City of Greater Geelong

Northern and Western Geelong Growth Areas
Utility Servicing Strategy

May 2019

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1. Introduction

1.1 Project Overview

1.1.1 Project Overview

The City of Greater Geelong (CoGG) seeks to address Geelong's long-term population increase by facilitating urban growth in both the western and northern regions of Geelong as identified in the G21 Regional Growth Plan. The Northern and Western Geelong Growth Areas (NWGGA) project seeks to transform the mainly greenfield farmland and rural living in these regions into mixed use zones incorporating living, employment and open space to facilitate Geelong's long-term population growth. The NWGGA will create approximately 39,000 residential dwellings and a population of approximately 110,000 people.

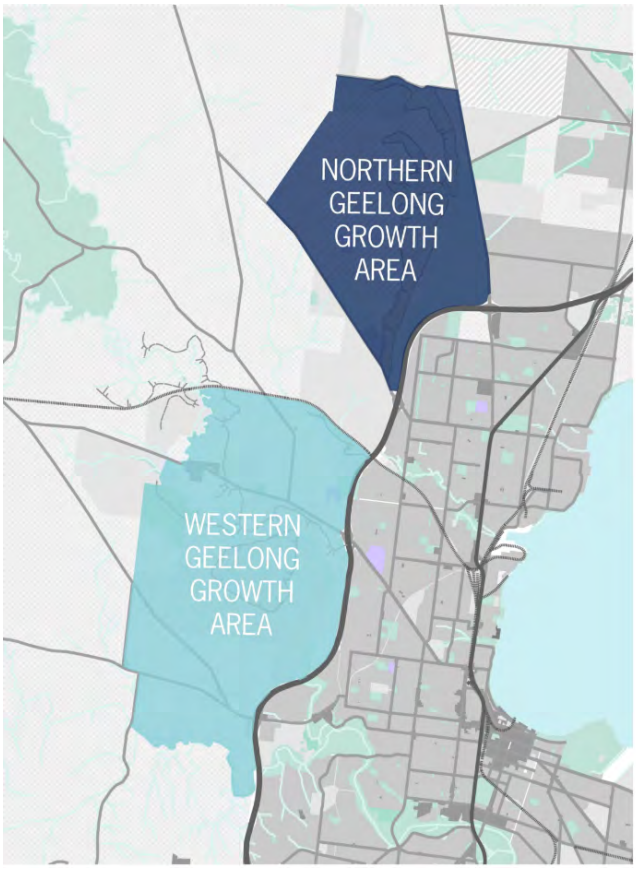


Figure 1 Boundaries of the Northern and Western Geelong Growth Areas[1]

Figure 1 illustrates the boundaries of the Northern Geelong Growth Area (NGGA), in the suburb of Lovely Banks, and the Western Geelong Growth Area (WGGA) encompassing Batesford South and Bell Post Hill. The NGGA is bounded by Stacey's Road to the north, Geelong Ring Road (Princes Hwy) Road to the south, Bacchus March Road to the east and Anakie Road to the west. The WGGA is bounded by the Ballarat-Geelong railway line to the North, Barwon River to the south, the Geelong Ring Road to the east and the Moorabool River and Dog Rocks Road to the west.

1 : CoGG, "Northern and Western Geelong Growth Areas – Retrieved 30 August 2018 https://www.geeloNGGAustralia.com.au/futuregrowth/default.aspx

The existing land use in both NWGGA is predominantly rural farmland with very low density rural residential. Large sections of the NGGA were rezoned to Urban Growth Zone in 2014 by the then Minister for Planning, the remaining land mainly consisting of Farming Zones and Rural Living Zones. Currently the WGGA has not been rezoned, and consists of mainly Farming Zone, Rural Living Zone, Special Use Zone and Public Conservation and Resource Zone. The Special Use Zone is applicable to the Batesford Quarry and the Public Conservation and Resource Zone is applicable to the Barwon and Moorabool Rivers. Figure 2 and Figure 3 below illustrates the existing planning zones applicable to the NWGGA.



Figure 2 Current Planning Zones in the Northern Geelong Growth Area [http://mapshare.maps.vic.gov.au/vicplan/]

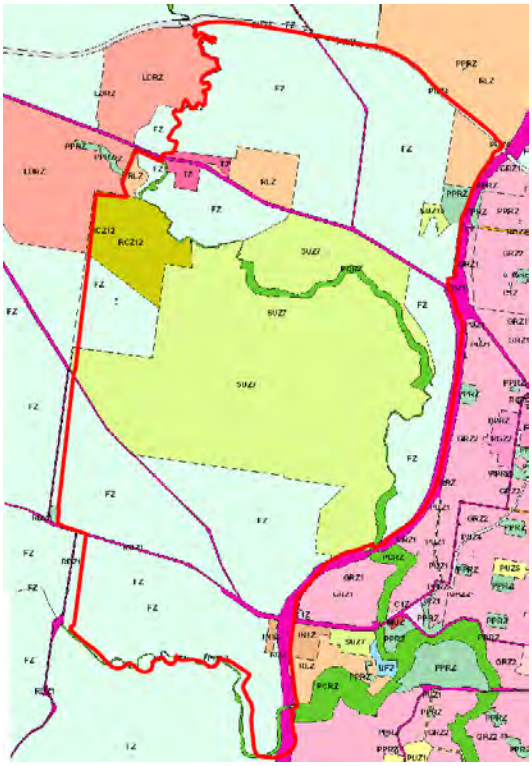


Figure 3 Current Planning Zones in the Western Geelong Growth Area [http://mapshare.maps.vic.gov.au/vicplan/]

1.2 Purpose of this report

The purpose of this report is to provide CoGG with a high level servicing strategy document to inform its Infrastructure Delivery Plan. The focus of this assessment was to determine the condition and capacity of existing infrastructure servicing the NWGGA, as well as to examine the type of infrastructure required to support forecast population growth and potential key staging limitations applicable to the growth areas. This report includes an assessment of sewerage, water, gas, telecommunications and electricity infrastructure within the NWGGA.

Table 1 outlines the Authorities consulted in this assessment. This report integrates their previous advice regarding existing and proposed infrastructure to service the NWGGA.

Table 1 Service Authorities and Stakeholders

Authority	Infrastructure Type
APA	Gas
AusNet	Gas and Electricity
Barwon Water	Water
	Sewer
NBN	Telecommunications
Powercor	Electricity
Telstra	Telecommunications

1.3 Limitations and Assumptions

The location of existing services has been determined by GHD based on information provided from Authorities. The location and depth of existing infrastructure cannot be confirmed as accurate.

Assessment of the condition and capacity of existing infrastructure has been based on advice and data received from utility providers and authorities.

This report: has been prepared by GHD for City of Greater Geelong and may only be used and relied on by City of Greater Geelong for the purpose agreed between GHD and the City of Greater Geelong as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than City of Greater Geelong arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this section of the report. GHD disclaims liability arising from any of the assumptions being incorrect.

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Information provided by stakeholders is preliminary information only, subject to change and should not be relied upon without verification.

1.4 Methodology

GHD undertook an investigation into the utility infrastructure within the NWGAA through a desktop study. This research involved utilising previous servicing information and spatial data prepared by Authorities and supplied by CoGG to GHD. The servicing advice previously provided by Authorities focussed on potential impacts of future development on existing infrastructure. This advice considered the expected constraints due to existing infrastructure on the proposed development increase, the expected impact of the proposed development on local infrastructure and the identification of staging constraints on the population growth in the NWGGA.

Previous advice provided by authorities to CoGG was from the CoGG-established NWGGA Civil Technical Reference Group (TRG), formed to discuss general servicing requirements, challenges and opportunities for the two growth areas. The TRG established the key objectives for infrastructure planning, including the preparation of an more detailed Integrated Infrastructure Delivery Plan (IIDP) as being " to provide a mechanism for the integrated and orderly rollout of infrastructure, with emphasis on innovation, sustainability and efficiency".

GHD commenced discussions with the relevant Authorities to verify the previous spatial data and servicing information was current and relevant to the NWGGA. Through these consultations, GHD was able to obtain information not previously disseminated in order to provide a comprehensive utility servicing assessment.

This report synthesises previous servicing advice and current information obtained through discussions with Authorities, in order to predict infrastructure capacity constraints and upgrade requirements necessary to facilitate development whilst maintaining an acceptable level of service to customers within the NWGGA. Proposed Infrastructure Plans have been included in Appendix D as part of this assessment.

1.5 Report Abbreviations

- AHD = Australian Height Datum
- BW = Barwon Water
- CoGG = City of Greater Geelong
- FAN = Fibre Access Node
- MOS = Main Outfall Sewer
- NBN = National Broadband Network Corporation
- NWGGA = Northern and Western Geelong Growth Areas
- NGGA = Northern Geelong Growth Area
- NWP = Northern Water Plant
- RSP = Retail Service Provider
- SMS = Safety Management Study

- WGGA = Western Geelong Growth Area
- WRP = Water Reclamation Plant

1.6 Growth Forecasts

1.6.1 City of Greater Geelong Development Forecasts

In May 2018 CoGG published the *Northern and Western Geelong Growth Areas Summary Background Report* detailing the strategy for development in the NWGGA.[2] The following summary highlights key growth and development information relevant to infrastructure servicing strategies:

- Development in the NWGGA is forecasts to accommodate approximately 110,000 new residents: 48,000 in the NGGA and 62,000 in the WGGA
- The NGGA has a study area of 2,089 hectares (approx. developable area 1,325 Ha) and is expected to include approx. 17,000 new dwellings
- The WGGA has a study area of 3,245 hectares (approx. developable area 1,730 ha) and is expected to include approx. 22,000 new dwellings

1.6.2 Barwon Water Servicing Strategy Forecasts

The servicing strategy summarised in 3.1 and 3.2 is based on the following estimated forecasts for the NWGGA, taken from Barwon Water's Feb 2016 *G21 Regional Growth Plan Further Investigations Areas Servicing Strategy* Report.

Barwon Water has a projected growth in the above report at 21,000 which is slightly higher than CoGG projection of 18,000. It is reasonable to say that the projected growth to 21,000 inhabitancy is a fair estimate over the longer term to account for the potential for full transition of the rural living lots to higher density.

Projections for the growth areas will be confirmed as the land transitions over time.

2 Available at https://www.geeloNGGAustralia.com.au/common/Public/Documents/8d5b4ef9fca75ed-backgroundreportsummary-northernwesterngeelonggrowthareas.pdf

2.

2. Existing Assets

2.1 Water

Barwon Water is the responsible authority for the distribution and reticulation of potable water to the NWGGA.

Existing water assets are shown in Appendix A (Barwon Water's *Servicing Strategy Report* Figure 3). Only potable water assets are currently present in the NWGGA. There is no non potable (recycled) water infrastructure present. Although parts of the NWGGA are currently supplied by reticulated water, significant areas are zoned Farming Zone and are without reticulated water servicing.

The GHD *G21 Regional Growth Plan Further Investigation Areas Servicing Strategy* (Feb 2016) prepared for Barwon Water (*Barwon Water Servicing Strategy*) highlights the key elements of the Geelong water supply system as follows:

- **Main service reservoirs:** West Barwon, Wurdee Boluc, Lal Lal, Korweinguboora, Bostock and Upper Stony Creek.
- **Groundwater sources:** Anglesea, Barwon Downs
- **Water treatment plants:** Wurdee Boluc, Moorabool
- **Major pipelines:** She Oaks to Monpellier, Wurdee Boluc to Montpellier, Pettavel Montpellier, Melbourne to Geelong

The *Barwon Water Servicing Strategy* summarises the following relevant information regarding the existing condition of the Geelong water supply system:

- The primary supply to the Geelong system is the Wurdee Boluc Reservoir.
- The Lal Lal Reservoir can be utilised but required the release of water through the Moorabool River reducing the efficiency of the system and can result in a decrease in water quality.
- If required, the Anglesea and Barwon Downs groundwater sources can supply water to the Wurdee Boluc Reservoir.
- The Melbourne to Geelong pipeline has been used infrequently to supply water in times of water shortage/drought. It is generally a more expensive water supply option when compared to the other available sources. As demand grows with population, BW expect this asset to be used more frequently.
- The Moorabool WTP supplies the towns in that area but only supplies the Geelong system during the summer months where demands are high.

2.2 Sewer

Barwon Water is the responsible authority for the sewer servicing to the NWGGA. Existing sewer assets are shown in Appendix A (Barwon Water's *Servicing Strategy Report* Figure 4).

The *Barwon Water Servicing Strategy* highlights the key elements of the Geelong sewer system as follows:

- The Geelong sewerage system flows from the City of Greater Geelong and Surf Coast municipalities to the Black Rock Water Reclamation Plant (WRP) that discharges treated effluent into Bass Strait.

- Flows are discharged into the Black Rock WRP through a 1650mm diameter Main Outfall Sewer (MOS).
- The Northern Outfall, Southern Outfall and Ovoid Sewers discharge into the MOS.
- A pump-boosted siphon across the Barwon River receives flows from the Ovoid sewer.
- Two pump stations delivering flows to the Black Rock WRP, Torquay and Barwon Heads Pump Station's.
- The Northern Flow Retarding Facility that buffers flows during wet weather events currently has 10ML available storage.
- The Northern Water Plant (NWP) treats wastewater to provide Class A recycled water to the Viva Refinery and also buffers flows during wet weather events.

2.3 Electricity

The entirety of the Victorian electricity transmission network is owned and operated by AusNet Services (AusNet). The distribution network in the NWGGA is operated by Powercor, one of five electricity distributors in Victoria.

Existing Ausnet overhead transmission lines are located within and adjacent to each of the growth areas. In the NGGA, a 500kV line runs from Moorabool to Sydenham, Ausnet have indicated that there are provisions for an additional transmission line to be built. The overall average width of the easement is approximately 139 metres. The transmission line running from Keilor to Geelong is 220kV and is accompanied by an easement width of approximately 74 metres. The WGGA easement includes both Powercor and Ausnet assets. Currently, the transmission line running from Geelong to Point Henry has an easement width of approximately 74 metres.

Existing trunk assets are shown in Appendix C.

2.3.1 Northern Geelong Growth Area

Powercor provided an initial servicing strategy in August 2016 and the key information regarding existing electrical assets is summarised below:

- The Northern Geelong Growth Area is currently supplied by Corio Zone Substation (CRO) and the Ford North Shore Zone Substation (FNS) through 22 kV feeder lines.
- Although these two zone substations have capacity to initially service development, the feeder lines have capacity constraints.

2.3.2 Western Geelong Growth Area

Powercor provided an initial servicing strategy in August 2016 and the key information regarding existing electrical assets is summarised below:

- The Western Geelong Growth Area is currently supplied from the Geelong Zone Substation (GL) by three 22 kV feeder lines.
- Although the GL Zone Substation has capacity to initially supply the WGGA, two feeder lines servicing the Western Geelong Growth Area have capacity constraints and the zone substation will require augmentation works to service continuing growth in demand.
- Powercor advised in February 2019 that an additional overhead line to service the Bannockburn zone substation is planned to be constructed through the WGGA along Midland Hwy in approximately 2021, hence it would form an existing asset posing a constraint to development.

2.4 Gas

Existing gas assets in the NWGGA include both distribution and transmission assets. In the Geelong region, APA Group owns the gas transmission network and AusNet Services manages the distribution network. Gas transmissions assets do not usually supply gas directly to customers and therefore these assets will only be relevant in this report to the extent which they restrict the type and location of development in the NWGGA.

2.4.1 Northern Geelong Growth Area

The majority of the Northern Geelong Growth Area is not serviced by gas infrastructure. There are a number of distribution pipelines bordering the Northern Geelong Growth Area including:

- A 180 mm high pressure main along Tower Hill Drive suppling a 63 mm pipeline along Viewhill Road to the south of the NGGA.
- 125 mm and 100 mm high pressure mains along Heales Road and Bacchus Marsh Road respectively.
- A 100 mm high pressure main along Windermere Road that connects to the infrastructure on Bacchus Marsh Road.
- These connection locations are shown in Appendix C.

It should be noted that there is an existing APA 500mm diameter high pressure gas main traversing the NGGA. A Safety Management Study (SMS) workshop was held in October 2016 as part of the NWGGA project to identify and implications of the pipe line on the growth area and an SMS report was produced.

Key points are below:

- 144 km pipeline with a total length of 4,950m within the NGGA boundary.
- Pipe line installed within a 20 m easement with the provision for a second pipeline within approximately a 10+ year timeframe.
- Easement can be used for passive open space.
- Residential use is permitted from 0 - 65m setback to the pipeline easement.
- A minimum distance APA will accept for sensitive use such as schools, hospitals to the pipeline is 350 m
- This pipeline cannot be used for reticulation supply

The location of this pipeline is shown in Appendix C.

2.4.2 Western Geelong Growth Area

The majority of the Western Geelong Growth Area is not serviced by gas infrastructure and only has a single existing connection into the area boundary. There are a number of distribution pipelines located on the borders of the Western Geelong Growth Area including:

- A 100 mm high pressure main connection through the Geelong Ring Road along Creamery Road to the Midland Highway.
- Two 180 mm high pressure mains outside the growth area boundary along the Fyansford-Gheringhap Road and to the Fyansford town centre heading south to Highton.

2.5 Telecommunications

Reference is made to *Telstra's New Developments Policy*.

The NWGGA is currently serviced by Telstra fixed line infrastructure. Telstra is currently the Infrastructure Provider of Last Resort (IPOLR)[3] until April – June 2018 at which time IPOLR responsibility for the supply of new networks will fall to NBN. Before planning and construction begins, NBN will need to be notified as they have first right of refusal on all large developments. NBN was therefore consulted as part of this assessment.

In most cases, existing 22kV electrical poles also house Telstra copper line.

Currently, the Telstra network is serviceable and capable of handling capacity, however will need upgrading if additional capacity is required. Apart from maintenance, Telstra has no plans to upgrade existing network.

Mobile phone base stations consists of antennas mounted onto the towers and other hardware. Generally they have capacity for 168 voice channels. In terms of data and internet use, multiple frequency bands exist (700 MHz, 800 MHz, 900MHz, 1800 MHz, 2100MHz, 2600MHz). Frequency bands ranging from 1800 to 2100 MHz are able to provide optimum data speeds and voice services (i.e 4G).

In the NGGA, the base station (tower) services Telstra, Optus and Vodafone networks ranging from 700MHz – 2600MHz. The mobile phone towers in the WGGA service Telstra, Optus and Vodafone networks, they range from 700MHz – 2600MHz. Refer to Appendix C for locations of existing mobile phone towers.

2.5.1 Northern Geelong Growth Area

No NBN fixed line infrastructure exists currently within the NGGA and the majority of the growth area is serviced via NBN fixed wireless as illustrated in Figure 4.

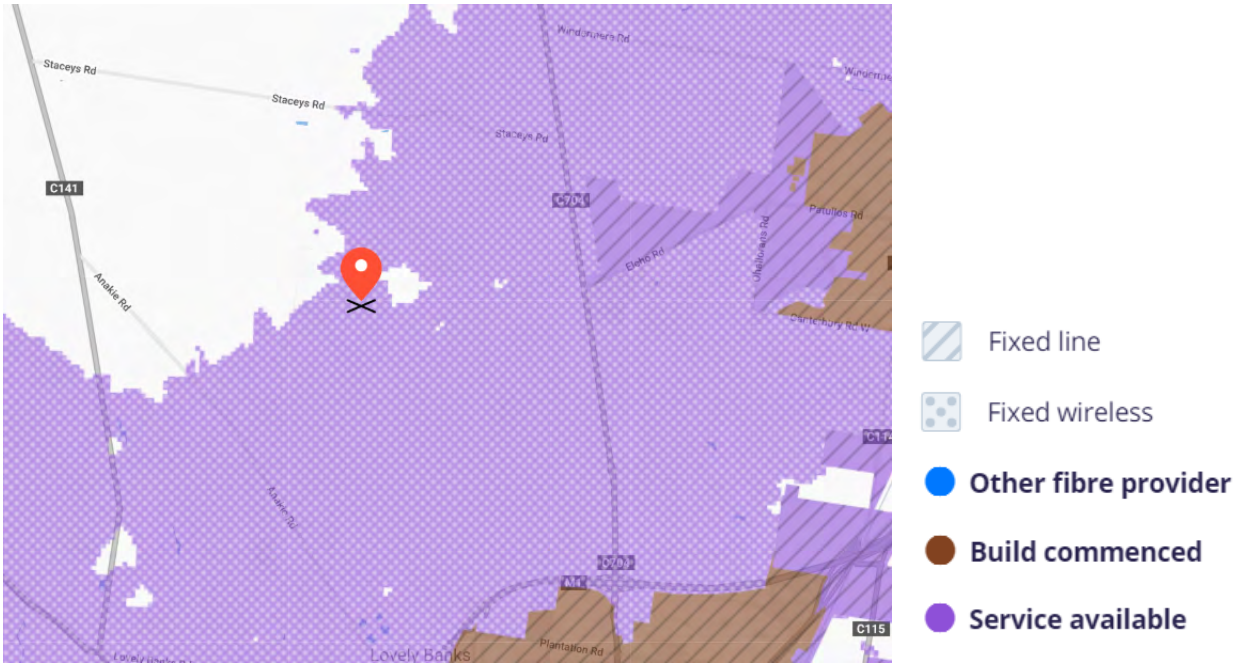


Figure 4 Existing NBN Infrastructure in NGGA

Retrieved from - https://www.nbnco.com.au/residential/learn/rollout-map.html]

It is noted that some areas are currently serviced by Telstra fixed line infrastructure (not shown).

3 The creation of IPOLRs ensures that one provider in an area of its responsibility will be obliged to service a new development, a crucial protection where developments are less commercially attractive to providers.

2.5.2 Western Geelong Growth Area

There is currently no known existing NBN fixed line infrastructure within the NGGA, but the majority of the area apart from around the Batesford Quarry is serviced via fixed wireless as shown in Figure 5.



Figure 5 Existing NBN Infrastructure in WGGA

Retrieved from - https://www.nbnco.com.au/residential/learn/rollout-map.html

It is noted that some areas are currently serviced by Telstra fixed line infrastructure (not shown).

3. Servicing Strategy

Future sequencing of development in the growth areas will be informed by the preparation of multiple precinct structure plans (PSPs) in each growth area.

The PSPs, which inform detailed development requirements, will be prepared in a logical sequence that allows urban development to reflect attributes including proximity to existing services and urban areas, drainage outfall, property configuration with timing that relates to existing land supply and growth rates.

CoGG has provided information relating to proposed PSP boundaries and their sequencing and timing on the basis of 'short', 'medium' and 'long' timeframes.

3.1 Water

It is noted that the development sequencing proposed by CoGG differs from Barwon Water's 2016 Servicing Strategy assumptions. Therefore this section summarises Barwon Water's findings and notes relevant differences, details of which are discussed further in Section 5 of this report and would be fully addressed in subsequent detailed PSP studies.

In order to provide sufficient water supply to the NWGGA areas as well as all other growth in the Geelong region, Barwon Water would need to augment its supply options. This would include the following elements:

- Moorabool WTP operating at maximum capacity (65 ML/d)
- The duplication of the Melbourne to Geelong pipeline and the pipeline operating at maximum capacity (96 ML/d)
- The upgrade of the Wurdee Boluc WTP from 190 ML/d to 270 ML/d

3.1.1 NWGGA Demand Forecasts

Future demand forecasts for the ultimate development of the NWGGA were estimated by adopting unit demands outlined in *Barwon Water Dual Pipe Design Basis Guidelines* and are summarised in Table 2 below.

Table 2 Unit Water Demand

Single Dwelling Residential Lot Size	Average daily demand (ADD) (litres/second/lot)	Peak daily demand (PDD) (litres/second/lot)	Peak hourly demand (PHD) (litres/second/lot)
500 m^2 (20 lots / ha)	0.0100	0.0230	0.0500
666 m^2 (15 lots / ha)	0.0113	0.0260	0.0566
1000 m^2 (10 lots / hectare)	0.0140	0.0320	0.0700

Table 3 summarises the peak demand forecasts based on the estimated growth forecasts outlined in section 1.6.2.

Table 3 Peak Water Demand Forecasts in the NWGGA

Growth Area	Peak daily demand (PDD) (megalitres/day)	Peak daily demand (PDD) (litres/second)	Peak hourly demand (PHD) (litres/second)
Northern Geelong Growth Area	53.9	624	1361
Western Geelong Growth Area	49.5	573	1247

3.1.2 Northern Geelong Growth Area Servicing Strategy

Reference is made to *Barwon Water's Servicing Strategy* Report, Figures 6 and 7 (as included in Appendix B noting that locations are subject to change as they were based on a superseded assumed road layout)

Barwon Water's *Servicing Strategy* provides that the Northern Geelong Growth Area can broadly be classified into two zones distinguished by areas above and below 50m Australian Height Datum (AHD), i.e. broadly above and below the monocline escarpment. Barwon Water's interim servicing strategy for development is as follows:

- Zone below 50m AHD: current system has adequate capacity to service development with existing water network from Lovely Banks Basin.
- Zone above 50m AHD: requires a new peak hour pump station supplied from the Lovely Banks Basin and a new DN600 trunk main (note: land acquisition outside of short term precincts is required).
- Typical land take for water pump station 13m x 15m.

The ultimate servicing strategies for these zones are summarised as follows:

- Zone below 50m AHD: future supply from the existing Lovely Banks Basin with new trunk infrastructure connecting to mains on the Geelong Ring Road and Bacchus Marsh Road.
- Zone above 50m AHD: future servicing includes multi-directional feed from a new trunk water main connecting to the She Oaks-Montpellier main and fed from the Moorabool WTP, and a new pump station at the Lovely Banks Basin site. New supply from the Moorabool WTP will require a new 19.6ML storage facility, a new DN750 trunk main and a new backup pump station will be also be required to ensure supply in the event that the Moorabool WTP is offline.

The Barwon Water strategy assumes that the zone below 50 metres comprises approximately 10% of the ultimate Northern Geelong Growth Area development. Hydraulic modelling has indicated that this portion of development can be serviced from the existing water network in the short to medium term. The new infrastructure required is primarily to service growth in the development zones above 50m.

Given that short and medium term precincts in NGGA are expected to be largely above the monocline escarpment (constraints in RLZ due to fragmented land ownership and GREP industrial buffer), the 'ultimate' solution would be needed during earlier stages of development. Exact development triggers would be the subject of a further detailed investigation, as would confirmation of size of development able to be serviced below the monocline.

3.1.3 Western Geelong Growth Area Servicing Strategy

Reference is made to Barwon Water's *Servicing Strategy* Report figures 9 & 10, as included in Appendix B (noting that locations, particularly of the reticulation network, are subject to change as this is based on a superseded assumed road layout).

The *Barwon Water Servicing Strategy* separated the Western Geelong Growth Area into two geological areas labelled "Bell Post Hill" and "Batesford South", broadly encompassing the regions in the Western Geelong Growth Area respectively to the north and south of the Moorabool River. Barwon Water's interim servicing strategies for these zones are summarised as follows:

- Bell Post Hill Zone (below 65m): a connection to the Montpellier-Lovely Banks transfer main will service early development and this transfer main has adequate capacity.
- Batesford South Zone: two direct connections to the She Oaks-Montpellier transfer main and ancillary new pressure reducing valves will service early development.

The ultimate servicing strategies for these zones are summarised as follows:

- Bell Post Hill Zone: a connection to the Montpellier-Lovely Banks transfer main will supply development. In the long term this main may be utilised to transfer water from the Melbourne to Geelong pipeline and this would require a new transfer pump station outside of the Growth area. Development in areas above 65 metres will require the installation of a booster pump station.
- Batesford South Zone: infrastructure required to service ultimate development includes two direct connections to the She Oaks-Montpellier transfer main and ancillary new pressure reducing valves and installation of DN 450 and DN 375 trunk mains. In the medium term two booster pump stations and connecting trunk mains are required. A future DN 825 trunk main may be required to mitigate potential issues resulting from a high maximum velocity in the She Oaks-Montpellier transfer main.

Given that CoGG's short and medium term precincts in WGGA include areas in "Bell Post Hill" above 65 m some of the ultimate infrastructure may be required in the interim/early development stage.

The detailed strategy should avoid subsequent land acquisition at later stages within early (built out) precincts to service later adjacent stages e.g. mains duplication.

Details of all of the above (including triggers for ultimate infrastructure in Batesford South) would be resolved at the PSP stage.

It is noted that the existing She-Oaks-Montpellier transfer main is located underneath the existing Fyansford-Gheringhap Road (both run diagonally through the site). Consideration needs to be given to mains relocation/easements/impact on development given that the order of the road is downgraded to the local street network as part of future development.

3.2 Sewer

The *Barwon Water Servicing Strategy* provided total flow rate forecasts for the NWGGA in order to estimate the demand load on the future sewer network as a result of development.

Refer to note at start of 3.1 Water above regarding differences between Barwon Water and CoGG assumed development precincts.

Table 4 below outlines the base flow rates utilised and summaries the total flow rates.

Table 4 Wastewater Flow Rate in the NWGGA

	Base Flow Rate per lot	Northern Geelong Growth Area	Western Geelong Growth Area	Total NWGGA
Average daily wastewater flow (ADWF) (L/s)	0.0058	120	126	**246**
Average daily wastewater flow (ADWF) (ML/d)	-	10.4	10.9	**21.3**
Peak daily wastewater flow (PDWF) (L/s)	0.0145	301	315	**616**
Peak wet weather flow (PWWF) (L/s)	0.0260	542	568	**1110**

In order to service the ultimate development of the NWGGA the Geelong sewerage system will require the following elements:

- Wet weather storage
- Upgrades to the existing system including trunk network duplications and increased pumping capacity
- Staged upgrades to the Black Rock WRP

Although hydraulic analysis indicates that the existing sewerage system will begin surcharging around 2025 (Barwon Water land use projections), Barwon Water has indicated a desire to defer significant upgrade works until 2030.

3.2.1 Interim Servicing Strategy

Barwon Water expects that the existing Geelong system will accept sewage flows from development in the NGGWA area in the short term without significant upgrade. Works required to connect the ultimate development to the existing system include the following:

- Reference is made to Barwon Water's *Servicing Strategy Report* Figure 13, in Appendix B.

  <u>Northern Geelong Growth Area</u>

- Installation of two pump stations in Lovely Banks
- One transfer rising main connecting NGGA to the Lara No. 1 gravity main.
- Installation of internal rising mains connecting the NGGA to the transfer mains.
- Installation of one storage facility

  <u>Western Geelong Growth Area</u>

- Installation of two pump stations in Batesford South, one pump station in Bell Post Hill and *two transfer pump stations.*
- One transfer rising main connecting WGGA to the Corio West gravity main.
- Installation of internal rising mains connecting the WGGA to the transfer mains.
- Installation of two storage facilities.

3.2.2 Ultimate Servicing Strategy

In addition to the infrastructure required in the interim servicing strategy, the *Barwon Water Servicing Strategy* outlines the following key works needed to service ultimate development in the NWGGA:

Reference is made to Barwon Water's *Servicing Strategy Report* Figure 12, in Appendix B.

List below covers both growth areas

- Upgrade Weddell, Northern Ovoid, Lara No.1, Corio West gravity mains
- Upgrade the new pump stations, mains, transfer pump stations and storage facilities installed in the interim servicing strategy
- Install four lift pump stations, three transfer / relift pump stations and ancillary connection rising mains (this includes RLZ pump station and main).
- Upgrade MOS including the augmentation of connecting mains and the installation of an SPS and DN1650 pipe
- Upgrade the Black Rock Water Reclamation Plant

The following is noted:

- Barwon Water's strategy identifies a potential opportunity to locate the storage off site to Heales Road
- Typical landtakes for storage facilities are up to 125m x 50m (for 15.5ML) and pump stations 60m x 30m
- As with Water above, the exact triggers for NWGGA precincts from interim to ultimate infrastructure required would be determined at the PSP stage
- The detailed strategy should avoid subsequent works and land acquisition at later stages within early (built out) precincts to service later stages

3.3 Electricity

Distribution power lines in the NWGGA would generally be located underground and sites will be required for the establishment of new kiosk substations (land take 7m x 5m)

3.3.1 Northern Geelong Growth Area

Interim development

Powercor highlighted in its initial servicing strategy the following planned upgrades relevant to supply in the Northern Geelong Growth Area:

- Works to increase the capacity on the 22 kV feeder out of CRO Zone Substation (completed in 2017) and the 22kV feeder out of the FNS zone substation.
- When the maximum feasible feeder augmentation has been completed, works to increase extend new 22 kV feeders from either supply zone substation are planned
- Two new 22 kV feeders are planned in the next 10 years and it is possible to rearrange these planned works to increase capacity in the Northern Geelong Growth Area

Full development

The following infrastructure is required to provide electricity servicing to facilitate full development in the Northern Geelong Growth Area:

- The installation of a new Lovely Banks Zone Substation near the load centre requiring a footprint of approximately 100 m x 100 and supplied from the Geelong Terminal Station (corner Cox Rd and Anakie Rd) by overhead sub transmission lines. A potential second overhead supply to the substation may be required from the east, subject to Powercor confirmation. These sub transmission lines would be surrounded by a 30 m easement.
- Powercor have advised that there is some degree of flexibility in the location of the substation, and that negotiations on location and potential for undergrounding of lines would occur at detailed design stage.
- Refer Appendix Dfor plan.
- Existing overhead transmission AusNet lines that will be retained. The easement width surrounding these transmission lines varies as discussed in section 2.3. Generally, restrictions are in place to limit the use of easements to ground level activities.

3.3.2 Western Geelong Growth Area

Interim development

Powercor highlighted in its initial servicing strategy the following planned upgrades relevant to supply in the Western Geelong Growth Area:

- Installation of a new 22 kV feeder from the GL zone substation to the Bannockburn township will provide further capacity for development (currently planned for 2021)
- The future installation of a Bannockburn Zone Substation is a planned, but unapproved proposal
- When the current feeders have reached capacity, additional 22 kV feeders will be installed from the GL zone substation
- The GL14 feeder has significant available capacity and could be used to supply the WGGA if significant new line infrastructure were installed and issues relating to private easement locations are overcome.

Full development

The following infrastructure is required to provide electricity servicing to facilitate full development in the Western Geelong Growth Area:

- The installation of a new Batesford South Zone Substation near the load centre requiring a footprint of 100 m x 100 m and supplied from a future sub transmission line between the Geelong Terminal (connecting to existing WGGA overhead line) and the planned Bannockburn zone substation by an overhead sub transmission line to Hamilton Hwy. As identified in Section 2.3.2 Powercor propose to construct a second sub transmission line to the Bannockburn zone substation along Midland Hwy in approximately 2021. These sub transmission lines are surrounded by a 30m easement.
- Powercor have advised that there is some degree of flexibility in the location of the substation, and that negotiations on location and potential for undergrounding of lines would occur at detailed design stage.
- Refer Appendix D for plan.
- Existing overhead transmission AusNet and Powercor lines that will be retained. The easement width surrounding these transmission lines is listed in Section 2.3.

3.4 Gas

In the interest of maintaining CoGG's commitment to being a carbon neutral city-region as outlined by the Clever and Creative Vision, the trunk network for gas is provided as part of the base position for servicing. The provision of gas is neither recommended nor rejected. In the context of the Framework Plan seeking to deliver sustainable development in the NWGGA, further investigation of provision of essential services without gas will be undertaken at subsequent detailed design stages.

AusNet provided a high level development assessment outlining an indicative gas servicing strategy for the NWGGA. This strategy is indicative as augmentation of the existing gas network is largely driven by development and gas is provided to customers on a connection-by-connection basis. AusNet will require the proposed gas loads and location of proposed gas connections in relation to existing gas assets to accurately advice on the proposed infrastructure required to service the development.

Reference is made to Appendix D.

3.4.1 Northern Geelong Growth Area

AusNet proposes the following indicative infrastructure connections to service the Northern Geelong Growth Area:

- A 180 mm high pressure gas main connecting to the existing main along TowerTower Hill Drive. This main will traverse Anakie and Evans Roads through to Stacey's Road.
- A 180 mm high pressure gas main connecting to the existing main along Bacchus Marsh Road and will continue through to Stacey's Road.
- Three 125 mm high pressure gas mains traversing east-west will connect the two 180 mm mains, creating a looped system currently proposed along Stacey's Road, Elcho Road and Heales Road.

A reminder that the APA high pressure gas pipeline will remain with its associated constraints. This pipe is planned to be duplicated by APA within the existing 20m easement and cannot be used for reticulation

3.4.2 Western Geelong Growth Area

AusNet proposes the following indicative infrastructure connections to service the Western Geelong Growth Area:

- A 125 mm high pressure gas main from the north-eastern boundary of the WGGA along Creamery Road, extending along the Midland Highway through to Dog Rocks Road.
- A 180 mm high pressure gas main connected to a field regulator (land take approximately 5m x 5m) from the south-east region of the WGGA. This main will extend along the Hamilton Highway through to Dog Rocks Road to connect with the NGGA extension.
- Two north-south and two east-west 125 mm high pressure gas mains that will create a looped system to service the future proposed roads located at the current quarry.

3.5 Telecommunications

NBN has provided an indicative high level servicing strategy. The purpose of this strategy is to inform high level planning decisions and NBN has highlighted that the final strategy and staging of telecommunications infrastructure installation will be influenced by developer applications.

Landline

NBN advised that telecommunications infrastructure in the NWGGA will be deployed using fibre to the node infrastructure and has highlighted the connection location points for both growth areas. Both the NGGA and WGGA will require fibre access node (FAN) sites to locate the active telecommunications infrastructure servicing the areas. NBN advised the FAN sites require approximately 60 sqm and will service approximately 11,400 dwellings.

Staging considerations require the FAN sites to be installed during the initial stages of the development and the service provider will negotiate land requirements with the developers.

Refer to Appendix D for proposed indicative FAN sites, noting that locations are subject to change at the detailed design stage.

3.5.1 Northern Geelong Growth Area

NBN provided the following indicative advice regarding servicing the NGGA with NBN telecommunications infrastructure:

- The NGGA has two potential connections points: one from Patullos Road and Elcho Road into the eastern side of the growth area, and the second via the south from Plantation road across the Geelong Ring Road.
- A minimum of two FAN sites will be required to service the area.
- The infrastructure along Elcho Road is currently in the planning stage. Further infrastructure in Lara West is under construction with planned completion in July 2019. The infrastructure in the south along Plantation Road is under construction with planned availability in July 2019.

3.5.2 Western Geelong Growth Area

NBN provided the following indicative advice regarding servicing the WGGA with NBN telecommunications infrastructure:

- The WGGA has two potential connection points: one from Hyland Street in Fyansford at the south of the WGGA which will feed under the Geelong Ring Road via the Hamilton Hwy, and the second from Neil Street at the east of the growth area which will feed under the Geelong Ring Road along the Midland Hwy.
- A minimum of three FAN sites will be required to service the area.
- The installation in the south along Hyland Street is currently under construction with planned availability around Oct 2018. Towards the East along the Midland Highway construction has already commenced with planned availability in October 2018.

3.5.3 Wireless

Mobile phone towers would be required to service mobile phone users for the full development. These towers could be located at the boundaries of the NWGGA precincts to potentially provide service to newer developments beyond the NWGGA. Locations to be identified at detailed design stage. Confirmation and liaison with applicable agents will be required before any further detailed investigation.

NBN Fixed Wireless is generally utilised in rural, bushland and remote areas where Fixed Line connections are unavailable. Telecommunications are offered by direct buried cable, wireless or satellite services. In the NWGGA, NBN have advised that Fibre to the Node (FTTN) connection will be used due to the presence of trunk infrastructure.

3.5.4 Alternate Providers

Alternate providers may provide design, construction, operation and maintenance of Fibre-to-the-Premises (FTTP) network solutions. TheirThe networks wouldnetwork not inherit the existing Telstra network and would require development of additional telecommunication infrastructure.

4. Infrastructure Funding Accountability

The Essential Services Commission (ESC) is an independent regulator that promotes the long-term interest of the Victorian consumers in regards to price, quality and reliability of essential services and regulate a wide variety of Victoria's sectors.

4.1 Water

Cost allocation of this infrastructure is yet to be determined. A specialised negotiated charge will be developed for each of the growth areas using the ESC pricing principles. Generally, for multiple developments, BW fund infrastructure less than 225mm dia. for reticulation water. Cost allocation for multiple developments include reticulation assets and BW New Customer Contributions are charged at a per lot basis.

Barwon Water's current water plan is to 1 July 2023 and at this stage does not include NWGGA. Development of the NWGGA prior to this date may incur associated cost implications including bringing forward costs. Liaison with Barwon Water is recommend if development will commence prior to this date.

4.2 Sewer

Cost allocation of this infrastructure is yet to be determined. A specialised negotiated charge will be developed for each of the growth areas using the ESC pricing principles. Generally, for multiple developments, BW fund infrastructure less than 300mm dia. for reticulation sewer (excluding pressure sewer pipelines). Cost allocation for multiple developments include reticulation assets and BW New Customer Contributions are charged at a per lot basis.

Refer to above comment on Barwon Water regarding development prior to 1 July 2023.

4.3 Electricity

Allocation of funds is through the Australian Energy Regulator. The Australian Energy Regulator regulates electricity networks and gas pipelines. Information from Powercor regarding funding has not been confirmed, the following was received previously from Powercor on similar projects.

Powercor's funding policy allocates the cost of electrical infrastructure installation to developers for works required to provide additional capacity on a sole use basis. Shared use arrangements between developments are generally funded by Powercor.

The total customer contribution depends on three components:

1. Gifted asset cost: is the value of the assets installed by the developer to be handed over to Powercor. Powercor calculates the cost of these assets on a unit rate basis.
2. Tie-in cost: is the cost of Powercor works in order to tie-in the developer installed assets to the Powercor network and energise the development.
3. Modelled revenue: is the revenue Powercor calculates the development will generate from power usage in the initial 5 years of development.

If the modelled revenue is large enough it can potentially cover the value of the gifted assets and also the tie-in cost. In this case the developer will pay little or no tie-in charge and would be eligible to claim the full rebate amount.

The cost allocation depends on how much electrical load is being added to the Powercor network and what is modelled for the costs. This will be impacted by how the development is staged and what costs are associated for electrical assets with each stage of the project.

4.4 Gas

4.4.1 Multi Lot Development

The developer must submit the New Estate Gas Supply Application Form for multi lot developments to be serviced by AusNet. AusNet will then propose a servicing option and provide a quote for the required costs to the developer.

4.4.2 Tariff Arrangements

There are two types of tariff arrangements for gas customers depending on the volume of gas required: tariff volume (Tv) customers include residential, small industrial and commercial end customers, and tariff demand customers (Td) include larger commercial and industrial end customers. AusNet provide general advice for distinguishing between the two customer types based on gas consumption: Tv customers have gas consumption below 10 terajoules per year and Td customers have gas consumption above 10 terajoules per year.[4] Customers such as residential developers usually fall into the category of a Tv customer. Td customers have an extremely high peak hourly load or annual volume required. Cost for gas is less expensive for Td customers but they are liable for greater capital costs in financing extensions and network augmentation.

Typically, provision of gas is at a lower cost to the asset owner for areas where high pressure gas mains are present or in close proximity. Financing of extensions and network augmentation would be economically assessed in accordance with Table 5 below.

Table 5 Gas Tariff Arrangements

	Tariff (volume) Tv	Tariff (demand) Td
Financing of Extensions	Economic Feasibility Tested	Almost always fully chargeable to developer Proposal will be analysed to see if any non-chargeable network benefit would be realised
Financing of Network Augmentation	Funded by APA (specific case dependent)	Economic Feasibility Tested (any revenue shortfall required to establish an economic proposal is generally chargeable to developer unless some augmentation component is incorporated to allow for other non-Td future development)

In line with regulatory requirements gas project funding is determined in several ways. The potential requirement for new infrastructure will be assessed on an individual request evaluation made via a Retailer. This evaluation includes a review of the economic viability of the connection based upon the requested demand against the gas supply infrastructure required, inclusive of any mains extensions.

4Available at <https://jemena.com.au/documents/price-reviews/gas/our-regulatory-proposal/chapter-13.aspx>

Where a request is made for installation of a gas main to a building or site for the purposes of enabling future connection, with no connection requests being current at the time of installation, the full construction cost is passed onto the developer

4.4.3 Field Regulator Cost

As outlined in section 1.1, the installation of a Field Regulator will be required as part of the WGGA. The cost for this infrastructure for a similar project in Melton which was required due to the lack of existing capacity was in the order of $500,000. Further investigation will be required to identify who is liable for this estimated cost.

4.5 Telecommunications

4.5.1 NBN Infrastructure

Developers will be liable for the cost of connection infrastructure, which is estimated to vary between $400 and $600 per premises in typical developments. Premises is defined by NBN as a single place capable of having its own physical address for which the end user may require broadband services.

Backhaul costs are attributable to the developer in certain circumstances outlined below. NBN requires an end-user (consumer) contribution of $300 per premises that is allocated to the Retail Service Provider (RSP), which may be passed through to the end-user. This end-user contribution is only applicable in new developments and developments of existing built-up areas for further construction such as this precinct.

NBN will charge a deployment contribution to developers for in-estate infrastructure and the value of these charges is shown in Table 6

Table 6 NBN Deployment Contributions on Developers for In-Estate Infrastructure

Lot Type	Developer Contribution
Single-Dwelling Unit Lot/Premises (SDU)	$600
Multi-Dwelling Unit Premises (MDU)	$400

The indicative cost allocation for backhaul for NBN infrastructure is outlined in Table 7 below.

Table 7 Developer Contributions for NBN Backhaul Infrastructure

Component	NBN Average Cost	Developer Contribution 50% of the first $1,000 per premises	Developer Contribution 100% above first $1,000 per premise
Haul	$13 / metre	$6.5 / metre	$13 / metre
Construction	$60 / metre	$30 / metre	$60 / metre

For developments that are not eligible for NBN Fixed Line connections, NBN will charge for Fixed Wireless or satellite services according to Table 8 below.

Table 8 NBN Deployment Contributions on Developers for Fixed Wireless Infrastructure

Lot Type	Developer Contribution
Single-Dwelling Unit Lot/Premises (SDU)	$1300
Multi-Dwelling Unit Premises (MDU)	$1100

5. Sequencing Principles

CoGG has provided information relating to proposed Precinct Structure Plan (PSP) boundaries and their sequencing and timing on the basis of 'short', 'medium' and 'long' term timeframes – refer to Figure 6 and Figure 7 below.

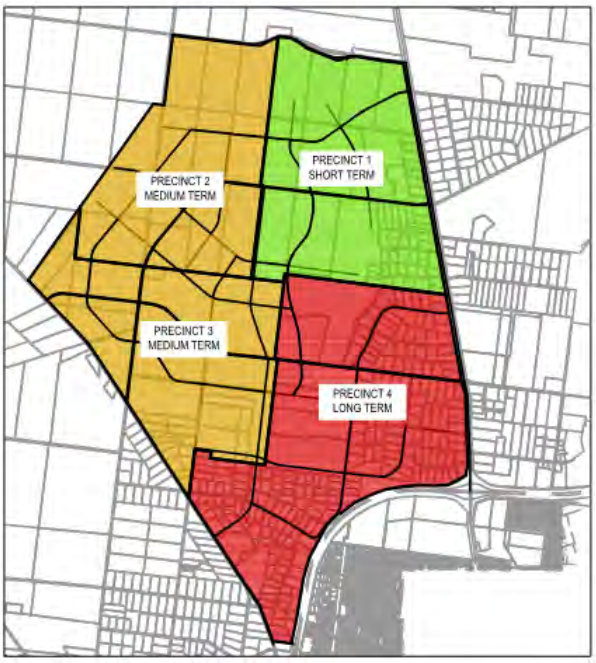


Figure 6 Proposed NGGA Sequencing Diagram

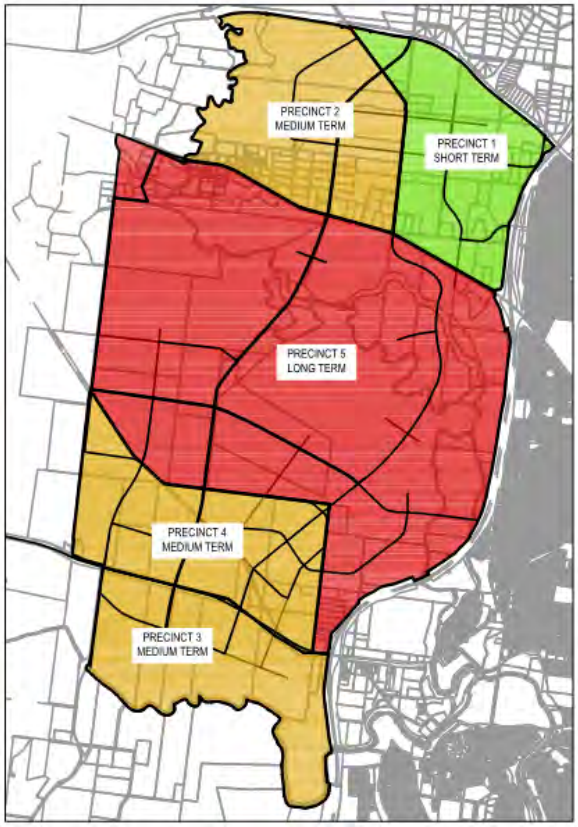


Figure 7 Proposed WGGA Sequencing Diagram

The sequencing of these areas are driven by a number of factors and the commentary below is a description of the requirements and any issues that may arise as part of these boundaries.

Every PSP will include a Detailed Servicing Plan which will need to consider the precinct servicing in terms of the overall NWGGA full development servicing strategy, to ensure sufficient provision of land in the first instance for ultimate servicing solutions.

5.1 Northern Geelong Growth Area

Powercor has stated that initial developments will have little impact on Powercor infrastructure as the appropriate capacity required will be scoped into development supply requests so will not play a critical role. A zone substation will be required which will be located near the future load centre of the growth area. Powercor have also stated that the Northern growth area is currently better prepared to deal with any power requirements due to lower capacity constraints of the existing infrastructure compared to the western growth area.

The gas infrastructure will require a significant amount of extension works from existing assets to service any of the precincts with all areas requiring trunk infrastructure. A connection into the area is available in the south along Tower Hill Drive and also along Bacchus Marsh Road.

The telecommunication infrastructure will require a significant amount of extension works from existing assets. Both NWGGA will require a FAN site.

5.1.1 Precinct 1

CoGG have indicated that Precinct 1 is the precinct currently anticipated to be most likely to be developed first. This precinct will require a significant amount of water and sewage infrastructure outside of the precinct to connect into the existing network.

5.1.1.1 Sewer

Based on the Barwon Water Servicing Strategy approximately 2.9 km of rising main along with a transfer pump station is required to connect Precinct 11 into the existing sewage network externally at Lara No. 1 GM and will be located within the Precinct 4 boundary. Based on the proposed Precinct 1 location, a further 5.9 km of rising main along with an additional pump station will be required to then connect into the transfer pump station.. The rising main could primarily run through a larger road reserve (approximately 60 m wide) along Bacchus Marsh Road and then into a smaller road reserve (approximately 20 m wide) in Houston Road and Tower Hill Drive (route may vary, to be confirmed at detailed design stage).. This sewerage infrastructure will accommodate approximately 60% of the serviceable area of this precinct.

To service the majority of the remaining area, a significant amount of gravity sewerage infrastructure will be required. This gravity main will finish at the transfer pump station constructed previously and run along Tower Hill Drive with the rising main and then run along an existing buffer (approximately 20 m) at the back of existing Rural Living Zoned properties and up then will proceed up the monocline (route may vary, to be confirmed at detailed design stage).. The remainder of the gravity line alignment and reach will primarily be dictated by the proposed road alignments or be created through future road reserves or easements.

The rising main from Precincts 1 to the proposed transfer station to the south will need to accommodate future connections injected directly into the pressure pipe or fallen back to the north into the closest downstream pump station. The second option would require a duel pipe gravity and a rising main.

5.1.1.2 Water

Precinct 1 consists of both a gravity zone as well as a pressure zone. The eastern frontage along Bacchus Marsh road below the monocline can easily be developed with a direct connection into the existing infrastructure but this only accounts for approximately 30% (subject to variation) of the precinct.

The remaining of the precinct is above the monocline and will require a significant amount of extension works outside of the precinct based on the current strategy to appropriately feed this area. The proposed strategy to feed the western portion of the precinct will be through an extension of a proposed DN 600 from the existing Lovely Banks Basin along with a new Pump station. The extension could run up the existing road reserve of Emmersons Road with an approximately road reserve of 20m road reserve and then progress through private property until it connects up to Elcho Road (route may vary, to be confirmed at detailed design stage).. This line will approximately be 4.3 km in length before it is reduced to a smaller diameter pipe and follow the proposed road network.

5.1.2 Precinct 2

Based on the infrastructure required to service Precinct 1, a large portion of the trunk infrastructure will already be available to connect this development.

5.1.2.1 Sewer

The gravity infrastructure constructed as part of Precinct 1 will be utilised for the initial development along the eastern front of this precinct. Once the capacity and extent of that sewage system is exhausted, a secondary sewer pump station will need to be constructed within the boundaries of Precinct 3 in the vicinity of Anakie Road and Evans Road. This will require a pump station and approximately 3.0 km of rising main to connect back into the transfer pump station. The current proposed alignment for this infrastructure is located along the border of existing rural living property and larger rural parcels as well as down Emmersons Road (all routes may vary, to be confirmed at detailed design stage).. The main gravity trunk infrastructure will extend along Evans Road in an approximate 20 m wide road reserve and can potentially extend right through to Stacey's Road in the north, through the existing road reserve (route may vary, to be confirmed at detailed design stage).. The remaining smaller trunk infrastructure can be constructed based on the proposed road network alignments once development commences.

5.1.2.2 Water

The water infrastructure can be utilised based on an extension of the infrastructure constructed as part of Precinct 1. Consideration should also be given to the infrastructure requirements for the DN 750 connection which forms part of the ultimate strategy but the timing of this will be dependent on the amount of development occurring and may be required sooner rather than later.

5.1.3 Precinct 3

Based on the infrastructure required to service Precinct 3, all the required infrastructure will have already extended through this precinct from the work completed in Precinct 1 and 2.

5.1.3.1 Sewer

The gravity trunk infrastructure as well as the pump station constructed as part of Precinct 2 will already been operational which will allow for connection and of gravity systems into this pump station.

5.1.3.2 Water

The water extension as part of Precinct 2 will also be sufficient to supply the majority of the Precinct 3 water requirements.

5.1.4 Precinct 2 & Precinct 3 Priority

As discussed, Precinct 2 and Precinct 3 will be classified as a “medium” term development. The water and sewerage infrastructure for Precinct 2 will be required to be extended from Precinct 3, which will mean that the infrastructure required for Precinct 3 will already be available for development or could be developed at the same time as Precinct 2. This could create a gap in development which may not be an ideal situation but may help with shared funding for the major infrastructure extensions and upgrades.

If Precinct 2 is developed first, the extension and upgrades to the electrical, gas and telecommunications will be extended from Precinct 1 while additional connections will be required from the south if Precinct 3 is developed first.

5.1.5 Precinct 4

5.1.5.1 Sewer

Precinct 4 will form the area of the existing RLZ which will likely be developed slower than other stages due to the mix of ownership. This area will require its own pump station but will only require approximately 1 km of rising main to connect into the transfer pump station constructed as part of Precinct 1. The pump station is shown to be located in Tilly’s Lane within private property and will be sized appropriately to catch the majority of the existing rural living zone area in order to upgrade them from septic systems (proposed asset locations to be confirmed at detailed design stage)..

5.1.5.2 Water

Water will already be available to this area however upgrades will be required as identified in the servicing strategy to supply the additional residences.

5.2 Western Geelong Growth Area

Based on the supplied information, there are 5 major precincts identified for the WGGA. The Quarry precinct has been established as the last area to be developed due to the unknown detailed timeframe for closure of the Batesford Quarry which splits the precinct into two major areas.

Powercor has stated that initial developments will have little impact on Powercor infrastructure as the appropriate capacity required will be scoped into development supply requests so will not play a critical role. A zone substation will be required which will be located near the future load centre of the growth area. Powercor have stated that currently the Western area is not as well prepared for development as the Northern.

The gas infrastructure will require a significant amount of extension works from existing assets to service any of the precincts with both area’s requiring trunk infrastructure and the southern area requiring a field regulator.

The telecommunication infrastructure will require a significant amount of extension works from existing assets requiring a FAN site.

5.2.1 Precinct 1

5.2.1.1 Sewer

Based on the Barwon Water Servicing Strategy the most practical area for the WGGA to be developed first is Precinct 1 as it will require the shortest length of rising main (approximately 1.9 km) as well as a transfer pump station to connecting to the existing infrastructure at Corio West GM. This connection to the GM will run through the existing corridor (approximately 50 m reserve) of the Ballarat Train line and the transfer pump station will be located on existing private property in the vicinity of Bluestone Bridge Road (route may vary, to be confirmed at detailed design stage).. The extension of the gravity main that will feed into the pump station will have to occur within private property or through newly created road reserves to service these areas. It should also be noted that the sizing of the infrastructure will have to be sufficient to allow for a connection of a pump station and rising main as part of Precinct 2.

5.2.1.2 Water

This area will require a connection to the existing water transfer main on the East of the Geelong Ring Road which can service the northern section of the precinct via a feed which accounts for approximately 60% of the precinct. This DN 750 main will run down the existing road reserve of Avonlea Road which has rural properties both side in a 10m road reserve which will pose issues (route may vary, to be confirmed at detailed design stage).

The remaining area south of Avonlea Road will be supplied by a booster pump station as part of the ultimate strategy. This is currently proposed in private property on the alignment of Avonlea Road and will service through to the Midland Highway.

There is currently no major gas connection in the west and it will connect to the precinct through an extension through Creamy Road.

The connection to NBN infrastructure will be developed from a connection down the Midland Highway from the East.

Precinct 1 will serve as the first connection for the western precinct but there is a large distance between the proposed connection points for the infrastructure. This may pose significant issues due to the limitation in the existing road reserve to service the first lot of development.

5.2.2 Precinct 2

Once Precinct 1 has extended through to Precinct 2, existing connections can be utilised.

5.2.2.1 Sewer

The extension of the existing gravity sewerage system from precinct 1 can supply approximately 30% of the Precinct 2 area before a second supply will be required. A second sewer pump station and approximately 2.4 km of rising main will be required to connect back into the gravity system constructed as part of Precinct 1. The current proposed alignment will need to run through private property in reserves (route may vary, to be confirmed at detailed design stage)..

5.2.2.2 Water

The extension of the water main from Precinct 2 will continue through private property and connect up to the Geelong-Ballan Road and head further West into the centre of Precinct 2. The majority of the area is pressure supplied from the pumps station constructed as part of Precinct 1 and the proposed reticulation will align with the new road layout (routes may vary, to be confirmed at detailed design stage)..

5.2.3 Precinct 3

Precinct 3 and 4 are consider separate fronts due to the quarry physically separating the north from the south.

5.2.3.1 Sewer

A significant amount of sewerage infrastructure is required to make the South of Batesford Quarry serviceable. There are two proposed alignments, an interim and ultimate.

The interim connection will require a transfer pump station to be constructed along Hamilton Highway and approximately 1.8 km of rising main heading north to connect to another pump station.. This will utilise a mix of the existing Geelong Ring Corridor and private land converted to reserves.. From this point a further 6.7 km of rising main also utilising the Geelong Ring Road Corridor will be required to connect back to the transfer pump station constructed as part of Precinct 1.

The ultimate connection will head south and connect to the Main outlet Sewer located in the southern suburbs of Geelong. This will require 3 transfer Pump stations with a total of approximately 14.5 km of rising main to reach the MOS. This alignment will utilise the Geelong Ring Road Corridor as well as other road and rail corridors to reach the ultimate outfall.

Once the connection to the sewage network can be reached to the existing system, the transfer overover system over the Barrabool Hills will be able to service the majority of Precinct 3, 4 as well as a large portion of Precinct 5. The main gravity trunk will extend along the Hamilton Highway to the closest existing pump station in the Southern outlet system.

5.2.3.2 Water

The existing She Oaks – Montpellier Transfer Main running down the Fyansford – Gheringhap Road cancan be utilised to service Precinct 3. A connection into this existing main will require a Pressure Reduction Valve where the appropriately sized reticulation system can connect to.

It is noted that the existing She-Oaks-Montpellier transfer main is located underneath the existing Fyansford-Gheringhap Road (both run diagonally through the site). Consideration needs to be given to mains relocation/easements/impact on development given that the order of the road is downgraded to the local street network as part of future development.

This area will also require an NBN and gas connection. The NBN connection will come from the East along Hamilton Highway and will require a FAN site. The gas connection will also connect from the East along Hamilton Highway and will require a Field Regulator to be constructed before a gas main can be constructed into the precinct.

5.2.4 Precinct 4

The major infrastructure constructed as part of Precinct 3, will also be able to service the majority of Precinct 4.

5.2.4.1 Sewer

The infrastructure constructed along the Hamilton Highway will be able to be utilised with major trunks running along any new proposed road reserves as well as existing such as Friend In Hand Road with a reserve width of approximately 20 m (route may vary, to be confirmed at detailed design stage).. The development will have to occur sequentially back from the Hamilton Highway to allow for no disconnection between the infrastructure requirements.

5.2.4.2 Water

The water will follow a similar principle as sewerage and will be an extension off the PRV constructed as mentioned in Precinct 3. There is also another opportunity for a second PRV at the north of the precinct boundary which will also be used to supply the Precinct 5.

5.2.5 Precinct 5

Precinct 5 covers the largest area due to the size of the quarry being located in the centre. Much of the quarry land will not be suited to residual development. Services such as public toilets and water for maintenance will need to be carefully considered.

5.2.5.1 Sewer

As the precinct covers such a large area, the Precinct 5 area will be an extension of all previous precinct infrastructure. Precinct 1 and 2 will extend from the Midland Highway utilising Lift pump stations to service development south of the Midland Highway.

Precinct 3's interim pump station requirements will allow for a small section North of Hamilton Highway and just West of the Geelong Ring road to be serviceable. This has the potential to be developed early on as the infrastructure will already be present.

Precinct 4's gravity system will be appropriately sized to allow for further development towards the north into Precinct 5. One lift pump station will be required to service a smaller portion of the precinct near the Batesford Quarry.

5.2.5.2 Water

The water for precinct 5 will be mainly extensions of previously constructed lines.

Infrastructure constructed as part of Precinct 1 and 2 will cross south over the Midland Highway connecting into the extensions and will utilise both the existing Batesford Booster as well as the pump station constructed as part of Precinct 1.

The PRV constructed as part of Precinct 2 will allow for a northern connection into the precinct which will service the majority of the area also serviced by the interim sewerage connection. A small pump station will be required to service a small pocket south of the Batesford Quarry.

The PRV constructed as part of Precinct 4 will be used to extend north into the area West of the Batesford Quarry. This will require another pump station to ensure adequate pressure in this area.

5.2.6 Precinct 3 and Precinct 4 Staging

From the strategy mentioned above, there is no priority given to Precinct 3 over Precinct 4. The development will have to start from the East to allow connections of all essential services over the Geelong Ring Road and could continue towards the West on both sides of the Hamilton Highway.

6. Key Challenges and Issues

Based on the sequencing principles, there are a number of factors that drive development. All agencies will want logical sequencing of development to ensure that they get optimal return on capital investment and minimum service costs for the consumer.

6.1 Existing Road Reserve Size

One of the major key challenges with developing existing land is the issue around placing large infrastructure down small existing road reserve. Some of the road reserves within the growth areas have existing road reserves less than 20m wide and some as small as approximately 10m. This will prove difficult when extending large water mains or sewerage connections through the undeveloped land.

6.2 Segregated Development

As stated in the sequencing strategy, some areas are proposed to extend infrastructure down undeveloped land. This will create an issue if the appropriate planning is not undertaken. Issues such as placing water mains to fit existing services which will later be replaced with larger road reserves to facilitate residential development. The ideal sequencing will occur that the infrastructure requirements move along with the reformed road reserves.

6.3 Major Highway Crossings

Crossing of major highways may propose difficult due to a number of issues such as the constructability without causing disruption to traffic. This can be achieved through directional boring to limit disruptions to traffic for smaller conduits or pipe jacking for larger culverts or pipes. There is also consideration for existing services that may be running along the Highway that will need to be considered and avoided if possible.

6.4 APA High Pressure Gas Main

Works around the APA high pressure gas line will require special attention due to the risk of rupturing the pipe. This may cause issues when dealing with services trying to cross over the pipeline especially with critical items such as drainage and sewerage. The *APA SMS Workshop Report* is the best reference when dealing with works around the pipeline.

There will also need to be considerations around land use and open space also as discussed in the *APA SMS Workshop Report*.

6.5 AusNet and Powercor Overhead Electrical Easement

The existing overhead transmission lines run within the NGGA and adjacent to the NGGA western boundary. An easement of 40m exists due to these transmission lines and are a constraint to land development. There is also a presence of overhead transmission lines in the WGGA.

Any land use buffers adjacent to the easements would require consideration at the detailed design stage. Opportunities for undergrounding may be considered.

6.6 Topography

The topography and existing landform will prove to be difficult for a number of factors such as sewage and drainage. The most difficult areas for this development will be along the rivers such as the Quarry and Moorabool River Valley as well as the Lovely Banks Monocline.

6.7 Waterway Crossings

As the developments are surrounded by a number of rivers, it is likely that a number of waterway crossings will be required. This will require a significant amount of environmental considerations as well as approvals from the catchment authorities.

6.8 Capital Investment

As a lot of services are not available or not appropriately sized within the growth areas, a significant amount of capital investment by the developers and service authorities will be required. The developer may provide a significant portion of the initial investment but further details will have to be determined as part of the future planning.

6.9 Barwon Water

As stated in the servicing strategy section, BW have stated that both interim strategies as well as ultimate strategies will have to be adopted. The strategic timing of these triggers will largely be implemented based on the development of the land. Based on this principle, Barwon Water have stated that they would prefer a logical sequencing of development and no leap frogging of infrastructure which requires outfalls or pipelines through undeveloped properties.

The WGGA and in particular the Batesford South area presents a major challenge as there currently is no obvious interim sewage outfall. There is potential for connections through Highton and Fyansford but the capacity is likely to be limited. The ultimate strategy at present to build a pump station around the Geelong Ring Road to Armstrong Creek is likely to be extremely expensive, difficult and provide further challenges not yet identified.

6.10 Fragmented Land ownership/Existing Rural Living Zone

Both the WGGA and NGGA have a large number of individual parcels and potentially a number of different owners. This may prove difficult for authorities to get their services to the proposed development if access across private property is required. This will further become difficult in the Rural Living Zone if one landowner is not willing to sell their property which could restrict the growth of the entire Rural Living zone redevelopment in the future.

7. Next Generation Technology/ Opportunities

The NWGGA project seeks to develop primarily greenfield areas to support future urban growth. In planning infrastructure and services, the most suitable approach is one that is committed to supporting sustainability principles outlined by One Planet Living.

In particular, principles detailing sustainable water usage, zero waste and zero carbon are highly relevant to the infrastructure planning of NWGGA. CoGG's Clever and Creative Vision outline measures of success for these relevant key areas. These measures of success include but are not limited to:

- Greater Geelong being a carbon neutral city-region
- 20 per cent of all water used in the municipality is sourced from alternative sources
- Performing better than the Victorian average in solid and green waste diverted from landfill

This document shows the logical roll out of essential service infrastructure, but it is not intended that this rollout would preclude opportunities for innovation. Further investigation will be undertaken at PSP stage to identify futureproofing opportunities for innovation as well as achievements of current sustainability targets and initiatives using next generation technology and infrastructure models.

Barwon Water

Barwon Water have stated there is significant opportunities for potential recreational and agricultural recycled water use that warrants further detailed investigation particularly in the WGGA which will require further consideration before proceeding to the 'ultimate' servicing solution for the area.

Batesford Quarry

The Batesford Quarry occupies approximately 190 Ha and is identified a possible future recreational /aesthetic lake when quarry operations cease. Advice from the owners is that the lake could take approximately 15-20 years to fill once quarry operations cease.

BW could investigate whether a new WRP (water recycling plant) in the west of Geelong could contribute inflow to the future lake and assist with realising the recreational values. A recycled water discharge could assist in reducing the impact of diverting river water flow for filling on the lake and assist in replenishing evaporative losses from the lake long term which would otherwise be replenished by the river. This recycling plant could also be used for residential use in the growth area themselves for things such as toilet flushing and watering the garden.

Careful consideration will be required for the potential impact of nutrients in the recycled water on the lake and the interactions with flows and Water quality in the Moorabool River.

Feasibility of this option is currently uncertain as the quarry is still being operated and there is uncertainty around the timing when quarry operations will cease which allows sufficient time to thoroughly investigate the feasibility of this opportunity as well as investigate any issues such as saline water.

Recycled Water for Agriculture

In addition to the discharge of treated water to the potential future lake and residential use, there could be an opportunity to supply recycled water for agriculture in the Moorabool Valley.

Further investigation into the feasibility of this opportunity is best undertaken closer to the time of implementing the 'ultimate' solution at it will be difficult to confirm demand for recycled water with potential users more than 15 years before any water will become available.

In addition, there will likely require an approved discharge into the future lake which will allow for flows to be managed during times when agricultural water usage is low with the issues discussed in the section above.

Other Opportunities

There are many other opportunities that could potentially be investigated by Barwon Water, but at this stage, there is currently no known investigations being undertaken into the following opportunities:

- WRP that generate electricity – could not only take sewerage but also other organic wastes to increase load to the plant and create more power.
- Co-Generation – generation of electricity and the use of the steam left over from generation for heating.
- Recycled Water for open space or Sewer Mining Plant.
- Smart Water Meters on all properties.
- Smart Sewers.
- Aquifer storage.
- Smart rainwater tanks – empties in advance of a storm.
- Integration of swales, rain gardens and retaining basins
- Water Sensitive Urban Design (WSUD) / Integrated Water Cycle Management (IWCM)

7.1 Electricity

Many opportunities exist for the utilisation of next generation technology designed to minimise carbon footprint or potentially achieve carbon neutrality. In regards to the supply of electricity; opportunities to access renewable energy sources are abundant. Further investigation of the following technology can contribute to eliminating carbon footprint:

- On and off site solar farms
- On and off site wind farms
- Battery storage
- Electrical vehicle charge points
- Smart electricity meters
- Power tracking

Additionally, passive design features such as building orientation and layout may be investigated to reduce and potentially eliminate the requirement of auxiliary heating or cooling.

7.2 Gas

Gas connections are used throughout developments for cooking and heating applications. The shift towards renewable energy and net neutral power generation creates an opportunity to eliminate all natural gas connections in the interest of minimising fossil fuels.

7.3 Waste

A major component of sustainable developments includes the responsible elimination of waste. Waste diverted to landfill produces methane emissions and account for approximately 3% of Australia's greenhouse gas emissions. In an effort to minimise the amount of waste to landfill the following can be implemented:

- Organic waste treatment systems
- Closed loop management of organic waste
- Accessible recycling facilities
- Resource recovery facilities

7.4 Other

Environmentally Sustainable Design (ESD) details principles for developments to achieve optimal sustainable design. By considering ESD principles during the design process, the following can be achieved:

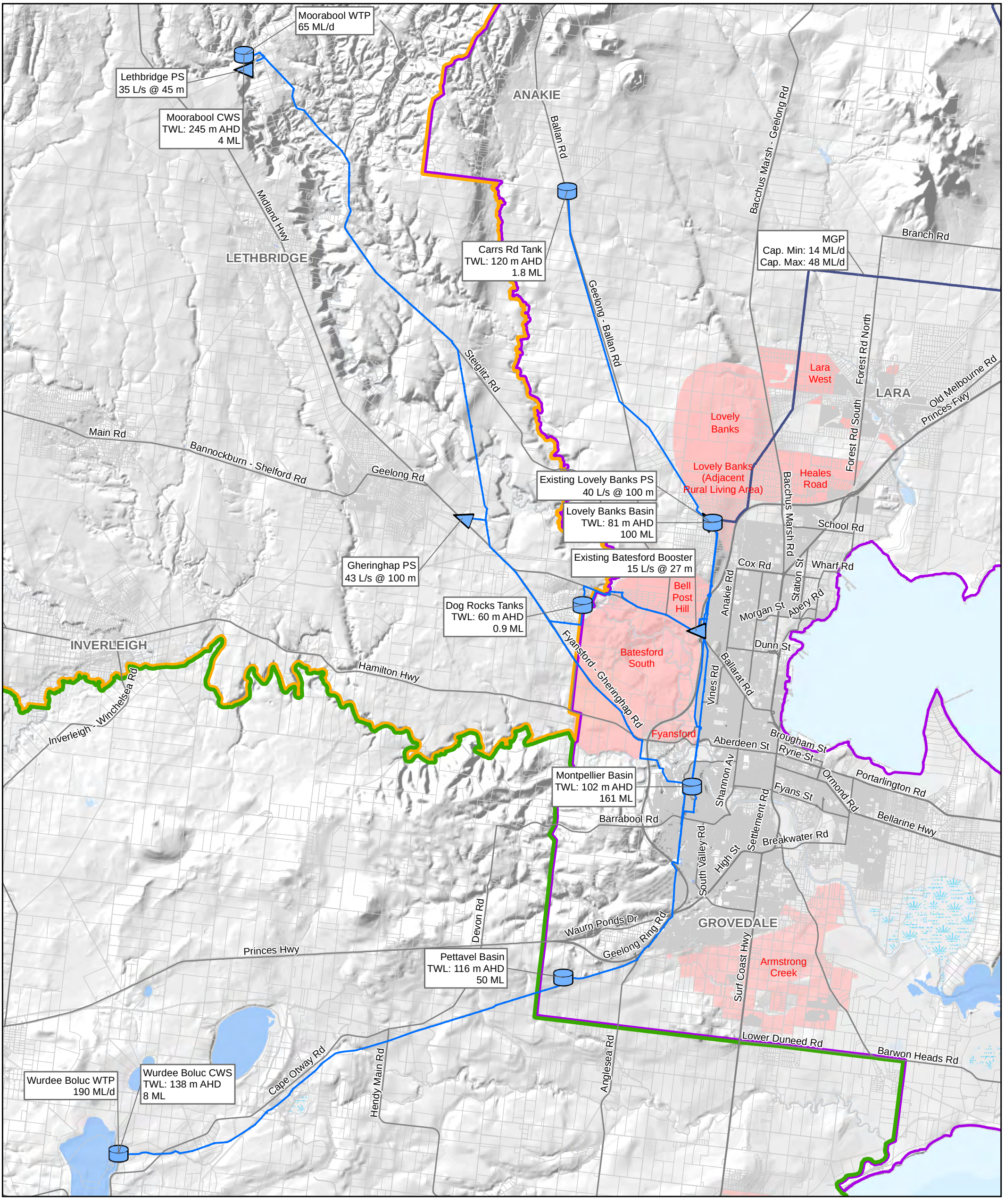
- 85% reduction in energy use
- 60% reduction in water use
- 70% reduction in construction waste

For NWGGA, adopting ESD principles would involve actions such as optimising usage of sites, maximising renewable energy consumption and reducing potable water use. Ultimately these actions are designed to have minimal negative impacts on the environment. Engaging in an ESD assessment includes the consideration of ten building categories selected to indicate key sustainability performance indicators.

Provisions for the future implementation of next generation technology have been considered to provide flexibility and adaptability of NWGGA when the opportunity arises.

Appendix A – Existing Water and Sewer Trunk Infrastructure

Drawings reproduced by approval from Barwon Water from the GHD *G21 Regional Growth Plan Further Investigation Areas Servicing Strategy* (Feb 2016) prepared for Barwon Water.



LEGEND

- Existing Pump
- Existing Reservoir
- Melbourne-Geelong Pipeline
- Trunk Main
- Road
- **LGA Boundaries**
- City of Greater Geelong
- Golden Plains Shire
- Surf Coast Shire
- Existing Parcels
- Growth Area

Paper Size A3

0 875 1,750 3,500 5,250 7,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD Barwon Water

Barwon Water
G21 RGP - FIA Servicing Strategy

Job Number 31-32334
Revision 1
Date 10 Feb 2016

Trunk Water Network

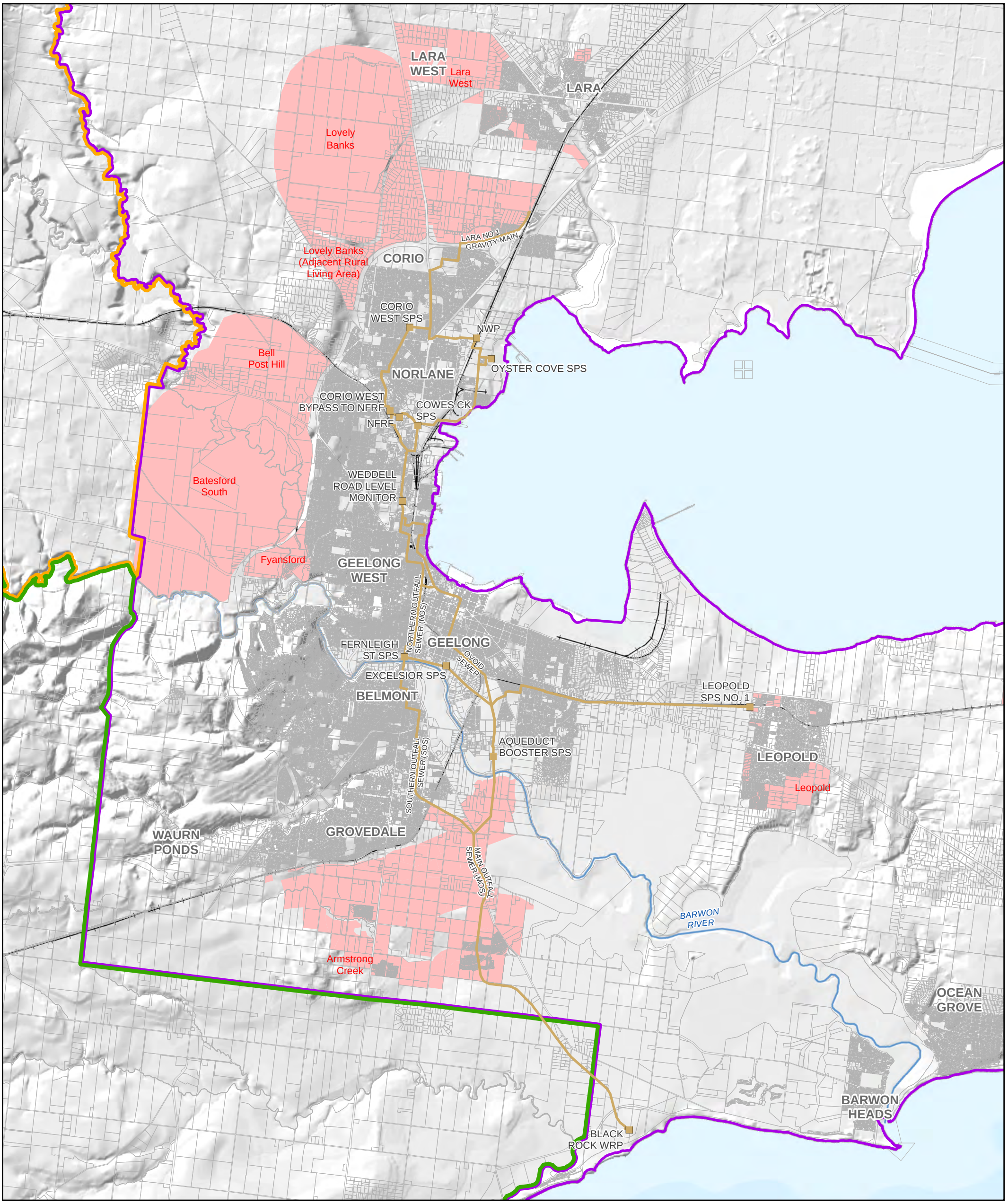
Figure 3

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Data source: Barwon Water, Asset Information, 2014-15; GHD, Concept Plans, 2015; DELWP, Base Map, 2015. Created by: NKostraby



LEGEND

- Existing Sewer Infrastructure
- Trunk sewer network
- City of Greater Geelong
- Golden Plains Shire
- Surf Coast Shire
- Existing parcels
- Growth Areas
- Rail

Paper Size A3

0 650 1,300 2,600 3,900 5,200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Barwon Water
G21 RGP - FIA Servicing Strategy

Job Number	31-32334
Revision	1
Date	03 Feb 2016

Trunk Sewer Network

Figure 4

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Data source: Barwon Water, Trunk Sewer Network, Growth Areas, 2014; DEPI, VicMap, 2015. Created by: nkostraby

Appendix B – Proposed Water and Sewer Trunk Infrastructure

Drawings reproduced by approval from Barwon Water from the GHD *G21 Regional Growth Plan Further Investigation Areas Servicing Strategy* (Feb 2016) prepared for Barwon Water.

Passive Open Space

Staceys Rd

LARA WEST

Lovely Banks Pressure/Gravity (>50m) Zone

DN600

Potential Interim Connection Point (Typ.)

Anakie Rd

Lovely Banks Gravity Zone (<50m)

Bacchus Marsh Rd

Existing Lovely Banks PS
40 L/s @ 100 m

New Pump Station
530 L/s @ 49 m

CORIO

Plantation Rd

LOVELY BANKS

Lovely Banks Basin
TWL: 81 m AHD
100 ML

Matthews Rd

Purnell Rd

Geelong Ring Rd

LEGEND

- Potential Interim Connection Points
- New Pump
- Existing Pump
- Existing Reservoir
- Melbourne-Geelong Pipeline
- **Existing Potable Pipes (mm)**
  - 100 - 250
  - 251 - 400
  - 401 - 1000
  - 1001 - 3000
- **New Pipes**
  - DN600 Main
  - Road
  - Contour (5m)
- Existing Parcels
- Passive Open Space
- FIA Boundaries from G21 Regional Growth Plan
- **Water Supply Zones**
  - Lovely Banks Pressure/Gravity (>50m) Zone
- Lovely Banks Gravity Zone (<50m)

Paper Size A3

0 155 310 620 930 1,240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD Barwon Water

Barwon Water
G21 RGP - FIA Servicing Strategy

Water Servicing Strategy
Lovely Banks - Interim Connections

Job Number	31-32334
Revision	1
Date	10 Feb 2016

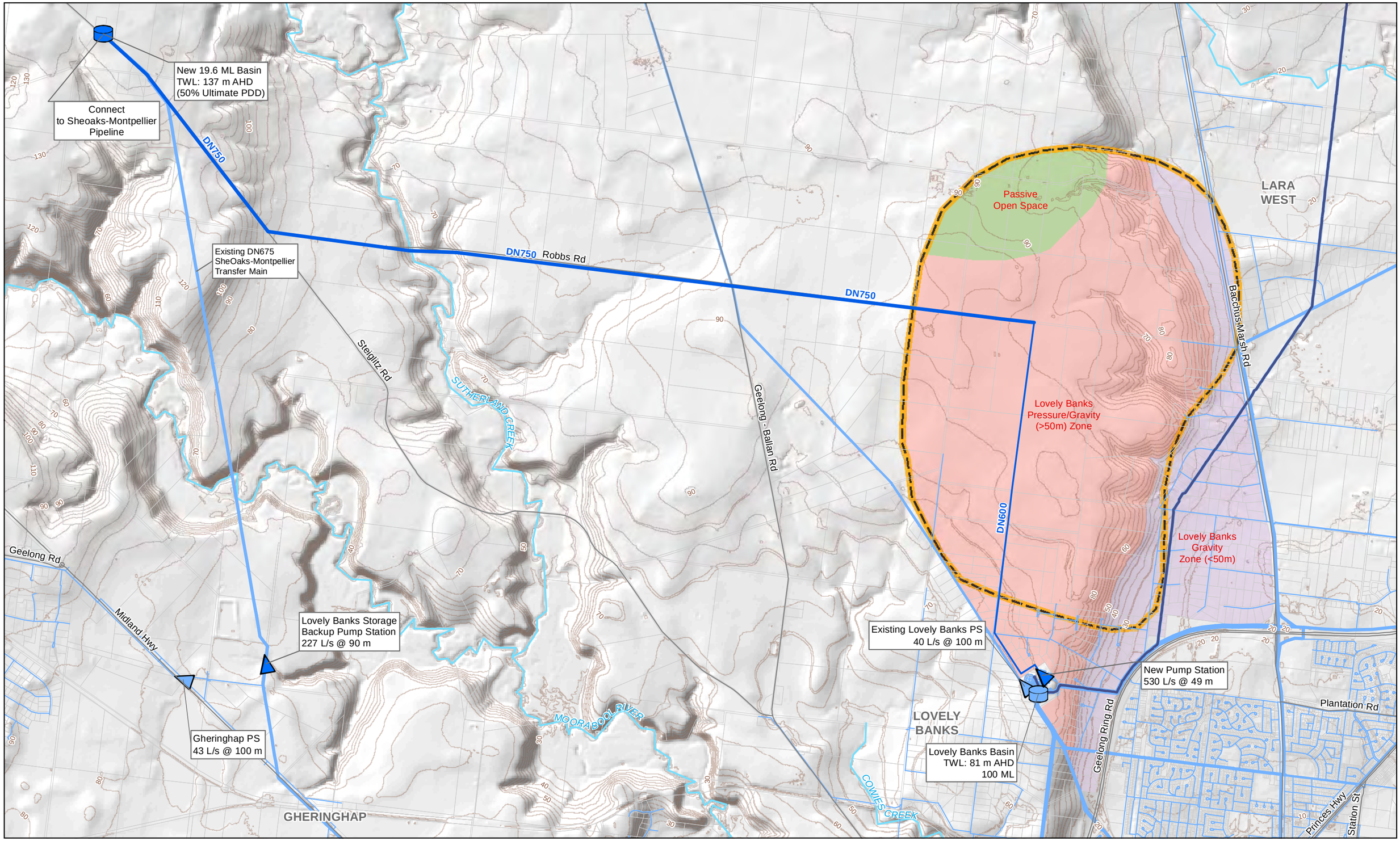
Figure 6

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Data source: Barwon Water, Asset Information, 2014-15; GHD, Concept Plans, 2015; DELWP, Base Map, 2015. Created by: NKostraby



Paper Size A3

0 0.25 0.5 1 1.5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

New Reservoir
New Pump
Existing Pump
Existing Reservoir
Melbourne-Geelong Pipeline

New Trunk Mains (mm)
600
750

Existing Potable Pipes (mm)
100 - 250
251 - 400
401 - 1000
1001 - 3000

Existing Parcels
Contour (5m)
FIA Boundaries from G21 Regional Growth Plan

Passive Open Space
Lovely Banks Pressure/Gravity (>50m) Zone
Lovely Banks Gravity Zone (<50m)

GHD

BarwonWater

Barwon Water
G21 RGP - FIA Servicing Strategy

Job Number 31-32334
Revision 1
Date 10 Feb 2016

Water Servicing Strategy
Lovely Banks - Ultimate Connections

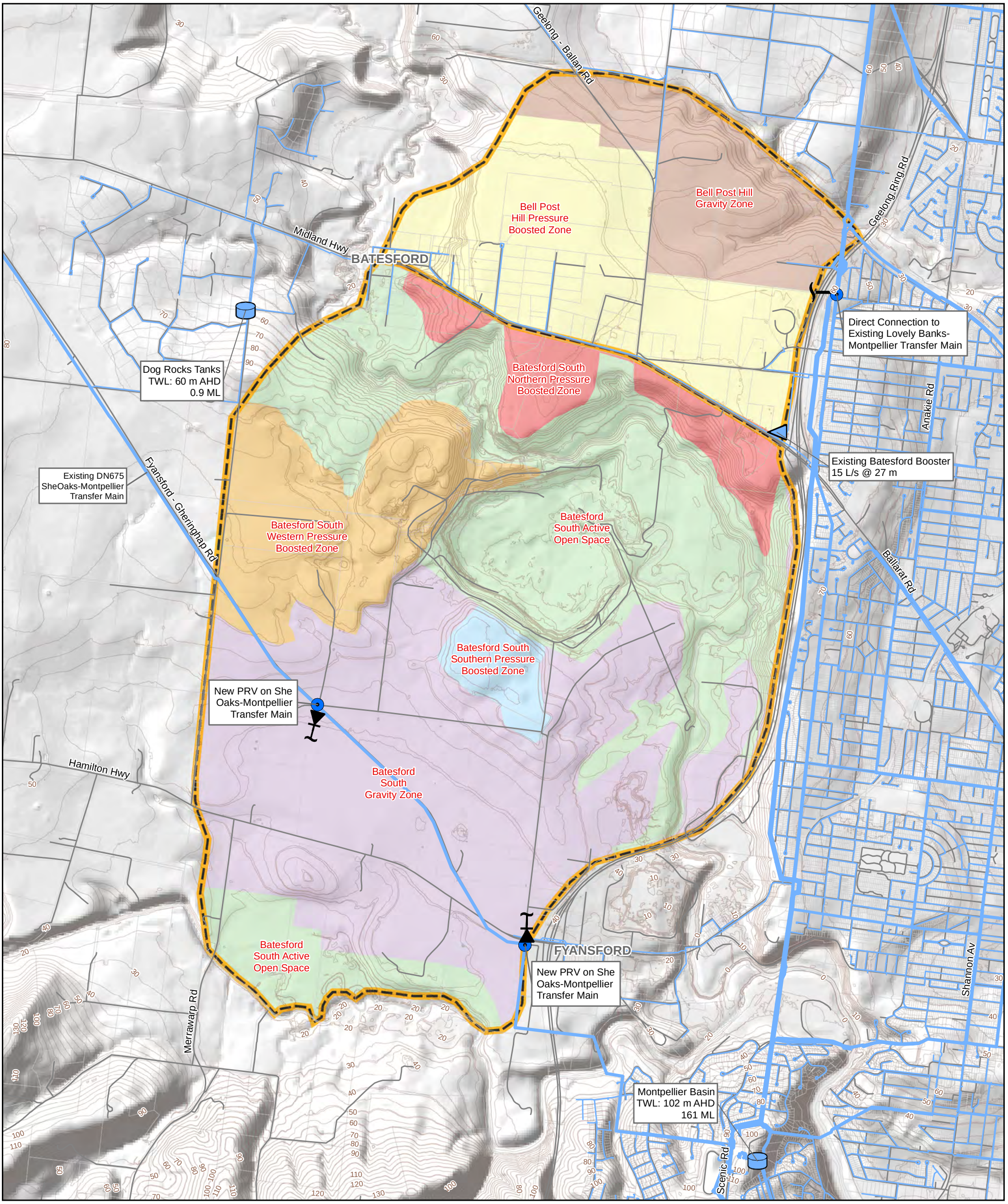
Figure 7

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LEGEND

- Potential Interim Connection Points
- Existing Pump
- Existing Reservoir

Existing Potable Pipes (mm)

- 100 - 250
- 251 - 400
- 401 - 1000
- 1001 - 3000
- Road
- Contour (5m)
- Existing Parcels
- FIA Boundaries from G21 Regional Growth Plan
- Bell Post Hill Pressure Boosted Zone
- Bell Post Hill Gravity Zone
- Batesford South Northern Pressure Boosted Zone
- Batesford South Western Pressure Boosted Zone
- Batesford South Southern Pressure Boosted Zone
- Batesford South Gravity Zone
- Batesford South Active Open Space

Paper Size A3

0 190 380 760 1,140 1,520

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Barwon Water
G21 RGP - FIA Servicing Strategy

Water Servicing Strategy

Bell Post Hill / Batesford South - Interim Connections

Job Number	31-32334
Revision	1
Date	10 Feb 2016

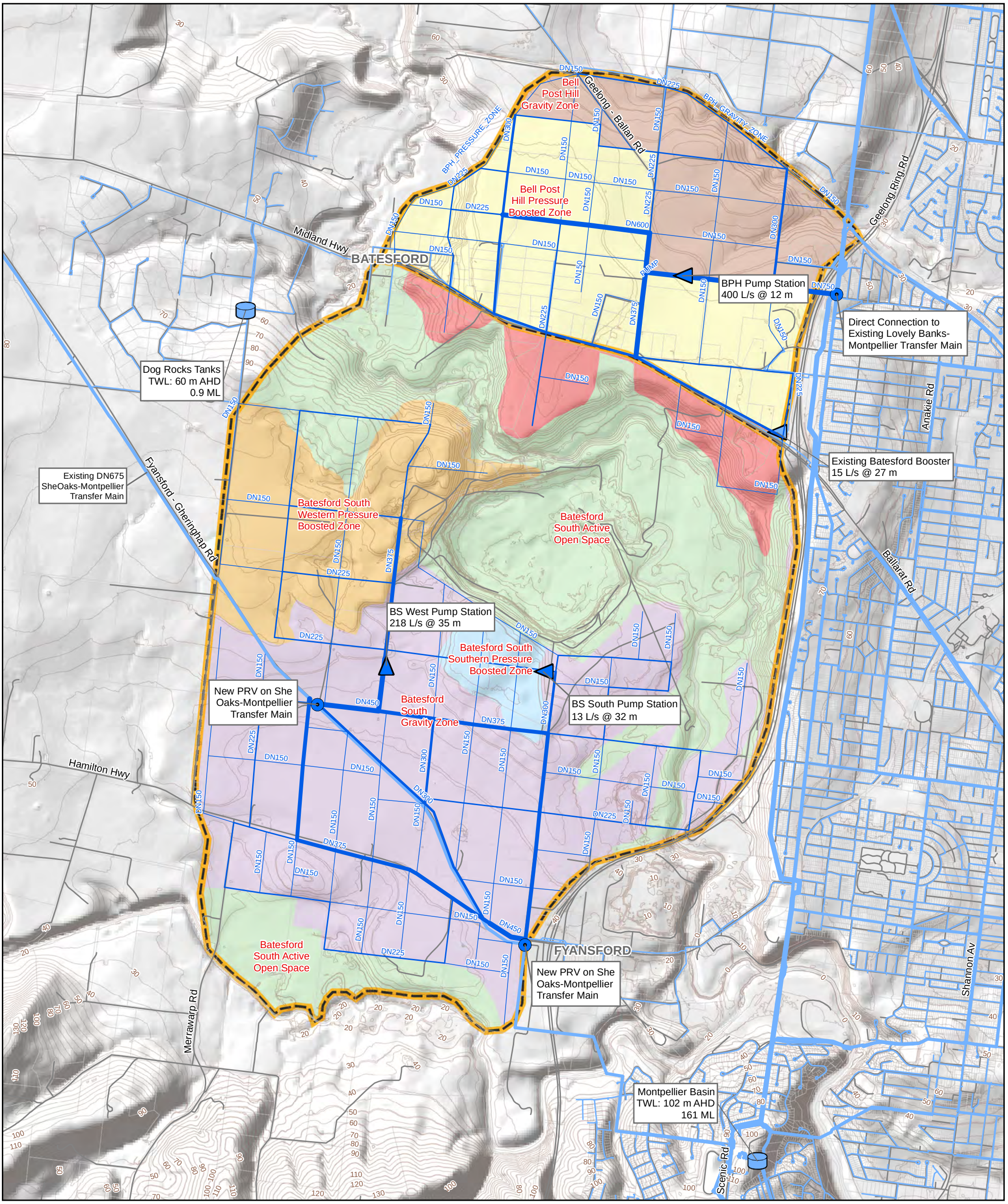
Figure 9

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Data source: Barwon Water, Asset Information, 2014-15; GHD, Concept Plans, 2015; DELWP, Base Map, 2015. Created by: NKostraby



LEGEND

- Potential Interim Connection Points
- New Pump
- Internal Servicing Network (mm): 150, 225, 300, 375, >375
- Existing Pump
- Existing Reservoir
- Existing Potable Pipes (mm): 100 - 250, 251 - 400, 401 - 1000, 1001 - 3000
- Road
- Contour (5m)
- Existing Parcels
- FIA Boundaries from G21 Regional Growth Plan
- Bell Post Hill Pressure Boosted Zone
- Bell Post Hill Gravity Zone
- Batesford South Northern Pressure Boosted Zone
- Batesford South Western Pressure Boosted Zone
- Batesford South Southern Pressure Boosted Zone
- Batesford South Gravity Zone
- Batesford South Active Open Space

Paper Size A3

0 190 380 760 1,140 1,520

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD Barwon Water

Barwon Water
G21 RGP - FIA Servicing Strategy

Water Servicing Strategy

Bell Post Hill / Batesford South - Ultimate Connections and Internal Servicing

Job Number 31-32334
Revision 1
Date 10 Feb 2016

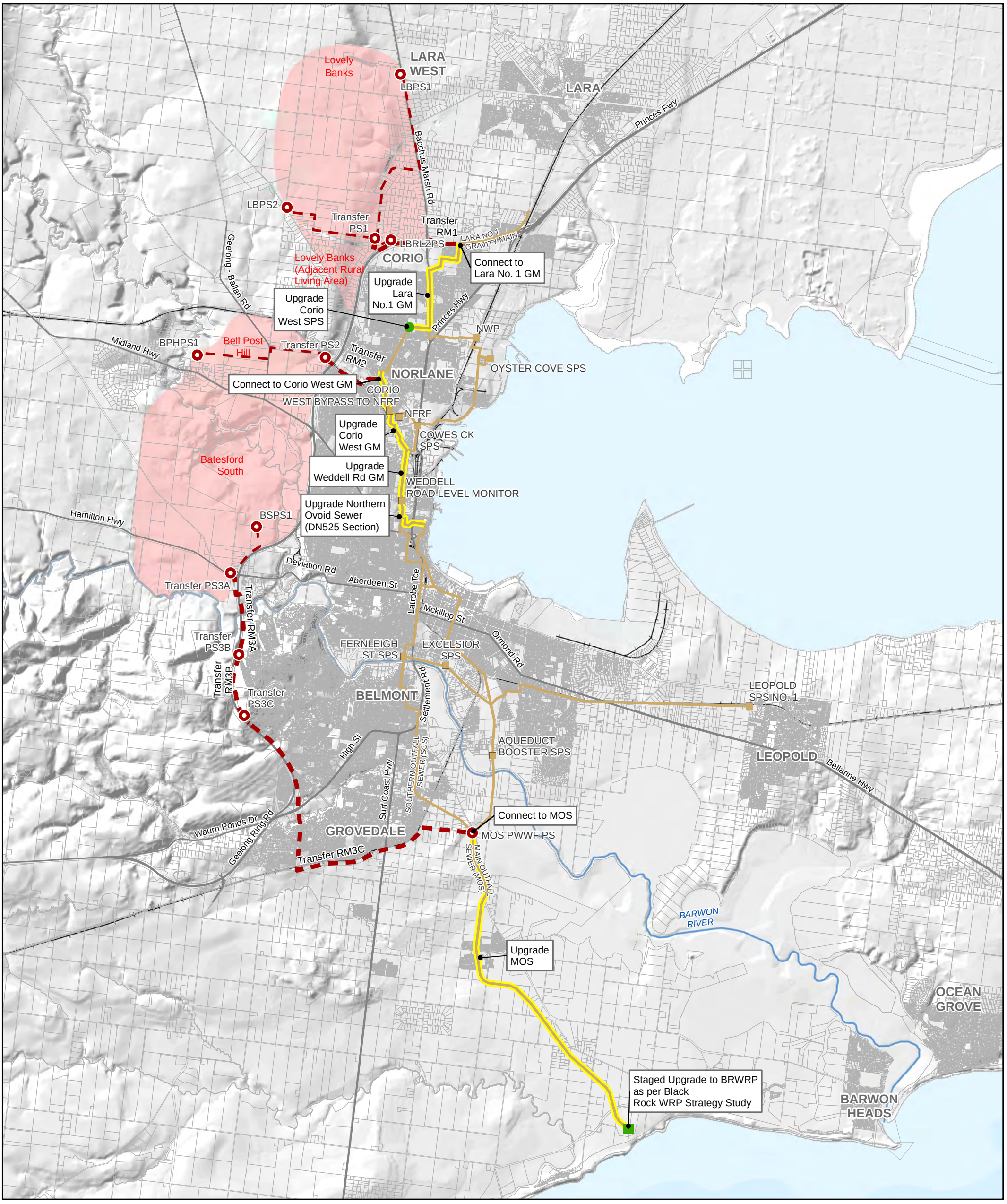
Figure 10

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Data source: Barwon Water, Asset Information, 2014-15; GHD, Concept Plans, 2015; DELWP, Base Map, 2015. Created by: NKostraby



LEGEND

- Existing Sewer Pump Station for Upgrade
- Existing Water Reclamation Plant for Upgrade
- Existing Sewer Infrastructure
- Proposed Pump Stations

Proposed Sewer Network

- Internal FIA Rising Main
- Transfer Rising Main
- Existing Trunk Main for Upgrade
- Trunk sewer network
- Existing parcels
- Study Area
- Rail

Paper Size A3

0 650 1,300 2,600 3,900 5,200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD Barwon Water

Barwon Water
G21 RGP - FIA Servicing Strategy

Sewer Servicing Strategy Overview

Job Number 31-32334
Revision 1
Date 10 Feb 2016

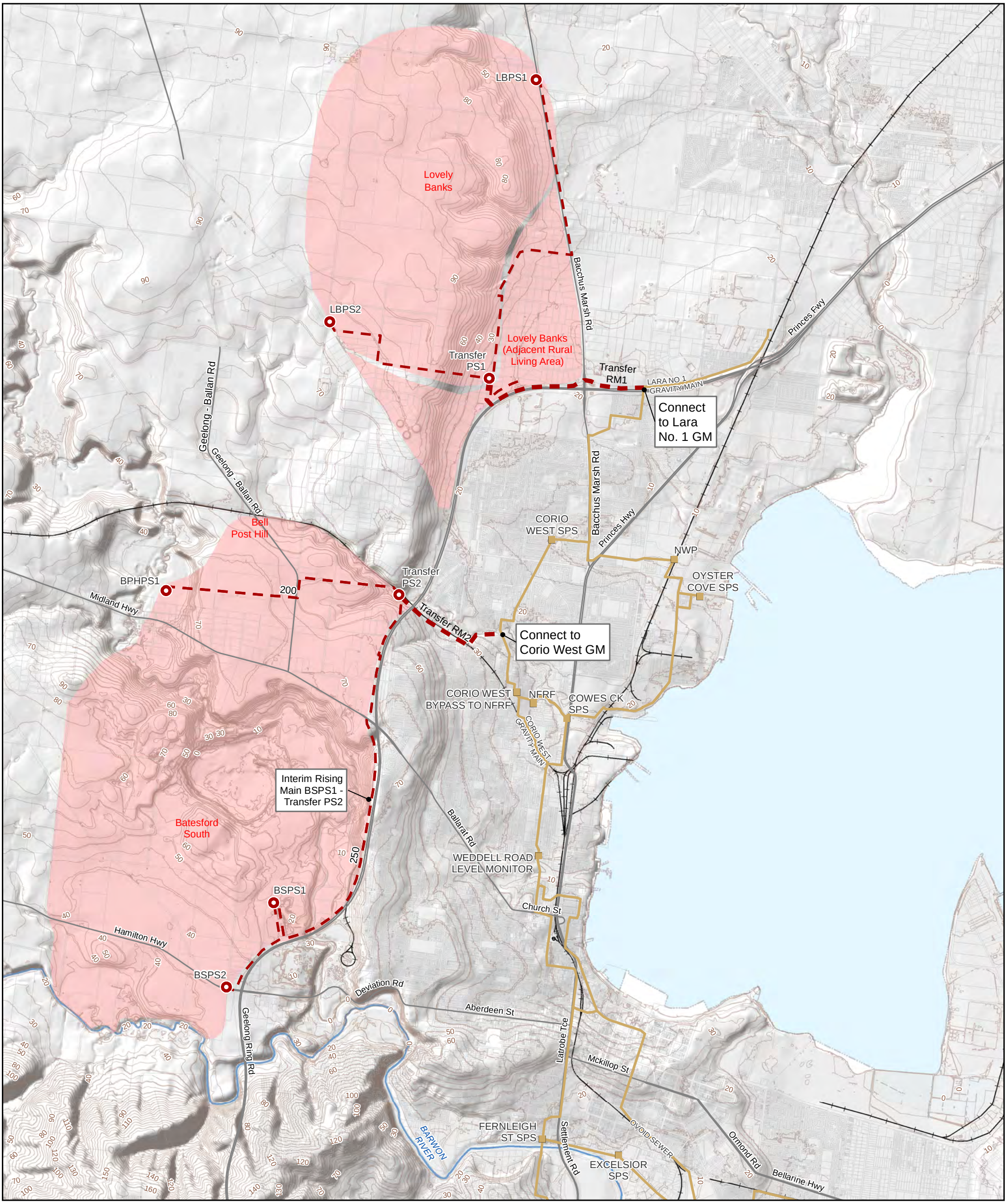
Figure 12

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Data source: Barwon Water, Trunk Sewer Network, Growth Areas, 2014; DEPI, VicMap, 2015. GHD, Proposed Sewers, 2015. Created by: NKostraby



LEGEND

- Proposed Pump Stations
- Existing Sewer Infrastructure
- Existing parcels
- **Proposed Sewer Network**
- Trunk sewer network
- Study Area
- Internal FIA Rising Main
- Interim Rising Main
- Rail
- Transfer Rising Main
- Contour (5m)

Paper Size A3

0 360 720 1,440 2,160 2,880

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Barwon Water
G21 RGP - FIA Servicing Strategy

Sewer Servicing Strategy
Interim Connections

Job Number	31-32334
Revision	1
Date	10 Feb 2016

Figure 13

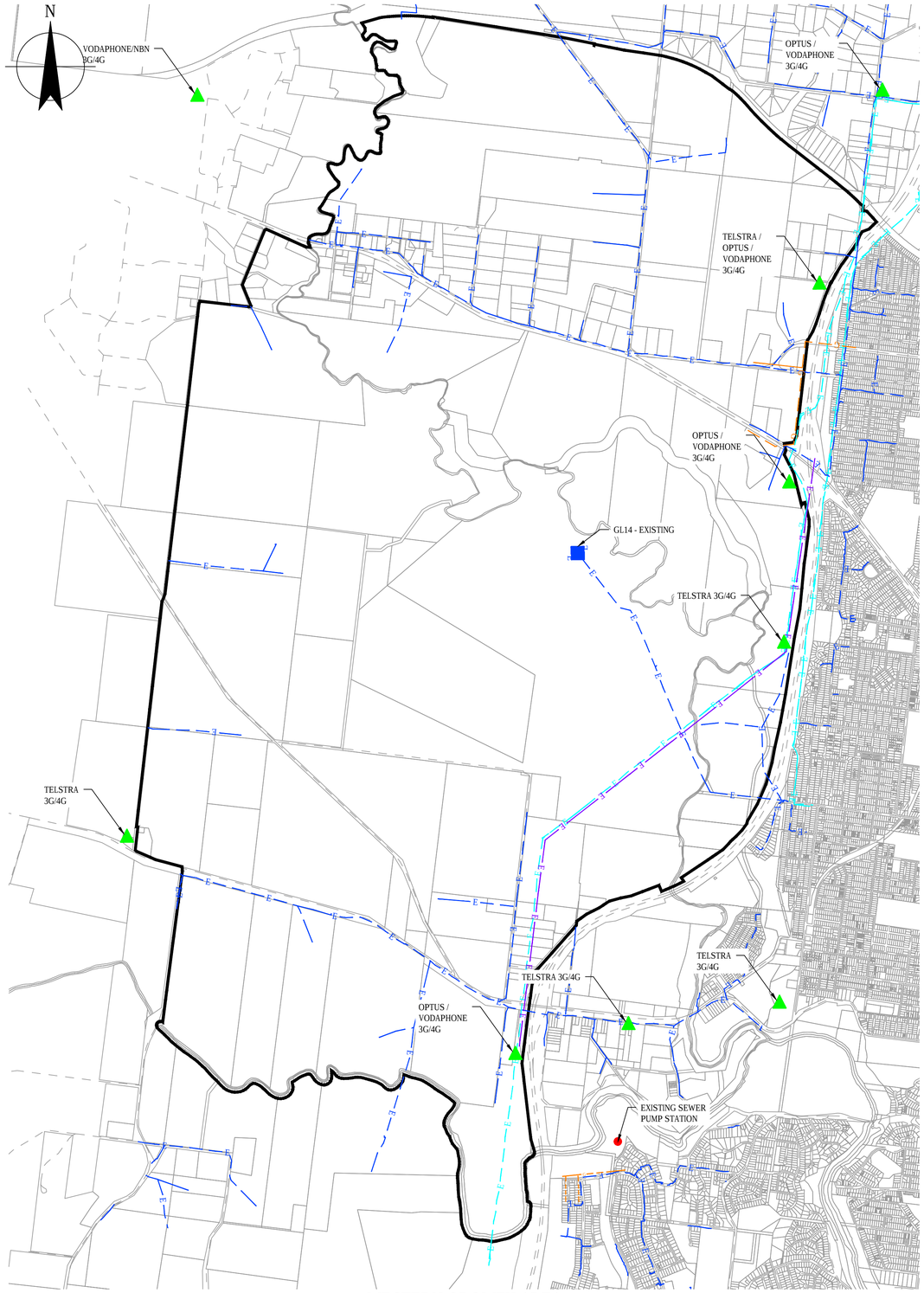
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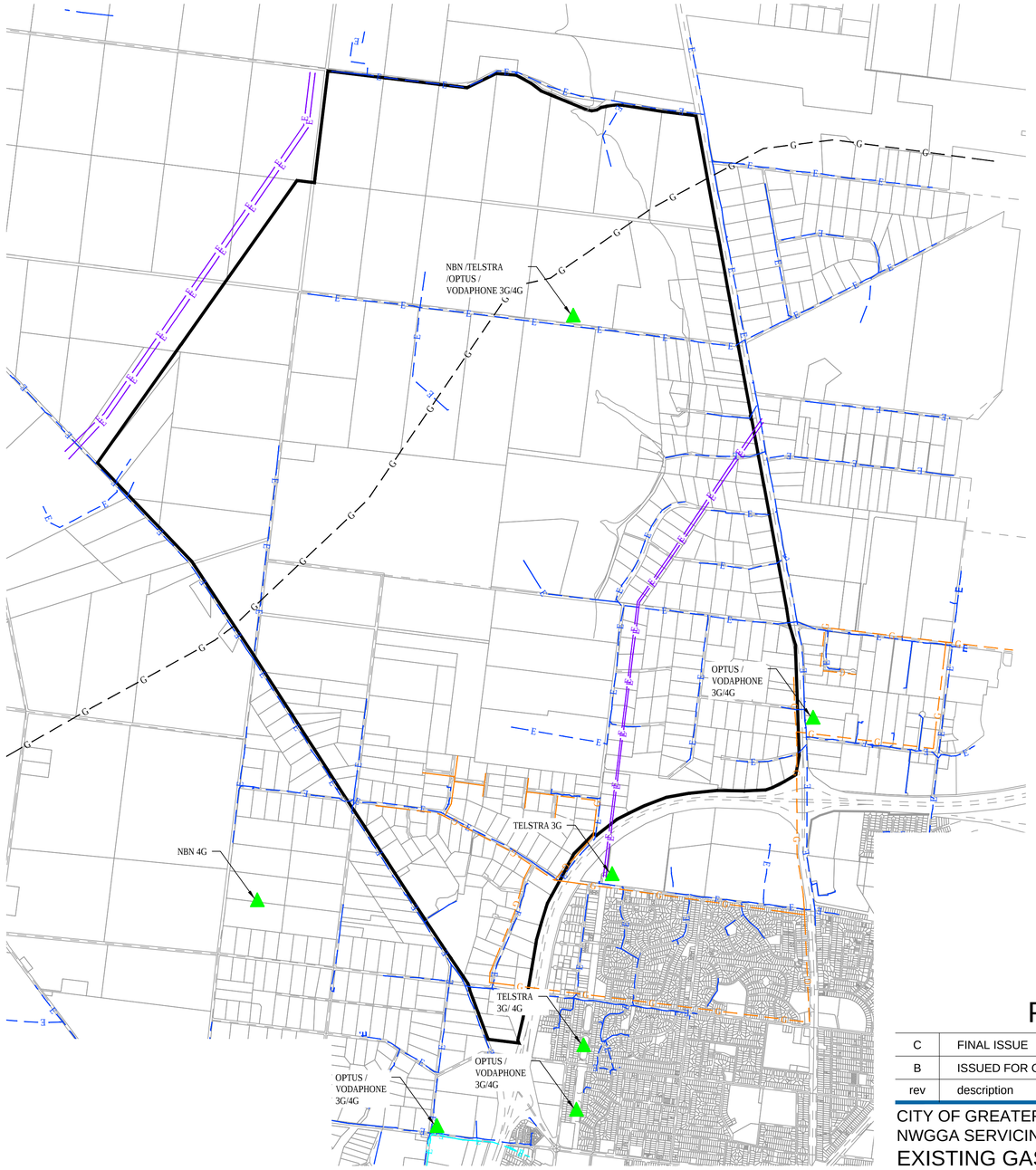
Data source: Barwon Water, Trunk Sewer Network, Growth Areas, 2014; DEPI, VicMap, 2015. GHD, Proposed Sewers, 2015. Created by: NKostraby

Appendix C – Drawings: Existing Gas, Electrical and Telecom Trunk Assets



WESTERN GROWTH AREA

SCALE 1:20000



NORTHERN GROWTH AREA

SCALE 1:20000

LEGEND

- GROWTH AREA EXTENT
- EXISTING PROPERTIES
- EXISTING GAS
- EXISTING HIGH VOLTAGE ELECTRICAL
- EXISTING POWERCOR ELECTRICAL - 22kV
- EXISTING POWERCOR ELECTRICAL - 66kV
- EXISTING APA GAS MAIN
- EXISTING SEWER PUMP STATION
- EXISTING ELECTRICAL ASSET
- EXISTING TELECOM TOWER

NOTES:

1. REFER TO APPENDIX A FOR EXISTING SEWER AND WATER ASSETS
2. NOT ALL TELECOMMUNICATION ASSETS ARE SHOWN
3. MOST 22kV ELECTRICAL POLES ALSO HOUSE A TELSTRA COPPER LINE.

0 200 400 600 800 1000m

SCALE 1:20,000 AT ORIGINAL SIZE

PRELIMINARY

rev	description	app'd	date
C	FINAL ISSUE	DM	JUN 19
B	ISSUED FOR COMMENT	DM	APR 19

CITY OF GREATER GEELONG

NWGGA SERVICING STRATEGY

EXISTING GAS, ELECTRICAL AND TELECOM TRUNK SERVICES

Level 2, 45 Brougham Street Geelong VIC 3220 Australia
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scale 1:20000 for A1 job no. 31-36336

date JUN 19 rev no. C

approved (PD) SK004

Plot Date: 31 May 2019 - 2:16 PM Plotted by: Tom Burnett Cad File No: C:\pwwork\pwv8iss4ocxx\tburnett\d0190152\31-36336-SK001.dwg

Appendix D – Drawings: Proposed Trunk Services (Indicative)

N

PROPOSED SEPARATE ELECTRICAL LINE (APPROX. 2021)

PROPOSED SEWER PUMP STATION

PROPOSED WATER SUPPLY PUMP

PROPOSED FAN SITE

WATER LINE

BDS ZSS - PROPOSED

PROPOSED FAN SITE

PROPOSED WATER SUPPLY PUMP

PROPOSED WATER PRV

PROPOSED WATER SUPPLY PUMP

INTERIM PROPOSED SEWER LINE

PROPOSED SEWER PUMP STATION

PROPOSED FAN SITE

PROPOSED SEWER PUMP STATION

PROPOSED WATER PRV

PROPOSED GAS FIELD REGULATOR

1

2

3

4

5

WESTERN GROWTH AREA

SCALE 1:20000

PROPOSED SEWER PUMP STATION

PROPOSED FAN SITE

EXISTING MGP

LVB ZSS - PROPOSED

POTENTIAL ONLY

PROPOSED SEWER PUMP STATION

PROPOSED FAN SITE

PROPOSED SEWER PUMP STATION

LOVELY BANKS RESERVOIR

PROPOSED WATER SUPPLY PUMP

EXISTING GEELONG TERMINAL STATION

NORTHERN GROWTH AREA

SCALE 1:20000

LEGEND

- PROPOSED PRECINCT BOUNDARY
- PROPOSED ROAD NETWORK
- EXISTING PROPERTIES
- PROPOSED GAS
- PROPOSED ELECTRICAL
- PROPOSED TELECOMMUNICATION
- PROPOSED WATER
- PROPOSED SEWER
- EXISTING APA GAS MAIN
- EXISTING HIGH VOLTAGE ELECTRICAL
- PROPOSED SEWER PUMP STATION
- PROPOSED WATER SUPPLY PUMP
- PROPOSED ELECTRICAL ASSET
- PROPOSED FAN SITE
- PROPOSED FIELD REGULATOR
- SHORT TERM PRECINCT
- MEDIUM TERM PRECINCT
- LONG TERM PRECINCT

NOTES:

1. THIS PLAN SHOWS A POTENTIAL INDICATIVE GAS NETWORK. AS PART OF ENVIRONMENTALLY SUSTAINABLE DESIGN OPPORTUNITIES IN THE DETAILED DESIGN STAGE, CoGG ARE INVESTIGATING WHETHER GAS WILL BE PROVIDED. REFER TO SECTION 3.4 OF NWGGA UTILITY SERVICING STRATEGY FOR FURTHER DISCUSSION.
2. REFER TO APPENDIX B FOR SEWER/WATER AUGMENTATION WORKS.
3. SERVICE ALIGNMENTS SUBJECT TO CHANGE UPON DETAILED DESIGN OF SERVICES, SEQUENCING OF STAGES AND ALIGNMENTS OF ROADS.
4. MOBILE TELECOMS TOWERS NOT SHOWN.

0 200 400 600 800 1000m

SCALE 1:20,000 AT ORIGINAL SIZE

PRELIMINARY

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CITY OF GREATER GEELONG
NWGGA SERVICING STRATEGY

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approved (PD) .....

SK001

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https://projects.ghd.com/oc/Victoria1/coggnwggaservicerepo/Delivery/Documents/3136336-REP-A-NWGGA Servicing Report Final.docx

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Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	Tom Burnett/ Alina Pham	Daniel Mapleson		Brian Jones		6/05/19
1	Tom Burnett/ Alina Pham	Daniel Mapleson		Brian Jones		31/05/19

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