

ActewAGL Distribution

Canberra High Pressure Network

Capacity Assessment

2013 - 2033

Public

24 June 2015

ActewAGL

An appropriate citation for this paper is:


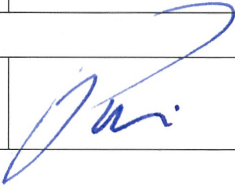
CA Canberra High Pressure Network 2013-2033

Copyright statement

© Jemena Limited. All rights reserved. Copyright in the whole or every part of this document belongs to Jemena Limited, and cannot be used, transferred, copied or reproduced in whole or in part in any manner or form or in any media to any person other than with the prior written consent of Jemena.

Printed or downloaded copies of this document are deemed uncontrolled.

Authorisation

Name	Job Title	Date	Signature
Reviewed by:			
Veronica Wieckowski	Capacity Planning Manager	24/6/15	
Approved by:			
Phil Colvin	Asset Manager Networks	24 JUN 15	

History

Rev No	Date	Description of changes	Author
2	20 January 2015	Second Draft	Duncan Rutherford
3	24 June 2015	Updated with Comments	Aaron Greaves

Owning Functional Area

Business Function Owner:	Capacity Planning
--------------------------	-------------------

Review Details

Review Period:	Five years or significant changes to network topology or supply requirements
NEXT Review Due:	2018

TABLE OF CONTENTS

Abbreviations	iv
Overview	v
1. Technical Requirements.....	1
2. Other Considerations	2
2.1 Stakeholders.....	2
2.2 Assumptions & Constraints.....	2
3. The Current Network	3
3.1 Introduction.....	3
3.2 Network Integrity Issues	4
3.3 Jemena standard Network Pressures.....	4
3.4 Current Network configuration	4
3.5 Telemetry Requirements	7
3.6 Historical Volume Growth	7
4. Future Development and Gas Demand	9
4.1 Housing Development	9
4.2 Network Peak Load Projections.....	16
5. Capacity Development & Performance Forecasts	18
5.1 Current Network Capacity.....	18
5.2 Scheduled Projects 2015.....	18
5.3 Network Projections For 2015.....	20
5.4 Network Projections 2016 – 2033	20
5.5 Network Projections for 2016.....	21
5.6 Network Projections for 2017.....	26
5.7 Network Projections For 2019.....	29
5.8 Network Projections For 2020.....	32
5.9 Network Projections For 2022.....	36
5.10 Network Projections For 2024.....	38
5.11 Network Projections For 2025.....	41
5.12 Network Projections For 2027.....	44
5.13 Network Projections For 2031.....	47
5.14 Network Projections For 2033.....	50

ABBREVIATIONS

ACT	Australian Capital Territory
NSW	New South Wales
HP	High Pressure
RMS	Roads and Maritime Services
NCA	National Capital Authority
CTS	Custody Transfer Station
APA	Australian Pipeline Trust
MSP	Moomba to Sydney Pipeline
EGP	Eastern Gas Pipeline
TRS	Trunk Receiving Station
PRs	Primary Regulating Stations
POTS	Package Off-take Station
SCADA	Supervisory Control and Data Acquisition's

OVERVIEW

This capacity assessment is of AAD's primary and secondary network in the Canberra region. This region includes the Australian Capital Territory (**ACT**), but also adjacent areas of New South Wales (**NSW**), notably Queanbeyan.

For the sake of simplicity, these primary and secondary networks are referred to as the High Pressure (**HP**) network.

This assessment covers 2013-2033, from the base year of 2013 and a focus on the years of the next access arrangement, 2016 – 2021. Capacity assessment and development projects for outer years are subject to greater variability, but included to inform future capacity planning.

The drivers of capacity management decisions are different for HP networks than for those operating at lower pressures. With medium pressure networks, the primary concern of capacity management is to ensure that peak demand can be supplied from the network, which in Canberra, occurs on the coldest hour of the coldest day in July-August. With HP networks, the larger capacity management concern is to ensure that the reach of the network is sufficient to maintain supply to the medium pressure networks as they are extended as a consequence of housing estate growth. Therefore, to a very significant degree, an HP Capacity Manager must monitor housing development and the development of medium pressure networks being supplied by the HP network.

Due to the proposed development of significant housing estates in the Canberra region, notably in Belconnen and Molonglo, the coming years will see a number of major secondary extensions to supply this new housing. In turn this will create a requirement for a number of primary main extensions in the years 2020 – 2033. These extensions, while being triggered by market expansion activities, are managed within Capacity Management due to their construction lead times, and because their timing is driven by the rate of development and impact on network pressures.

1. TECHNICAL REQUIREMENTS

1.1.1 AUSTRALIAN STANDARDS

This Capacity Assessment allows for structured design process, appropriate to the requirements of the specific pipeline to ensure that all safety, performance and operational requirements are met during the design life of the pipeline as per AS2885 (Primary Mains) and AS4645 (Secondary Mains).

Number	Title
AS2885 2008	Pipelines – Gas and Liquid Petroleum
AS4645 2008	Gas Distribution Networks

1.1.2 JEMENA TECHNICAL POLICIES AND PROCEDURES

This CA plans for efficient development of network infrastructure to facilitate growth demands. All proposed designs are revised against known assumptions (design input and projected design provisions) and verified by computer models as per TPG.DES.010, TPG.DES.020 and TPG.DES.040.

Policy	Title
TPG.DES.010	Distribution Network Operating and Metering Pressures
TPG.DES.020	Network Supply Performance Validation
TPG.DES.040	Distribution Network Capacity Planning Criteria
TPG.MAT.010	Approved Materials List for low and medium pressure systems (MAOP<500kPa)

1.1.3 OTHER KEY REFERENCE DOCUMENTS

Jemena is governed by a hierarchy of controls that are codified in specific strategies, plans and manuals. The most relevant of these for Capacity Assessments are specified in this section. The specific version of each is footnoted where the document is cited.

Document Title
ActewAGL Asset Management Plan
ActewAGL Capacity Management Strategy
ActewAGL Risk Management Manual
ActewAGL medium pressure networks Capacity Management Strategies 2013-2033.

1.1.4 RISK ASSESSMENT

The risk level included for each simulation refers to the ActewAGL Risk Management Manual.

2. OTHER CONSIDERATIONS

2.1 STAKEHOLDERS

There are many stakeholders to the Canberra gas networks. The most directly involved are:

2.1.1.1 Key Internal Stakeholders

- Jemena Asset Management;
- Network Development;
- Engineering;
- Capital Projects.

2.1.1.2 Key External Stakeholders

- ACT Territory and Municipal Services;
- Roads and Transport Authority ACT;
- Roads and Maritime Services (**RMS**);
- National Capital Authority (**NCA**);
- ACT Environment and Planning Directorate (Was ACTPLA);
- Local government for Queanbeyan and Bungendore.

2.2 ASSUMPTIONS & CONSTRAINTS

The following assumptions and constraints are relevant to this Capacity Assessment:

2.2.1 ASSUMPTIONS

Description	Implication	Criticality
Route of proposed mains lays is based on existing roads or roads as planned for construction	Changes to roads corridors may affect length or route of proposed projects and therefore their cost	High

2.2.2 CONSTRAINTS

Description	Implication	Criticality
In the ACT, development approvals are required for gas main construction	Delay in land and construction approvals of the proposed design with the ACT Environment and Planning Directorate would mean the capacity enhancement projects are not completed on time. Timing of approvals are dependent on the complexity and route of proposed projects.	High

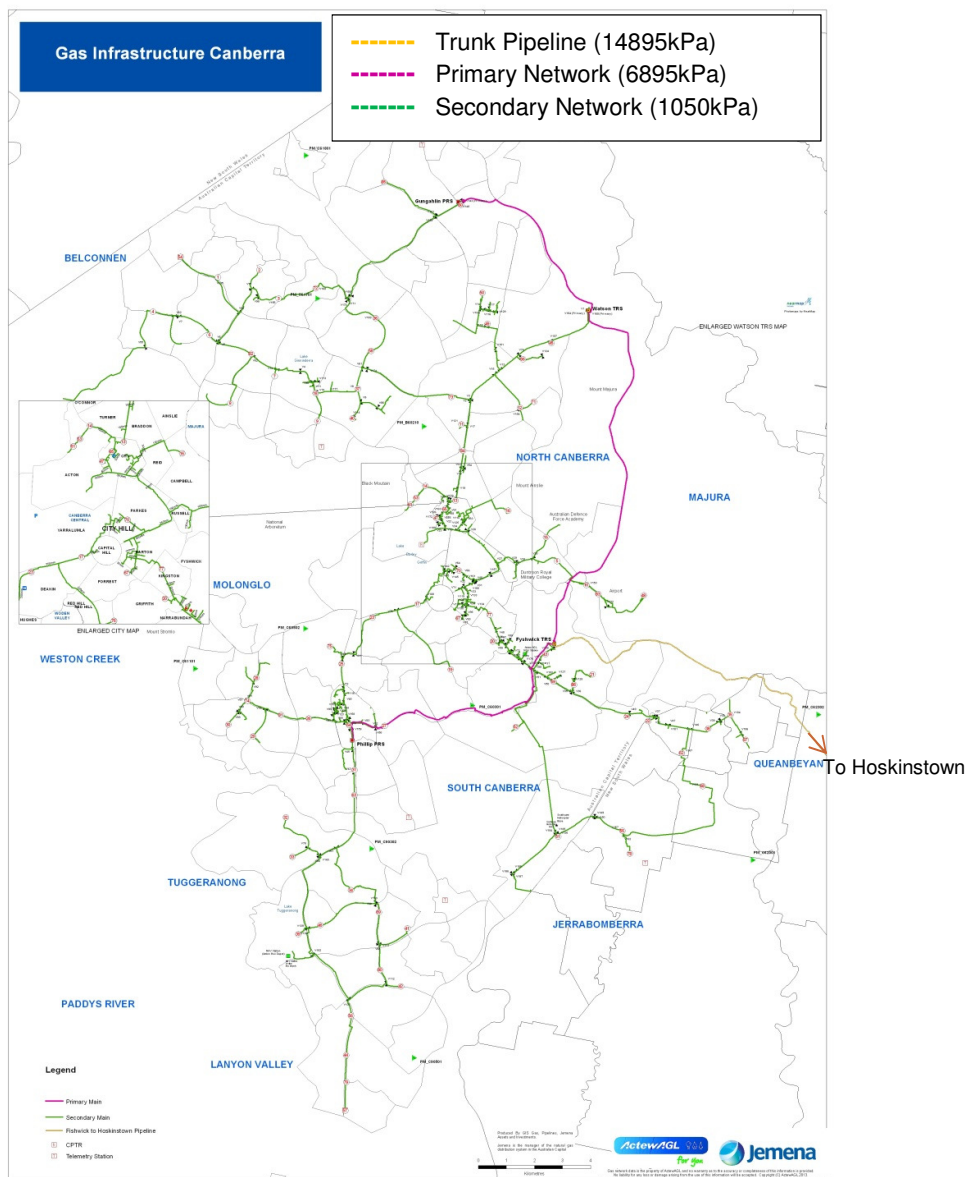
3. THE CURRENT NETWORK

3.1 INTRODUCTION

The ACT primary and secondary network supplies gas to the nine medium pressure networks in the Canberra and Queanbeyan area. Most of the network lies in the ACT, however because a growing portion lies in adjacent areas of NSW, the area is generally referred to as the “Canberra Network”.

The primary and secondary network is illustrated in Figure 3-1 below.

Figure 3-1: Network Layout



3 — THE CURRENT NETWORK

3.2 NETWORK INTEGRITY ISSUES

The network was constructed comparatively recently and there are no significant integrity issues in this network.

3.3 JEMENA STANDARD NETWORK PRESSURES

Table 3-1 below depicts the relevant operating pressure limits for high pressure networks¹.

The primary network is operated at 6895 kPa, and the secondary network at 1050 kPa.

Table 3-1: Operating Pressure Limits

MAOP (kPa)	Minimum Inlet Pressure Required	Normal Operating Pressure Limits			Emergency Pressure Limits		Standard Metering Pressures
		Regulator Set Point	Network Design	Network Minimum	Max Over-Pressure Set Point	Network Minimum	
6895	3500	4300	4200	1750	4500	1500	Floating
1050	1,750	1,030	1,010	525	1,155	400	100

3.4 CURRENT NETWORK CONFIGURATION

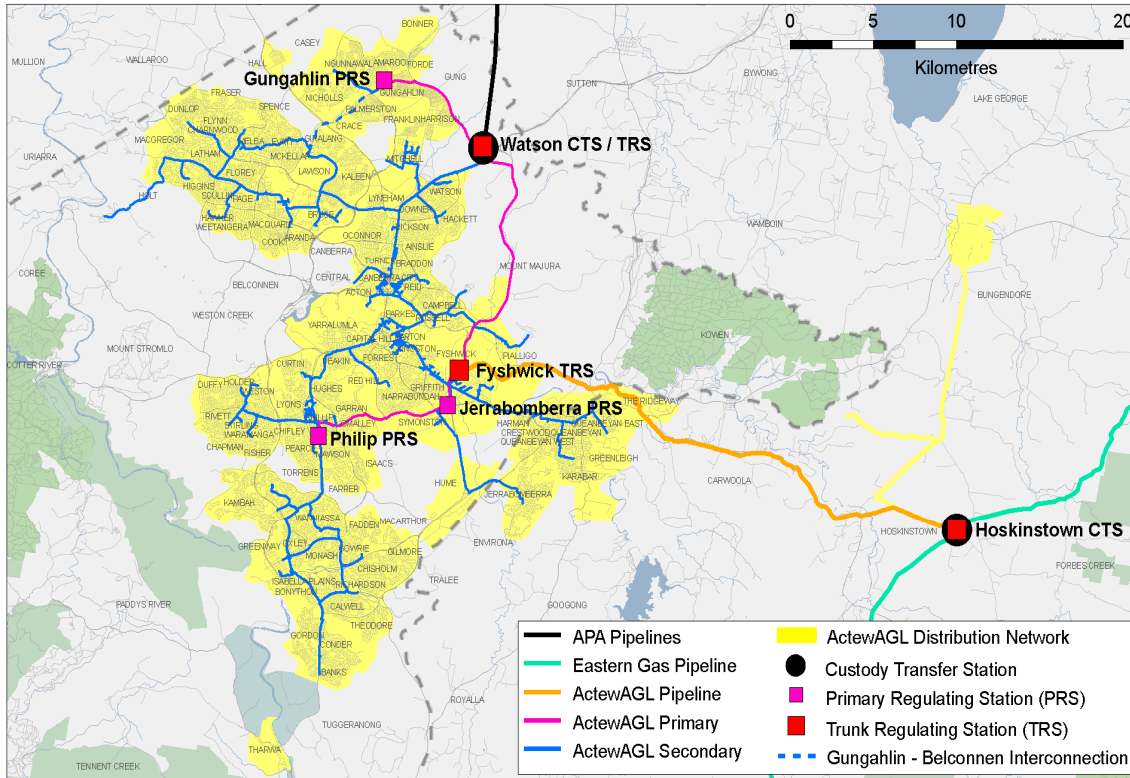
3.4.1 SOURCES OF SUPPLY

Natural gas is supplied to the Canberra gas distribution networks from two sources:

1. The Dalton to Watson Lateral trunk pipeline in the North of Canberra, via the Watson Custody Transfer Station (**CTS**). The Dalton to Watson lateral is owned by the Australian Pipeline Trust (**APA**) group and branches off the Moomba to Sydney Pipeline (**MSP**) transmission pipeline. This currently supplies as much as 50% of gas to the Canberra networks in winter, but little in summer;
2. The Eastern Gas Pipeline (**EGP**), due east of Canberra supplies the Canberra network via Hoskinstown CTS. The gas is then supplied into the Canberra network is through AAD's trunk pipeline which runs between Hoskinstown CTS and Fyshwick Trunk Receiving Station (**TRS**) with supply delivered into the network via Fyshwick TRS. The EGP is owned and operated by Jemena, and extends from Longford, Victoria, through NSW and to Sydney.

¹ From TPG.DES.010 Distribution Network Operating and Metering Pressures

Figure 3–2: Sources of Supply for the Canberra Network²



3.4.2 AAD'S PRIMARY AND SECONDARY NETWORKS

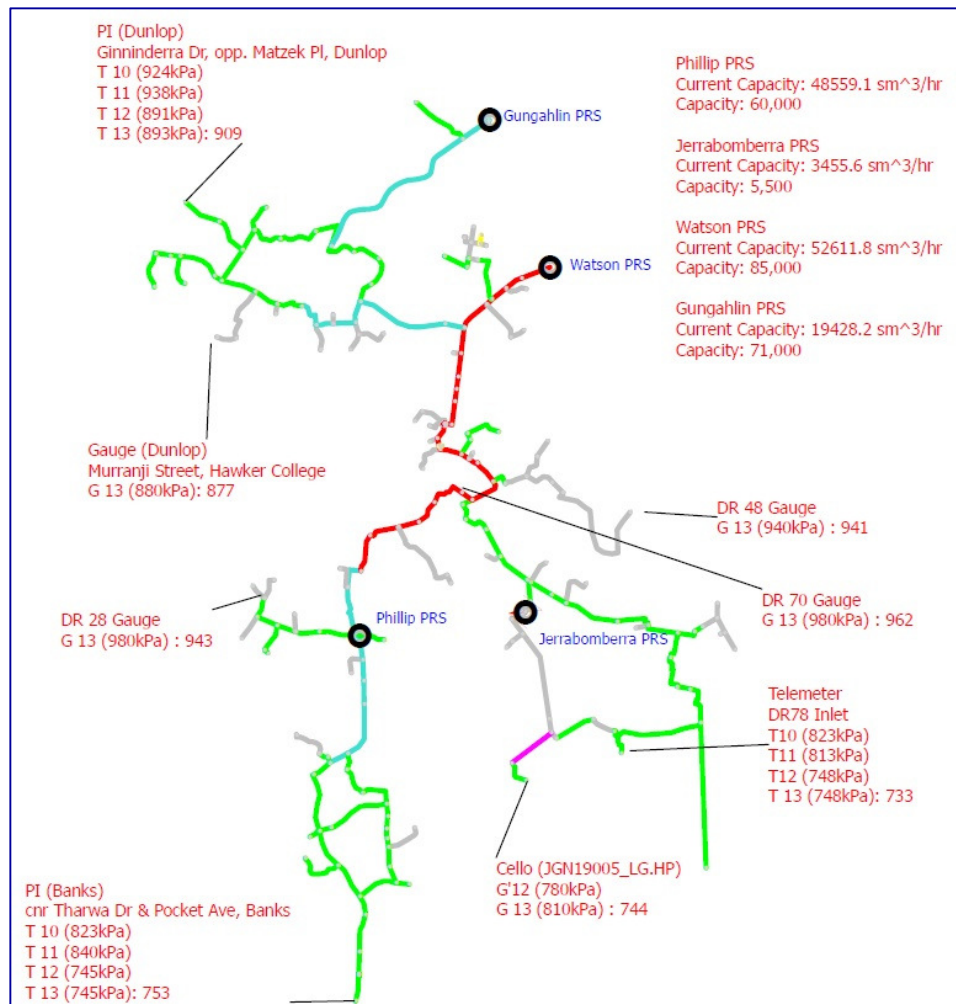
Primary mains are steel mains operated at 6,895 kPa. These are used to supply secondary mains via Primary Regulating Stations (**PRs**). On Figure 3-3 above, the Canberra Primary Main runs northwest from the Watson TRS to the Gungahlin PRS, and southwest to interconnect at the Fyshwick TRS and thence to the Jerrabomberra Package Off-Take Station (**POTS**) and Phillip PRS.

Secondary mains, illustrated in blue above, are operated at 1,050 kPa.

Figure 3-3 below, shows the current pressures at PRs, and the location of telemetry and gauging stations.

² 2013 Network configuration represented.

Figure 3-3: 2013 Network Configuration



3.4.3 SECURITY OF SUPPLY CONSIDERATIONS

Historically, Canberra's gas supplies have been supplied through Watson TRS from the MSP. Around 2000, with the development of the EGP, the possibility of having more than one supply point became a reality. This has produced the possibility of a number of wholesaler commercial and AAD security of supply advantages.

Until recently, a large proportion of gas supply to Canberra has been through Watson TRS/MSP, with gas via AAD's Hoskinstown/EGP being used as a top-up. This situation is driven by wholesaler nominations, not by AAD.

From a security of supply perspective, the availability of gas via two supply points reduces the risk of loss of supply due to a major rupture. However, the capacity of either point to supply the entire network is impacted by commercial considerations (the requirement for nominations to provide incoming gas), and pressures in parts of the network distant from either point of supply in the event of loss of the other. In summer, either TRS could supply the entire network; during winter however, part of the network may lose supply if one of these supply sources were to fail, dependant on the winter severity of the day in which the failure occurs and the extent of failure.

3.5 TELEMETRY REQUIREMENTS

There are several telemetry points scattered throughout the Canberra Network. The purpose of these telemeters is to make measurements and collect data with regards to pressure, and transmit this information back to Jemena's Supervisory Control and Data Acquisition's (**SCADA**) infrastructure. This telemetry allows for monitoring of the Canberra network.

Figure 3-3 and Table 3-2 show the permanent telemetry points on the HP network. During winter additional gauging of the network is conducted using portable telemeters and Bristol gauges. Locations of winter gauging devices are reviewed annually, and these devices are moved to the most sensitive areas of the network as and when required.

Table 3-2: Network Telemetry

Type of Device	Address	Suburb	Minimum Pressure
Telemeter	Ginninderra Drive opposite Matzek Place	Dunlop	748 kPa
Telemeter	Corner of Tharwa Drive and Pockett Avenue	Banks	745 kPa
Telemeter	Corner of Jerrabomberra Parkway and Bicentennial Drive	Jerrabomberra	893 kPa

Additionally, consumption data is available for large customers.

3.6 HISTORICAL VOLUME GROWTH

Historical gas consumption volumes in the Canberra region are tabulated below. Canberra gas demand is at its peak demand in Canberra's cold winter months, between June and August. The average gas consumption per household is above 40GJ/year.

Table 3: Canberra Network Gas Consumption Trends 2008-2013

Load Type	Load Type		Network Utilization Trend by Year						
			2008	2009	2010	2011	2012	2013	% Cmpd
Tariff	Domestic	Annual Load (TJ)	4,979	4,948	5,265	5,394	5,477	5,152	0.7
		Average per customer (GJ)	48.3	46.8	48.1	48.1	47.9	43.8	-1.9
		Number of Customers	103,079	105,808	109,510	112,147	114,260	117,670	2.7
	I&C	Annual Load (TJ)	1,602	1,562	1,554	1,623	1,649	1,517	-1.1
		Number of Customers	2630.0	2609.0	2655.0	2679.0	2700.0	2735.0	0.8
	Undefined	Annual Load (TJ)	19	19	16	9	9	8	-16.3
Number of Customers		525	585	189	171	161	149	-22.3	

3 — THE CURRENT NETWORK

Load Type	Load Type		Network Utilization Trend by Year						
			2008	2009	2010	2011	2012	2013	% Cmpd
Contract	I&C	Annual Load (TJ)	1218.4	1218.4	1218.4	1218.4	1218.4	1218.4	0.0
		Number of Customers	41	41	41	41	41	41	0.0
Network Overall	Total Annual Load (TJ)		7,799	7,728	8,037	8,236	8,345	7,888	0.2
	Number of Customers		105,750	108,458	112,206	114,867	117,001	120,446	2.6

In GASS, there are a few customers who are not flagged as either Domestic or I&C. In this table, they are shown as Undefined.

Overall, 2008-2012 saw total annual gas consumption across the Canberra area increase at around 1.6% per annum, although average use declined significantly, largely a consequence of consumers adopting higher-efficiency appliances.

The very mild Canberra winter of 2013 saw a very significant decline in annual residential consumption due to high average winter temperatures. However, even allowing for 2013 decline, there is still growth in overall consumption across the years.

4. FUTURE DEVELOPMENT AND GAS DEMAND

4.1 HOUSING DEVELOPMENT

Major housing developments have a significant impact on the HP network. This is because medium pressure networks which will supply those developments have limited capacity to extend their reach without loss of pressure, so new medium pressure distribution networks are generally supplied by an extension to a secondary main reaching into the new area, rather than via incremental extensions on the periphery of a medium pressure network.

Virtually all projects proposed in this capacity assessment are HP extensions are to extend reach to supply these housing developments.

The following table summarises the major housing developments that have been included in modelling of the primary and secondary networks. They are summarised in turn in the next sections.

Table 4–1: Significant Housing Developments across the Canberra Region to 2033

Locality	Adjacent Secondary Network	Total Planned Dwellings	Dwellings to 2033 ³	Comments
Lawson	Belconnen	1,850	1,850	Redevelopment of disused military site near Belconnen Town Centre
West Belconnen	Belconnen	Over 8,000 on both sides of the ACT/NSW border over the next 20-30 years	7,300	First block releases 2015. Development of 4,500 dwellings in ACT is firm and under planning; the larger housing developments over the NSW border are contentious and vague.
Molonglo	Weston Creek	16,000	15,800	Large multi-phased development through ACTPLA
Gungahlin	Gungahlin	13,000	N/a	Large development in the NE of the ACT. Will have to be supplied by secondary extensions, of which two are planned.
Googong	Queanbeyan	Around 5,500 homes	2,500	A secondary extension was laid in 2013 to supply the first dwellings. Additional development will have no impact on the high pressure network, given the scale of development and the capacity of the secondary extension.
West Tuggeranong	Tuggeranong	Not specified	Not known	There has been some debate in Canberra about varying current NCA development plans and developing across the Murrumbidgee River west of Tuggeranong. At the time of writing, NCA have been asked to investigate the concept; no firm proposals have been received.

³ As allowed for in network pressure modelling

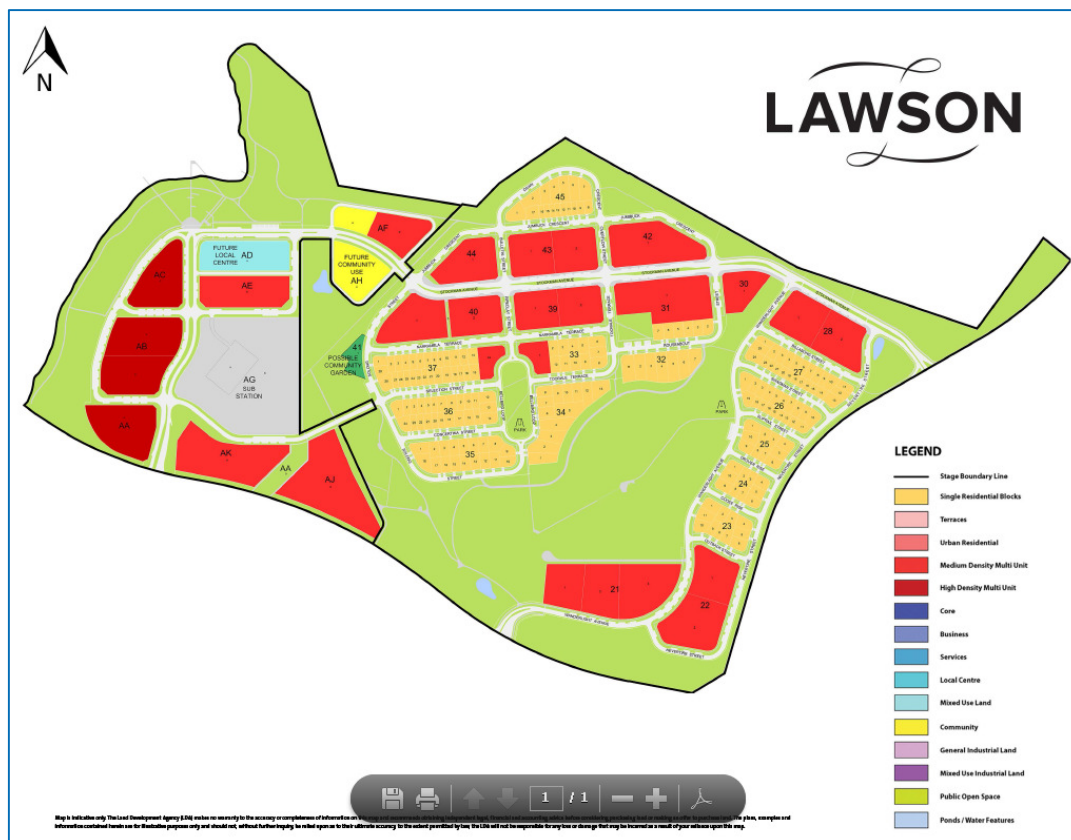
4 — FUTURE DEVELOPMENT AND GAS DEMAND

Locality	Adjacent Secondary Network	Total Planned Dwellings	Dwellings to 2033 ³	Comments
Hume Industrial Area	Tuggeranong	Industrial	Industrial	Hume Industrial Area is well established, but there is further space available for expansion.
Tralee	Tuggeranong	Residential	1,350	

4.1.1 LAWSON HOUSING DEVELOPMENTS

This is a relatively small redevelopment of the former naval radio station site bounded by Baldwin and Ginninderra Drives, to the north of the University of Canberra. Development is underway. Most sites are medium density rather than suburban blocks, befitting the location adjacent to Belconnen Town Centre.

Figure 4–1: Lawson Housing Developments



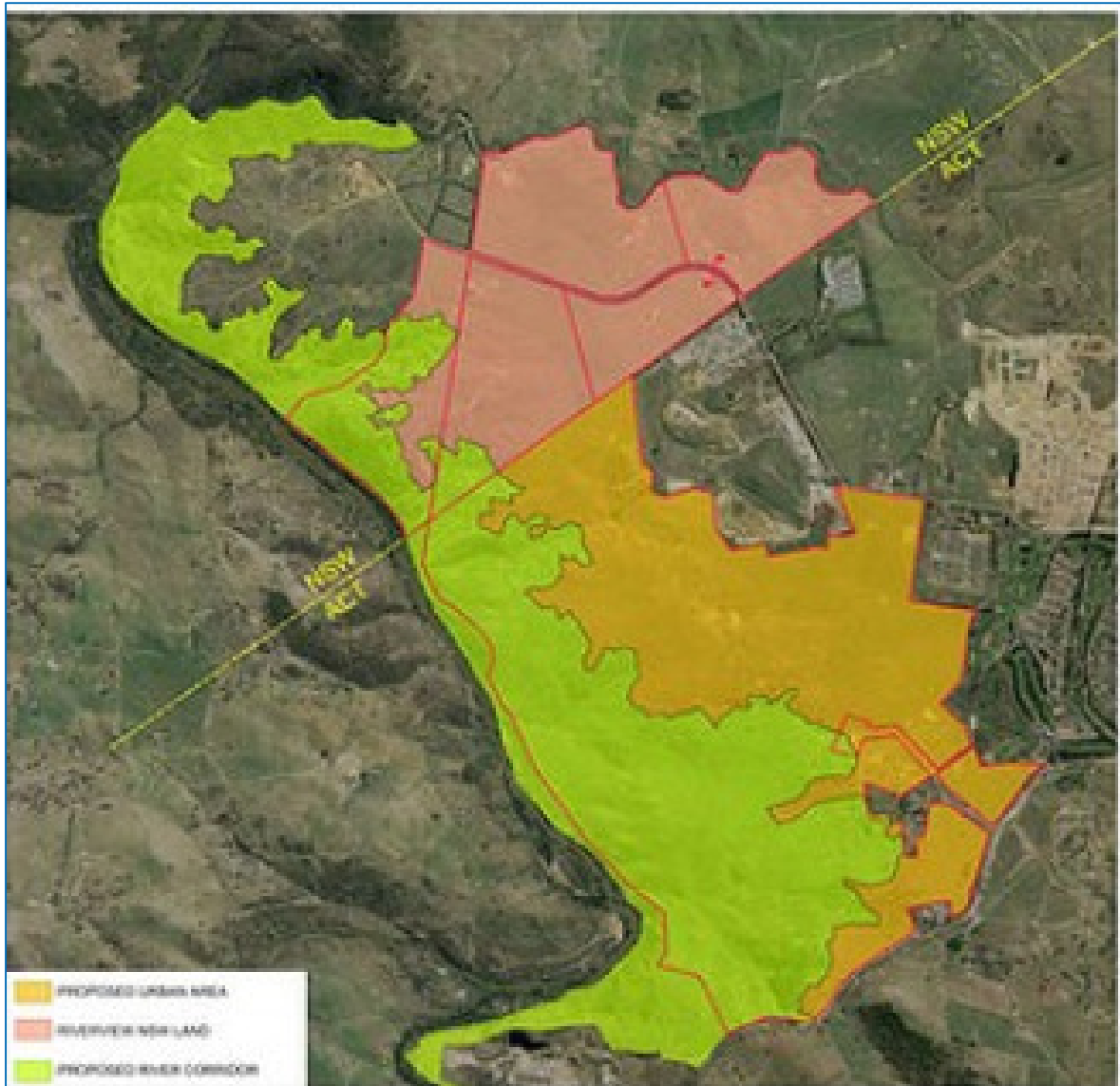
4.1.2 WEST BELCONNEN HOUSING DEVELOPMENTS

West Belconnen is a major, long term private housing development spanning both sides of the NSW-ACT border. On the ACT side, 4,500 dwellings are envisaged in the long term, although the planned rate of development and its distribution are currently unspecified. The first blocks are to be released for construction in 2015.

There will be three secondary extensions supporting this development over time. The timing and sequencing of the three extensions depends on the timing and geographical distribution of housing development, which has not been announced at time of writing. Changes in the scope of these projects are likely, as the road layouts and land releases for the new estate area are yet to be confirmed.

The extent and viability of the proposed extension into NSW, shown on the developer’s map below, is unclear. It has not been approved to the time of writing.

Figure 4–2: West Belconnen Housing Developments

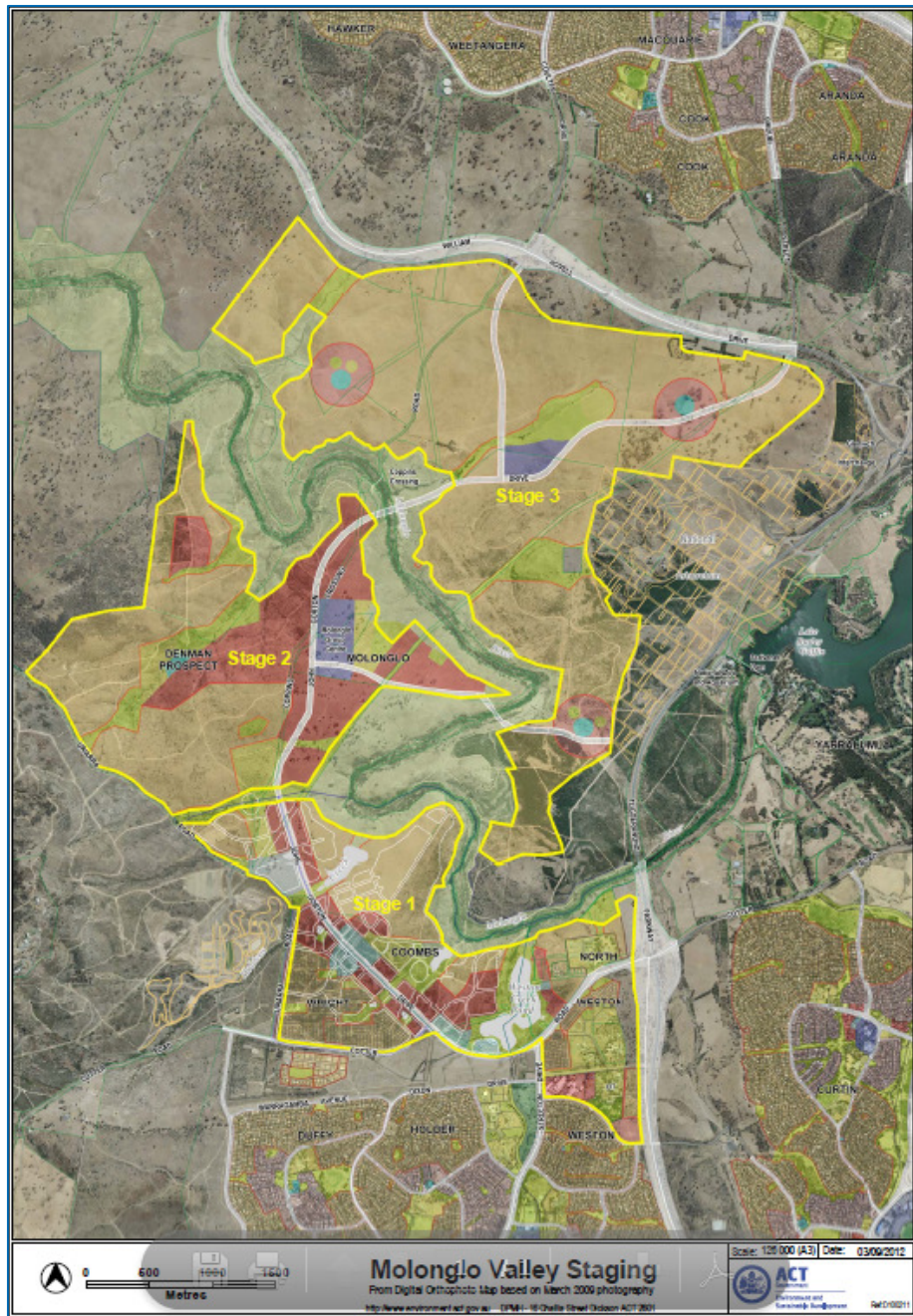


4.1.3 MOLONGLO HOUSING DEVELOPMENTS

Molonglo developments encompass a number of new suburbs in three release stages. Compared to West Belconnen developments, Molonglo developments are more concretely specified and closer to development at time of writing.

The first stage, the suburbs of Wright and Coombs in the south of the subdivision, is now largely subdivided and around 200 houses have already been built. The second stage, with suburb names of Denman Prospect and Molonglo, are under planning. The third stage suburbs have not been named or planned as yet. It is envisaged that development and construction of the latter stages will stretch out the next 30 years. Extensions of the Secondary and later, the Primary networks will be required over time in order to supply the growth in the new estate area.

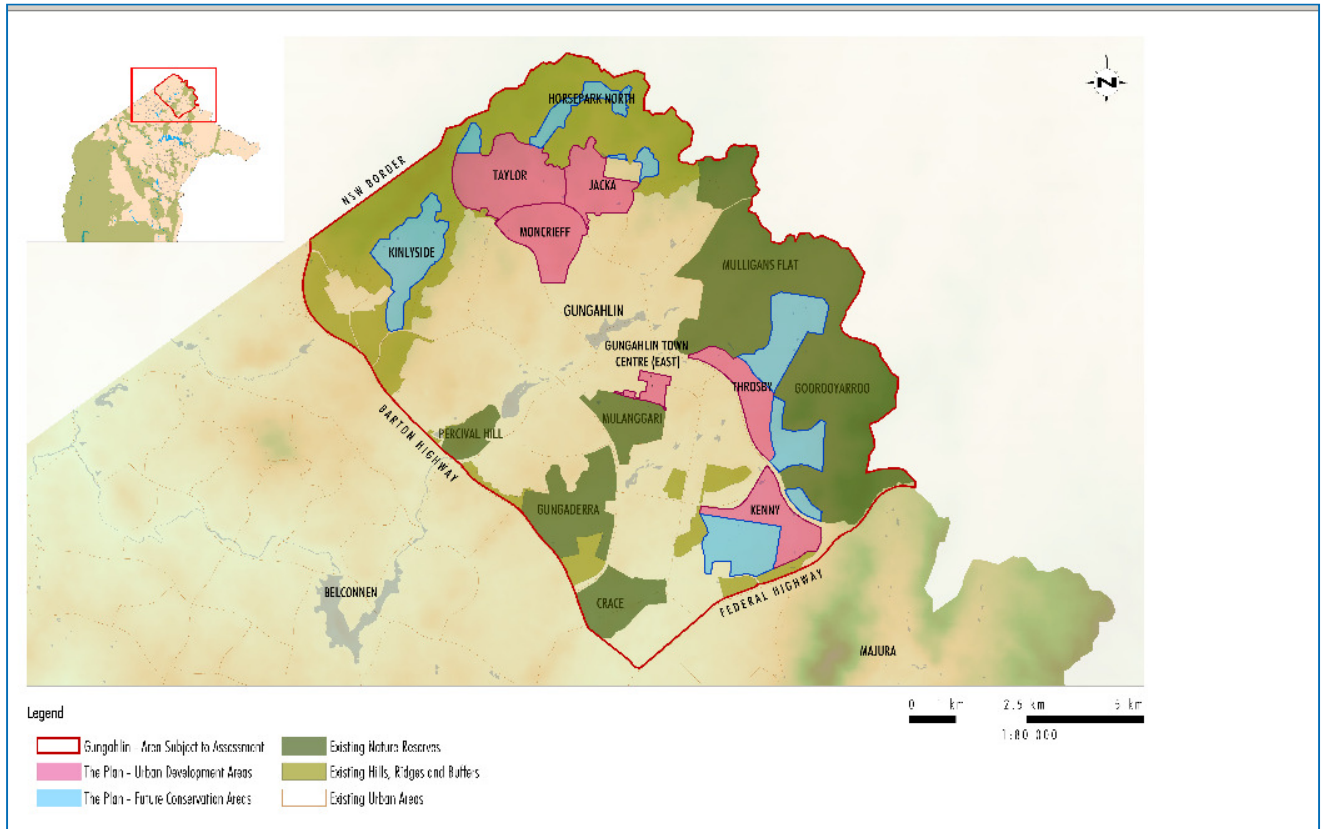
Figure 4–3: Molonglo Subdivision Stages 1-3



4.1.4 GUNGAHLIN HOUSING DEVELOPMENTS

Gungahlin is in the very northeast of the ACT, and one of the original “towns” planned for Canberra in the 1950s. A major housing subdivision is planned, including the new suburbs of Taylor, Jacka, Moncrieff, Throsby and Kenny. The secondary network will be extended into the new estate areas in order to support the growth.

Figure 4–4: Gungahlin Housing Developments

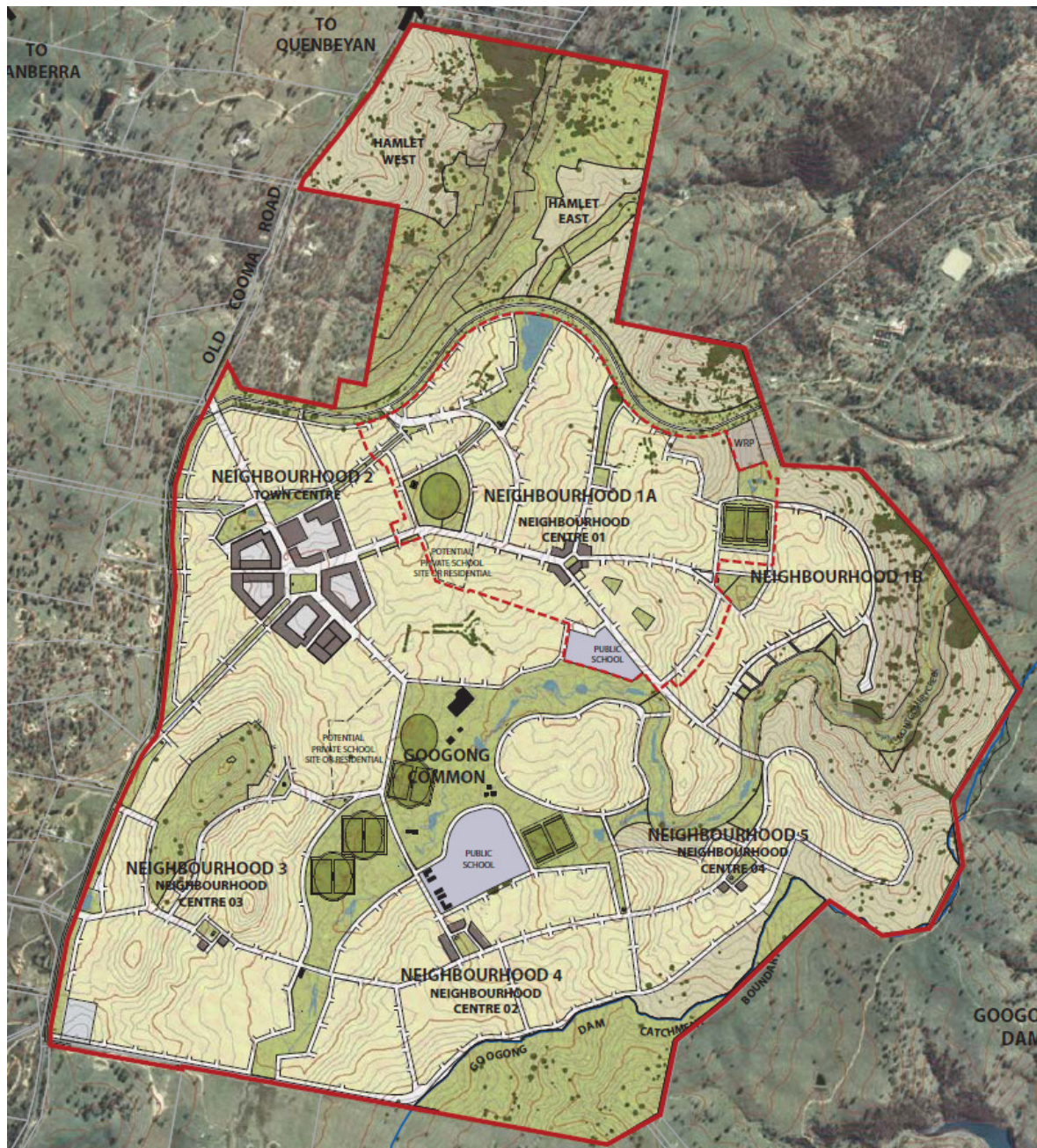


4.1.5 GOOGONG HOUSING DEVELOPMENTS

Googong is a private development in NSW, south of Queanbeyan. It will remain a separate township as it is 5 km from Queanbeyan and 2 km from the eastern outskirts of Jerrabomberra. The first houses of Stage 1 were completed at the end of 2013, when a secondary main extension was laid to supply the area. Stage 1 and Stage 3 are around 780 houses, but development is anticipated to be slower than suburban development in the ACT.

Proposed forecast housing growth in the Googong development area will have no further impact on the high pressure network, as the secondary extension is easily able to supply future growth. The Secondary network was extended south from Queanbeyan in order to supply this new estate growth.

Figure 4–5: Googong Development Master Plan



4.1.6 HUME INDUSTRIAL AREA EXPANSION

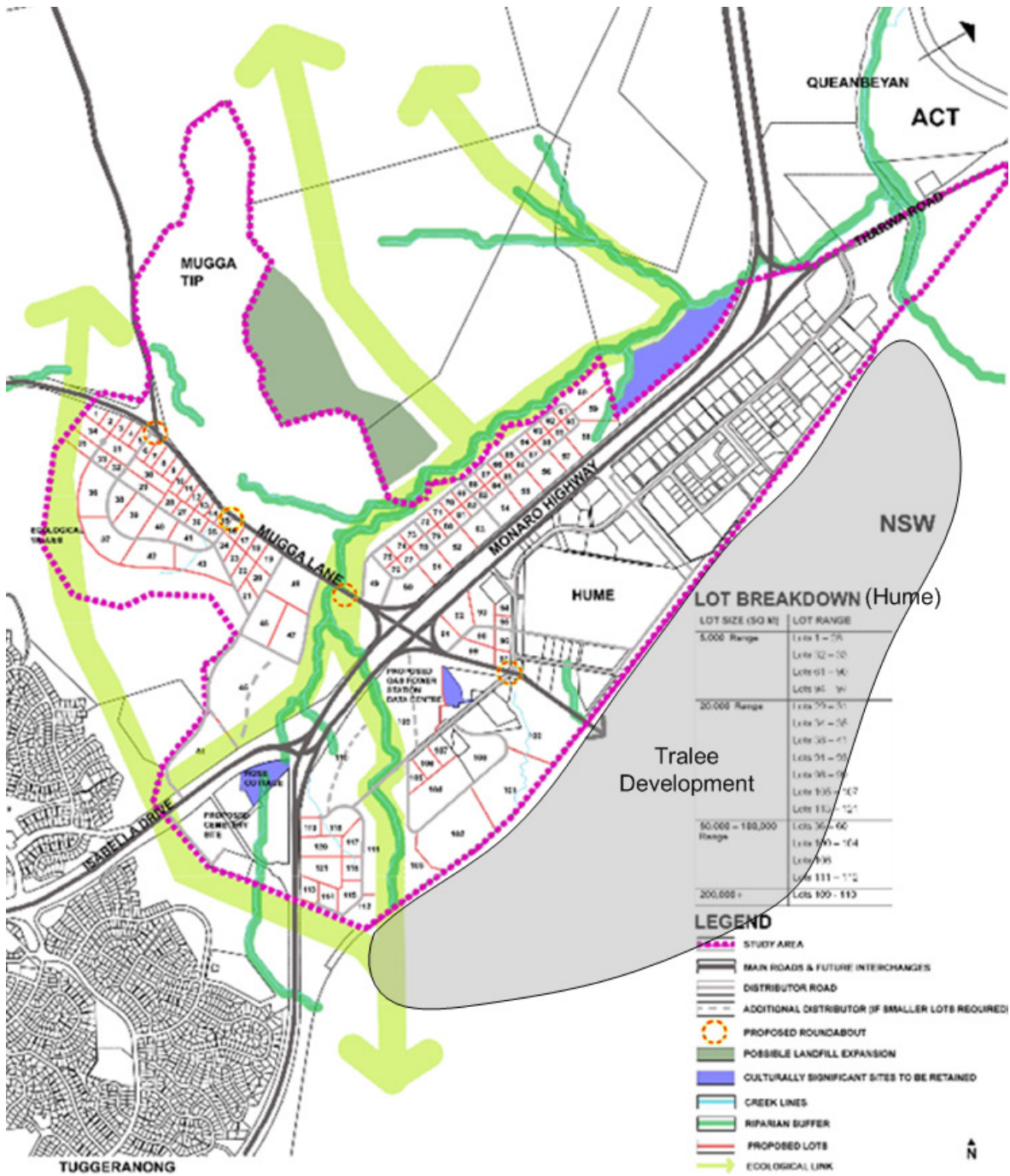
The large Hume Industrial Area is in the east of the network, bordering Lanyon Drive and the ACT/NSW border is a significant industrial subdivision. Areas of it are still being developed. It will expand over time, and with that expansion may come significant I&C and possibly contract customers. Expansion of the gas network's footprint in this area will be achieved through specific market expansion projects as and when that need arises.

The recently-completed Hume Primary Main Extension and Hume PRS means that the PRS is immediately adjacent to the industrial area, which will continue to be supplied by a direct secondary main. The Hume

Primary Mains Extension permits future supply for growth in the entire Tuggeranong and Jerrabomberra areas, including both the industrial area but also the future housing development areas of Googong and Tralee.

A development in Tralee has been approved by the Queanbeyan City Council; this development is located south of the Hume industrial area and is proposed to incorporate approximately 1,350 dwellings. Timing for this development is to be confirmed when the information becomes available.

Figure 4–6: Hume Industrial Area Expansion Concept Plan and Tralee Development Area



4.2 NETWORK PEAK LOAD PROJECTIONS

The following table show the load projection in standard m³/h from 2013 to 2033 based on the organic growth rate and estimated new development penetration rate where relevant. The network performance of winter 2013 is used as the basis of the projections.⁴

Table 4–2: Canberra Secondary 210kPa Network Winter Peak Load Projections

Load type		Winter Peak Load in SCMh					
		2013	2015	2017	2020	2023	2033
Established Area	Domestic	96,172	100,057	104,100	110,472	113,819	125,727
	I&C	28,318	28,887	29,468	30,361	31,281	34,554
	Undefined	146	149	152	156	161	178
New Estates	Molonglo Valley	29	1,467	2,904	5,061	7,217	11,588
	West Belconnen	0	535	1,071	1,874	2,677	5,354
	Gungahlin	0	513	1,027	3,594	5,134	10,268
	Lawson	0	169	367	499	697	1,357
	Googong	0	240	960	1,440	2,160	3,840
	Hume ⁵	-	-	-	-	-	-
	Tralee ⁶	-	-	-	-	-	-
Total Load (SCMH)		124,665	132,017	140,049	153,457	163,146	192,866

4.2.1 ESTIMATING FUTURE PEAK LOADS FOR CAPACITY MANAGEMENT PURPOSES

There are methodological difficulties in accurately identifying changes in demand for gas from the development of new estates compared to underlying changes to demand by established customers when both changes are occurring simultaneously in any network. This in turn impacts on forecasting of peak flows, which is driven by the total number of residential customers on the network, and their propensity to use gas at the same time.

AAD manages their networks with the objective of maintaining supply during the short periods of peak demand, which in Canberra occur in the morning or evening of the coldest winter days. This means maintaining gas pressure for each minute of each hour of the weekday coldest winter morning or evening, which is when the largest numbers of customers are drawing down gas at the same time. What impacts pressure is the absolute

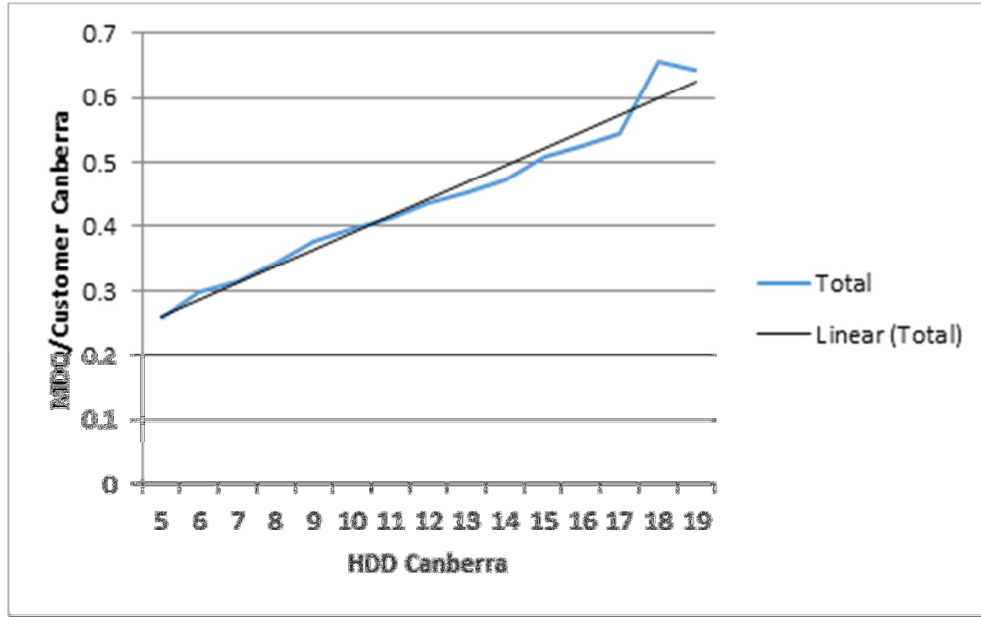
⁴ Refer to the JGN Capacity Management Strategy for the methodology of calculating hourly peak rate.

⁵ No data available to calculate peak load for industrial customers.

⁶ Timing for Tralee to be confirmed.

number of customers simultaneously using their gas appliances and consuming gas during that time. Capacity management must manage gas pressures to supply peak demand rather than average or total demand.

Figure 4–7: Average MDQ by HDD, Canberra 2003 – 2013



The above chart shows the historical record of daily gas consumption in Canberra winters (June-August) 2003-2013.

The standard measure of “coldness” is Heating Degree Days (HDD), which measures the difference between a standard temperature (18.3 degrees) and the average of minimum and maximum temperatures on the day, so that a larger HDD value means a colder day.

In the above Figure, holidays and weekends are excluded, as gas consumption is much lower on those days. Very clearly, the colder it gets, the greater the consumption of gas by the average customer. Therefore, the more customers there are on a network, the greater the peak on these cold days.

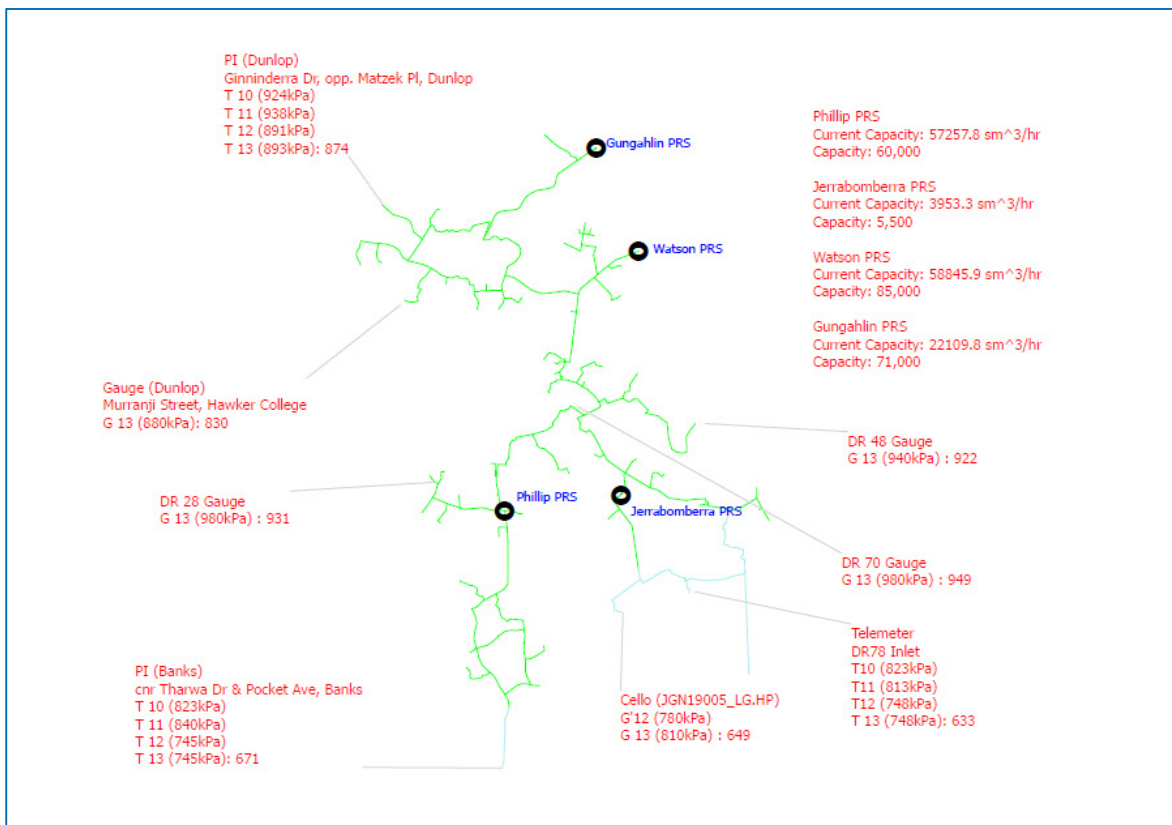
Maintaining supply to all customers at that peak time is the major challenge of capacity management. For this reason, AAD forecasts peak gas demand via forecasting changes to the number of customers in the network. This in turn has methodological challenges in that the extent of housing development and infill development and more particularly the rate at which it occurs is difficult to forecast precisely.

5. CAPACITY DEVELOPMENT & PERFORMANCE FORECASTS

5.1 CURRENT NETWORK CAPACITY

The following pressure plot shows a simulation of network pressures as they would have been in the primary and secondary network if the Canberra winter of 2013 had been of a severity of one in twenty, given the distribution of customers across the network at that time.

Figure 5–1: Severe Winter 2013 Performance



Projection Assumptions	Projected Performance
One in twenty winter peak load 2013	Network pressures are satisfactory across the network, given the distribution of customers at the time.

5.2 SCHEDULED PROJECTS 2015

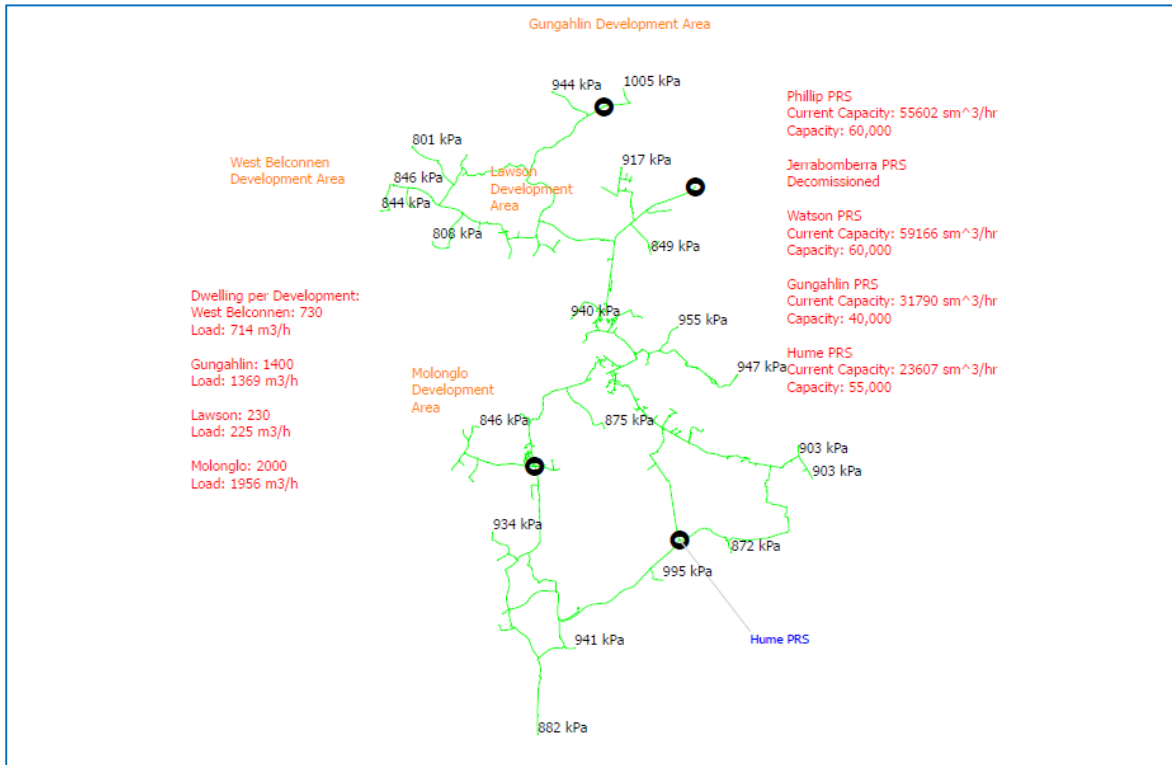
The following table shows projects scheduled for 2015. These projects appear in this Capacity Assessment to give context to network capacity development projects planned in 2016 – 2021 and beyond. The impact of the 2015 projects is covered in the below simulation, and in modelling thereafter.

Table 5–1: Canberra Primary and Secondary Projects 2015

Project Title	Project Summary	Cost 2015
Hume Primary Main Extension	Lay 5km of 250mm ST (Primary Main) from the existing primary main in Hindmarsh Dr, south of Fyshwick TRS to Monaro Highway, Hume. This is being commissioned February 2015	Completed
Hume PRS	Install 55,000m ³ /hr PRS at intersection of Lanyon Dr and Monaro Highway. Location has been confirmed adjacent to ESA. This is being commissioned February 2015. The final part of the project is to remove the Jerrabomberra PRS.	Completed
Gungahlin – Amaroo Capacity Development Project (Secondary Mains Extension)	Lay 1.9km of 150mm ST from the existing 250mm ST main in Gundaroo Drive along Stray Leaf Cres to the intersection of Horse Park Dr and Katherine Av, Amaroo. Install a new SRS.	Completed

5.3 NETWORK PROJECTIONS FOR 2015

Figure 5–2: Network Performance Severe Winter 2015 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2015 2% organic growth 2013-2015	With the implementation of approved projects as depicted in Figure 5–2, network pressures are satisfactory.

5.4 NETWORK PROJECTIONS 2016 – 2033

Capacity development projects and their associated simulations considered in this Capacity Assessment are tabulated below. Risk assessments and options for each project, where relevant, are included at the relevant date.

In the following assessments, pre-CDP pressure simulations are not provided, as the pressure impact shows in the medium pressure network downstream rather than in the secondary network itself. Post-CDP simulations show the network extensions themselves.

Table 5-2: Network Projections

1 in 20 winter scenario	Pressure Projection Post CDP	Proposed CDP scope
2016	Figure 5–6 Network Performance Severe Winter 2016 Post CDP	Figure 5–3 Molonglo Secondary Extension Stage 1 option 1 Figure 5–4 Molonglo Secondary Extension Stage 1 option 2 Figure 5–5 Moncrieff Secondary Extension
2017	Figure 5–8 Network Performance Severe Winter 2017 Post CDP	Figure 5–7 West Belconnen Secondary Extension
2019	Figure 5–10 Network Performance Severe Winter 2019 Post CDP	Figure 5–9 Molonglo Secondary Extension Stage 2
2020	Figure 5–12 Network Performance Severe Winter 2020 Post CDP	Figure 5–11 Molonglo Primary Extension Stage 1 No Figure: Phillip PRS capacity Upgrade
2022	Figure 5–14 Network Performance Severe Winter 2022 Post CDP	Figure 5–13 Taylor Secondary Extension
2024	Figure 5–16 Network Performance Severe Winter 2024 Post CDP	Figure 5–15 Molonglo Primary Extension Stage 2
2025	Figure 5–18 Network Performance Severe Winter 2025 Post CDP	Figure 5–17 Molonglo Secondary Extension Stage 3
2027	Figure 5–19 Network Projection 2027 Post CDP	No Figure: Belconnen PRS No Figure: Watson PRS Upgrade
2031	Figure 5–21 Network Projection 2031 Post CDP	Figure 5–20 West Belconnen Secondary Extension Southern Cross Drive West
2033	Figure 5–24 Network Projection 2033 Post CDP	Figure 5–23 West Belconnen Secondary Extension Southern Cross Drive East

5.4.1 PROJECT PRICING

The value of these projects is a high level estimate, included here for the purpose of option comparison and planning. They are refined on an ongoing basis, as part of the capital planning activities.

5.5 NETWORK PROJECTIONS FOR 2016

Capacity development requirements for the primary and secondary network are driven by the pressure requirements of the medium pressure networks, which in turn are driven by changes to underlying growth and housing estate development.

By 2016, there is forecast to be significant housing growth in West Belconnen, Molonglo and Gungahlin, with smaller growth in Lawson.

5.5.1 NETWORK UNTREATED RISK ASSESSMENT 2016

Table 5–3: Network Untreated Risk Assessment 2016

	Severe Winter	Security of Supply
Financial	~\$165k from OPEX per loss of supply incidents and loss of revenue from not being able to connect new customers. Minor	N/A
Operational	Potential loss of gas supply to ~5000 customers for <12 hours Moderate	N/A
Reg & Compliance	Minimal regulatory enquiries Minor	N/A
B/R/S	Little or no stakeholder interest, requiring minimal stakeholder communication. Minor	N/A
Consequences	Moderate	N/A
Likelihood	Possible	N/A
Risk Level	Medium	N/A

5.5.2 PROJECT OPTIONS AND SCOPE

Two separate secondary main extensions will be implemented prior to winter 2016 to extend gas supply to forecast housing developments in the separate development areas of Gungahlin and Molonglo. These projects are independent of one another, and each is driven by the timing of market expansion.

The Molonglo development area will be supplied from a series of primary and secondary main extensions over the twenty year period. Molonglo Secondary Extension Stage 1 is designed to supply the housing development as it appears at time of writing. Molonglo Secondary Extensions 2 and 3 will extend the reach of the secondary network.

Table 5–4: Molonglo Secondary Extension 1 Project Options and Scope

	Molonglo Secondary Stage 1	Option 2
Scope	Lay approximately 4 km of 200mm ST main from the 100mm ST main in Streeton Drive Holder, into the Molonglo Development area. Install one 7,000m ³ /hr DR.	Lay approximately 4 km of 200mm ST main from the 100mm ST main in Streeton Drive Holder, into the Molonglo Development area along John Gorton Drive. Install one 5,000m ³ /hr DR.
Value	\$5M	\$7M
Benefits	This option will provide supply to the secondary network extensions required to supply housing growth.	This option will provide supply to the secondary network extensions required to supply housing growth.
Disadvantages	N/a	Due to construction issues, it would be much more costly to construct along this route

	Molonglo Secondary Stage 1	Option 2
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the West Belconnen Development Area	N/a
Recommendation	Preferred	

Figure 5–3: Molonglo Secondary Extension Stage 1 option 1

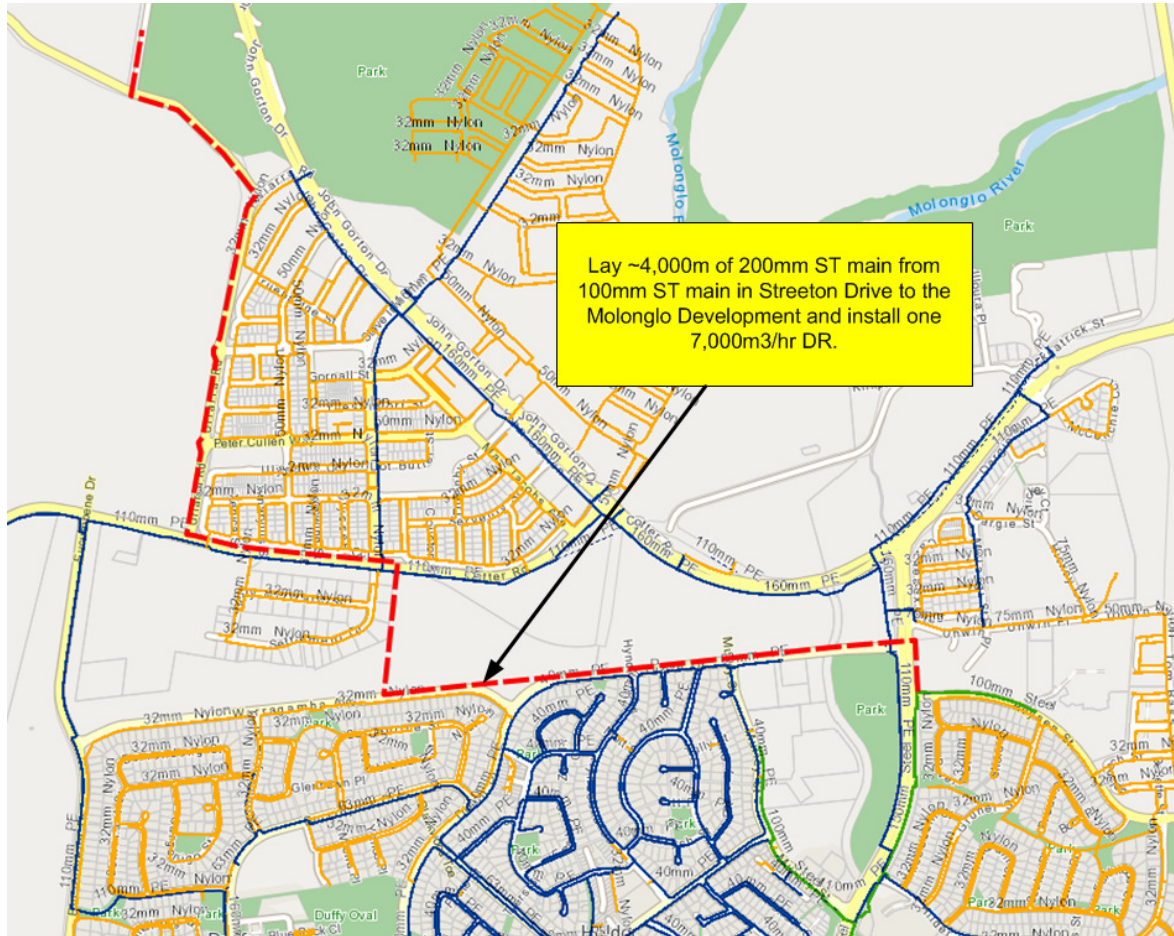


Figure 5–4: Molonglo Secondary Extension Stage 1 option 2

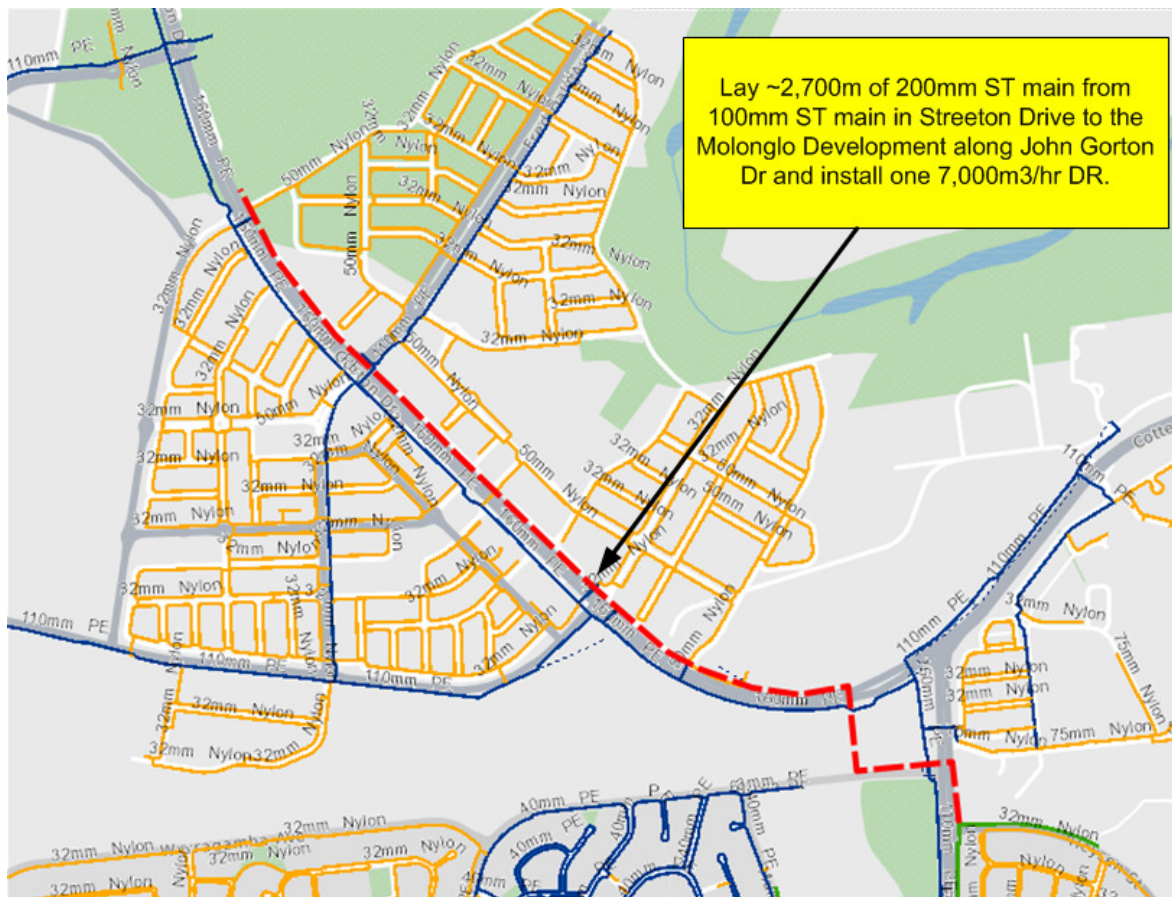


Table 5–5: Moncrieff Secondary Extension Project Options and Scope

	Moncrieff Secondary Extension	Option 2
Scope	Lay 2.4kms of 150mm steel main along Horse Park Drive from 150mm ST main on Gungahlin Dr Nggunawal. Includes a 7,000scmh DR installation.	Another Secondary extension route was considered on Mirrabai Dr, However due to the significant increase in length, this option would be far more expensive and therefore was considered infeasible.
Value	\$4M	N/a
Benefits	This option will provide supply to the secondary network extensions required to supply housing growth in Taylor, Moncrieff and Jacka as these subdivisions are developed.	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Gungahlin Development Area	N/a
Recommendation	Preferred	

Figure 5–5: Moncrieff Secondary Extension

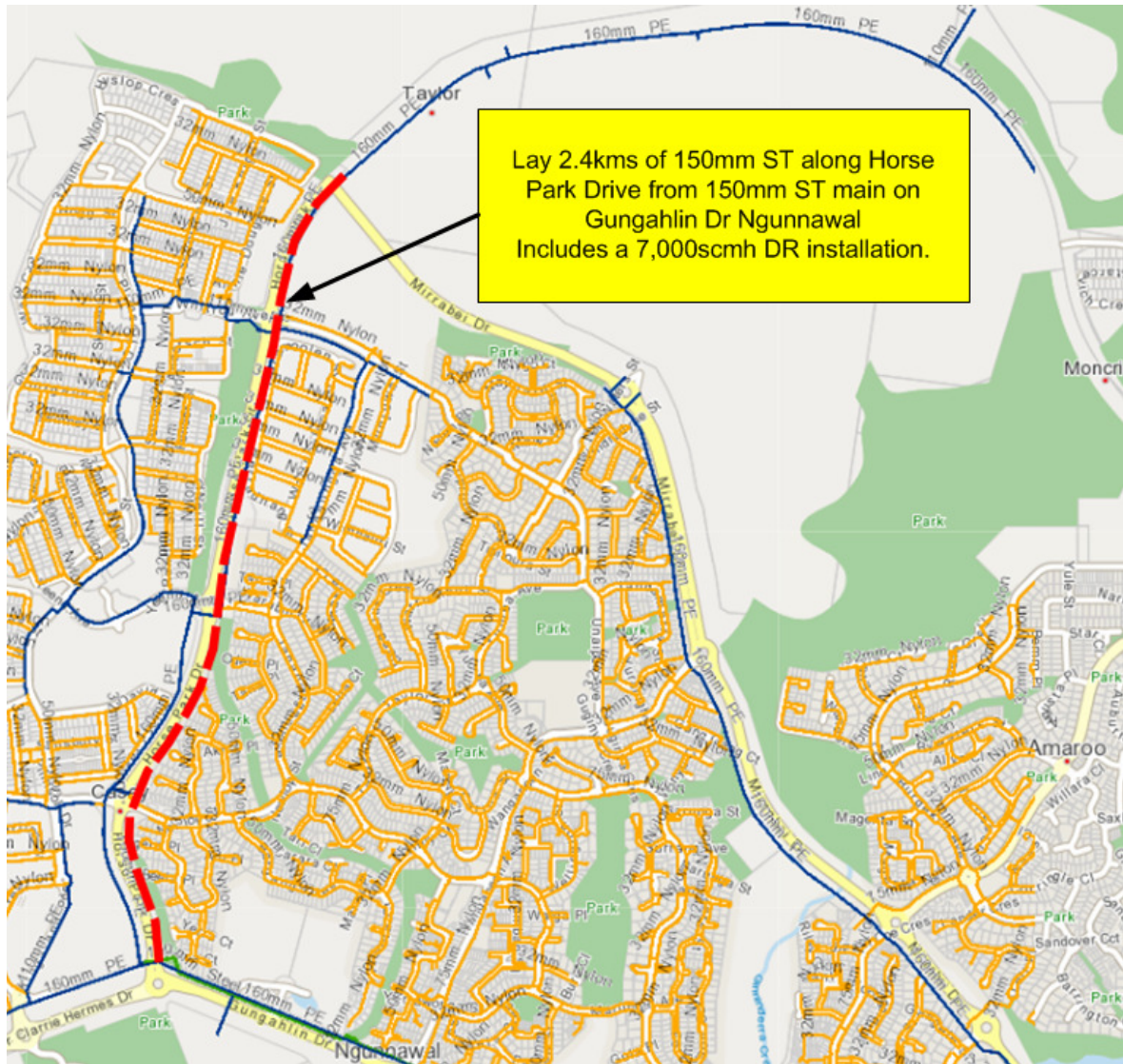
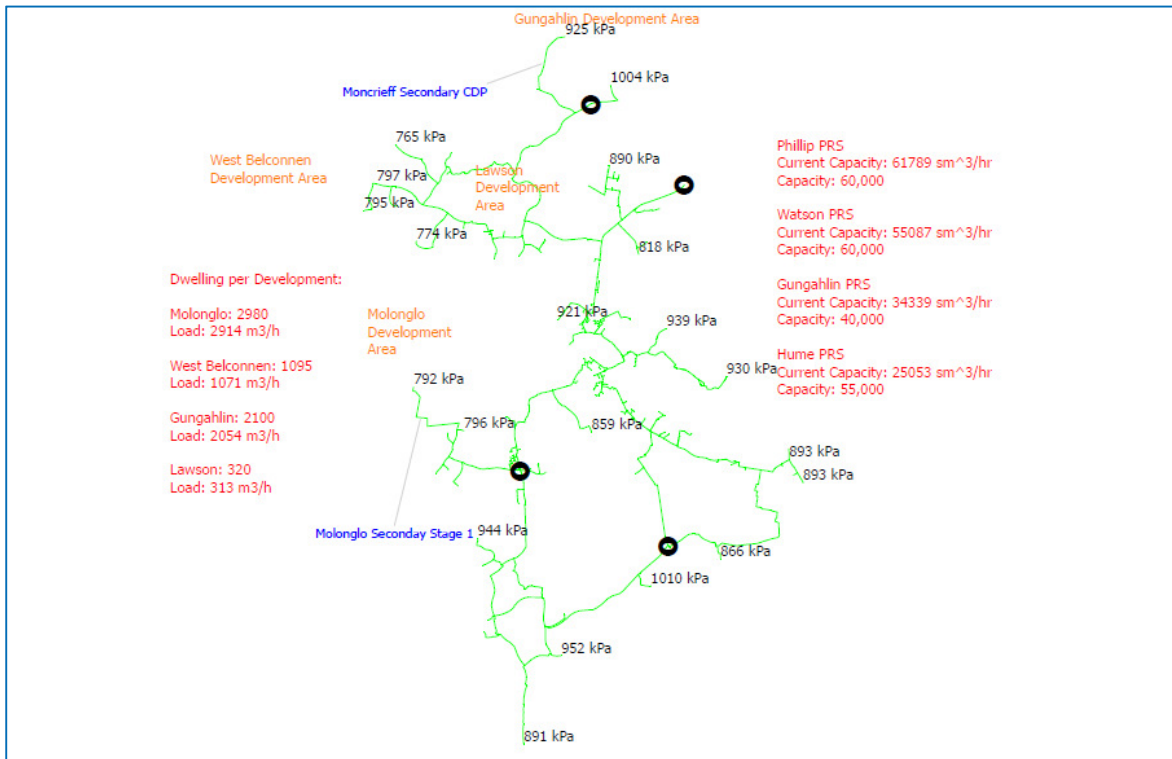


Figure 5–6: Network Performance Severe Winter 2016 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2016 2 % organic growth 2013-2016 New Estate Growth.	With the implementation of Moncrieff and Molonglo Secondary Stage 1 extension projects, supply to the downstream medium pressure networks will be satisfactory.

5.6 NETWORK PROJECTIONS FOR 2017

By 2017, forecast housing development in the West Belconnen development area will require a secondary main extension to supply the growing medium pressure network in the area.

5.6.1 NETWORK UNTREATED RISK ASSESSMENT 2017

Table 5–6: Network Untreated Risk Assessment 2017

	Severe Winter	Security of Supply
Financial	~\$71k from OPEX per loss of supply incidents and loss of revenue from not being able to connect new customers. Minor	N/A
Operational	Potential loss of gas supply to ~1,500 customers for <12 hours	N/A

	Severe Winter	Security of Supply
	Minor	
Reg & Compliance	Minimal regulatory enquiries Minor	N/A
B/R/S	Little or no stakeholder interest, requiring minimal stakeholder communication. Minor	N/A
Consequences	Minor	N/A
Likelihood	Possible	N/A
Risk Level	Medium	N/A

5.6.2 PROJECT OPTIONS AND SCOPE

There are three secondary extensions supporting the market expansion growth in West Belconnen. The timing and sequencing of the three Stages depends on the timing and geographical distribution of housing development, which has not been announced at time of writing. Therefore the timing and sequencing of these three extensions may be subject to change.

Table 5–7: West Belconnen Secondary Extension Stockdill Dr

	West Belconnen Secondary Extension Stockdill Dr	Option 2
Scope	Lay approximately 3kms of 200mm steel main westwards from end of the existing secondary main on Stockdill Drive. Includes the installation of a 7000 scmh DR	None.
Value	\$4.5M	N/a
Benefits	This will ensure that the downstream secondary network in West Belconnen development area will be able to maintain gas supply	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the secondary network supplying the West Belconnen area	N/a
Recommendation	Preferred	

Figure 5–7: West Belconnen Secondary Extension Stockdill Drive

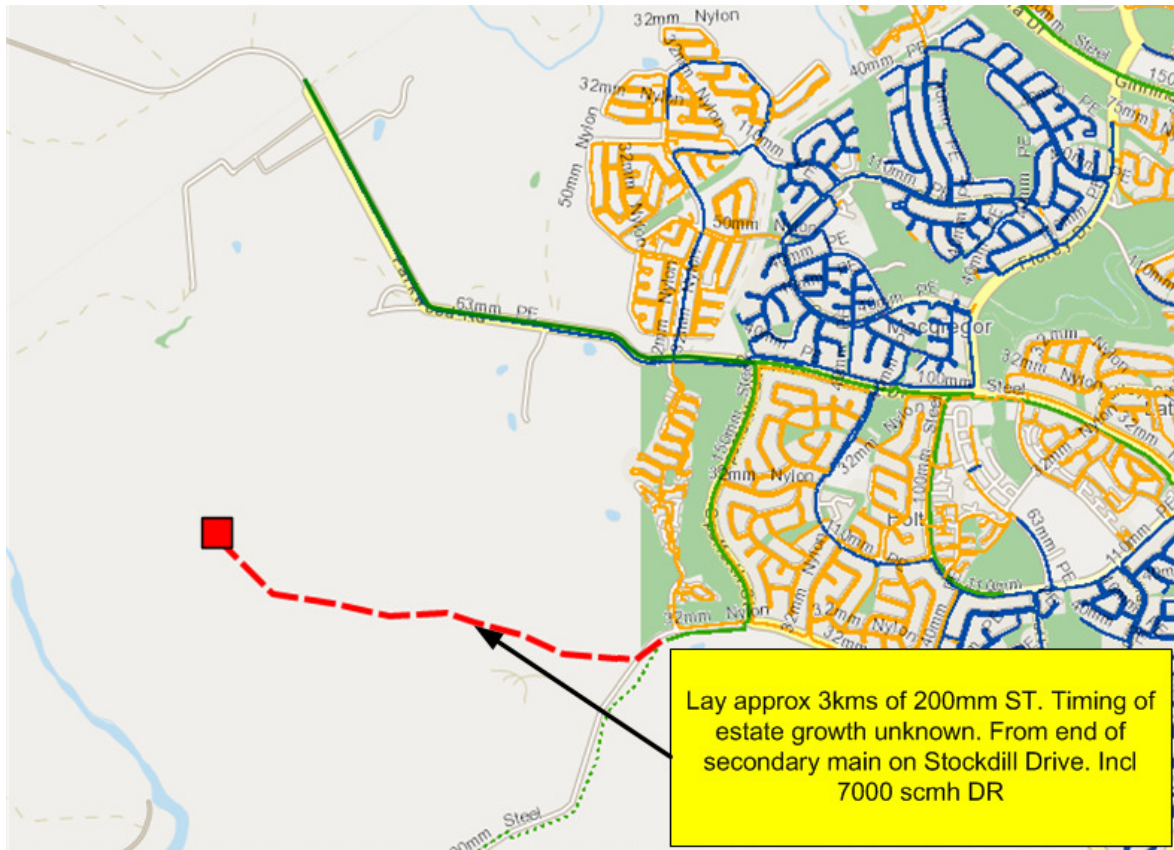
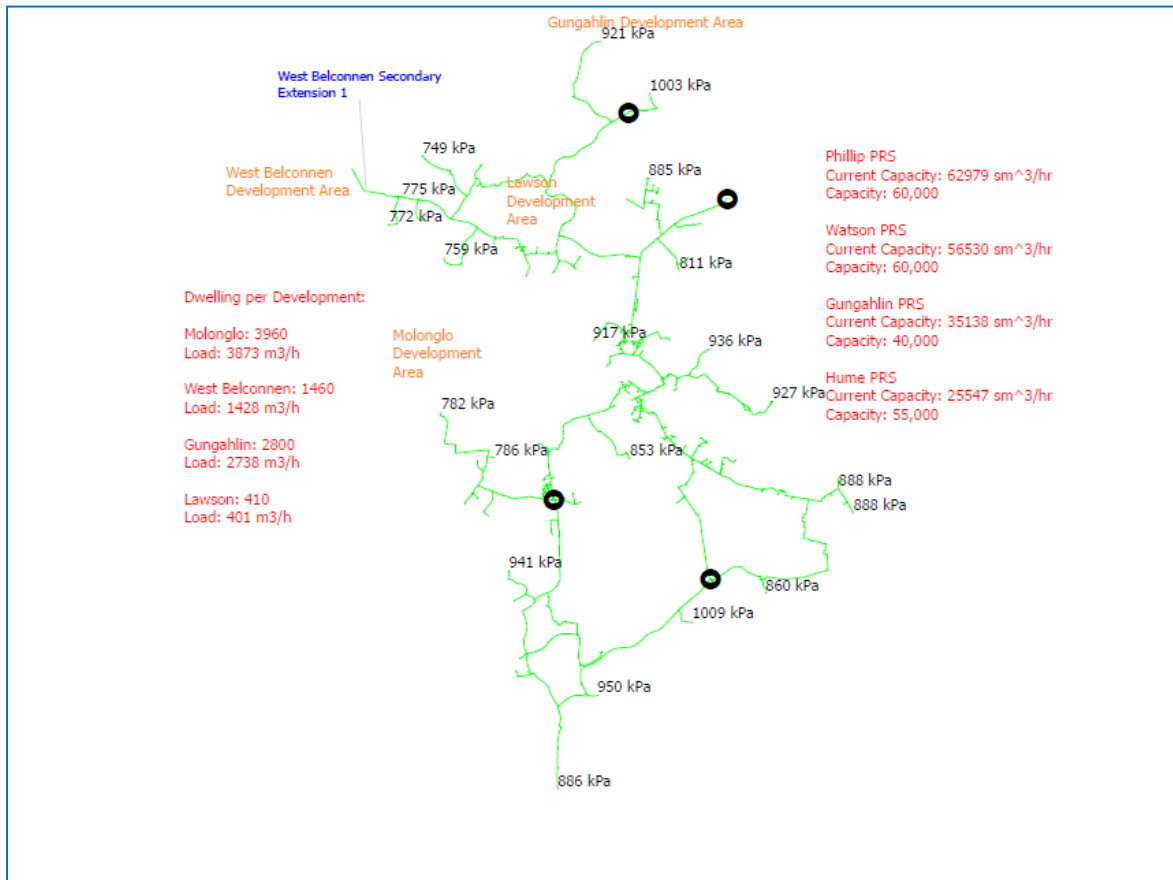


Figure 5–8: Network Performance Severe Winter 2017 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2017 2 % organic growth 2013-2017 New Estate Growth	With the commissioning of West Belconnen Secondary Extension stage 1, pressure to the West Belconnen development area is satisfactory.

5.7 NETWORK PROJECTIONS FOR 2019

With continued housing growth 2017-2019, especially in the Molonglo development area, a further secondary extension will be required to supply the medium pressure network.

5.7.1 NETWORK UNTREATED RISK ASSESSMENT 2019

Table 5–8: Network Untreated Risk Assessment 2019

	Severe Winter	Security of Supply
Financial	~\$84k from OPEX per loss of supply incidents and loss of revenue from not being able to connect new customers.	N/A

	Severe Winter	Security of Supply
	Minor	
Operational	Potential loss of gas supply to ~2,000 customers for <12 hours Minor	N/A
Reg & Compliance	Minimal regulatory enquiries Minor	N/A
B/R/S	Little or no stakeholder interest, requiring minimal stakeholder communication. Minor	N/A
Consequences	Minor	N/A
Likelihood	Possible	N/A
Risk Level	Medium	N/A

5.7.2 PROJECT OPTIONS AND SCOPE

With the forecast expansion of housing developments in Molonglo, the second secondary extension is required before winter 2019.

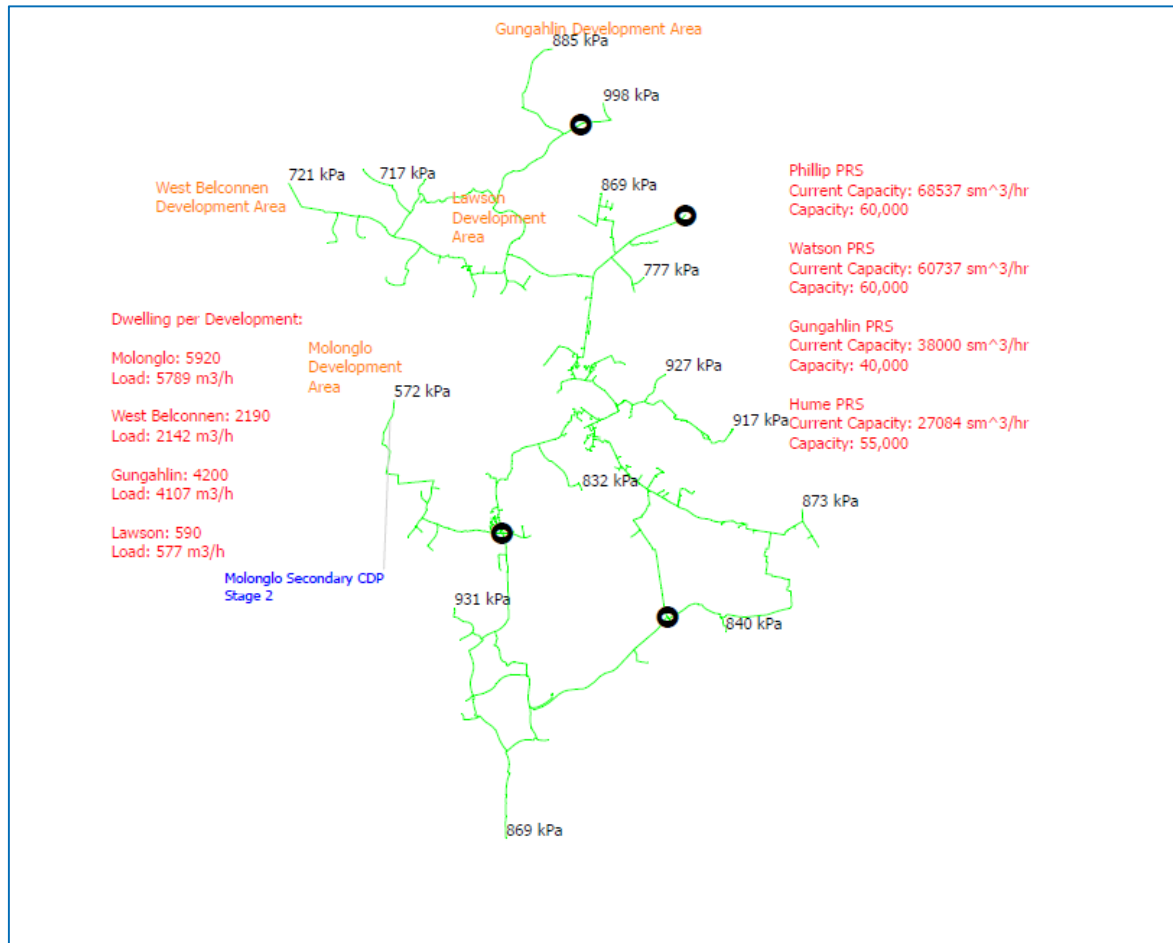
Table 5–9: Molonglo Secondary Extension 2 Project Options and Scope

	Molonglo Secondary Stage 2	Option 2
Scope	Lay approximately 2.5kms of 200mm steel main continuing from the end of Molonglo Stage 1 extension along either Coppins Crossing Road or the proposed roads extension of John Gorton Drive. Includes 5000 DR installation in Denman Prospect at the end of the extension. The exact timing and route is subject to road development and housing growth	There are possible variations of exact route that may emerge as the suburban roads develop.
Value	\$3M	N/a
Benefits	This option will provide supply to the secondary network extensions required to supply housing growth.	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development Area	N/a
Recommendation	Preferred	

Figure 5–9: Molonglo Secondary Extension Stage 2



Figure 5–10: Network Performance Severe Winter 2019 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2019 2 % organic growth 2013-2019 New Estate Growth	With the commissioning of the secondary extension, supply to Molonglo housing developments is satisfactory

5.8 NETWORK PROJECTIONS FOR 2020

By 2020, with forecast housing growth driving demand for gas, a primary mains extension will be required to supply the secondary and medium pressure networks. Additionally, a PRS capacity upgrade will be required for the existing Phillip PRS.

5.8.1 NETWORK UNTREATED RISK ASSESSMENT 2020

Table 5–10: Network Untreated Risk Assessment 2020

	Severe Winter	Security of Supply
Financial	~\$500k from OPEX per loss of supply incidents and loss of revenue. Moderate	N/A
Operational	Potential loss of gas supply to ~20,000 customers for >24 hours Moderate	N/A
Reg & Compliance	Regulator requires formal explanations and remedial action plans. Moderate	N/A
B/R/S	Adverse local media and/or heightened concern Moderate	N/A
Consequences	Moderate	N/A
Likelihood	Possible	N/A
Risk Level	Medium	N/A

5.8.2 PROJECT OPTIONS AND SCOPE

In the Molonglo area, a primary extension terminating in a PRS will ultimately be required to ensure supply to a fully developed housing area. The Molonglo Primary Mains extension will be completed in three stages, in 2020 (Stage 1), and Stage 2 and 3 anticipated about 2033-34.

Before 2020, an secondary extension will be required. This will be installed as a primary main, but will operate at secondary pressures until a Molonglo PRS is required. The timing of this PRS installation is not forecast before 2033.

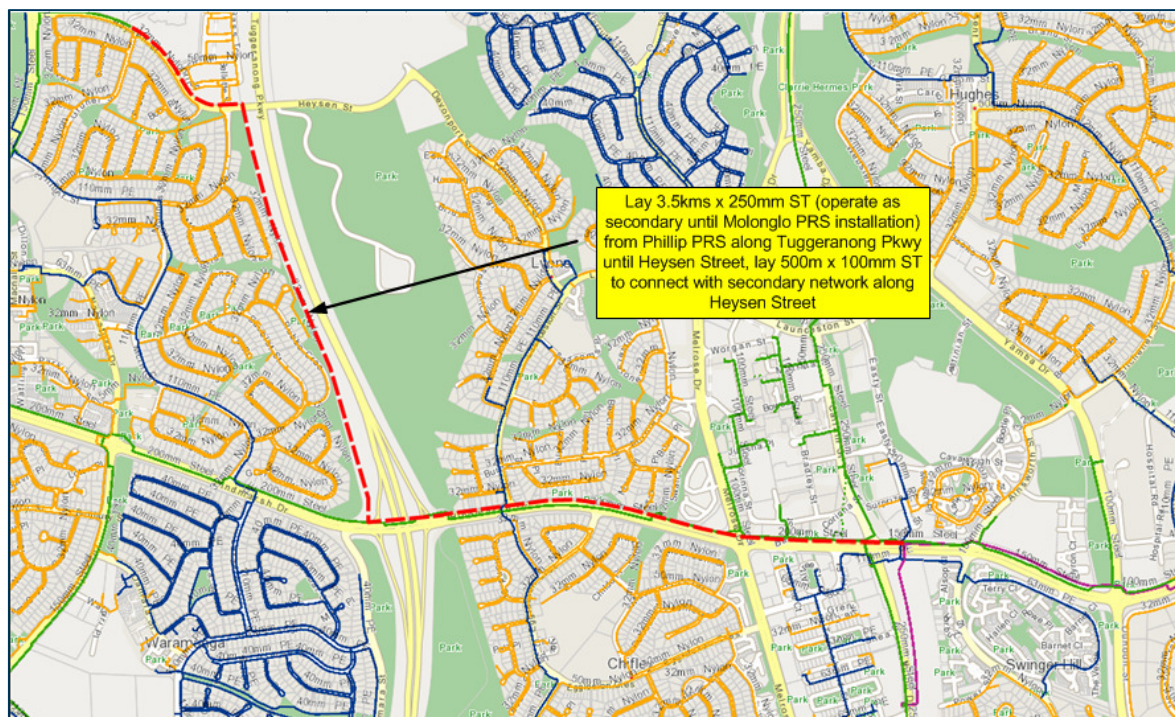
Note this is a different project than the Molonglo Secondary extension projects.

Table 5–11: Molonglo Primary Extension Stage 1 Options and Scope

	Molonglo Primary Extension Stage 1	Option 2
Scope	Lay 3.5kms of 250mm ST from Phillip PRS (Woden Town Centre) along Tuggeranong Parkway to Heysen Street. Lay 500m of 100mm ST to connect with secondary network along Heysen Street. This main will operate at Secondary pressure until it is required to be used as a primary main. The exact timing is subject to the rate of housing development.	Lay 10km of Primary main as one project.
Value	\$10M	\$20M
Benefits	This option will provide supply to the secondary	N/a

	Molonglo Primary Extension Stage 1	Option 2
	network extensions required to supply housing growth.	
Disadvantages	N/a	High upfront CAPEX; No availability of route at this stage.
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development area.
Recommendation	Preferred	Not Preferred

Figure 5–11: Molonglo Primary Extension Stage 1



5.8.3 PROJECT OPTIONS AND SCOPE

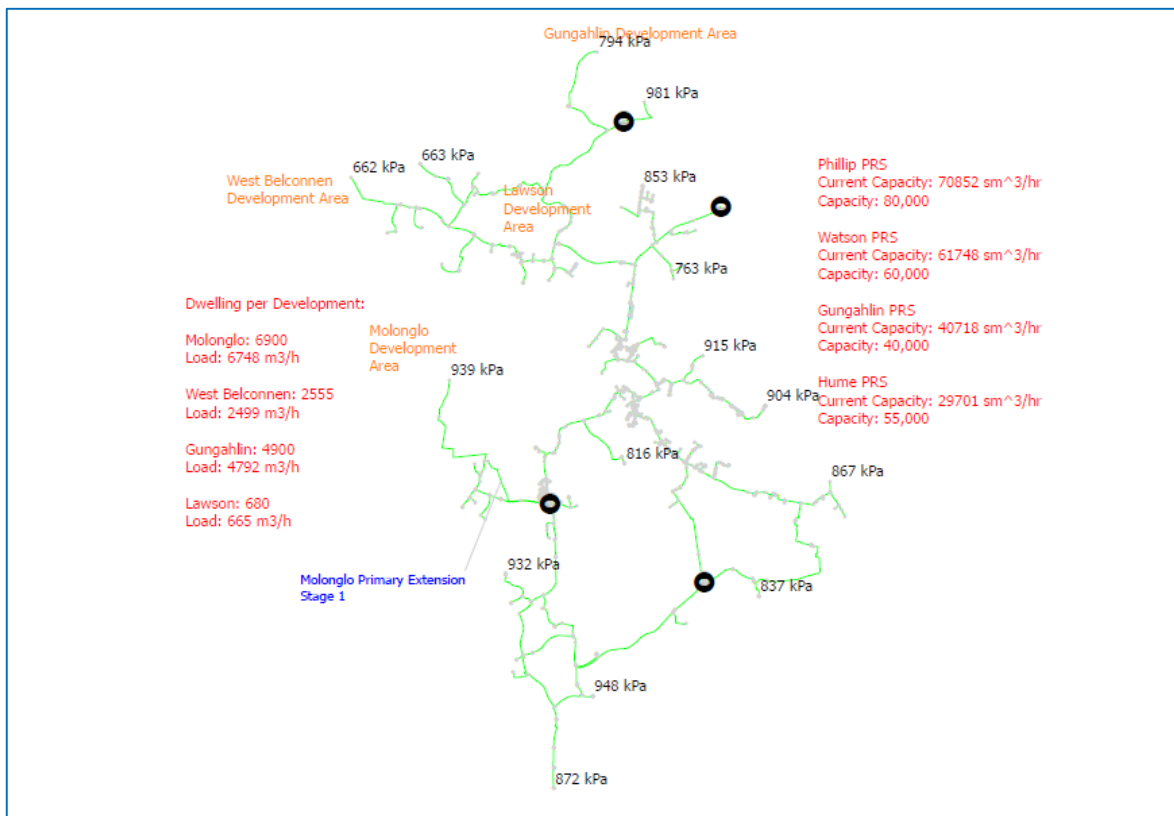
Due to the growth of the Molonglo Valley Development and the capacity limitation of Phillip PRS, by 2020 an upgrade to Phillip PRS is required in order to supply sufficient capacity into the Secondary network to support ongoing growth and existing customers and prevent large scale loss of supply.

Table 5–12: Phillip PRS Capacity Upgrade Project Options and Scope

	Phillip Capacity Upgrade	Option 2
Scope	Upgrade Phillip PRS to 80,000 scmh The final timing is subject to the rate of housing development.	N/a

	Phillip Capacity Upgrade	Option 2
Value	\$6M	N/a
Benefits	This will ensure that Phillip PRS will be able to supply the expanding network	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development area.	N/a
Recommendation	Preferred	Not Preferred

Figure 5–12: Network Performance Severe Winter 2020 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2020 2 % organic growth 2013-2020 New Estate Growth	With the commissioning of the Molonglo Primary extension, operating as a secondary main, and upgrade to the Philip PRS, supply to secondary and medium pressure networks is satisfactory

5.9 NETWORK PROJECTIONS FOR 2022

The forecast development in the new suburb of Taylor and adjacent areas in Gungahlin is beyond the boundaries of the current network. This will require secondary augmentation to maintain supply.

5.9.1 NETWORK UNTREATED RISK ASSESSMENT 2022

Table 5–13: Network Untreated Risk Assessment 2022

	Severe Winter	Security of Supply
Financial	~\$33k from OPEX per loss of supply incidents and loss of revenue. Minor	N/A
Operational	Potential loss of gas supply to ~100 customers for <12 hours Minor	N/A
Reg & Compliance	Minimal regulatory enquiries Minor	N/A
B/R/S	Little or no stakeholder interest, requiring minimal stakeholder communication. Minor	N/A
Consequences	Minor	N/A
Likelihood	Possible	N/A
Risk Level	Medium	N/A

5.9.2 PROJECT OPTIONS AND SCOPE

By 2022, housing growth north of the Moncrieff extension laid in 2016 along Horse Park Drive will require an additional secondary extension to supply the medium pressure network to that area.

Table 5–14: Taylor Secondary Extension Options and Scope

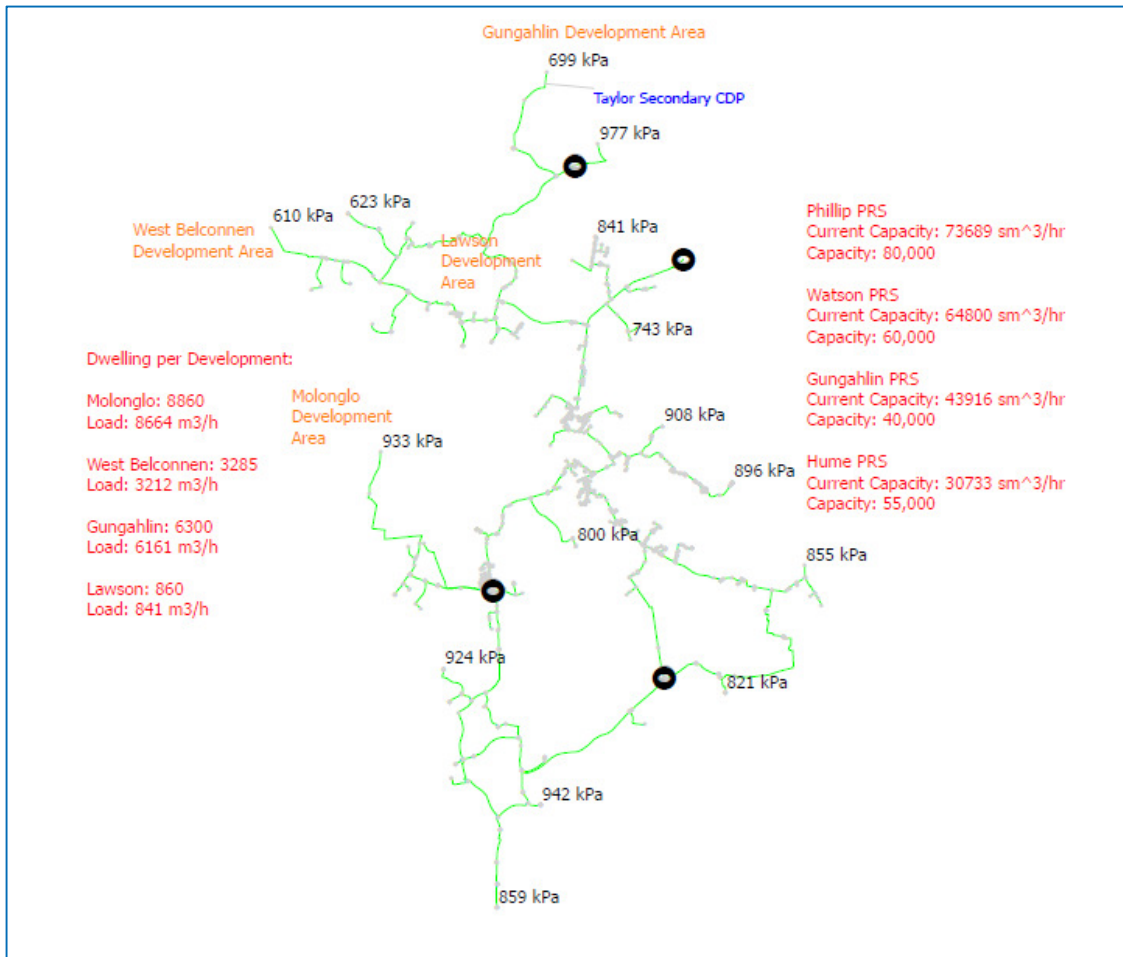
	Taylor Secondary Extension	Option 2
Scope	Lay approximately 4kms of 150mm steel main along Horse Park Drive from the end of the Moncrieff secondary extension. Install a DR at its end.	Another secondary extension route was considered from Amaroo, However due to the significant increase in length, this option would be far more expensive, and was considered infeasible.
Value	\$4M	N/a
Benefits	This will provide supply to the market expansion of the medium pressure network in the suburb of Taylor, north of Horse Park Drive	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures capacity in the medium pressure network supplying the growing housing estates	N/a

	Taylor Secondary Extension	Option 2
	in Taylor	
Recommendation	Preferred	

Figure 5–13: Taylor Secondary Extension



Figure 5–14: Network Performance Severe Winter 2022 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2022 2 % organic growth 2013-2022 New Estate Growth	The Taylor secondary extension will provide supply to the medium pressure network extensions laid in response to housing development.

5.10 NETWORK PROJECTIONS FOR 2024

By about 2024, a second extension to the Molonglo primary main will be required if the current staged concept is implemented. The timing and scope will be reviewed post implementation of stage 1. For planning purposes this is currently presumed to be 2024.

5.10.1 PROJECT OPTIONS AND SCOPE

The Molonglo Primary Mains extension will be completed in three stages, in 2020 (Stage 1), this extension (Stage 2) and Stage 3 anticipated about 2033-34. The Stage 2 extension timing is flexible, as its major impact is when it is interconnected with Stage 3 and the Molonglo PRS at the terminus of Stage 3.

Table 5–15: Molonglo Primary Main Extension Stage 2

	Molonglo Primary Main Extension Stage 2	Option 2
Scope	2.9kms of 250mm steel main extending from Molonglo Stage 1 along Tuggeranong Parkway. This will operate at secondary pressures until interconnected with Stage 3 in 2033/34.	Lay 10km of Primary main as one project.
Value	\$5M	\$20M
Benefits	This will provide pressure to the secondary and medium pressure networks beyond its end. Additionally, it will provide the capacity to interconnect with Stage 3 when built.	N/a
Disadvantages	N/a	High upfront CAPEX; No availability of route at this stage.
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development area.	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development area.
Recommendation	Preferred	Not Preferred

Figure 5–15: Molonglo Primary Extension Stage 2

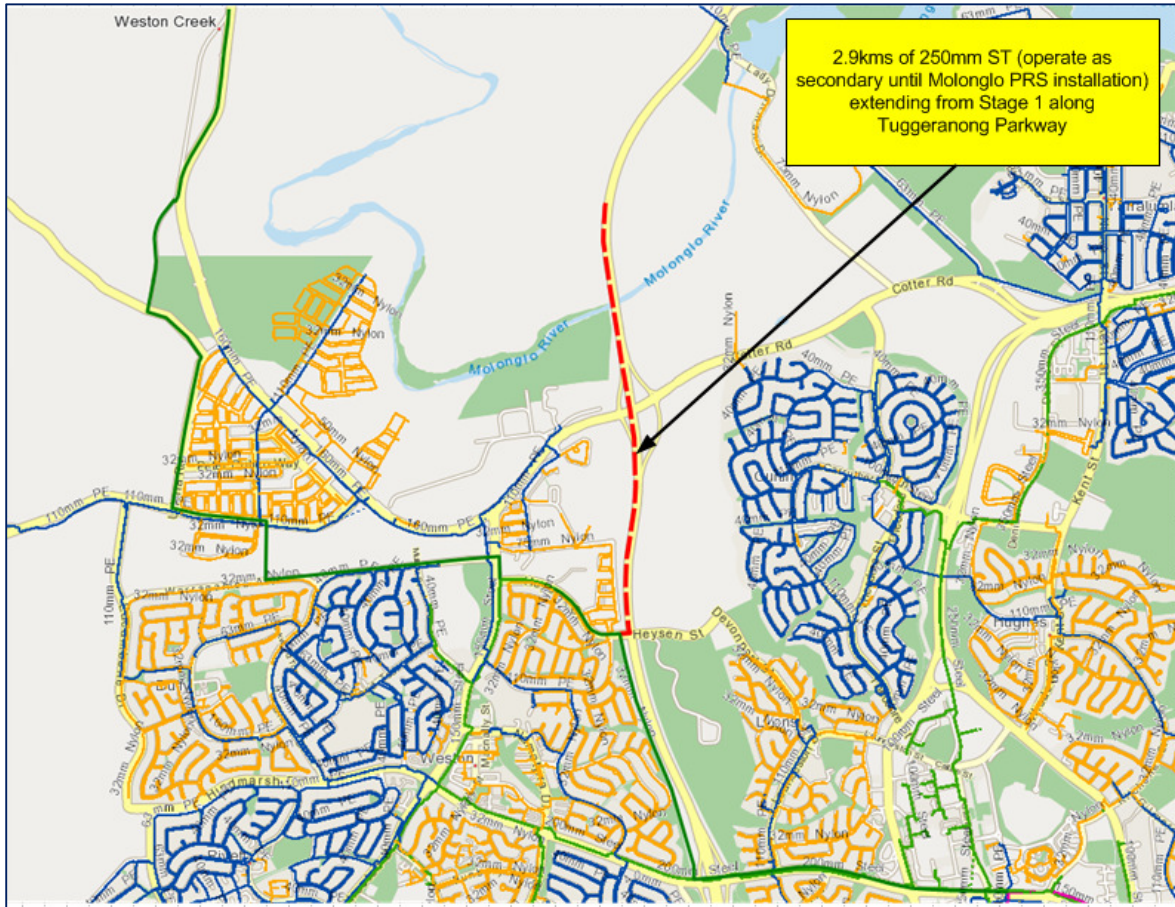
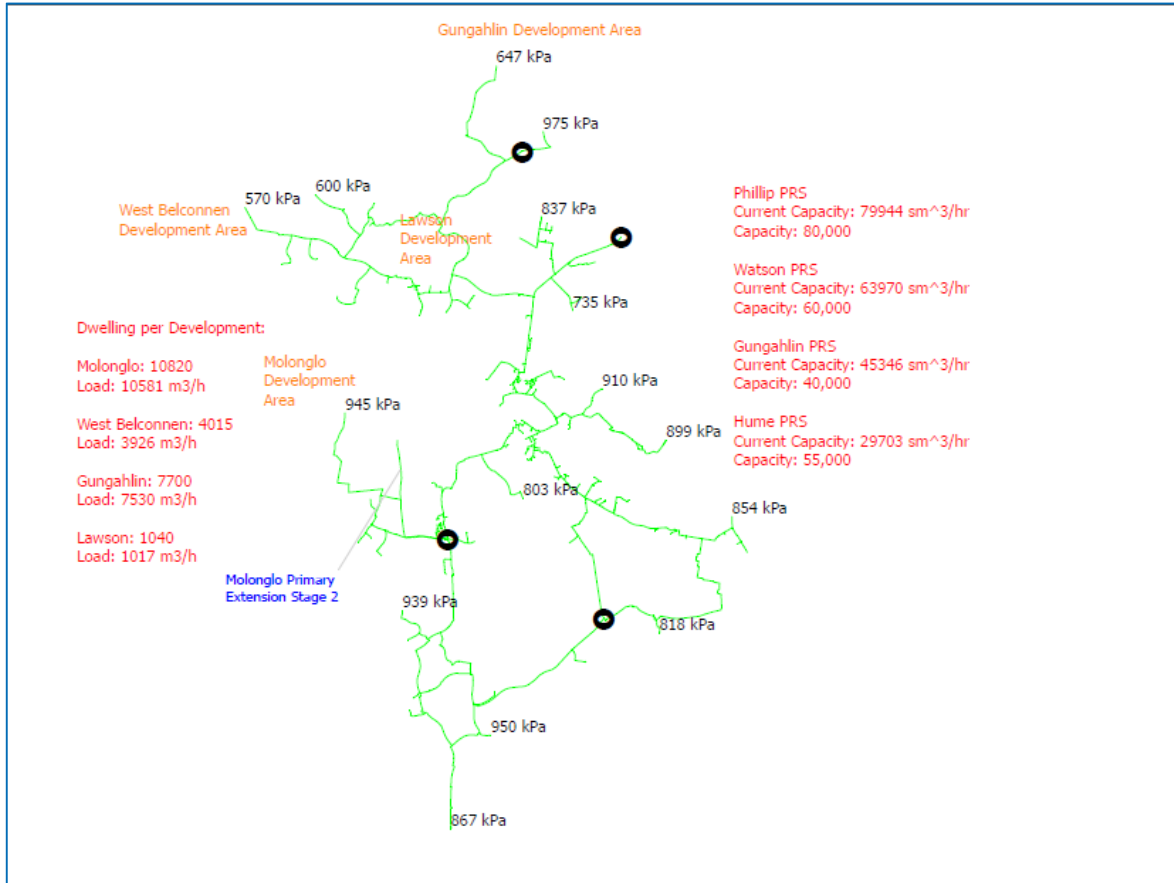


Figure 5–16: Network Performance Severe Winter 2024 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2024 2 % organic growth 2013-2023, 1% 2024 New Estate Growth	Performance is satisfactory

5.11 NETWORK PROJECTIONS FOR 2025

By about 2025, forecast housing growth in the Molonglo area will be in the north of the area, distant from the previous secondary extensions.

5.11.1 NETWORK UNTREATED RISK ASSESSMENT 2025

Table 5–16: Network Untreated Risk Assessment 2025

	Severe Winter	Security of Supply
Financial	~\$44k from OPEX per loss of supply incidents and loss of revenue.	N/A

	Severe Winter	Security of Supply
	Minor	
Operational	Potential loss of gas supply to ~1500 customers for <12 hours Minor	N/A
Reg & Compliance	Minimal regulatory enquiries Minor	N/A
B/R/S	Little or no stakeholder interest, requiring minimal stakeholder communication. Minor	N/A
Consequences	Minor	N/A
Likelihood	Possible	N/A
Risk Level	Medium	N/A

5.11.2 PROJECT OPTIONS AND SCOPE

Molonglo Secondary Extension is the third and final extension to the secondary required to supply the growing suburbs in the Molonglo development area. It will connect with the Molonglo PRS when that is built.

Table 5–17: Molonglo Secondary Extension Stage 3 Options and Scope

	Molonglo Secondary Extension Stage 3	Option 2
Scope	Lay 3.2kms of 200mm steel main continuing from Molonglo Secondary Extension Stage 2 along Coppins Crossing Rd to the proposed location of Molonglo PRS to the north of the Molonglo River. Includes a 5000 scmh DR The timing of this extension is subject to the rate and direction of housing development.	There are possible variations of exact route that may emerge as the suburban roads develop.
Value	\$5.5M	N/a
Benefits	This option will provide supply to the secondary network extensions required to supply housing growth in the Molonglo development area.	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development Area.	N/a
Recommendation	Preferred	

Figure 5–17: Molonglo Secondary Extension Stage 3

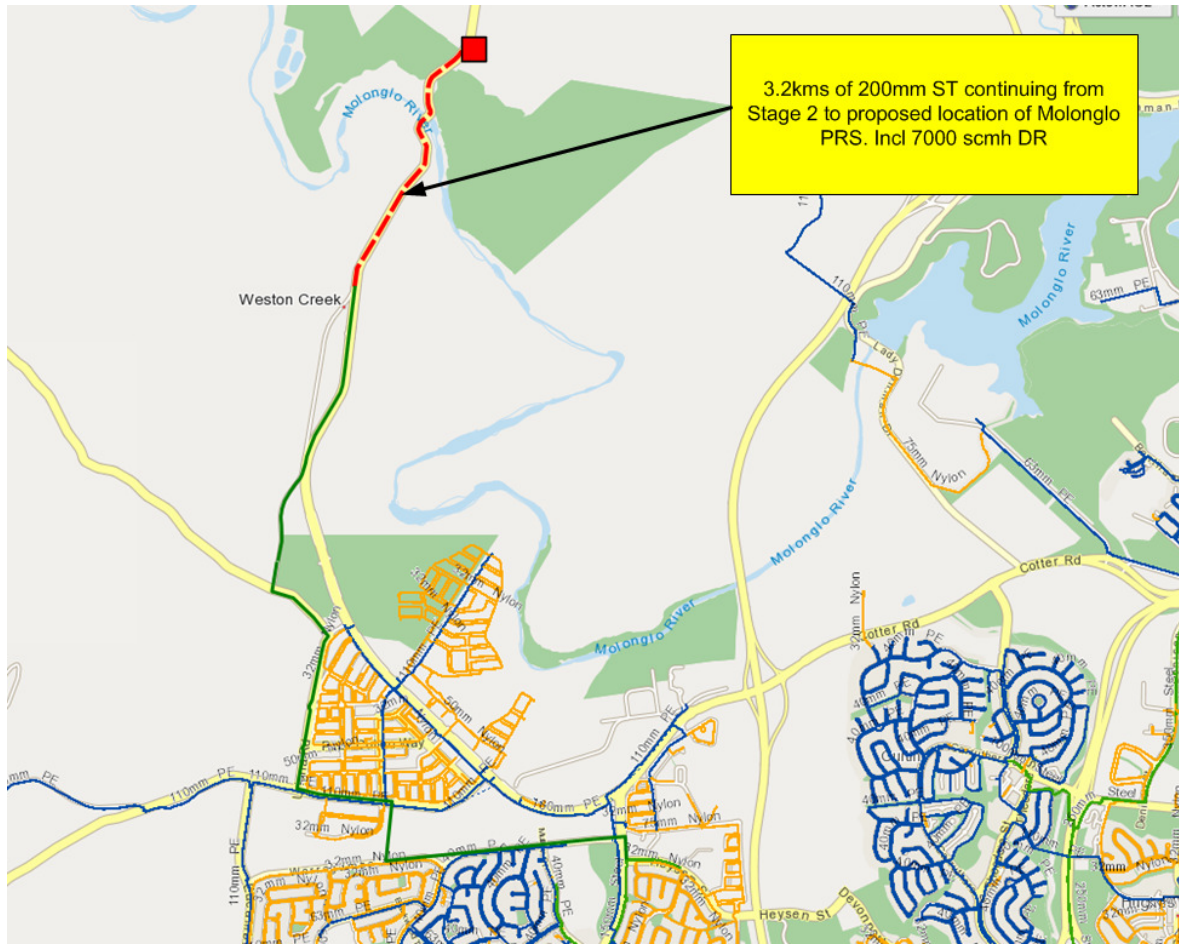
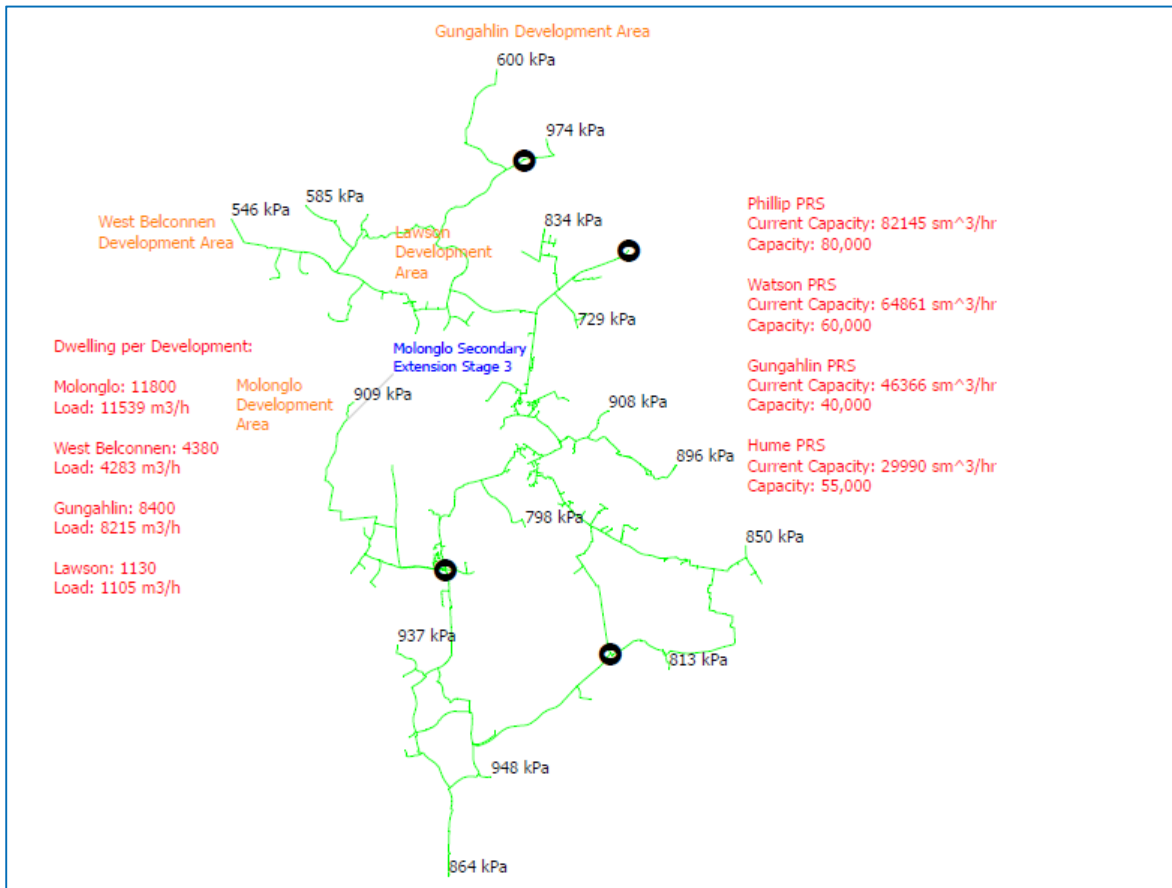


Figure 5–18: Network Performance Severe Winter 2025 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2025 2 % organic growth 2013-2023, 1% 2024-2025 New Estate Growth	With the completion of the last of three Molonglo secondary extensions, pressure to the medium pressure network is satisfactory.

5.12 NETWORK PROJECTIONS FOR 2027

By 2027, with forecast housing growth driving demand for gas, it will be necessary to construct a new PRS in order to provide sufficient capacity into the existing secondary network. Similarly, Watson TRS is forecast to be running close to maximum capacity in a 1 in 20 scenario and will require upgrade in order to maintain security of supply in the secondary network.

5.12.1 NETWORK UNTREATED RISK ASSESSMENT 2027

Table 5–18: Network Untreated Risk Assessment 2027

	Severe Winter	Security of Supply
Financial	~\$570k from OPEX per loss of supply incidents and loss of revenue. Major	N/A
Operational	Potential loss of gas supply to ~20,000 customers for >24 hours Major	N/A
Reg & Compliance	Regulator requires formal explanations and remedial action plans. Moderate	N/A
B/R/S	Adverse local media and/or heightened concern Moderate	N/A
Consequences	Moderate	N/A
Likelihood	Possible	N/A
Risk Level	Medium	

5.12.2 PROJECT OPTIONS AND SCOPE

By about 2027, with forecast housing growth, it is anticipated that the Watson TRS will be running close to maximum capacity in a one in twenty severe weather scenario.

Table 5–19: Watson PRS Capacity Upgrade Project Options and Scope

	Watson PRS Capacity Upgrade	Option 2
Scope	Upgrade the Watson PRS from 60,000 SCMh to 80,000 SCMh.	None.
Value	\$3M	N/a
Benefits	This will ensure that the downstream secondary network in the Belconnen area will be able to maintain gas supply	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Belconnen area	N/a
Recommendation	Preferred	

5.12.3 PROJECT OPTIONS AND SCOPE

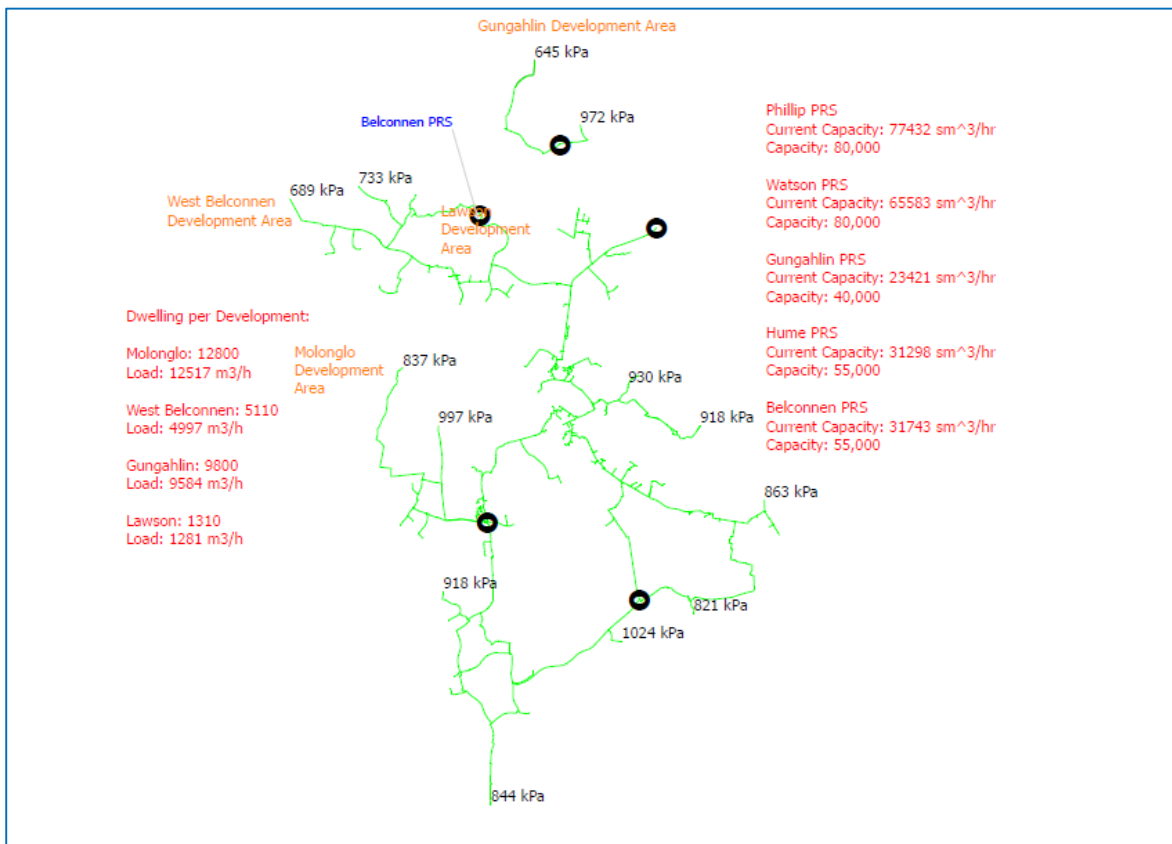
By about 2027, the terminal pressures in the secondary network will be such that an upgrade to primary pressures will be required to maintain pressure in the downstream network.

Table 5–20: Belconnen PRS Project Options and Scope

	Belconnen PRS	Option 2
Scope	Install new PRS at Belconnen. Upgrade the existing Belconnen secondary mains to primary pressure to ensure MAOPs downstream	NB: Depending on the progress of land releases in West Belconnen and Molonglo, Molonglo PRS may need to be installed before Belconnen PRS. An option to loop the primary main is also being considered for the future and this may impact on the scope and timing of this project.
Value	\$4.5M	
Benefits	This will ensure that the downstream secondary network in the Belconnen area will be able to maintain gas supply	
Disadvantages	N/a	
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Belconnen area	
Recommendation	Preferred	

5.12.4 PRESSURE PROJECTION FOR 2027

Figure 5–19: Network Projection 2027 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2027 2 % organic growth 2013-2023, 1% 2024-2027 New Estate Growth	With the implementation of the new Belconnen PRS and the upgrade to Watson PRS, supply to secondary and medium pressure networks is satisfactory.

5.13 NETWORK PROJECTIONS FOR 2031

With the projected expansion of housing in Belconnen, the third extension of the secondary main will be required around 2031.

5.13.1 NETWORK UNTREATED RISK ASSESSMENT 2031

Table 5–21: Network Untreated Risk Assessment 2031

	Severe Winter	Security of Supply
Financial	~\$205k from OPEX per loss of supply incidents and loss of revenue from inability to connect new customers. Moderate	N/a
Operational	Potential loss of gas supply to ~6500 customers for <24 hours Moderate	N/a
Reg & Compliance	Regulator requires formal explanations and remedial action plans. Moderate	N/a
B/R/S	Adverse local media and/or heightened concern Moderate	N/a
Consequences	Moderate	N/a
Likelihood	Possible	N/a
Risk Level	Medium	N/A

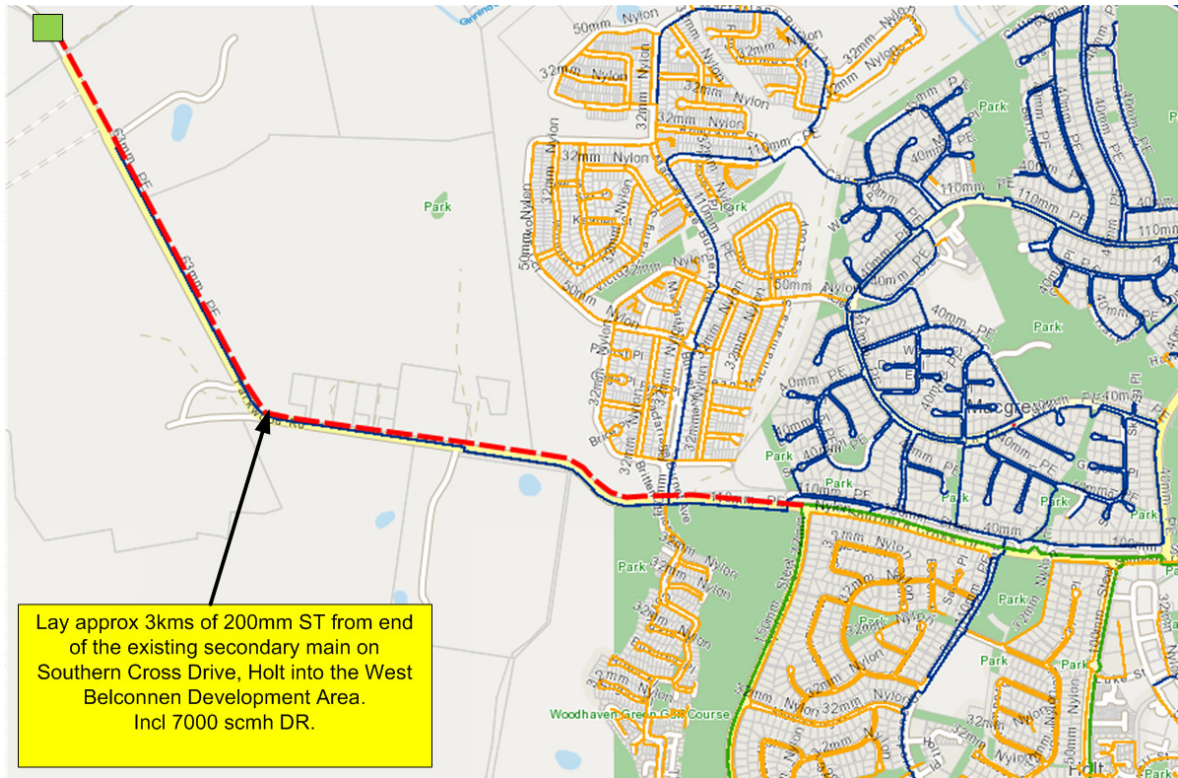
5.13.2 PROJECT OPTIONS AND SCOPE

In the West Belconnen development area, there are three secondary extensions proposed to supply the growth of the medium pressure network in that area. The timing and sequencing of the three West Belconnen secondary extensions depends on the timing and distribution of housing development in the area, which is not firm at time of writing. The first extension has been planned for implementation first as it supplies the centre of the development area, the most likely area of initial housing development.

Table 5–22: West Belconnen Secondary Extension Southern Cross Drive West Project Options and Scope

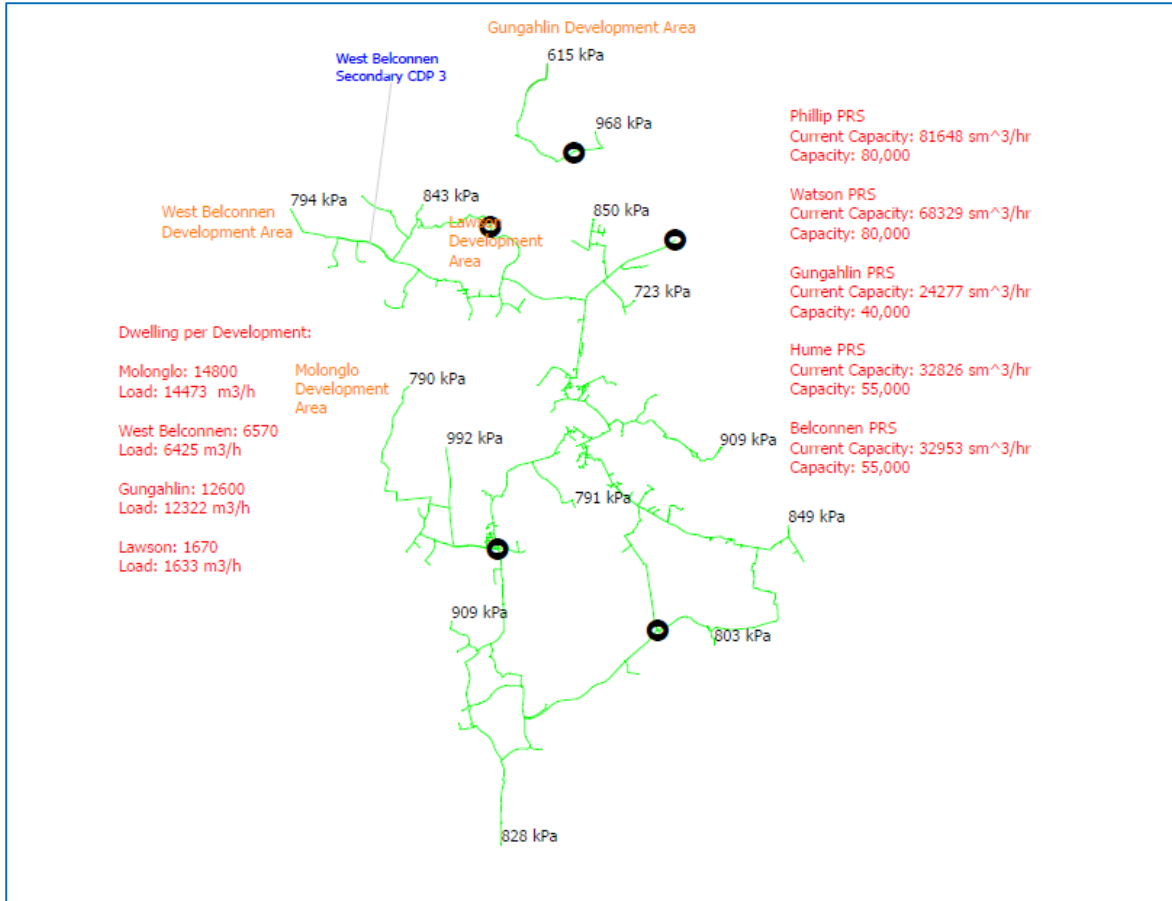
	West Belconnen Secondary Southern Cross Drive West	Option 2
Scope	Lay approximately 3kms of 200mm steel main from end of the existing secondary main on Southern Cross Drive, in Holt. Includes a 7,000 scmh DR. The exact timing and route is subject to housing subdivision and development timing in West Belconnen.	There are possible variations of exact route that may emerge as the suburban roads develop.
Value	\$5M	N/a
Benefits	This option will provide supply to the secondary network extensions required to supply housing growth.	N/a
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the West Belconnen Development area	N/a
Recommendation	Preferred	

Figure 5–20: West Belconnen Secondary Extension Southern Cross Drive West



5.13.3 PRESSURE PROJECTION FOR 2031

Figure 5–21: Network Projection 2031 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2031 2% organic growth 2013-2023, 1% 2024-2031 New Estate Growth	With the implementation of West Belconnen extension Stage 3, supply to the medium pressure network is satisfactory.

5.14 NETWORK PROJECTIONS FOR 2033

By about 2033, a third secondary extension will be required to support the ongoing growth in the West Belconnen Development area. Also, a third primary extension in the Molonglo Valley Development area is forecast to be required by this time. This Molonglo Primary Extension Stage 3 will be tied into the existing secondary network, in order to supply capacity for continuing growth in the Molonglo Valley Development Area.

5.14.1 NETWORK UNTREATED RISK ASSESSMENT 2033

Table 5–23: Network Untreated Risk Assessment 2033

	Severe Winter	Security of Supply
Financial	~\$165k from OPEX per loss of supply incidents and loss of revenue. Moderate	N/A
Operational	Potential loss of gas supply to ~5,000 customers for <24 hours Moderate	N/A
Reg & Compliance	Minimal regulatory enquiries Minor	N/A
B/R/S	Little or no stakeholder interest, requiring minimal stakeholder communication. Minor	N/A
Consequences	Minor	N/A
Likelihood	Possible	N/A
Risk Level	Medium	N/A

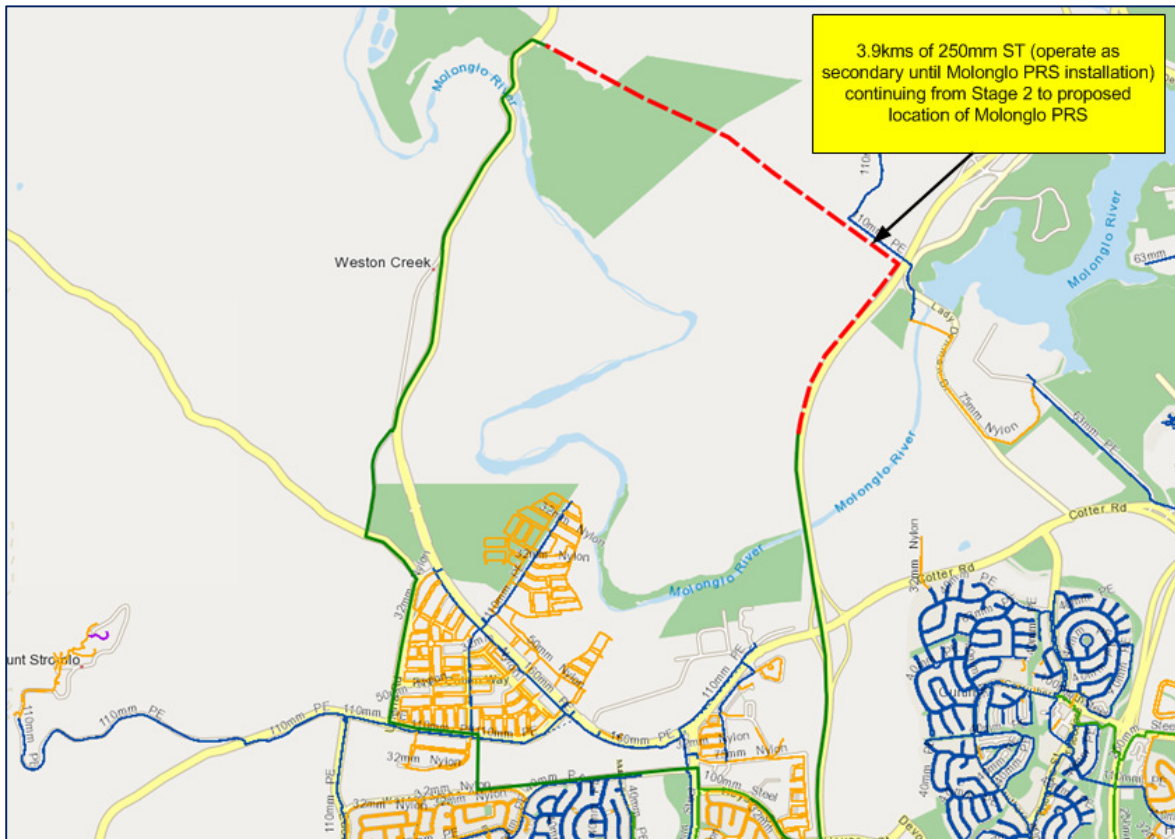
5.14.2 PROJECT OPTIONS AND SCOPE

With the growth on the periphery of the Canberra networks, a further primary extension is required.

Table 5–24: Molonglo Primary Main Extension Stage 3

	Molonglo Primary Main Extension Stage 3	Option 2
Scope	Lay approximately 4 kms of 250mm steel main from the end of Stage 2 to the proposed location of Molonglo PRS Operate as secondary until Molonglo PRS installation (currently beyond 2035)	Lay 10km of Primary main as one project.
Value	\$5M	\$20M
Benefits	This will ensure that the downstream secondary network in Molonglo development area will be able to maintain gas supply	N/a
Disadvantages	N/a	High upfront CAPEX; No availability of route at this stage.
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development area.	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Molonglo Valley Development area.
Recommendation	Preferred	Not Preferred

Figure 5–22: Molonglo Primary Extension Stage 3



5.14.3 PROJECT OPTIONS AND SCOPE

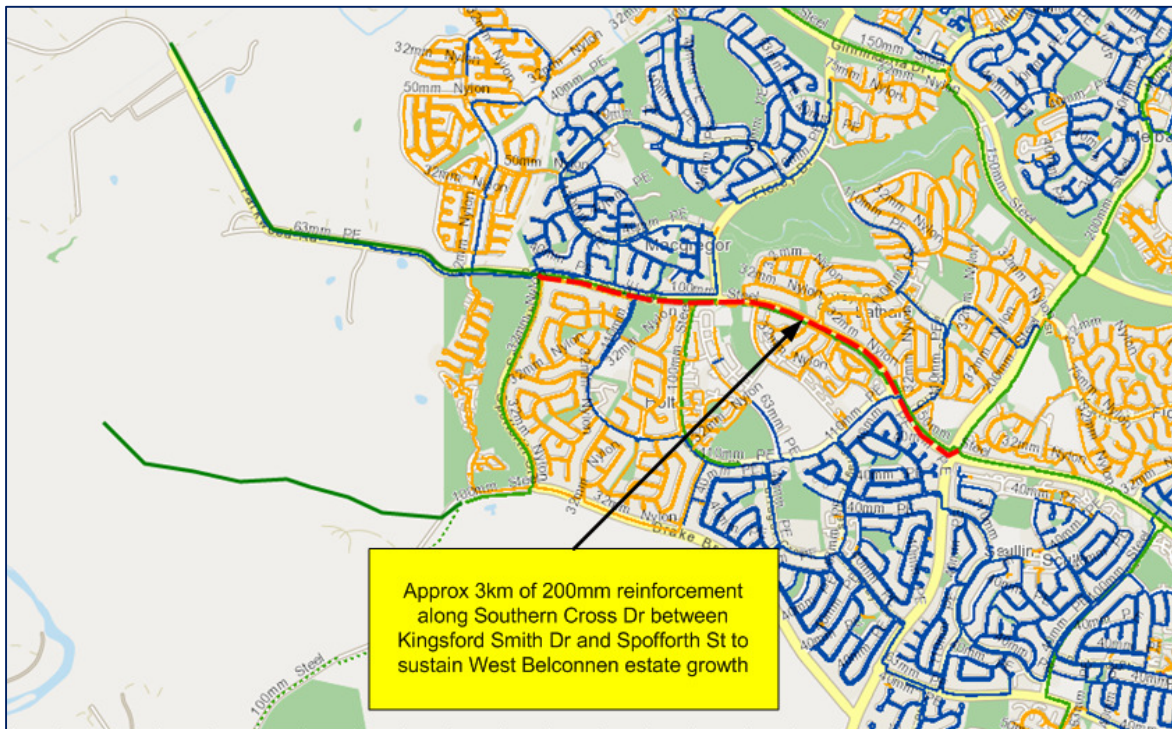
There are three secondary extensions supporting the market expansion growth in West Belconnen. The timing and sequencing of the three Stages depends on the timing and distribution of housing development, which has not been announced at time of writing. Therefore the timing and sequencing of these three extensions may be subject to change. At this time, it is anticipated that West Belconnen Secondary Extension 3, which is a reinforcement project, will precede West Belconnen Secondary Extension Southern Cross Drive East, which will extend the network into a greenfields area that has yet to be approved.

Table 5–25: West Belconnen Secondary Extension Southern Cross Drive East

	West Belconnen Secondary Extension Southern Cross Drive East	Option 2
Scope	Approximately 3km of 200mm ST reinforcement along Southern Cross Dr between Kingsford Smith Dr and Spofforth St, interconnecting with Secondary Extension Stage 1	None.
Value	\$4M	N/a
Benefits	This will ensure that the downstream secondary network in the West Belconnen development	N/a

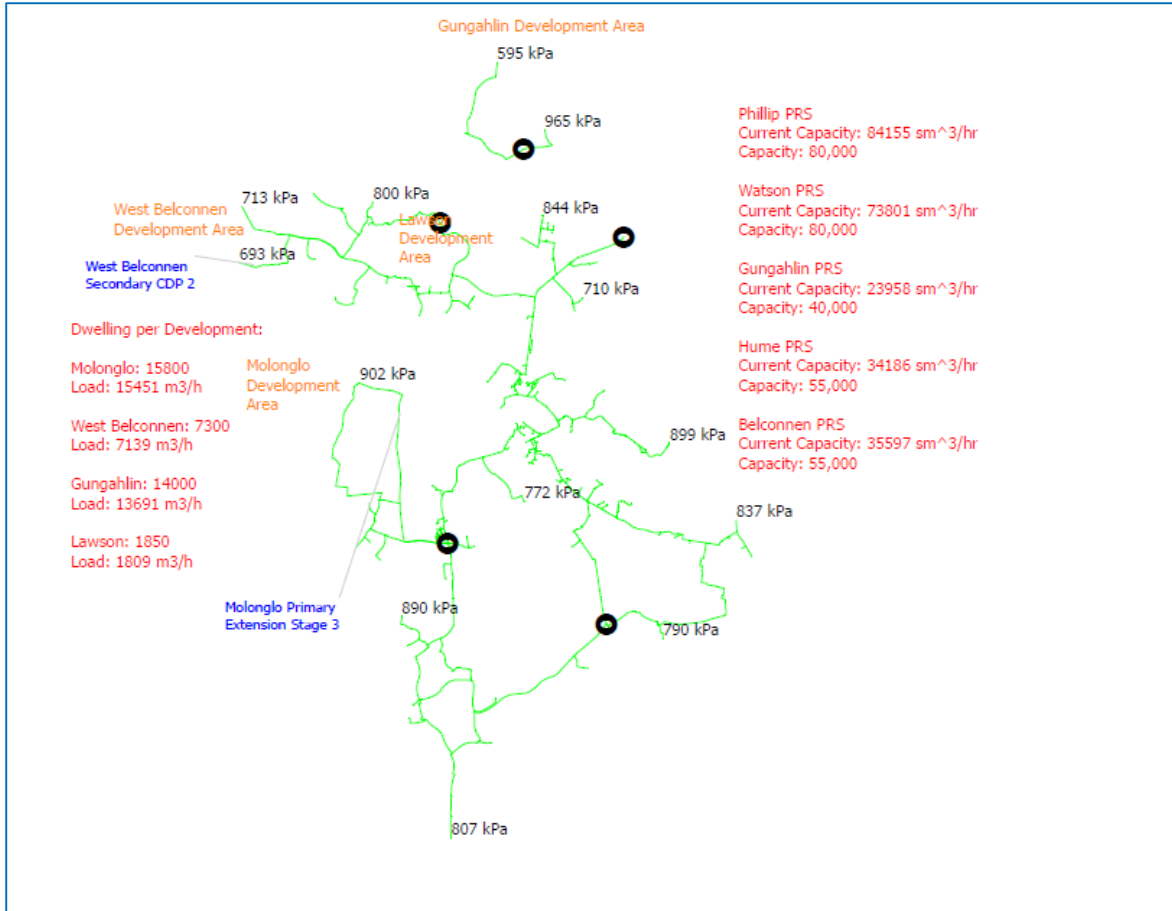
	West Belconnen Secondary Extension Southern Cross Drive East	Option 2
	area will be able to maintain gas supply	
Disadvantages	N/a	N/a
Treated Risk	Ensures ongoing capacity in the medium pressure network supplying the growing housing estates in the Belconnen area	N/a
Recommendation	Preferred	

Figure 5–23: West Belconnen Secondary Extension Southern Cross Drive East



5.14.4 PRESSURE PROJECTION FOR 2033

Figure 5–24: Network Projection 2033 Post CDP



Projection Assumptions	Projected Performance
Severe (one in twenty) winter 2033 2 % organic growth 2013-2023, 1% 2024-2033 New Estate Growth	With the implementation of the two high pressure extensions, supply to the medium pressure networks at their perimeter is satisfactory.

Appendix A

Facility Capacities

Page intentionally blank

A1. FACILITY CAPACITIES

A1.1 CURRENT FACILITY DETAILS

Facility	Location	Inlet Pressure	Outlet Pressure	Design Capacity (scmh)	Comments
Gungahlin PRS	Mirrabei Dr cnr Gundaroo Dr	6895 kPa	1050 kPa	50,000	
Watson TRS	Federal Hwy	6895 kPa	1050 kPa	60,000	
Jerrabomberra POTS	Hindmarsh Dr cnr Monaro Hwy	6895 kPa	1050 kPa	5,000	
Phillip PRS	Athllon Dr cnr Parramatta St	6895 kPa	1050 kPa	48,000	

A1.2 FUTURE FACILITY DETAILS

Facility	Location	Inlet Pressure	Outlet Pressure	Design Capacity (scmh)	Comments
Hume PRS	Monaro Hwy cnr Lanyon Dr	6895 kPa	1050 kPa	50,000	
Belconnen PRS	TBD	6895 kPa	1050 kPa	50,000	
Molonglo PRS	TBD	6895 kPa	1050 kPa	TBD	

Appendix B
File Locations

Page intentionally blank

B1. NETWORK FILE LOCATIONS

B1.1 NETWORK FOLDER:

G:\SOP\nds_desn\networks\CAPACITY ASSESSMENTS\CA\Canberra\Secondary

G:\SOP\nds_desn\networks\HIGHPRES\CANBERRA\Val_14\CA

B1.2 SIMULATIONS:

Scenario	Filename
Secondary 1 in 20 2014	Secondary 1 in 20 2014.mdb
Secondary 1 in 20 2015	Secondary 1 in 20 2015.mdb
Secondary 1 in 20 2016	Secondary 1 in 20 2016.mdb
Secondary 1 in 20 2017	Secondary 1 in 20 2017.mdb
Secondary 1 in 20 2019	Secondary 1 in 20 2019.mdb
Secondary 1 in 20 2020	Secondary 1 in 20 2020.mdb
Secondary 1 in 20 2022	Secondary 1 in 20 2022.mdb
Secondary 1 in 20 2024	Secondary 1 in 20 2024.mdb
Secondary 1 in 20 2025	Secondary 1 in 20 2025.mdb
Secondary 1 in 20 2027	Secondary 1 in 20 2027.mdb
Secondary 1 in 20 2031	Secondary 1 in 20 2031.mdb
Secondary 1 in 20 2033	Secondary 1 in 20 2033.mdb

B1.3 OTHER SUPPORTING FILES

Scenario	Filename
Capacity Assessment	Canberra Primary and Secondary Network Capacity Assessment 2013 - 2033 v2.docx