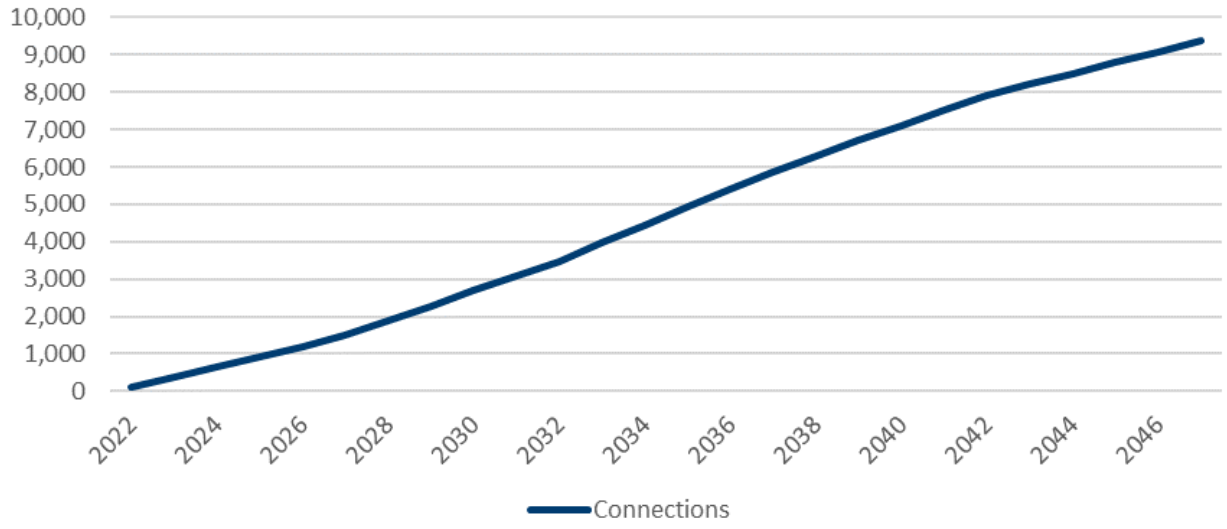
#A section of Northgate, Northfield and Greenacres was renamed to Lightsview in April 2016 with many of the new connections in these suburbs between July 2011 and April 2016 now gas customers in Lightsview.

Source: Table 5, Mount Barker Extension Business Case, June 2018.

This business case covers proposed works during the forthcoming AA period, which runs from 2021/22 to 2025/26. Based on the information provided by CLM, 1,204 allotments will have been created by the end of the period. If we apply a 95% penetration rate, this means 1,143 residential connections will be required during the forthcoming AA period.

Figure 1.1 shows the estimated growth in residential customer connections in Concordia

Figure 1.1: Estimated growth in residential customer connections in Concordia



Based on the forecast growth in residential developments alone, high level economic analysis indicates connecting the Concordia estate with natural gas will deliver positive returns within a reasonable period of time (16 years – see section 1.6 for a summary of the net present value (NPV) analysis). The incremental revenue from commercial customers has not been included in our NPV analysis at this time, however we consider connection of I&C or Tariff D customers would only strengthen the business case from an economic perspective.

1.3.2 Technical solutions

The Concordia development is currently not supplied with natural gas. New network infrastructure must be installed to distribute gas to the Concordia estate.

A number of feasible technical solutions exist, including installing a high pressure connection to the existing Gawler distribution network to the south west of Concordia, or installing a direct connection to the SEA Gas transmission pipeline that runs south east of the Concordia growth area. This business case considers which technical solution is the most prudent and efficient, in terms of cost, timing, customer impact and interconnectivity with other projects.

1.4 Risk assessment

Figure 1.2: Risk management principles

Risk management is a constant cycle of identification, analysis, treatment, monitoring, reporting and then back to identification (as illustrated in Figure 1.2). 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.

The Concordia expansion is driven by forecast growth. There is therefore no current or underlying supply, safety or failure risk associated with existing assets in Concordia.

There is, however, an underlying risk of pressure drop in the nearby Gawler and Willaston distribution networks. Two new residential developments in the region – Springwood and Roseworthy – are driving the need for network augmentation to ensure the natural gas supply in the Gawler and Willaston region remains secure. Springwood and Roseworthy are further progressed than Concordia.

The Galwer and Willaston security of supply risk would be exacerbated if the Concordia development was to be connected to the existing Gawler network without appropriate augmentation being carried out beforehand. We propose to address this current pressure drop risk by installing a new connection to the SEA Gas transmission pipeline in Gawler. This is discussed in detail in business case SA115.

As long as the installation of the new gate station outlined in business case SA115 goes ahead, the Concordia development can connect to the Gawler network without compromising existing network pressures.

However, if project SA115 is not delivered as proposed, an alternative technical solution would be required. Therefore, in this business case, two feasible technical solutions have been considered: one that assumes the Gawler Gate Station project is delivered (Option 1), and one that assumes it is not (Option 2).

1.4.1 Risk associated with not connecting Concordia

If the Concordia expansion and reticulation project is not delivered, an opportunity for efficiently increasing the number of connections to the South Australian gas distribution network will be foregone. Under the price cap form of regulation, by increasing the number of customer connections, the costs of operating, maintaining and expanding the network are spread across a larger customer base. This means the cost to service each customer is lower, and the impact on customers' bills is less.

More significantly, there is sufficient evidence from CLM and prospective customers in the Concordia region that a natural gas connection is desired. CLM has stated its intent to make a natural gas supply available to the new residents and businesses in Concordia, and historical penetration rates for new developments tell us that customers continue to want and value a gas connection. We would therefore be exposed to some reputational risk if we choose not to uphold our commitment to providing a reliable and affordable natural gas supply to South Australians.

1.4.2 Risk associated with deferring connection of Concordia

We have an opportunity to install the gas distribution assets as part of the greenfield development. Installing gas infrastructure while the Concordia residential project is being constructed allows us to use common trenches and have greater access to the site without incurring additional excavation, reinstatement, and traffic management costs. This is the most efficient method of network expansion.

If the Concordia expansion and reticulation project is deferred, the opportunity to deliver the works efficiently as part of the greenfield development will be foregone. Typically, the cost of laying mains and services in a brownfield development is around two to three times more expensive than installing these assets in a greenfield project.

Historically, penetration rates for brownfield developments are also lower than for new builds. When reticulating brownfield areas, gas connection requests and penetration rates are primarily driven by appliance changeover decisions. As a result, typical gas penetration rates in brownfield area can grow as slowly as 2% to 5% per year, and ultimately only reach up to 75% after 20 years.

If the Concordia development deferred and reticulated as a brownfield project, not only would the costs be higher, the likely gas uptake and therefore the benefits to all consumers would be lower.

Table 1.5: Comparison of greenfield v brownfield development costs

Current average cost	Greenfield developments	Brownfield developments
Main (cost per metre)	$[redacted]	$[redacted]
Services (cost per unit)	$[redacted]	$[redacted]
Meter (cost per unit)	$[redacted]	$[redacted]
Penetration rate	~95%	50% to 75%

1.5 Options considered

We have considered the following options to provide natural gas supply to Concordia:

- **Option 1** – Connect Concordia to the Gawler high pressure network, and reticulate the Concordia site using common trenches as part of the greenfield development;
- **Option 2** – Connect Concordia to the SEA Gas transmission pipeline, install pressure regulating equipment at Concordia site, and reticulate the Concordia site using common trenches as part of the greenfield development; or
- **Option 3 –** Maintain status quo, do not offer a gas supply to the area.

These options are discussed in the following sections.

1.5.1 Option 1 – Connect Concordia to the Gawler high pressure network

Under this option, we would connect the Concordia land area to the existing Gawler natural gas distribution network. This would involve connecting to the high pressure mains at Calton Road, downstream of the new Gawler gate station.[94]

[94] See business case SA115.

We would install a total of 3 km of DN280 polyethylene main, running 1.5 km from Calton Road to the development, and extending into the Concordia land area. We would then install 17,760 metres of reticulation mains within the development, using common trenches where practicable.

During the forthcoming AA period we expect to connect 1,143 new homes and businesses as they are developed and occupied.

Option 1 would only be viable if the Gawler gate station (business case SA115) is installed in 2022 as proposed. Connecting the Concordia estate to the Gawler system without augmenting the existing network would exacerbate the pressure drop issue in the Gawler and Willaston areas.

1.5.1.1 Cost assessment

The direct cost of this option is $3.1 million (see Table 1.6).

Table 1.6: Cost estimate – Option 1, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Trunk mains DN280	2,040.0	255.0	255.0	255.0	253.6	3,058.6
Total ($)	**2,040.0**	**255.0**	**255.0**	**255.0**	**253.6**	**3,058.6**

The reticulation cost of this option is $2.8 million over the next AA period, as provided in Table 1.7. Note that approval of these costs is not sought as part of this business case. Reticulation costs are forecast at a macro level and are included as part of our growth capex forecast. This is included in the provided capex model and reflects:

- the number of connections estimated in our demand forecast; and
- the average unit rate provided in our unit rates report.

Table 1.7: Reticulation costs – Option 1, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Reticulation mains	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Inlets	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total ($)	**349.8**	**604.2**	**604.2**	**604.2**	**604.2**	**2,766.4**

Refer to Appendix B for a more detailed cost breakdown.

1.5.1.2 Alignment with vision objectives

Table 1.8 shows how Option 1 aligns with our vision objectives.

Table 1.8: Alignment with vision – Option 1

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-

Vision objective	Alignment
A Good Employer – Employee Engagement	-
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	Y
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 1 aligns with our objective of *Delivering for Customers*, as it will ensure customers who want to connect to natural gas, can connect to natural gas.

Option 1 also aligns with our objective of being *Sustainably Cost Efficient*, as expanding and reticulating into the Concordia growth area will increase the number of network connections, spreading the total network costs over a larger customers base. Installing the distribution assets as part of a greenfield development is also the most efficient method of providing natural gas supply.

1.5.2 Option 2 – Connect Concordia directly to the SEA Gas transmission pipeline

Under this option, the Concordia land area would be connected directly to the SEA Gas transmission pipeline, which runs to the south east of Concordia. This would include installing pressure regulating equipment at the SEA Gas pipeline CL900, stepping down from transmission pipeline pressure to Adelaide Metro transmission pressure (CL150). We would then run 3.8 km of Adelaide Metro high pressure to the centre of the Concordia development, at which point we would install pressure regulating equipment to step down to distribution pressure.

We would then install 17,760 metres of reticulation mains within the development, using common trenches where practicable. During the forthcoming AA period we expect to connect 1,143 new homes and businesses as they are developed and occupied.

Option 2 would only be prudent if the Gawler gate station (business case SA115) is not installed in 2022 as proposed. If the SEA Gas connection at Gawler is not installed, then the direct connection from the SEA Gas pipeline to Concordia would be necessary to ensure the estate can be supplied at the necessary pressures. However, if the Gawler gate station is installed, Option 2 would not be prudent, as it would represent over-security of supply to have two connections to the SEA Gas pipeline in such close proximity.

Option 2 provides the advantage that the Adelaide Metro transmission pressure (CL150) could be extended from the centre of Concordia in the future to a more northern point in the network, and thereby provide additional security of supply from north to south. It also has the advantage that it would place no additional pressure on security of supply in Gawler, as gas would be supplied direct from the transmission system.

A disadvantage of this option is the timing. A pressure constraint in the Gawler region is expected to occur by 2023 unless network reinforcement is undertaken. While a connection to the SEA Gas pipeline via Concordia would provide a second source of supply to the broader network over the long term, it is likely to be 10-20 years until the Concordia estate is sufficiently developed to make a connection to the existing distribution networks efficient (note the Concordia development is phased over 25 years). Therefore, the security of supply benefit from the SEA Gas connection via Concordia would come too late to address the Gawler network pressure issues.

If Option 2 for Concordia is pursued, then an alternative option to address the Gawler pressure drop risk before 2023 would be required.[95]

1.5.2.1 Cost assessment

The direct cost of this option is $15.2 million (see Table 1.9).

Table 1.9: Cost estimate – Option 2, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Adelaide Metro TP gate station	[redacted]	[redacted]	-	-	-	[redacted]
Adelaide Metro TP-HP DRS	[redacted]	[redacted]	-	-	-	[redacted]
Adelaide Metro TP Pipeline CL150	[redacted]	[redacted]	-	-	-	[redacted]
Total ($)	**10,041.3**	**5,197.3**	**-**	**-**	**-**	**15,238.6**

The reticulation cost of this option is $2.9 million over the next AA period, as provided in Table 1.7. Note that approval of these costs is not sought as part of this business case. Reticulation costs are forecast at a macro level and are included as part of our growth capex forecast. This is included in the provided capex model and reflects:

- the number of connections estimated in our demand forecast; and
- the average unit rate provided in our unit rate document.

Table 1.10: Reticulation costs – Option 2, $'000 2019/20

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Reticulation mains	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Inlets	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total ($)	**349.8**	**604.2**	**604.2**	**604.2**	**604.2**	**2,766.4**

1.5.2.2 Alignment with vision objectives

Table 1.11 shows how Option 2 aligns with our vision objectives.

Table 1.11: Alignment with vision – Option 2

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	N
Delivering for Customers – Customer Service	Y
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-

[95] For example duplicating the existing trunk main that supplies Gawler from the south (as per Option 2 in business case SA115).

Vision objective	Alignment
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	N
Sustainably Cost Efficient – Delivering Profitable Growth	Y
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 2 aligns with our objective of *Delivering for Customers*, as it will ensure customers who want to connect to natural gas, can connect to natural gas.

However, Option 2 would not address the forecast pressure drop issues in the existing Gawler network by 2023 (as described in SA115). The security of supply benefits of making a new SEA Gas connection via Concordia would not take effect until the Concordia network is connected to the existing distribution networks. This would not occur until sufficient organic growth occurred to justify connection at the periphery of the Concordia network, which would likely take at least 10-20 years.

Option 2 aligns in part with our objective of being *Sustainably Cost Efficient*, as expanding and reticulating into the Concordia growth area will increase the number of network connections, spreading the total network costs over a larger customer base. Installing the distribution assets as part of a greenfield development is also the most efficient method of providing natural gas supply.

However, Option 2 has a higher direct cost than Option 1.

1.5.3 Option 3 – Maintain status quo

Under this option we would not extend the network into the Concordia region, and no additional capex would be incurred.

Note that network reinforcement to the Gawler region, as described in business case SA115, is required even if Concordia does not connect. This is because the pressure drop risk in Gawler and Willaston is being driven by the Roseworthy and Springwood developments, which are further progressed than Concordia. A decision to not supply Concordia, or to defer connection, would not defer capital expenditure to augment Gawler.

1.5.3.1 Cost assessment

While there are no additional upfront costs associated if we maintain the status quo, we will forego the opportunity for incremental revenue from up to 10,000 new connections over the next 25 years. It is feasible that around 40 of these new connections would be industrial and commercial customers, with potential for some Tariff D customers.

1.5.3.2 Alignment with vision objectives

Table 1.12 shows how Option 3 aligns with our vision objectives.

Table 1.12: Alignment with vision – Option 3

Vision objective	Alignment
Delivering for Customers – Public Safety	-
Delivering for Customers – Reliability	-
Delivering for Customers – Customer Service	N
A Good Employer – Health and Safety	-
A Good Employer – Employee Engagement	-

Vision objective	Alignment
A Good Employer – Skills Development	-
Sustainably Cost Efficient – Working within Industry Benchmarks	-
Sustainably Cost Efficient – Delivering Profitable Growth	N
Sustainably Cost Efficient – Environmentally and Socially Responsible	-

Option 3 would not align with *Delivering for Customers*, as Concordia residents that want a natural gas connection will not be able to connect to the network. Option 3 would also not be *Sustainably Cost Efficient*, as it would not deliver profitable growth in the network which benefits all customers by increasing the number of customers contributing to the fixed costs of our network.

1.6 Summary of costs and benefits

Table 1.13 presents a summary of how each option compares in terms of the estimated cost, the residual risk rating, and alignment with our vision objectives.

To assess which solution is likely to cost the most over time, we have conducted a net present cost assessment of Options 1 and 2. We have not included Option 3 (maintaining the status quo) in the NPV assessment as we do not consider this to be a prudent option.

Table 1.13: Comparison of options

Option	Estimated cost ($ million)	Alignment with vision objectives	25yr NPV ($ million)
Option 1 – connect to Gawler network	3.1	Aligns with Delivering for Customers and Sustainably Cost Efficient (delivering the best NPV)	18.7
Option 2 – connect to SEA Gas	15.2	Aligns with Delivering for Customers but is less Sustainably Cost Efficient than Option 1 (delivers a lower NPV).	6.6
Option 3 – status quo	no upfront capital costs	Does not align with Delivering for Customers or Sustainably Cost Efficient	N/a

1.7 Recommended option

Option 1, connecting to the Gawler network downstream of the new Gawler gate station, is the recommended option.

1.7.1 Why is the recommended option prudent?

Option 1 is the most efficient and practicable technical solution, particularly given the proposal to install the new Gawler gate station in 2022.

Assuming the Gawler gate station project goes ahead as expected, it would be most economical to make the Concordia connection downstream of this new Gawler regulator set and run a DN280 polyethylene trunk main up to Concordia from the existing high pressure mains.

If the Gawler gate station project is not delivered, Option 2 is a valid technical solution, and will ultimately deliver its own security of supply benefits over the long term. However, a SEA Gas connection via Concordia would not address the pressure drop issues in Gawler and Willaston in time. This means some form of additional network augmentation in the Gawler region will be required within the next five years even if Option 2 is pursued.

We submit that Option 1 of this Concordia business case, and Option 1 of the Gawler business case SA115 (installing the new gate station) is the most prudent and efficient combination of solutions across these two interrelated projects.

Option 1 returns a positive NPV after 16 years, and results and an NPV of $17 million after 25 years. As a result, it passes the incremental revenue test specified under NGR 79(2)(b).

Connecting to the existing Gawler network and reticulating the site as a greenfield project will enable new homes and businesses to connect immediately and at a lower overall cost than if the Concordia development were to be constructed as a brownfield project. Developers and potential customers have expressed a desire for gas in the area, and there is sufficient evidence that the forecasted number of connections will arise if the necessary gas infrastructure in installed.

Option 3 (not supplying the Concordia growth area) is not recommended, as the opportunity for new connections and incremental revenue will be foregone.

1.7.2 Estimating efficient costs

Key assumptions made in the cost estimation include:

- the cost estimate is based on costing the activities that comprise the work breakdown structure;
- the rates utilised in costing these activities are based on current vendor and contractor rates in 2019 and historical costing; and
- the distribution assets will be installed as part of the greenfield development.

This project will be delivered using a combination of internal and external resources. The project will be initiated internally by the asset manager. Design, project management and installation will be completed by contractors. Contractors will be selected through a competitive tender process. Quality assurance and project closure will be handled by internal resources.

Current project delivery practices and controls such as advanced planning and scheduling of work are in place to effectively manage risk in delivery. The risk of not completing this project is considered to be low. Delivery of this project is planned to be phased over the AA period.

The project timeframe with respect to provision of infrastructure and connection of customers is based on discussions with the developer.

The forecast cost breakdown included in the NPV analysis is shown in the table below, which includes the delivery of the trunk mains (the subject of this Business Case). The table also shows the associated reticulation costs to connect the new customers. Note that these reticulation and connection costs are not sought as part of this business case. Reticulation costs are forecast at a macro level and are included as part of our growth capex forecast. This is included in the provided capex model and reflects:

- the number of connections estimated in our demand forecast; and
- the average unit rate provided in our unit rate document.

Table 1.14: Cost breakdown included in NPV analysis

Quantity	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Trunk mains 280mm (m)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Quantity	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Reticulation mains (m) - based on 12m/ lot For years 1&2 default + 20%	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
No of allotments	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Domestic inlets (95% penetration rate)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Domestic meters	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
I&C - inlets	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
I&C - meter sets	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Capital expenditure ($) (Direct rates)						
Trunk cost ($/[redacted] - Refer Appendix B	**2,040.0**	**255.0**	**255.0**	**255.0**	**253.6**	**3,058.6**
Reticulation mains ($[redacted]/m)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Domestic - inlet costs ($[redacted]/inlet)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Domestic - meter cost ($[redacted]/meter)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total reticulation & services	**349.8**	**604.2**	**604.2**	**604.2**	**604.2**	**2,766.4**

The following table shows the costs escalated to June 2021 dollars.

Table 1.15: Escalated cost estimate ('000)

	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Total unescalated ($ Dec 19)	2,040.0	255.0	255.0	255.0	253.6	3,058.6
Escalation	68.8	9.9	11.4	12.9	14.1	117.1
Total escalated ($ Jun 21)	**2,108.8**	**264.9**	**266.4**	**267.9**	**267.7**	**3,175.7**

1.7.3 Consistency with the National Gas Rules

In developing these forecasts, we have had regard to Rule 79 and Rule 74 of the NGR. With regard to all projects, and as a prudent asset manager, we give careful consideration to whether capex is conforming from a number of perspectives before committing to capital investment.

Rule 79(1)

The proposal to conducted the necessary network expansion and reticulation works to connect the new Concordia development is consistent with the requirements of NGR 79(1). Specifically, we consider that the capital expenditure is:

- Prudent – the expenditure is necessary in order to supply natural gas to new customers. The land developer has expressed a desire to offer natural gas to residents, and historical penetration rates indicate that substantial demand for natural gas will occur. The proposed asset design is consistent with accepted industry practice and current standards, and will enable new customers to connect immediately. Practicable options have been considered, and the most prudent option to support the ongoing growth and integrity of the network has been considered. The proposed expenditure is therefore consistent with that which would be incurred by a prudent service provider.

- Efficient – installing the natural gas distribution assets as part of a greenfield development is the most efficient solution, and is two-to-three times less expensive than undertaking the works as part of a brownfield development. The forecast costs have been developed using current vendor rates and historical precedent. The preferred option returns the best NPV (which is positive after 16 years).

- Consistent with accepted industry practice – the recommended technical solution is consistent with current standards, and negates the need for an additional SEA Gas connection or duplication of trunk mains to augment the Gawler network.

- To achieve the lowest sustainable cost of delivering pipeline services –the proposed option has the lowest direct costs and returns the best NPV and is positive NPV after 16 years. Increasing the number of customers connected to the network helps spread total network costs over a larger customers base and helps us deliver pipeline services at a lower cost per customer.

NGR 79(2)

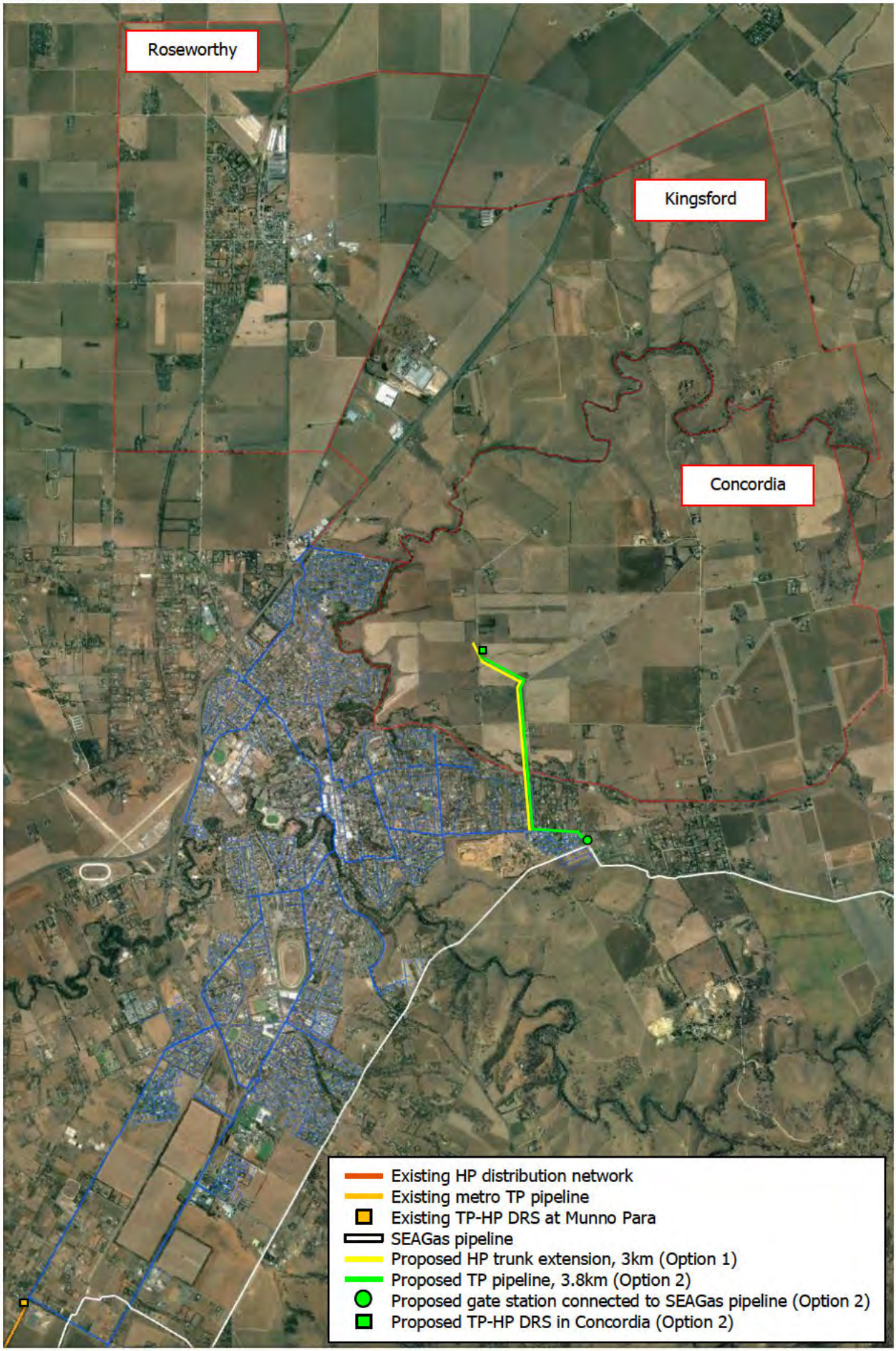
The proposed capex is justifiable under 79(2)(b) as the present value of the expected incremental revenue generated as a result of the network expansion and reticulation into Concordia exceeds the present value of the capital expenditure, returning the best NPV which is positive NPV after 16 years.

NGR 74

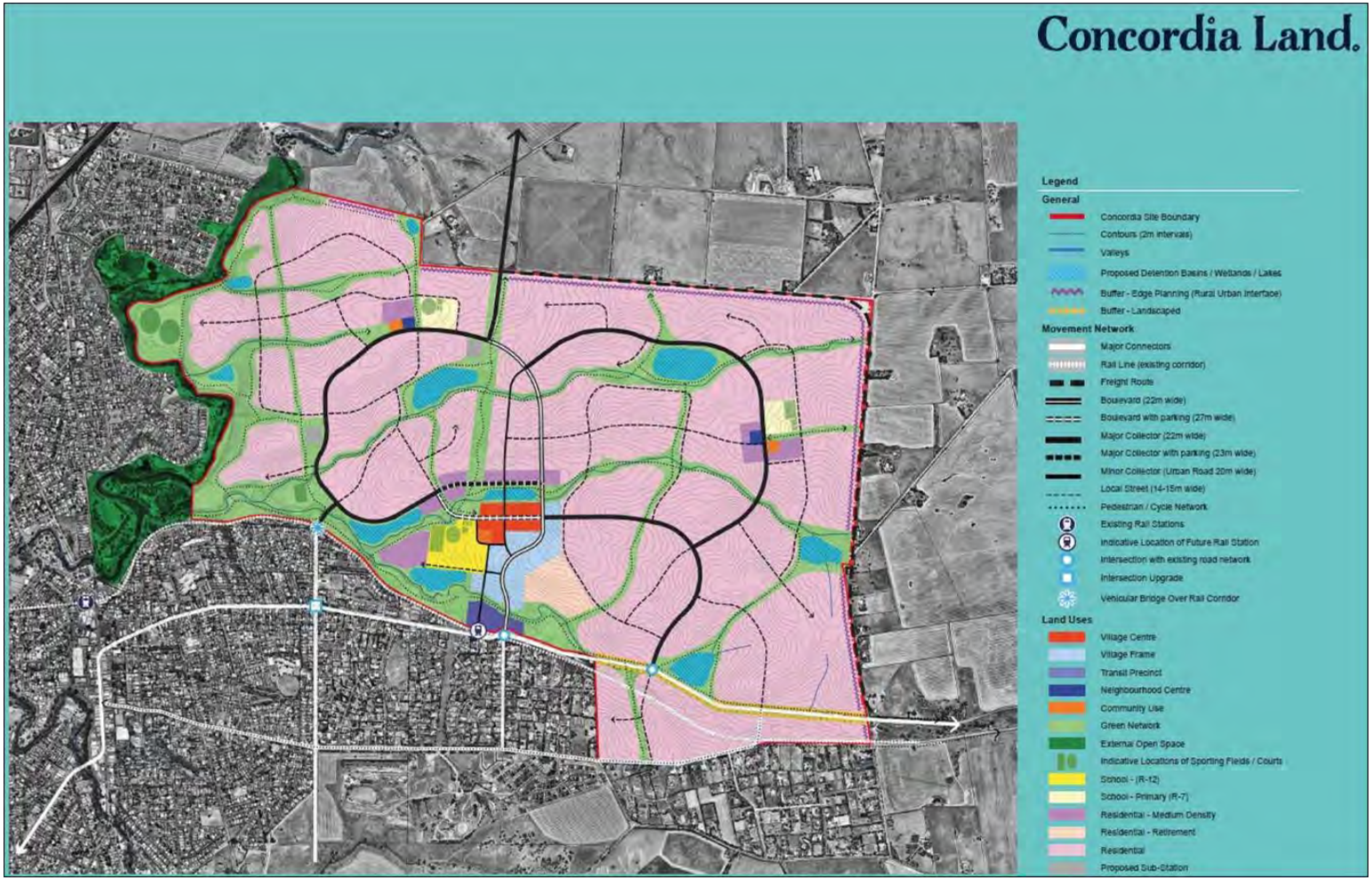
The forecast costs are based on the latest market rate testing and estimated demand in the region is based on evidence provided by developers and prospective customers. We have also used precedent set in similar network expansions to inform the forecast number of connections and penetrations rates. An NPV assessment has been conducted for the recommended option. The estimate has therefore been arrived at on a reasonable basis and represents the best estimate possible in the circumstances.

Appendix A – Asset location map

A.1: Indicative location of proposed options



A.2: Concordia Land Management master plan



Appendix B – Cost estimates

Cost estimate – Trunk headworks - Option 1

Category	Description	Units	Units QTY	Number of sites	Unit Cost $/ unit	Total $
Materials						
Pipe, valves and fittings	DN280 polyethylene pipe, valves and fittings	meters	[redacted]	[redacted]	[redacted]	[redacted]
Other	Freight, storage, and handling	each	[redacted]	[redacted]	[redacted]	[redacted]
Total materials						**410.0**
Labour						
Project management, design and initiation	Project manager	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Project engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Planning engineer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	GIS technician	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Draftsperson	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Site supervisor	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Compliance and communication officer	hours	[redacted]	[redacted]	[redacted]	[redacted]
	HSE representative	hours	[redacted]	[redacted]	[redacted]	[redacted]
	Survey alignment, land acquisition and third party permits	each	[redacted]	[redacted]	[redacted]	[redacted]

Category	Description	Units	Units QTY	Number of sites	Unit Cost $/ unit	Total $
Project site labour and delivery	Contractor rate (based on historical rates)	meters	[redacted]	[redacted]	[redacted]	[redacted]
	Reinstatement (based on historical rates)	meters	[redacted]	[redacted]	[redacted]	[redacted]
	Reinstatement (DPTI Road Profiling)	meters	[redacted]	[redacted]	[redacted]	[redacted]
	Traffic control (based on historical rates)	meters	[redacted]	[redacted]	[redacted]	[redacted]
	Pressure testing (Hydro test)	each	[redacted]	[redacted]	[redacted]	[redacted]
	Non-destructive testing	each	[redacted]	[redacted]	[redacted]	[redacted]
	Commissioning	each	[redacted]	[redacted]	[redacted]	[redacted]
Total labour						**2,648.6**
Total project						**3,058.6**

Appendix C – Letter from Concordia Land Management

Concordia Land.

20 August 2019

Mr David Holden
Gas Development Representative
APA Group
330 Grange Road
KIDMAN PARK SA 5025

Dear David,

Business Case – Gas Provision for Concordia

Further to our recent discussions in regard to the future provision of natural gas to the Concordia project area, I am pleased to provide the following information in support of your business case for the a new truck main which would have capacity to service the development area.

Concordia Land

Leyton Funds Management is a property investment manager and holds an Australian Financial Securities Licence (AFSL) issued by the Australian Securities Commission (ASIC) 483762. We currently own multiple assets in South Australia including; a majority of the future urban land at Concordia (through the Concordia Land Trust (CLT)); and the Gawler Central Shopping Centre, directly adjoining the Gawler Central Train Station (through the Gawler Trust (GT)).

The principles of Leyton Funds Management have a combined 75 years of project development experience and are actively developing a range of commercial and residential projects around South Australia to with a total value range of up to $200million.

Concordia Land Management (CLM) provides the specialist skills to manage and seek a rezoning of the land for urban development on behalf of (and under direction from) LFM.

CLM is under the Directorship of Damien Brown and Richard Osborne who also have a partnership in the development company Arcadian Communities, which is delivering the Springwood Development at Gawler East. The Springwood Development was purchased from Lend Lease in early 2016 and the project team has been working closely with State and local government, and the community since then to resolve key infrastructure issues and implement a refreshed master plan to deliver a quality lifestyle choice in the Gawler hills.

Concordia Growth Area

The Concordia Growth Area comprises approximately 935 hectares of land adjacent Gawler Township. It is located within the Greater Adelaide Area (within the Barossa Council) and is outside the Environment and Food Protection Areas and Barossa Valley Character Preservation District boundaries. This land is required to accommodate urban growth in the northern region of Adelaide over the coming years.

The land is identified in the 30 Year Plan for Greater Adelaide as a "Future Urban Growth" area to be developed in accord with demonstrated market demand. Detailed market research has been undertaken by

Concordia Land Management
abn 61 152 547 598
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Adelaide SA 5000
PO Box 7120, Hutt Street
Adelaide SA 5000
Telephone: 08 7225 8800

Concordia Land.

Holmes Dyer that indicates that Concordia will need to come on line from 2022/23 to meet Adelaide's housing needs.

Concordia forms a logical extension of Gawler in the north and is a natural and sequential extension of the township. The location and unique site features of Concordia enable the project to provide innovative, sustainable, and cost saving solutions for the provision of power, water and sewer services which will result in more affordable living for its future residents.

Both the Barossa Council and the Town of Gawler have agreed to work collaboratively with the land owners on the development of this significant new community.

Concordia Master Planned Development

CLM has a vision to transform the Concordia Growth Area into a master planned community that will form a natural extension of the existing Gawler Township, to support its role as a true Regional Centre on the Gawler transit corridor, while helping preserve the primary production, wine, food and tourism character of the Barossa. The development of Concordia will contribute to the physical and social infrastructure of Gawler and Barossa, whilst providing a critical mass to support and underpin the economic strength and viability of local businesses, services and institutions.

Concordia will be home to a community of approximately 10,000 homes and 24,000 residents. The development comprises the following key features:

- A mixed use Village Centre located within close proximity and immediately north of the future rail station/ transport hub enabling walking permeability and easy connection;
- Two local community hubs including school, retail, community uses and public spaces located to maximise the residential catchments and creating important amenity and services for residents;
- Provision of a comprehensive range of community, education, health, recreation, commercial and retail facilities to support the new community;
- Extension of the electrified rail service to Concordia incorporating a new rail station and depot (subject to Federal Government support);
- Creation of a sub-arterial road network providing efficient and fluid movement through the Growth Area, including development of the North East Link Road providing a strategic regional road connection between the Barossa Valley Way and the Sturt Highway;
- Alignment of roadways to maximise the natural topography and features of the terrain;
- A comprehensive green network to create a defining feature for Concordia as a connected, functional and verdant place, including improvements to the biodiversity value of areas adjacent to the North Para River and Whitelaw Creek;
- Provision of integrated utilities solutions (water, sewer, energy) harnessing best practice alternative technologies, which will reduce development costs, operational costs for households and environment impacts;
- Using the green network to play a critical role in stormwater drainage and water quality treatment;
- A variety of housing densities and types including medium density residential development located to support and activate the Village Centre;
- Provision of an appropriate buffer to the adjoining rural land incorporating 'edge planning' techniques; and
- A future freight route to the periphery of the site, to assist in creating and managing the rural/ urban interface.

Concordia Land.

Development approval timing

In December 2018, CLM lodged a proposal with the Minister for Planning for the declaration of a Precinct Authority over the Concordia Growth Area (pursuant to Section 7H of the *Urban Renewal Act 1995*). The establishment of a Precinct Authority for the delivery of the Concordia project offers significant advantages for all stakeholders compared to a rezoning via Development Plan Amendment by providing a holistic governance framework and infrastructure funding mechanism, for what will be a large scale, comprehensively planned community.

The Precinct Authority legislation is yet to be applied in South Australia so Concordia is likely to be the first project to be undertaken using this approach. The comprehensive Business Case lodged by CLM is currently being considered by the Minister and we hope to have the Precinct declared in the 2019/20 financial year however, we cannot provide a guarantee of the project timing until government approvals are issued.

Planning to include natural gas

In 2017, CLM prepared an Urban Framework Plan for the Concordia project (this document was subsequently updated in 2018) which assessed the projects' infrastructure and augmentation requirements. Our discussions with APA identified two service options for gas infrastructure as follows:

- Extend the current APA Gawler supply to the development. (It will have capacity to cater for an additional 100 allotments prior to extensive augmentation works); and/or
- Put a business case forward for a new truck main which would have capacity to service the development.

Our intention at this time is to include the provision of natural gas to the development subject to a resolution of the augmentation required. CLM see natural gas as an important part of the provision of sustainable and affordable fuel options for the Concordia development.

Allotment yield and estimated growth rate.

These figures are based on achieving a rezoning in 2020. At this stage we would estimate that it is more likely to occur in 2021 (based on the Precinct Authority established in 2020 with master plan approval in 2021).

Year	Average Annual Allotment Creation	Allotments Created (Cumulative)	Dwellings Occupied (Cumulative)	Population (New residents per annum)	Population (Cumulative at 2.5 people per household)
2022	-	100	0	0	0
2027	276	1,480	1,130	565	2,825
2032	400	3,480	3,030	950	7,575
2037	480	5,880	5,380	1,175	13,450
2042	410	8,330	7,930	1,275	19,825
2047	290	9,780	9,580	825	23,950

Concordia Land.

Concordia Preliminary Master Plan

Attached is a copy of the preliminary master plan for Concordia which has formed the basis of our discussions with Local and State Government to date. CLM is currently in the process of refining this plan but the outcome will not substantially change the substance of the existing proposal in terms of extent of development, number of allotments and key project features.

I trust that the information provided herewith is sufficient for you current needs. If there is anything else you require please do not hesitate to contact me. CLM look forward to continuing to work with the APA Group on a positive outcome for Concordia.

Yours sincerely,

Anne Highet
Project Manager

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