Jemena Gas Networks (NSW) Ltd

Box Hill CDP

Options Analysis

BAB-DAA-000100

Jemena
bringing energy to life

Table of Contents

1. Summary 5
1.1 Project and Key drivers 5
1.2 Credible Options 5
1.3 Recommendation 5
2. Project Background and Key Drivers 6
2.1 Project Background 6
2.2 Related Projects 7
2.3 Identified Need 7
2.4 Project Drivers and Obligation 8
2.5 Assumptions 8
3. Options 9
3.1 Option costs & benefits 9
3.2 Comparison of Options 11
4. Recommendation 13
4.1 Recommended Solution 13
4.2 Scope 13
4.3 Cost Details 13
4.4 National Gas Rules 14
5. Terms and Definitions 15
Appendix A Network Risk Assessment Summary 16
Appendix B Additional options Routes 17
Appendix C PEM model (Preferred option) 18
Appendix D Synergi Model (Forecasted Pressures after CDP & SRS Installation) 19

1. Summary

1.1 Project and Key Drivers

One of the fastest growing areas in Sydney is the North West. This is evident with the many gas applications for new estates, volume boundary meters and high density developments occurring particularly in the pocket of Box Hill, Gables, Rouse Hill, Tallawong and Schofields.

Network pressures in the Sydney North West have been closely monitored over the last few years to determine the timing and requirements for capacity enhancements. The master plan of the Box Hill and Gables suburbs has forecasted a capacity restriction in the network due to fast growth and developments connecting.

With ongoing high-rise and medium density growth, pressures are forecasted to drop below 70 kPa by winter 2026. From this point we are unable to connect customers to the network resulting in a decrease in revenue and overall, higher costs to customers. Additionally, Jemena's existing customers may be at risk of loss of supply due to new estate loads connecting and coming online over a longer period of time. This puts capacity pressures on the network and puts the area at risk.

1.2 Credible Options

Option	Option Name	Description	Cost ($)
1	Do nothing	Do not connect customers from 2026 onwards	0
2	Vineyard: New SRS box and mains reinforcement.	Install new SRS box on Chapman Road, Box Hill and lay ~ 2.5 km of 160 mm PE main along Chapman Road and Commercial Road connecting to Boundary Road, Box Hill.	2.96M
3	Rouse Hill: New SRS box and mains reinforcement.	Install new SRS box in Garfield Road East, Rouse Hill and lay approximately 3 km of 160 mm PE mains extension crossing Windsor Road and connecting to Terry Road in Box Hill	4.00M

1.3 Recommendation

Option 2 is the recommended solution costing $2.96M, where a new SRS box is installed and approximately 2.5 km of 160 mm PE main is laid along Chapman Road and Commercial Road, the western side of Windsor Road with the suburb of Box Hill and Gables. This solution decreases the risk rating from significant to low and ensures customers can connect to the network. This project is required by 2026 as forecasted pressures indicate pressures will reach design minimum pressure at the terminal points of the network.

2. Project Background and Key Drivers

2.1 Project Background

The Hills LGA is one of the fastest growing areas in Sydney and NSW. Multiple applications per month are received between the areas of Box Hill and the new suburb Gables.

Over the last few years the pressures in these areas have been monitored via the annual winter gauging program. This program is used to accurately assess the network performance and ensure accurate forecasting of possible supply constraints.

A limitation in gas supply was identified for the Box Hill and Gables suburbs. The purpose of this Options Analysis is to describe the options assessed to increase capacity and maintain supply to customers in the area.

2.1.1 Box Hill Previous Augmentation Plan

Jemena's overall plan for the area was to service the initial development of dwellings in the Box Hill area in 2016 via the Pitt Town 210kPa network. This would be achieved through a 5.5km 160mm PE feeder main until a time when an additional source of supply was required to support the growing area.

One additional supply option was Stage 2 in the plan below (Figure 1), this involved extending the secondary main along Garfield Road East and installing a new SRS box located in Box Hill. Considering how the growth has occurred the last few years, the options have been refined and new ones created. A secondary mains extension through Vineyard (install new SRS box and a plastic feeder main) is also considered.

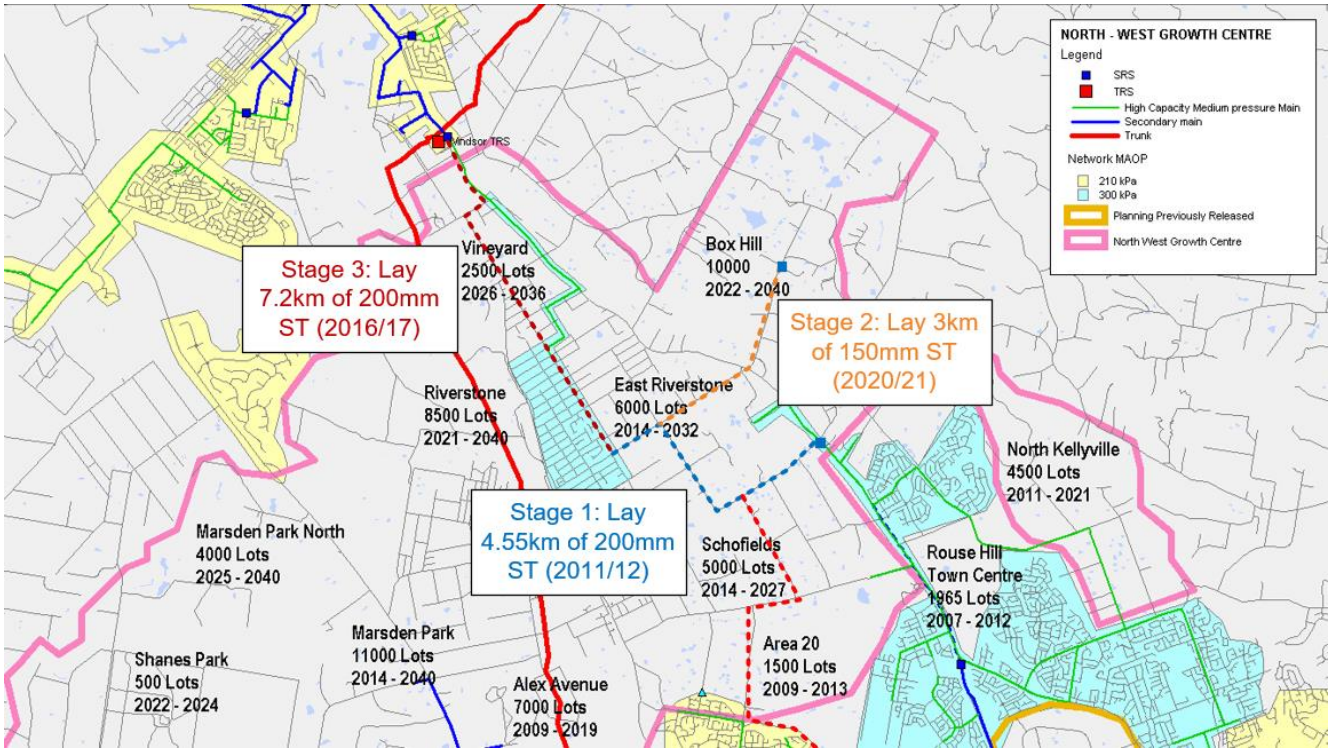

Figure 1: Previous proposed plan for The Hills area

2.1.2 Area growth

The Box Hill and Gables suburbs have grown rapidly in the last five years. Jemena's Enterprise Asset Management (EAM) tool reflects this with Table 1, showing the customer gas connection and gas consumption growth over the last five years. During this time the area has doubled in all metrics, which has resulted in a decrease in capacity over the last two years. Although, the area is developing quickly the consumption of gas per customer has been slow to reach the standard average consumption for a new estate area. This may be because of a lag between a connection and the house being occupied, it is for this reason that we set the threshold for new estate augmentation to a higher pressure threshold of 70 kPa for standard 210 kPa networks (as explained in Section 2.4.2).

Table 1:Historic growth data

Year	2019	2020	2021	2022	2023
Customer numbers	1,572	2,539	3,618	4,537	5,838
Consumption (GJ)	11,335	25,540	40,987	56,999	72,450
Avg Consumption per customer (GJ)	7.2	10.0	11.33	12.56	12.41

2.2 Related Projects

2.2.1 Rouse Hill CDP

The North West region in Sydney has seen significant growth in the last decade, other projects targeted in the area focus on low supply fringes of the network. The Sydney metro has incited further growth around Cudgewong Road and Tallawong Road where the Tallawong station is located. The 2023 Winter gauging program has recorded a minimum pressure of 80 kPa in Rouse Hill confirming the growth in the area.

2.3 Identified Need

ISO55000 defines level of service as: *...parameters, or combination of parameters, which reflect social, political, environmental and economic outcomes that the organisation delivers".* With respect to the Network, the outcomes that are required are the safe and reliable provision of gas supply.

The primary drivers of this augmentation project is to address significant loss of capacity across the network due to continuous growth in the area. Along with growth, the average consumption per customer is increasing from to 12 GJ in four years, creating a need for an additional gas supply, as this would enable more customers to be connected and keep steady the capacity at terminal points of the network.

2.4 Key Considerations

2.4.1 Project Drivers

The principal drivers for this project is to improve service reliability in the network by increasing pressures to a satisfactory level that will maintain safe and reliable gas supply to existing and new customers.

Without an adequate solution there is a untreated risk rating of 'high' which is above Jemena's risk threshold and needs to be addressed as shown in the risk assessment in Appendix A.

If we do not meet these obligations and enhance the reliability of the network, by preventing the loss of supply to Jemena's customers and the inability to supply gas for new connections. We will be in breach of the Gas Supply Act 1996 No.38, in the following ways:

- Facilitate the continuity of supply of natural gas to customers
- Satisfy all reasonable demands for the conveyance of gas
- Consider the development of efficient and safe gas distribution systems

2.4.2 Network Pressures

Capacity Augmentation is driven by increases in peak demand that are forecasted to reduce network pressures below critical thresholds. Increases in peak demand can stem from existing customers or new connections. Depending on the type of driver, the investment trigger threshold varies and in the case of Box Hill the driver is new estate connections.

For new estate connections, the investment threshold is higher at 70 kPa compared to a threshold of 40 kPa for existing areas. This is because new estate growth often requires substantial infrastructure to support new areas, including small estates or streets that are often built on the perimeter of larger estates and are not integrated into the suburbs master plan. These areas also experience significant growth, with connection volumes increasing by 10-30% per year. Due to this rapid growth, a higher investment threshold of 70 kPa is necessary to ensure reliable supply to customers.

Pressure gauges are used to continually monitor all areas of the network to determine when they are forecasted to reach the minimum pressure threshold. These investment triggers are also continually under review to ensure we are investing at the right time, to balance reliability and affordability.

2.5 Assumptions

The following assumptions were used:

1. Connection numbers: A five year forecast was obtained from Greater Sydney Urban Development Program Dashboard, and further forecast volumes were taken from the Department of Planning, Housing and Infrastructure.
2. Penetration rate: Typically for new estate areas such as Box Hill, penetration rates can be as high as 95%. To be conservative a penetration rate of 80% was chosen.

3. Options

3.1 Option Costs and Benefits

The following options were identified :

- Option 1: Do nothing
- Option 2: Vineyard: New SRS box and mains reinforcement.
- Option 3: Rouse Hill: New SRS box and mains reinforcement.

All options are explained in detail below.

3.1.1 Option 1: Do Nothing

To either not invest and allow customer connections to continue or do not invest and stop connections to the network.

3.1.1.1 Benefits

No CAPEX spent.

3.1.1.2 Limitations

Loss of reputation and regulatory implications due to the poor and/or loss of supply of up to 6,000 customers. Additionally, no new customers could connect to the network preventing Jemena's existing customer base from benefiting from more customers and subsequently lower bills.

3.1.2 Option 2: Vineyard: New SRS box and Mains Reinforcement

Install new SRS box on Chapman Road, Box Hill and lay ~ 2.5 km of 160 mm PE main along Chapman Road and Commercial Road connecting to Boundary Road, Box Hill. This has been costed to be approximately $2.96M in CAPEX.

3.1.2.1 Benefits

Improve pressure at the terminal points of the network, from 61 kPa to 165 kPa and eliminates the risk of poor and/or loss of supply to approximately 6,000 customers. Customers could be connected to the network beyond 2026.

The augmentation will enable over 3,000 more new connections in the area, generating a large amount of revenue to the benefit of Jemena's existing customer base. For this option the revenue far exceeds the cost to build the augmentation.

3.1.2.2 Risks

High CAPEX as it requires secondary mains extension and the installation of a new regulator set.

3.1.3 Option 3: Rouse Hill: New SRS box and Mains Extension

This option includes installing a new SRS box in Garfield Road East, Rouse Hill and lay approximately 3 km of 160 mm PE mains extension crossing Windsor Road and connecting to Terry Road in Box Hill.

This has been costed to be approximately $4.00M in total to be spent over 2025-2026.

3.1.3.1 Benefits

Improves pressures along the network, additionally allows for the possibility of a number of new connections due to mains extension. Customers could be connected to the network beyond 2026.

3.1.3.2 Risks

Highest CAPEX as it requires new SRS box and mains extension. Approvals and licence requirements with TfNSW for Windsor Road and Garfield Rd E.

3.2 Comparison of Options

A full risk assessment for each option is provided in Appendix A: Network Risk Assessment Summary

Criteria	Option 1	Option 2	Option 3
Option description	Do Nothing	**Vineyard: New SRS Box and Lay 2.5km mains extension**	Rouse Hill: New SRS Box and Lay 3 km of mains extension.
Project Driver	Reliability	**Reliability**	Reliability
Project Driver	Compliance and Safety	**Compliance and Safety**	Compliance and Safety
Complies with NGR	No	**Yes**	Yes
Delivery constraints	N/A	**High Cost**	RMS Road High Coast
Treated Risk Ranking	High	**Low**	**Low**
Cost Estimate[1]	0	**$2.96M**	$4.00 M
Options Analysis	Does not addresses the issue	**Fully addresses the issue**	Fully addresses the issue
Recommendation	Not-Recommended	**Recommended**	Not-Recommended

[1] Cost estimates for non-preferred options are a desktop costing

3.2.1 NPV output

The preferred option meets all of the assessment criteria and reduces the business risk to low. The project is required to be completed prior to winter 2026 in order to provide security of supply in the area.

Option 2, is preferred as the revenue generated from the augmentation exceeds the cost to build and therefore benefits the greater Jemena customer base. Please refer to 'JGN - RIN - 4.3 - 10068428 - Box Hill CDP - CBAM - 20240628 - Public' for a summary of the output of the financial analysis.

4. Recommendation

4.1 Recommended Solution

Option 2 is recommended as it is the lowest cost solution to increase capacity in the area: This solution will enable over 3,000 customers to connect to the network, generating revenue that exceeds the cost of the augmentation. The other options assessed increased capacity but were more costly to build.

4.2 Scope

The scope for the preferred Option 2 includes;

1. New SRS box on Chapman Road
2. Lay ~ 2.5 km of 160 mm PE main along Chapman Road and Commercial Road connecting to Boundary Road, Box Hill.

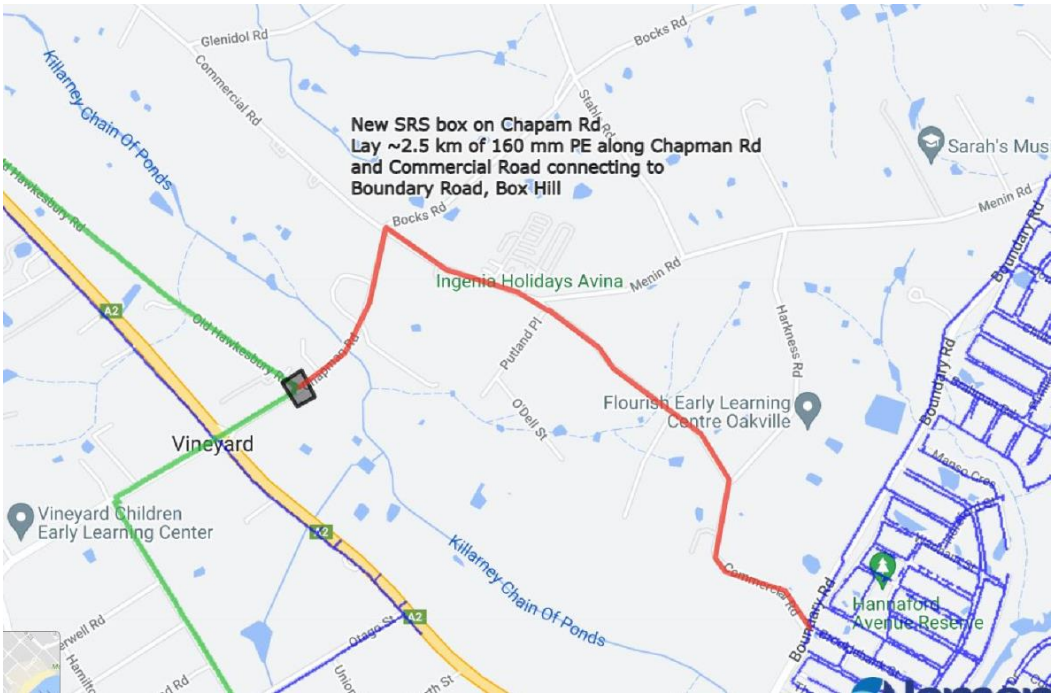

Figure 2: Location of proposed SRS and mains extension.

4.3 Cost Details

4.3.1 Cost Methodology

The costs for both of the preferred options were obtained through the Project Estimating Model (PEM) Methodology.

4.3.2 Summary of Costs

4.3.2.1 Option 2

Table 3: Project Estimation

Item	Project Estimate ($M, 2024)
Materials	0.06
Contractor Costs	1.52
Jemena Internal Labour	0.04
Risk (excl overhead)	0.48
Total Direct Costs	**2.10**
Overheads	0.86
Total Project Estimate	**2.96**

4.4 National Gas Rules

The proposed solution is consistent with rule 79(1)(a) of the National Gas Rules:

- Prudent – The expenditure is required to maintain gas reliability and to comply with regulatory obligations. These are the requirements of a prudent operator.
- Efficient – The costs of this project were obtained through the Project Estimating Model (PEM). The field work will be carried out by an external contractor who is selected via competitive tender, and has demonstrated specific expertise in completing the installation of the assets in a safe and cost effective manner.
- Consistent with accepted and good industry practice – Complying with the obligations set out by the Code where by the proposed reinforcement is consistent with good industry practice.
- Necessary to achieve the lowest sustainable cost of delivering pipeline services – The augmentation is designed to provide additional gas supply to a high risk area due to low reliability. The proposed project balances the risk of reliability, disruption to community and cost to customers to provide the lowest sustainable cost. A cost that proactively addresses a reliability issue to up to 6,000 customers, thereby avoiding reactive measures that would otherwise cause disruption to our customers. New customers will be able to connect further spreading the costs of the project, helping to drive down the average cost per customer.

The project is also consistent with rule 79 (2)(c), because it is necessary to:

- Maintain and improve the safety of services (79(2)(c)(i)) – if more connections to the network occur without augmentation, then there would be a high risk of gas outages and the associated health and safety impacts.
- Maintain the integrity of service (79(2)(c)(ii))- If the network did not undergo augmentation and minimum pressure was reached then customers would experience interruption and reduced reliability.
- Comply with a regulatory obligation (79(2)(c)(iii))- Jemena is required by the Code to maintain minimum pressures and to continue to connect new customers.

5. Terms and Definitions

Term	Definition
JGN	Jemena Gas Networks
AS	Australian Standard
CDP	Capacity Development Project
EAM	Enterprise Asset Management
NGR	National Gas Rules
PEM	Project Estimating Model
RMS	NSW Roads and Maritime Service
SRS	Secondary Regulator Sets

Appendix A Network Risk Assessment Summary

A risk assessment was conducted to determine the level of risk severity of the untreated risk. The table below shows the summary of results and then the treated risk summary for each option. The risk assessment was undertaken in accordance with the Jemena Risk Manual JAA MA 0050 Revision 10 (22/05/2023).

UNTREATED IMPACT/CONSEQUENCES								UNTREATED RISK SUMMARY		
Contributing Factors/ Scenario	Strategic	Financial	Safety	Operational	Regulatory & Compliance	Reputation	Comments	Consequence (Highest Impact)	Likelihood	Risk Level
Low supply in The Hills 210 kPa in the area of Box Hill and Gables, NSW due to continuous growth	Significant	Severe	Moderate	Severe	Severe	Severe	○ Strategic impacts due to inability to connect more customers and allow for growth ○ Loss of revenue due to not being able to connect new customers ○ Impacted supply to >6,000 customers. ○ Breach of Gas Supply Act to facilitate the continuity of supply of natural gas to customers. ○ Reputation adversely affected with a potential for media attention.	Severe	Likely	**High**

PREFERRED OPTION – Risk assessment summary				TREATED RISK SUMMARY		
Preferred Option/Treated risk	Cost	Benefit	Key Mitigations	Consequence	Likelihood	Risk Level
Option 2: Vineyard: New SRS Box and mains extension	$2.96	- Reinforces the secondary network by boosting pressures in Box Hill and Gables, NSW - Allows for continuing providing supply to new customers installing in the network.	○ Increased reliability of the medium pressure network	Minor	Rare	**Low**

Appendix B Additional options Routes

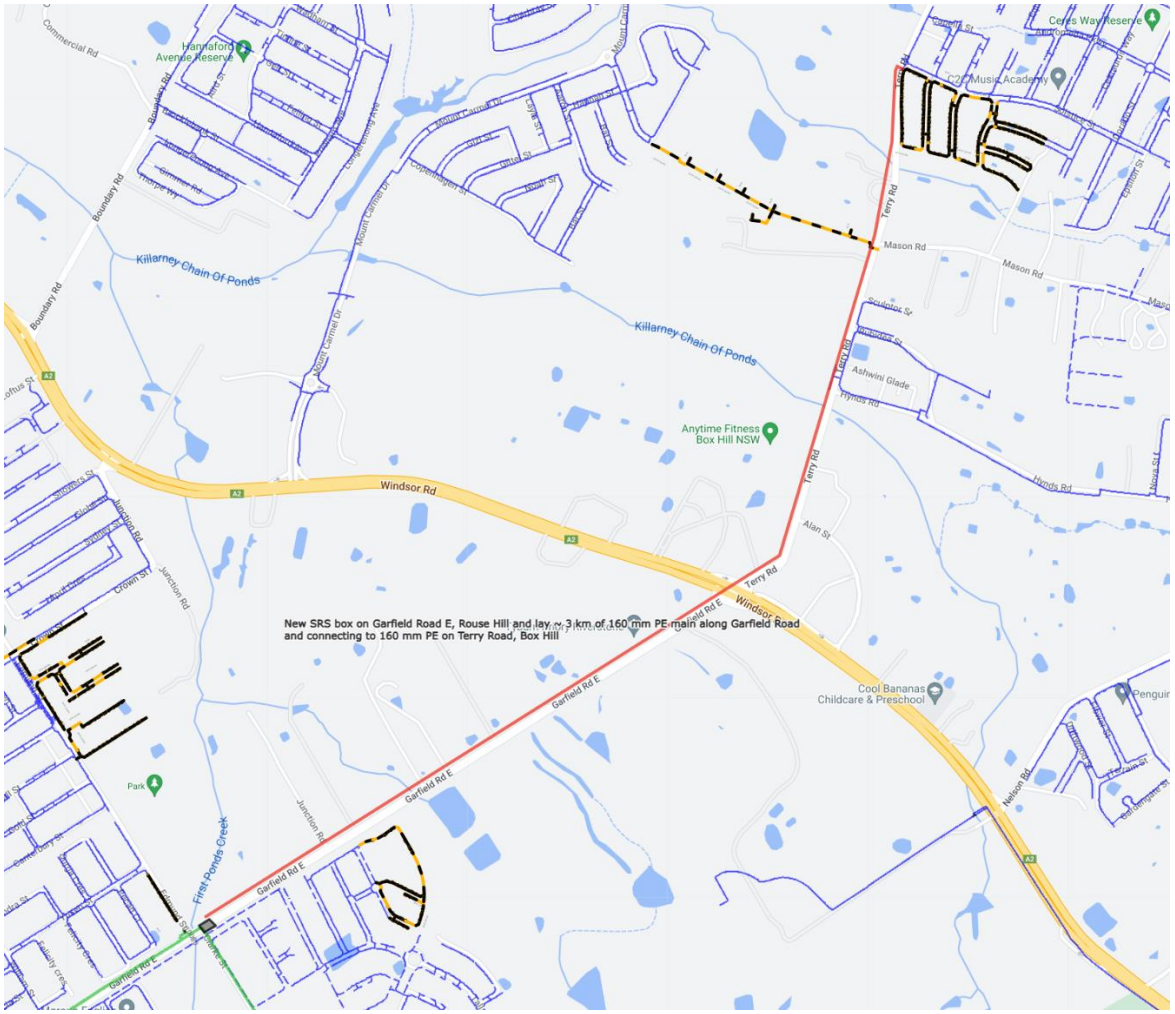

Figure 3: Option 3 – Rouse Hill: New SRS box and mains reinforcement

Appendix C PEM model (Preferred option)

Box Hill CDP Budget Summary

No Errors Found

Project Estimating Model (PEM) v.1.97R

Table of Contents

Box Hill CDP

Project Name	Box Hill CDP	Jemena WBS	BAB-DAA-000100
Asset (Capex/Opex)	Jemena Gas Network (JGN) - Capex	Zinfra WBS	ABP-DAA-000100
Capital Program		Project Start Date	1-Jan-25
Project Initiator	Maria Blanchard Delgado	PEM Version	1.97R
Project Manager	Andrew Taylor		

Inclusions

Option 2 - Vinyard
•New SRS box on Chapman Road
•Lay ~ 2.5 km of 160 mm PE main along Chapman Road and Commercial Road connecting to Boundary Road, Box Hill.

Exclusions

Engineering designs

Assumptions

There is no contamination in the area
Surveying enables proposed alignment
SDRS can be positioned in the souther verge of Old Hawkebury Rd at The corner of Chapman Rd.
Council approves underbor of Killarney Chain of Ponds Rd.
Council approves the open cut of Boundary Rd
There is no clash of services
All works 7.00am - 5.00pm
Note
Pricing provided bysourcing historical data from past projects, recent tender/RFQ prices, quote repository and contract schedule of prices for the purpose of providing a budget estimate.
Project has not been market tested.

Constraints

Business case acceptance
Availability of long lead items
Availability of internal resources
Budget estimate provided via desktop estimate only, alignment to be verificed following surveying,geotech investigation, service locating and pot holing

Project Cost Splits - by Gate

Gates	First Month of Expenditure	Budget ($) Direct Cost JEMENA ONLY	Budget ($) Direct Cost ZINFRA ONLY	Budget ($) Direct Cost Combined	% Split Direct Cost	Budget ($) Risk Allocation	Budget ($) Indirects (ZSS)	Budget ($) Overheads	TOTAL Budget ($) (DC+ RA+ IND + OH)
Gate 1 - Initiate	#N/A	-	-	-	-	-	-	-	-
Gate 2 - Plan & Define	#N/A	-	-	-	-	-	-	-	-
Gate 3 - Plan & Define	Jan-25	274	4,560	4,834	0.3%	483	1,925	261	7,503
Gate 4 - Deliver	Apr-25	497	13,817	14,315	0.9%	1,431	5,699	772	22,216
Gate 5 - Deliver	Jun-25	69,568	1,530,765	1,600,333	98.8%	476,000	751,425	101,740	2,929,499
Gate 6 - Deliver	#N/A	-	-	-	-	-	-	-	-
Gate 7 - Close	#N/A	-	-	-	-	-	-	-	-
Totals		**70,340**	**1,549,143**	**1,619,482**	**100.0%**	**477,915**	**759,048**	**102,772**	**2,959,218**

Appendix D Synergi Model (Forecasted Pressures after CDP & SRS Installation)

Figure 4: Synergi model forecast before after implementation of CDP increasing pressures at the end of the network (61 kPa)

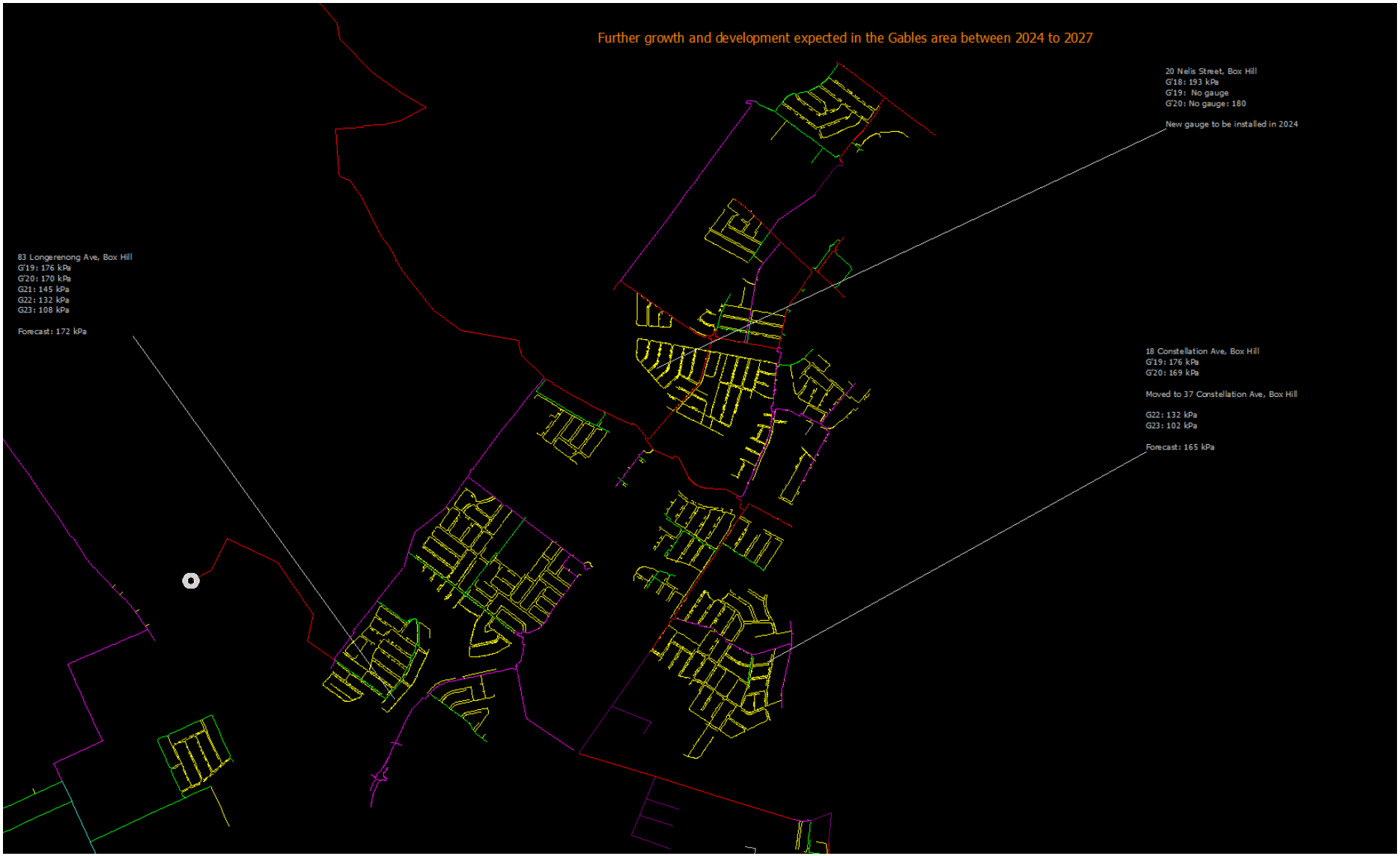

Figure 5: Synergi model forecast after implementation of CDP increasing pressures at the end of the network (165 kPa)