

Gas Network

Network Planning Report – Macedon Ranges PUBLIC

Friday, 10 June 2022

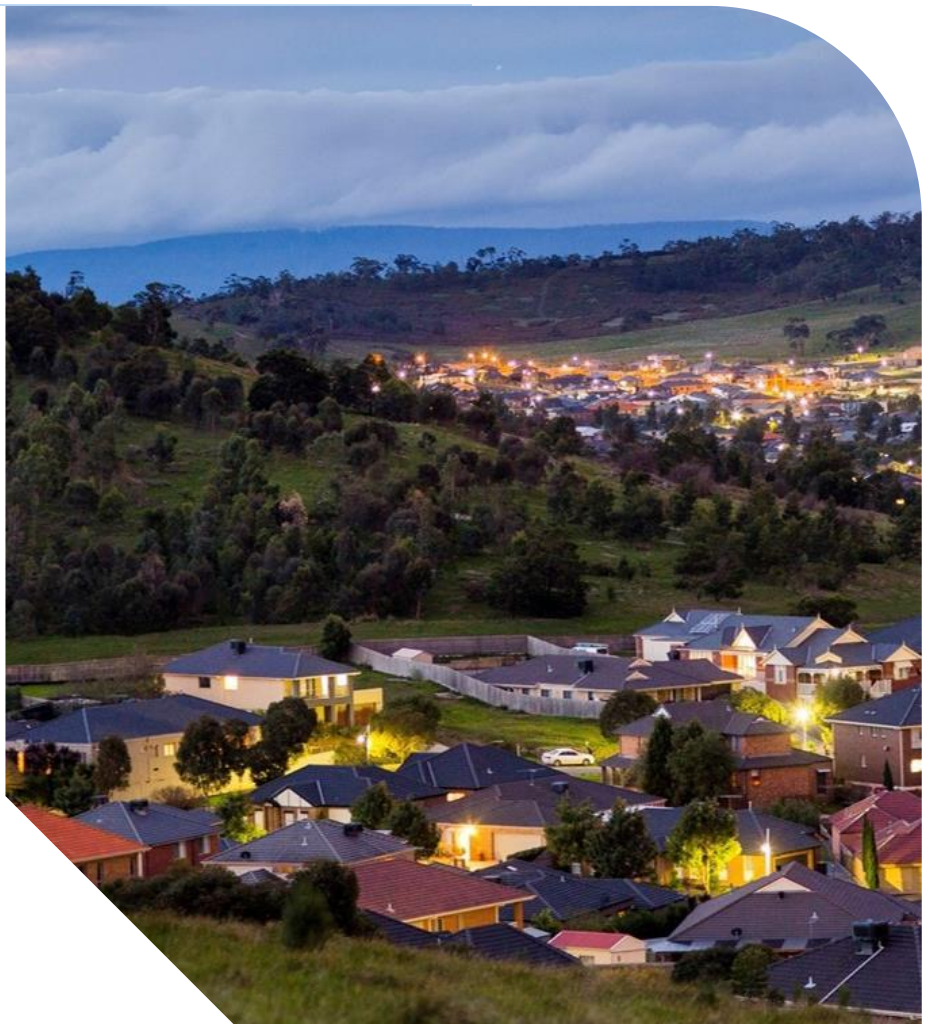
Document number: AMS 30-17-Macedon_Ranges

Issue number: 1

Status:

Approver:

Date of approval:



ISSUE / AMENDMENT STATUS

Issue Number	Date	Description	Author	Approved by
1.0	Jul 2020	Document Finalised	T Nguyen	

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Executive Summary

The High Pressure 2 (HP2) network Macedon Ranges network will be unable to support projected gas consumption growth and would require a network reinforcement by FY2022/23 to boost network capacity in affected areas of Gisborne and Riddells Creek to maintain adequate minimum network pressure and complying with Gas distribution code.

Recommendation - FY22/23

Looping of [C.I.C] of 250mm steel pipe from Woodend City Gate to tie-in to existing 200mm P9 main along Cobb and Co Rd.

1. Network Overview

The Macedon Ranges network is a High Pressure 2 (HP2) network with MOAP of 900kPa. It is a one-directional lateral pipeline supplying by Woodend City Gate located at Carlsruhe. This pipeline supplies 3 High Pressure 1 (HP1) networks of Woodend, Macedon, and Gisborne with 3 high pressure 1 (HP1) regulators.

Within the Macedon Ranges networks, Gisborne network is the largest consumer and experiencing strongest number of new development and expansion. Gisborne and Riddells Creek are continuing to experience substantial residential demand growth, resulting in increasing supply pressure declines in these towns.

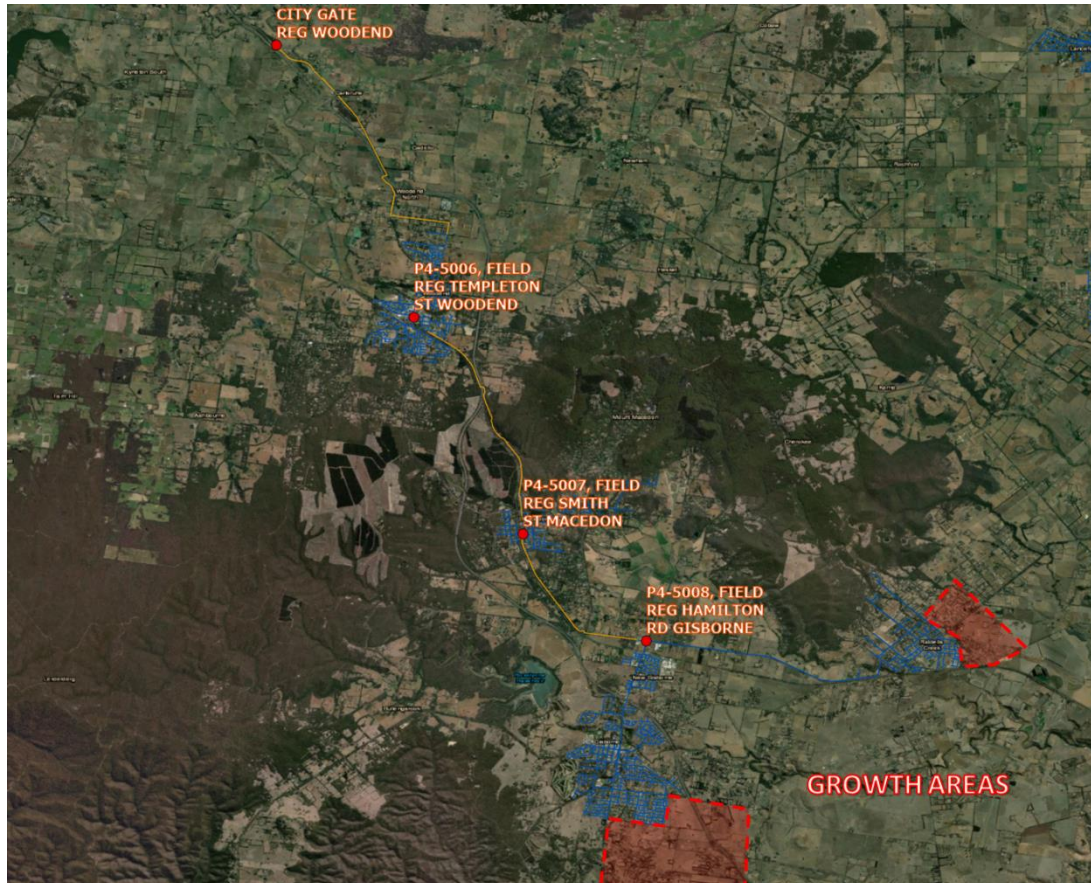


Figure 1: Macedon Ranges gas distribution network overview

2. Network Performance

As a result of continued strong growth in the Gisborne network within the Gisborne and Riddells Creek growth corridors, the existing lateral HP2 pipeline has seen a continued increase in demand resulting in a fall in inlet pressure to downstream regulators, with the most impacted HP1 field regulator at "Gisborne" falls to approximately below 480kPa during peak demand periods. This significantly impacts field regulator performance and reduces regulator outlet pressures, with the "Gisborne" HP1 field regulator outlet pressure falls to approximately below 300kPa during periods of peak demand. Falling field regulator outlet pressures results in delivery pressures dropping below minimum obligated pressures.

The chart below details the recent lowest occurrence of regulator outlet and inlet pressures of the most impacted Gisborne field regulator.

Gisborne Field Regulator Performance Issues

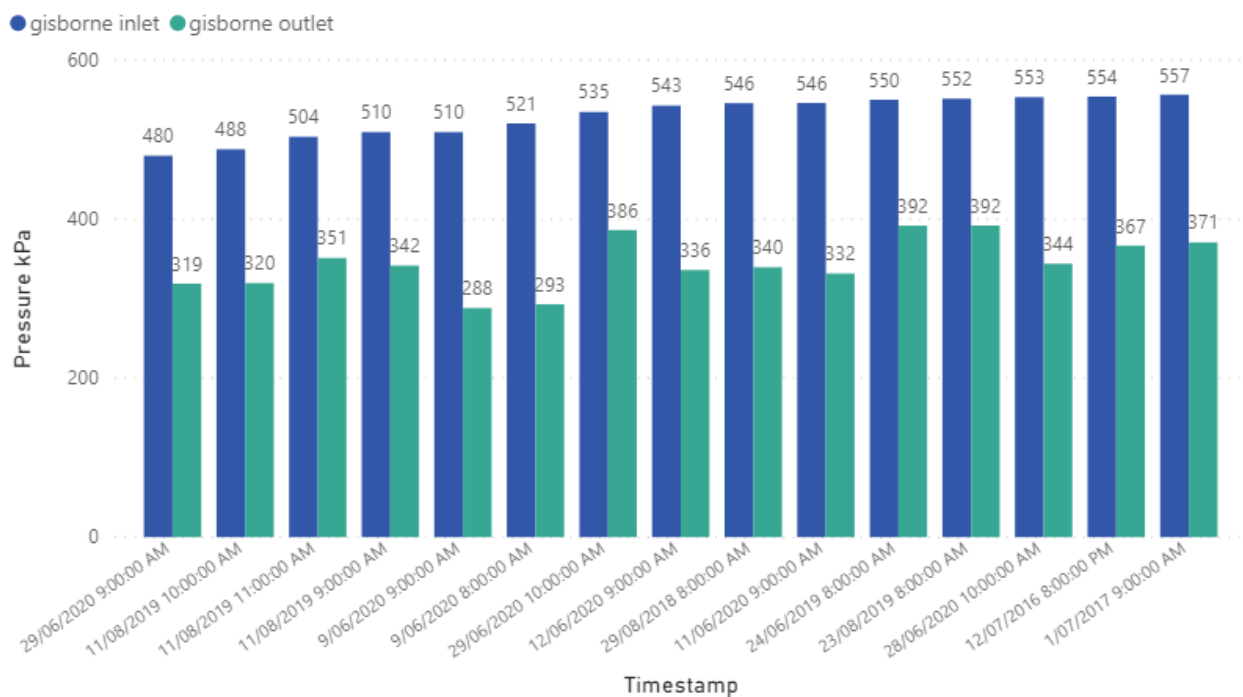


Figure 2: Downstream Gisborne HP1 Field Regulator Performance

The increasing low inlet and outlet pressures of Gisborne field regulator events have been resulting in the increasing network pressures issues in the Gisborne network. The chart below details the instances of low network pressure experienced in the Gisborne network in recent years as of August 2020.

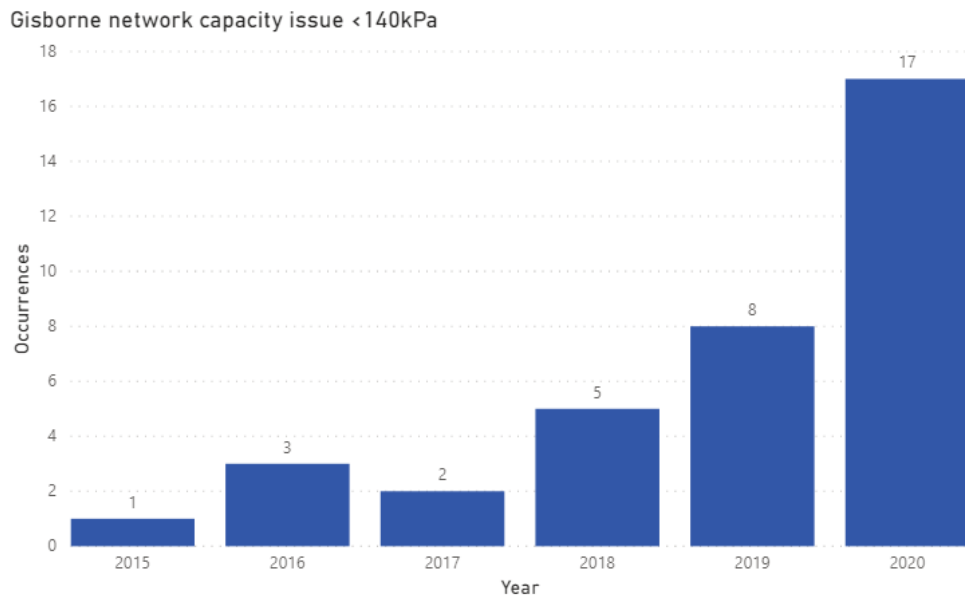


Figure 3: Gisborne fringes network pressure breaches

The 10 lowest instances of fringe pressure are also shown below, dropping to approximately below 10kPa on 4 occasions.

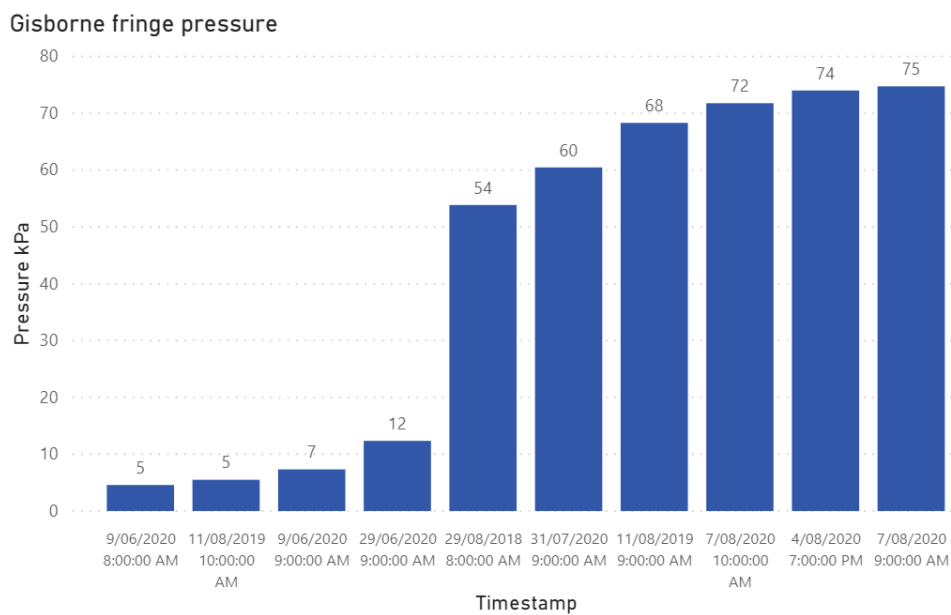


Figure 4: Lowest supply pressure instances

The major contributing factors to capacity constraints in the Macedon Ranges network include:

- Limited pipeline capacity in existing 200mm polyethylene with internal diameter of approximately 159mm.
- Reduction in pipeline size inlet to Gisborne Regulator from 200mm polyethylene to 80mm steel.
- Continued strong growth and increase in demand in the Gisborne network at the fringe of the Macedon Ranges network.

3. Network Modelling

Network model for the Macedon Ranges High Pressure 2 network is matched with latest analysis of the network using SCADA, fringe pressures monitoring program in 2020.

With matched Macedon Ranges network model of winter 2020, the areas of poor network pressures are illustrated showing poor inlet pressure at Gisborne field regulator impacting its outlet pressure and, as a result, networks pressures at Gisborne have been experiencing increasing low pressure events dropping below Gas distribution code of 140kPa minimum in the fringe areas during peak winter periods.

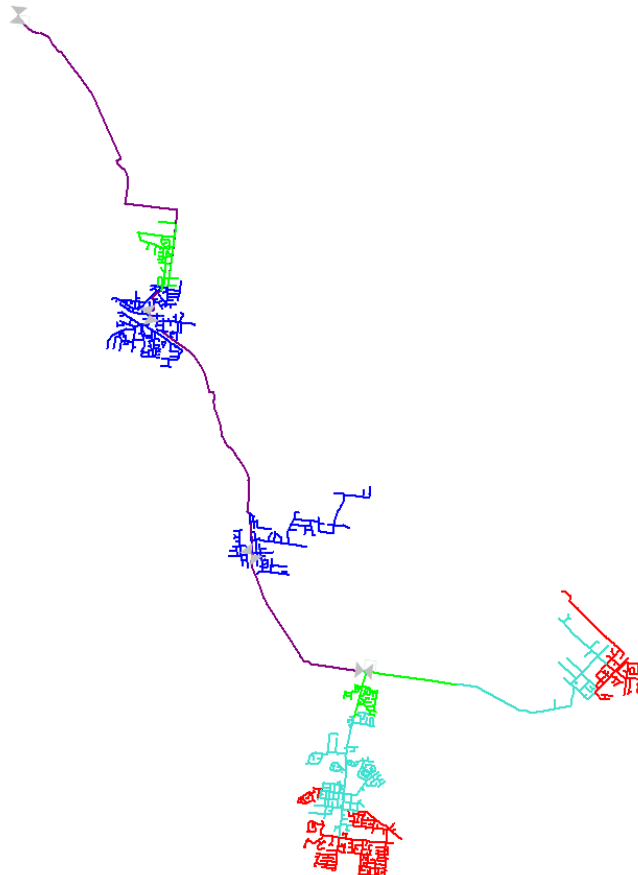


Figure 5: Macedon Ranges model - winter 2020

Growth Forecasts rates provided Finance Data Analytics in AusNet Services' Finance department for the Macedon Ranges are as shown in table below.

Table 1: Macedon Ranges Growth Rate Forecast

Postcode	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
3437	1.0%	1.0%	1.0%	1.0%	1.3%	1.3%	1.3%

Modelling the growth forecast rates above, the forecast minimum network pressures and estimated number of customer impact for the regulatory period can be obtained and detailed below:

Table 2: Macedon Ranges forecasted minimum pressure and customer impact

Macedon Ranges	2021/22	2022/23	2023/24
Minimum pressure (kPa)	479	470	Reinforcement required
Customer impact (no.)	2,460	2,460	0

Based on the consumption growth forecast, the Macedon Ranges HP2 network will be unable to support projected gas consumption growth and would require a network reinforcement by 2023 to boost network capacity in affected areas and maintain adequate minimum network pressure.

4. Recommendations

4.1. Options considered

Several options were considered to increase the Macedon Ranges network capacity, which include:

Table 3: Options Description Summary

OPTION	DESCRIPTION SUMMARY
1	No Capital Expenditure
2	Looping [C.I.C] of high pressure 2 pipe
3	Installation of a new City Gate and pipeline
4	Downstream Gisborne high pressure network reinforcement

4.2. Option 1 – Do Nothing / No Capital expenditure

With the current one directional pipeline operating at MOAP of 900kPa, there is no further current non-capital expenditure option available to increase flow capacity and address pressure issues to Gisborne network.

4.2.1. Cost Estimations

The cost of the Do Nothing option is to accept a system capacity shortfall and hence affecting the safe and reliable supply of the Macedon Ranges distribution network.

Total capital expenditure = \$0

4.2.2. Capacity

Capacity limitations would still be existing with this option and capital expenditure cannot be deferred.

4.3. Option 2 – Looping [C.I.C] of High Pressure 2 pipeline

Looping the existing main for approximately [C.I.C] with 250mm Steel pipe from the outlet of Woodend City Gate at Karlsruhe considerably increases flow capacity in the network and inlet pressure to all Macedon Ranges network field regulator including Gisborne Field Regulator, hence allowing Gisborne Field Regulator to maintain sufficient outlet pressure required to supply its fast-growing network complying with minimum supply pressure to customers.

Network Reinforcement work comprises of:

- Tie-in to existing 150mm S7 at the from the outlet of Woodend City Gate at Karlsruhe.
- Construct approximately [C.I.C] of 200mm S11 along Cobb and Co Rd.
- Tie-in to existing 200mm P9 main along Cobb and Co Rd.
- Tie-in to existing 200mm P9 main near the inlet of Gisborne Field Regulator.
- Construct approximately [C.I.C] of 200mm S11.
- Tie-in to existing 80mm S7 main near the inlet of Gisborne Field Regulator.

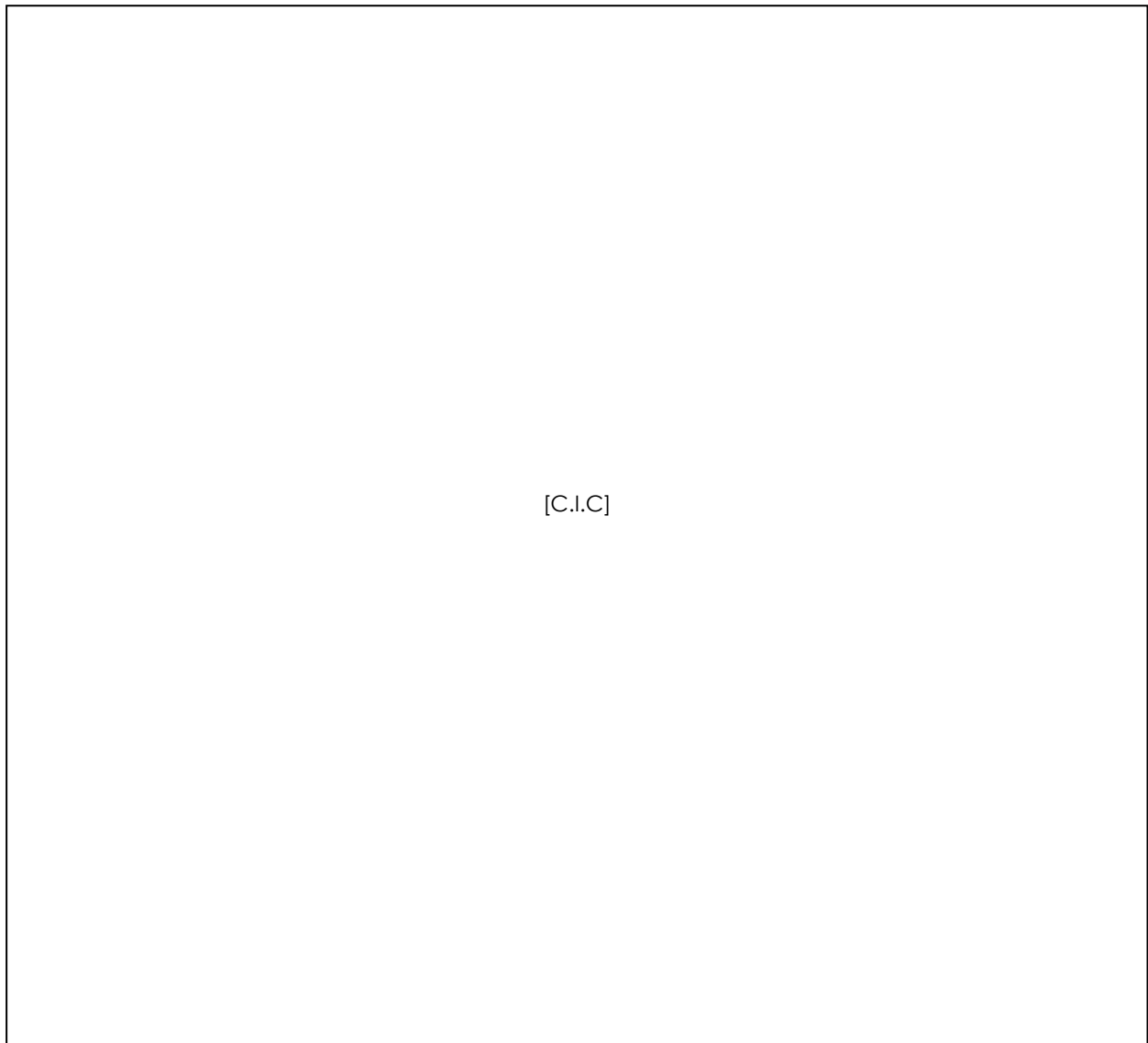


Figure 6: Macedon Ranges Reinforcement - Option 2

4.3.1. Cost Estimations

[C.I.C]

4.3.2. Capacity

Table 4: Option 2 – Macedon Ranges Identified Network Reinforcement

2023 Forecast Minimum Pressure	Affected Customers	REINFORCEMENT SUMMARY	Post Reinforcement Minimum Pressure
477kPa	2,460	[C.I.C] of 250mm steel pipeline	571kPa

Table 5: Macedon Ranges Forecast Minimum Network Pressures

2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
477kPa	571kPa	565kPa	561kPa	552kPa	540kPa

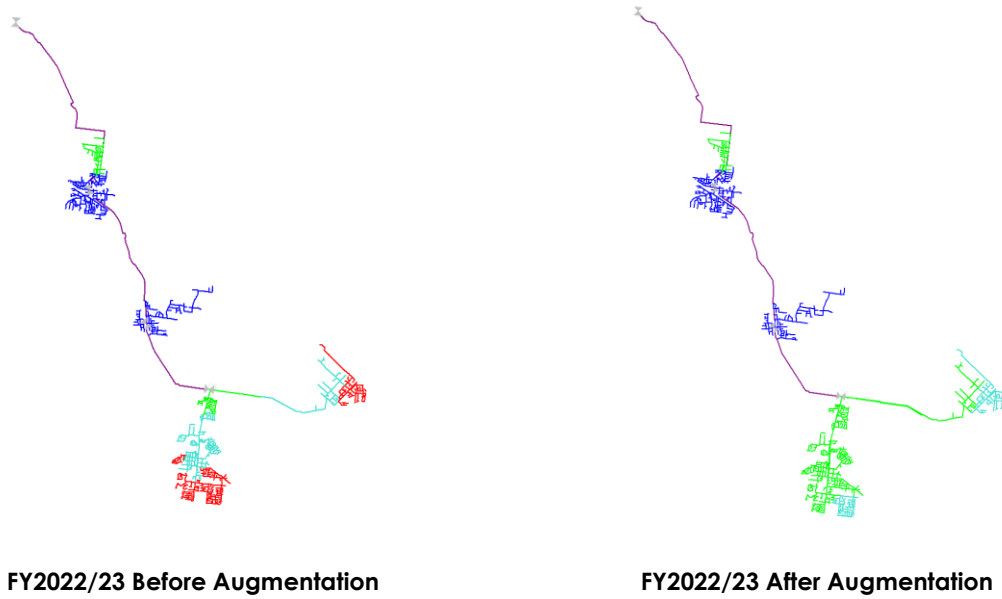


Figure 7: Macedon Ranges before and after augmentation

4.4. Option 3 – Installation of a new City Gate and HP2 pipeline

With the existing APA's transmission pipeline running horizontally from Carlsruhe to Lancefield, a new proposed City Gate can be constructed along this pipeline to provide an extra supply source to existing HP2 pipeline by laying a new pipeline from the new proposed City to connect to existing HP2 pipeline. This would significantly increase existing flow capacity and inlet pressure to Gisborne Field Regulator.

Network Reinforcement work comprises of:

- Construction of a new City Gate approximately 3km North of Newham town near Three Chain Rd and Dons Rd intersection
- Lay approximately [C.I.C] of 200mm Steel HP2 main from new proposed City Gate location to Woodend.
- Tie-in to existing 200mm P9 main at Woodend

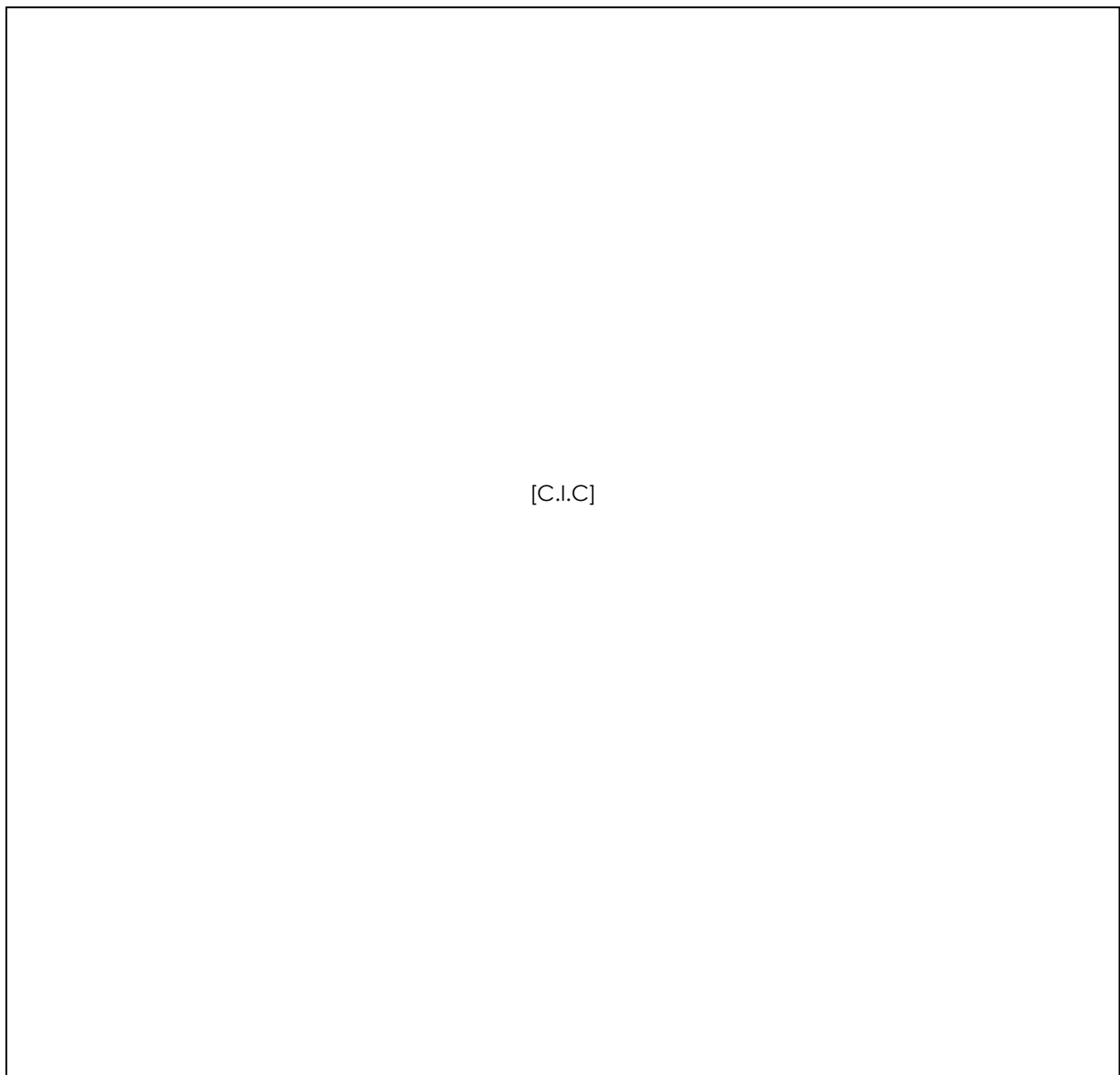


Figure 8: Macedon Ranges Reinforcements - Option 3

4.4.1. Cost and benefit analysis

[C.I.C]

4.4.2. Capacity

Table 6: Option 3 –Macedon Ranges Identified Network Reinforcement

2023 Forecast Minimum Pressure	Affected Customers	REINFORCEMENT SUMMARY	Post Reinforcement Minimum Pressure
477kPa	2,460	A new City Gate and [C.I.C] of 200mm steel pipeline	690kPa

Table 7: Macedon Ranges Forecast Minimum Network Pressures

2022/23	2023/24	2023/24	2024/25	2025/26	2027/28
477kPa	690kPa	687kPa	681kPa	675kPa	670kPa

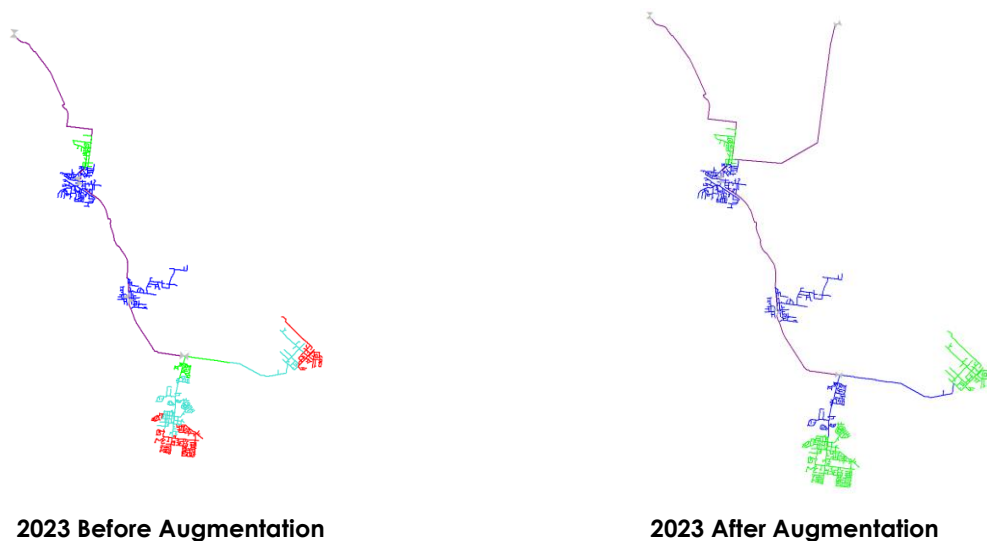


Figure 9: Macedon Ranges before and after augmentation

4.5. Option 4 – Downstream Gisborne High Pressure network reinforcement

This option looks to reinforce the downstream Gisborne high pressure network to ensure when capacity shortfall occurs in the high pressure 2 pipeline limiting the Gisborne field regulator capacity, the downstream distribution network is sufficiently reinforced to maintain network pressures at satisfactory levels. The reinforcements proposed would target the growth corridor in the Gisborne network of Gisborne and Riddells Creek, where the existing nearby Sunbury network located approximately [C.I.C] South East from the Gisborne's fringe can be extended to shift capacity towards the Gisborne fringe network. This proposed reinforcement would provide back feed to the Gisborne network from Sunbury lowering the capacity requirement from the existing Macedon Range HP2 pipeline.

Network Reinforcement work comprises of:

- Construction of approximately [C.I.C] of 180mm polyethylene at from Sunbury North West to Willowbank Rd at Gisborne.

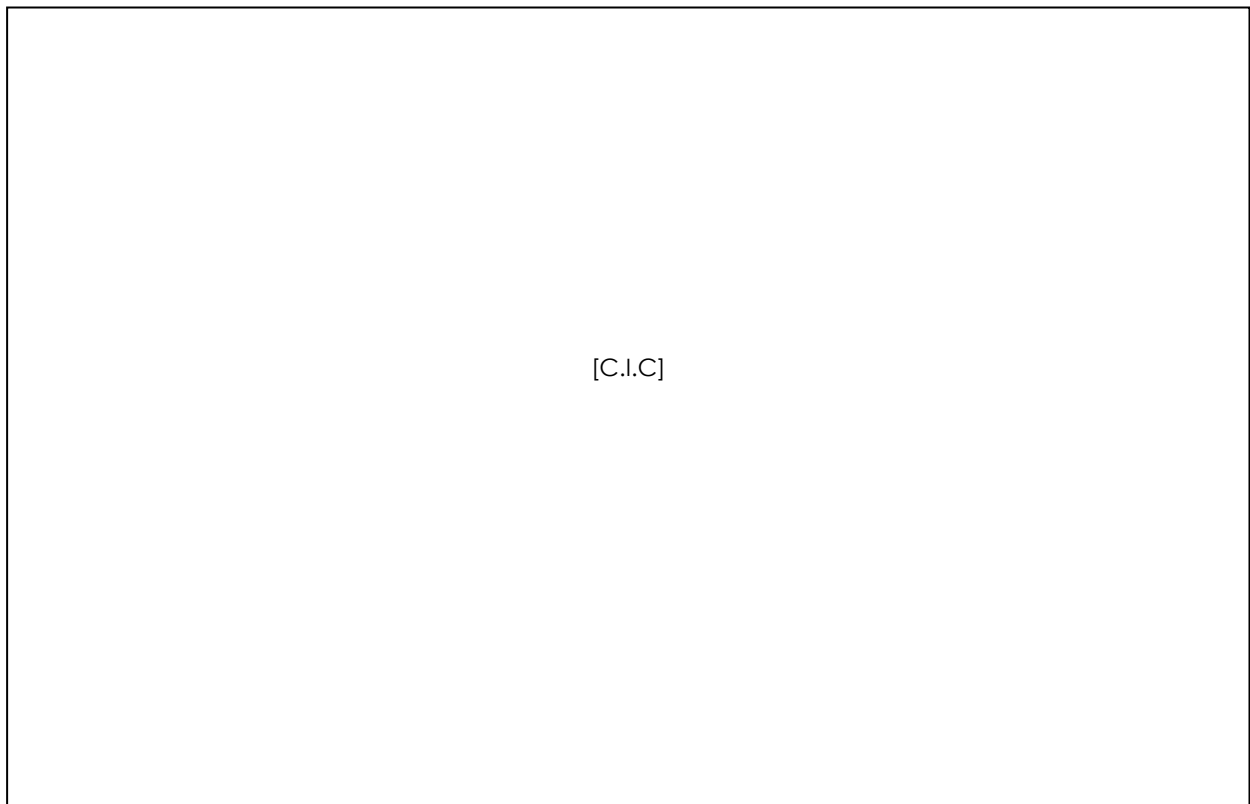


Figure 10: Macedon Ranges Reinforcement - Option 4

4.5.1. Cost and benefit analysis

[C.I.C]

4.5.2. Capacity

Table 8: Option 4 –Macedon Ranges Identified Network Reinforcement

2023 Forecast Minimum Pressure	Affected Customers	REINFORCEMENT SUMMARY	Post Reinforcement Minimum Pressure
81kPa	2,460	[C.I.C] of 180mm polyethylene pipeline	176kPa

Table 9: Macedon Ranges Forecast Minimum Network Pressures

2022/23	2023/24	2023/24	2024/25	2025/26	2027/28
176kPa	170kPa	165kPa	159kPa	155kPa	147kPa

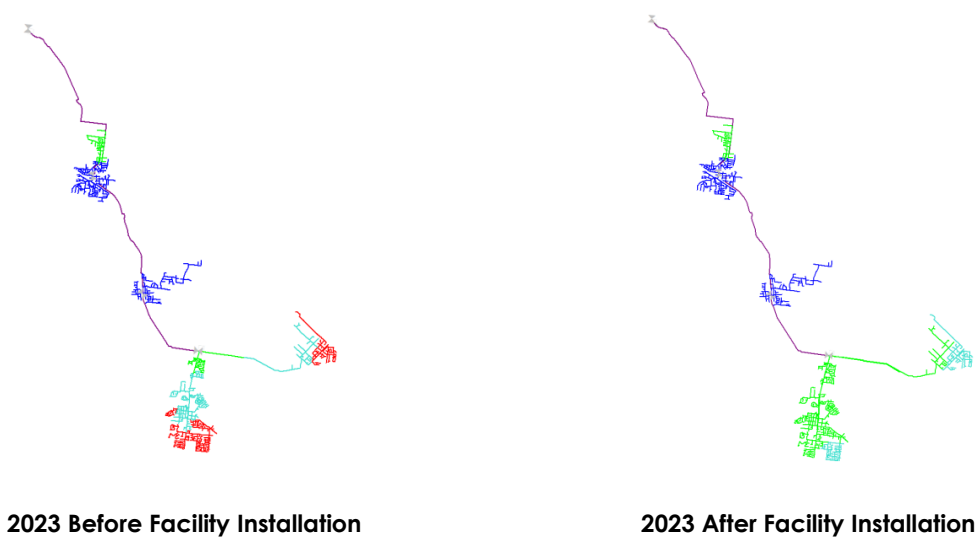


Figure 11: Macedon Ranges before and after augmentation

4.6. Benefit Assessment

The preferred solution is Option 2 which involves the looping of existing HP2 Macedon Ranges pipeline Gisborne required to be in service by FY2022/23. This augmentation is considered the most cost-effective solution to augment the capacity of the Macedon Ranges and Gisborne network.

Table 10: Options Assessment Summary

OPTION	BENEFITS	COSTS (\$2020)
Option 1	Nil.	Continue reduction of Macedon Ranges network capacity, hence impacting on the safety and reliability in the network.
Option 2	Looping [C.I.C] of 200mm steel pipe would approximately increase inlet pressure to Gisborne field regulator by 20% to 570kPa under peak demand condition, allowing Gisborne Field Regulator performing to its full capacity at 450kPa to maintain reliable and safe supply to Gisborne network.	[C.I.C]
Option 3	The new proposed City Gate and [C.I.C] of new pipeline would provide significant increase in long term capacity for the Macedon Ranges network of approximately 690kPa inlet pressure to Gisborne field regulator under peak demand condition, almost 45% of increased capacity. This would allow Gisborne field regulator to perform at its full capacity at 450kPa, ensuring safe and reliable supply to Gisborne network. This option would ensure long term system capacity for the Macedon Ranges. However, it would require an extremely high capital expenditure, almost 5 times the cost of Option 2, while only providing incremental capacity increase when comparing to Option 2 of 100kPa inlet pressure to Gisborne field regulator. Therefore, this option is not an acceptable or prudent solution.	[C.I.C]
Option 4	Boost capacity for affected Gisborne fringe area only. However, it would require significant mains extension and less cost efficient than Option 2.	[C.I.C]

5. Capital expenditure summary

Table 11: Capital Expenditure Summary

	2023-24	2024-25	2025-26	2026-27	2027-28	2024-28 TOTAL
			[C.I.C]			

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