INFRASTRUCTURE SERVICING ASSESSMENT

Rezoning of Redmond Place, Orange

3 Redmond Place, 154 Lone Pine Avenue and 5255 Mitchel Highway, Orange

July 2024

Prepared for: Landcom

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Issue	Date	Author	Reviewed	Approved
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A	19/04/24	Nicholas Geroulas	Adrian Miller	Frank Carrozza

1. Report Purpose

Colliers International Engineering and Design (CED) NSW has been engaged by Landcom to prepare an Infrastructure Servicing Assessment for the proposed residential rezoning at Redmond Place, Orange.

The scope of this report:

- Outlines the context and extent of the proposed rezoning and development of the subject site;
- Summarises the water and sewer servicing strategy recommended by Orange City Council;
- Determines servicing requirements and potential lead-in works for other utilities infrastructure including electricity, gas, telecommunications and stormwater;
- Provides commentary on the implications of infrastructure levies; and
- Demonstrates the proposed development will have adequate service provisions available to facilitate its intended rezoning.

2. Site Details

The Site is located on the southeast fringe of Orange, the largest city in the Central West Region. It is adjacent to the suburb of Glenroi, 4.4km from Orange City Centre and approximately 3.2km from Orange train station. The Site has a significant frontage along Mitchell Highway (A32) which runs from east to west from the M4 Motorway in Greater Sydney connecting through Penrith, Katoomba, Bathurst to Orange.

The Site lies on the southern side of Redmond Place, bounded by Bathurst Road / Mitchell Highway (on the northeast), Lone Pine Avenue (on the west) and Dairy Creek Road to the south. It is surrounded by a mixture of land uses with low density residential to the west, retail and large format retail to the north, rural farmland to the south and east, as well as a kart racing track 250m north of the Mitchell highway.

The Site is approximately 24.2 Ha in size and is currently vacant, except for a structure that previously housed an emergency services helicopter hangar. **Table 1** summarises the lot and DP information for the Site and **Figure 1** shows aerial imagery of the Site and the surrounding land.

The land is owned by Orange City Council, who will remain owners throughout the course of the project.

Table 1: Lot and DPs for the Site (Landcom 2024)

Address	Lot and DP	Area (ha)	Owner
3 Redmond Place, Orange	Lot 6 DP 1031236	2.28	Orange City Council
154 Lone Pine Avenue, Orange	Lot 1 DP 153167	4.10	Orange City Council
5255 Mitchell Highway, Orange	Lot 200 DP 1288388	17.85	Orange City Council

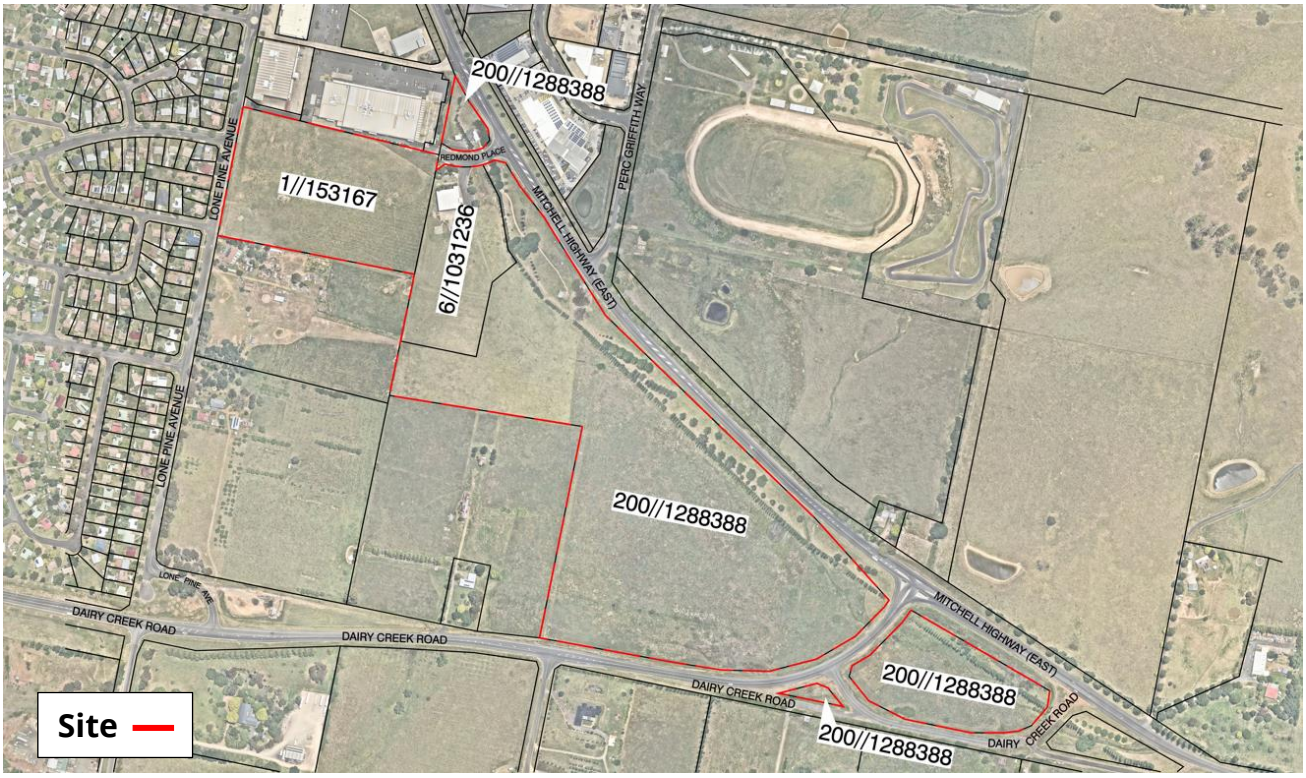


Figure 1: Aerial view of the Site (Nearmap 2024)

3. Proposed Masterplan

Landcom and Orange City Council have signed a Project Delivery Agreement for the purposes of delivering the Redmond Place project. Landcom are taking the lead in preparing a planning proposal to amend the Orange Local Environmental Plan 2011 (LEP) to rezone the Site for residential uses.

As per the Masterplan prepared by Oculus (dated 30 May 2024), the proposed masterplan for the residential development over the Site will deliver approximately 330 dwellings across 266 lots and four stages. **Table 2** below summarises each stage of the proposed development and **Figure 2** overleaf shows the masterplan and staging plan of the proposal.

Table 2: Summary of the proposed development (Landcom 2024)

Stage	Number of Dwellings	Anticipated Construction Commencement Date	Anticipated Construction Completion Date
1a	67	November 2026	October 2027
1b	60	November 2027	October 2028
2	92	November 2028	October 2029
3	111	November 2029	October 2030

The proposal will promote housing diversity through supporting a diverse mix of product, including:

- Apartments on superlots – Totalling 66 dwellings
- Medium density dwellings (215m^2 average lot size) – Totalling 130 dwellings
- Low density dwellings (422m^2 average lot size) – Totalling 134 dwellings

Twenty percent of all residential dwellings proposed will be allocated as affordable housing.

This proposed residential precinct will increase the supply of land to facilitate housing through the creation of lots to support a sustainable, innovative and affordable community.

Figure 2: Indicative Masterplan (Oculus 2024)

Figure 3: Indicative WSUD and Open Space (Oculus 2024)

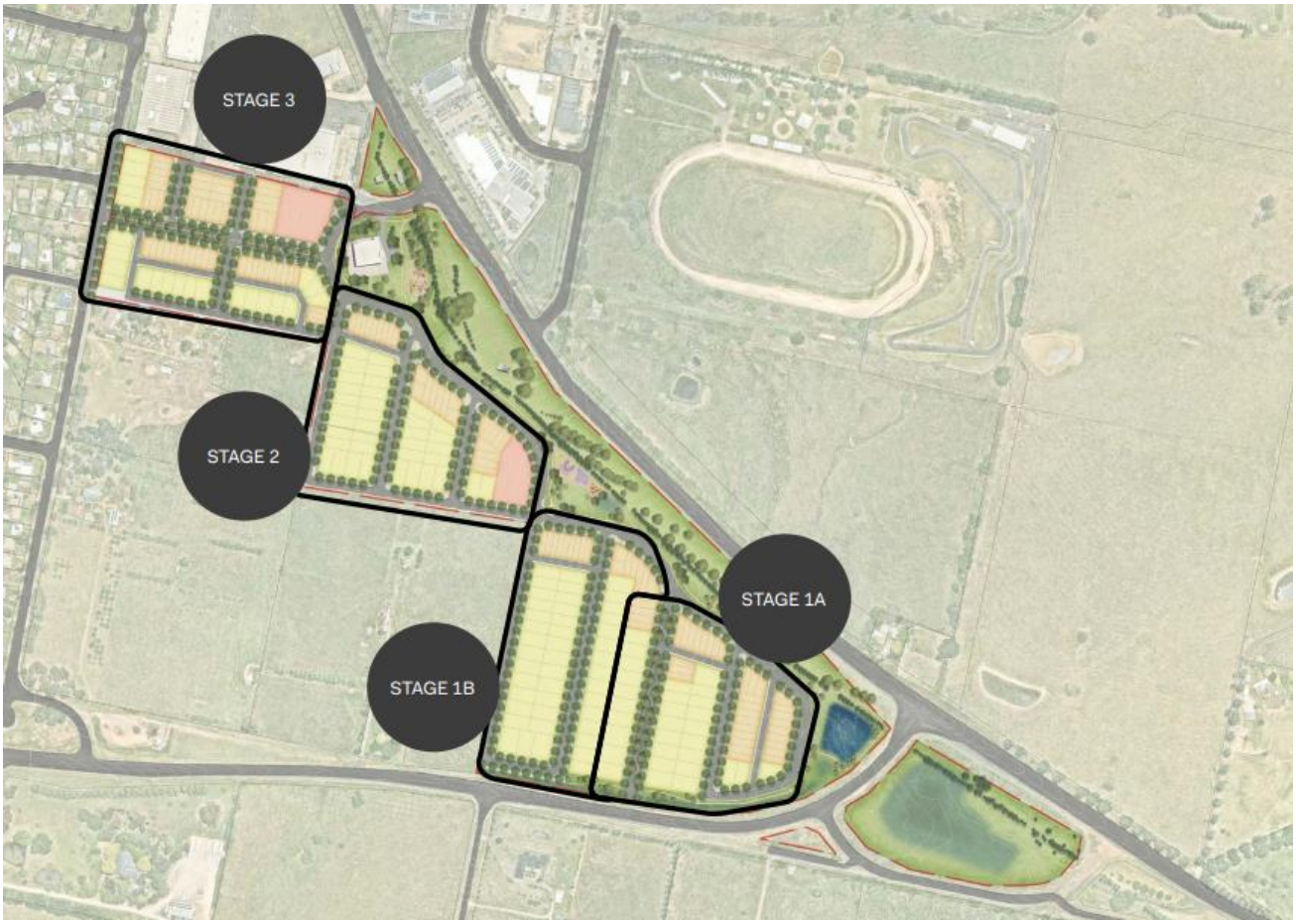


Figure 4: Proposed Staging of the Proposed Development (Oculus 2024)

4. Water and Sewer Service Provision

Orange City Council is the principal authority who manages water and sewerage services in the Orange LGA. As part of the rezoning, Orange City Council has prepared a Technical Memorandum (Revision 5, dated 4 June 2024) that investigates the existing network capacity and proposes water and sewer strategies to service the development.

This section will summarise the advice provided by Orange City Council in their Technical Memorandum (Refer to **Appendix A** for details).

4.1 Water

4.1.1 Existing Services

The Site is located in the East Orange Boosted Zone (EOBZ) and is supplied by a water booster station on 1 Lone Pine Avenue approximately 1.15km southeast of the Site (Refer **Figure 5**). The existing water supply network in the EOBZ is sufficiently sized for the existing load and shows no signs of having capacity constraints. The closest main for extension is located along Long Pine Avenue.

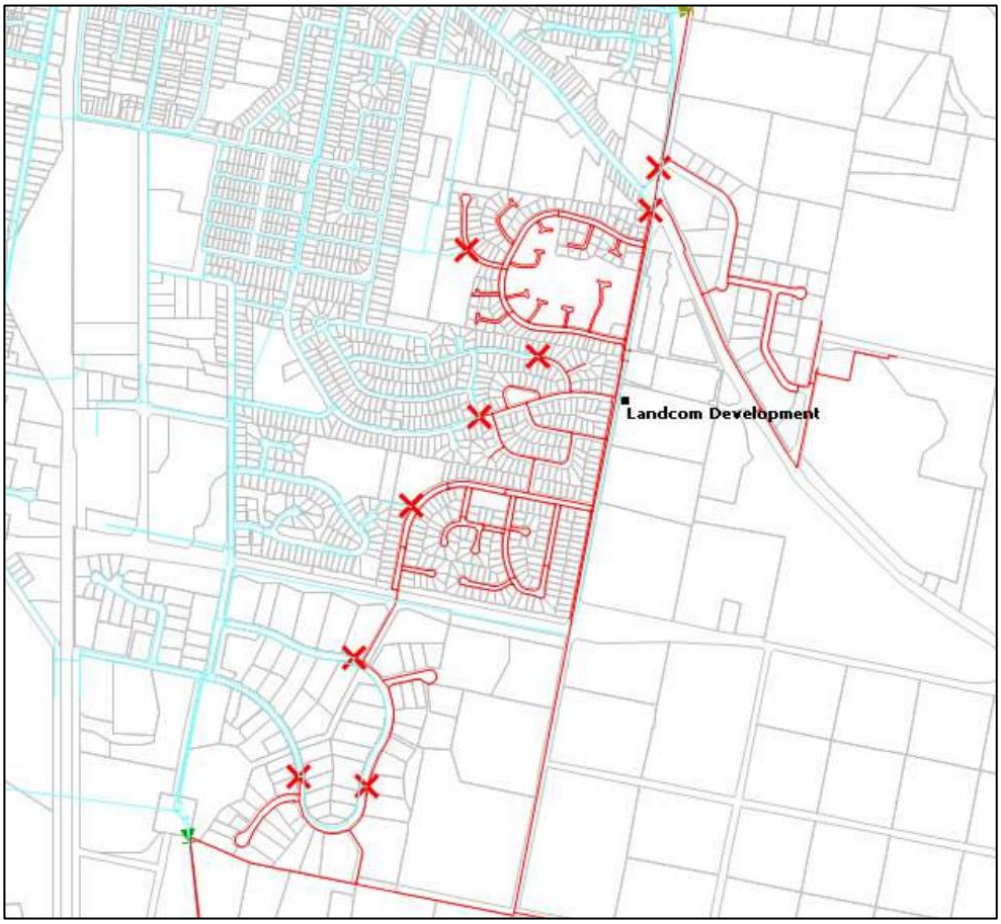


Figure 5: Extent of the EOBZ (Orange City Council 2024)

4.1.2 Proposed Water Demand

Refer to **Table 3** for a summary of the water demands for each stage of the proposed development.

Table 3: Summary of the proposed water demands (Orange City Council 2024)

Stage	Dwellings	Water Demand (ET)
1a	67	60
1b	60	57
2	85	70
3	118	77
Total	**330**	**264**

4.1.3 Proposed Services

In their Technical Memorandum, Council has undertaken modelling of the cumulative and ultimate effects of each stage on the system capacity of the EOBZ. The modelling used the following performance indicators to test the system's capacity:

- Pipe head-loss per unit (m/km) – Not to exceed 3m/km or higher and ideally less than 1m/km.
- Node residual pressure (m) – Not to drop below 20m and ideally greater than 30m.

The development was modelled with three potential connections to the existing water supply network, with the connections to be triggered based on the release of each stage of the development.

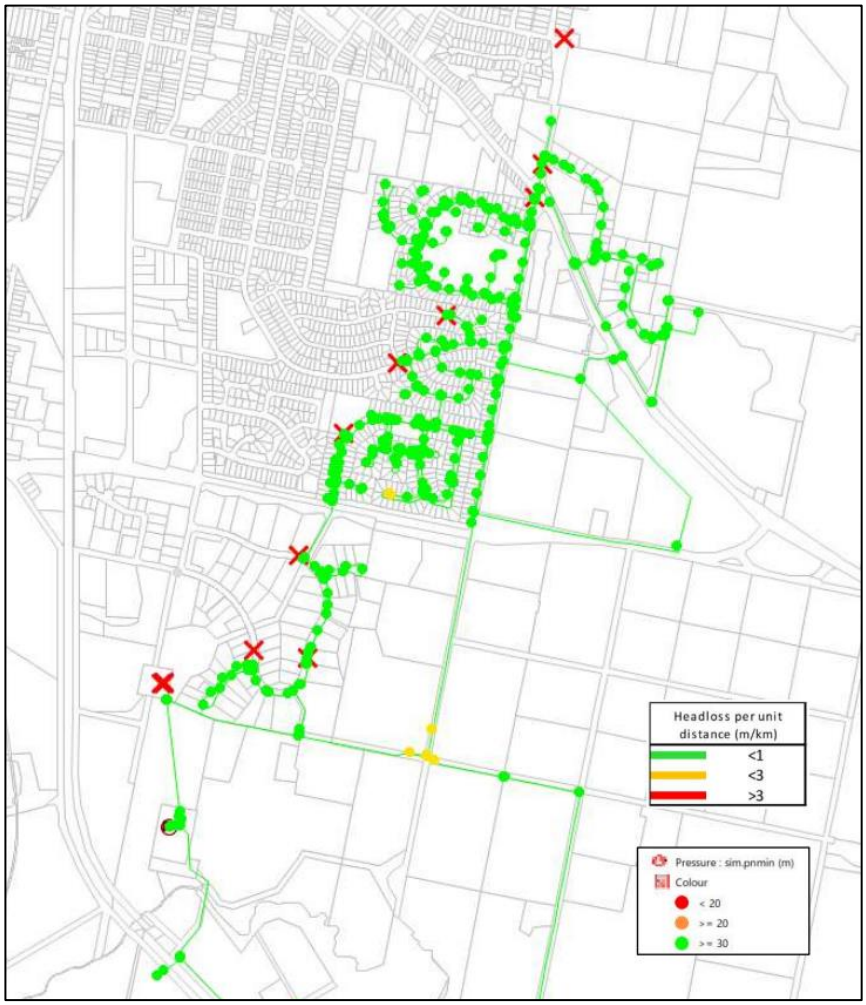


Figure 6: Ultimate Effect of the Proposed Development on the EOBZ (Orange City Council 2024)

As shown in **Figure 6** above, there is sufficient capacity in the existing network to facilitate the development, provided the following infrastructure upgrades are delivered for each stage (see **Figure 7**):

- Stages 1a and 1b – DN150 extension to the development site from the DN300 water main on Lone Pine Avenue.
- Stage 2 – DN150 extension from the DN150 main on Redmond Place.
- Stage 3 – DN150 extension connecting the Stage 2 lead-in main to the DN300 watermain on Lone Pine Avenue.

Note the preliminary water main sizes through the development are assumed to be DN150 water mains, which are to be confirmed in the detailed servicing strategy.

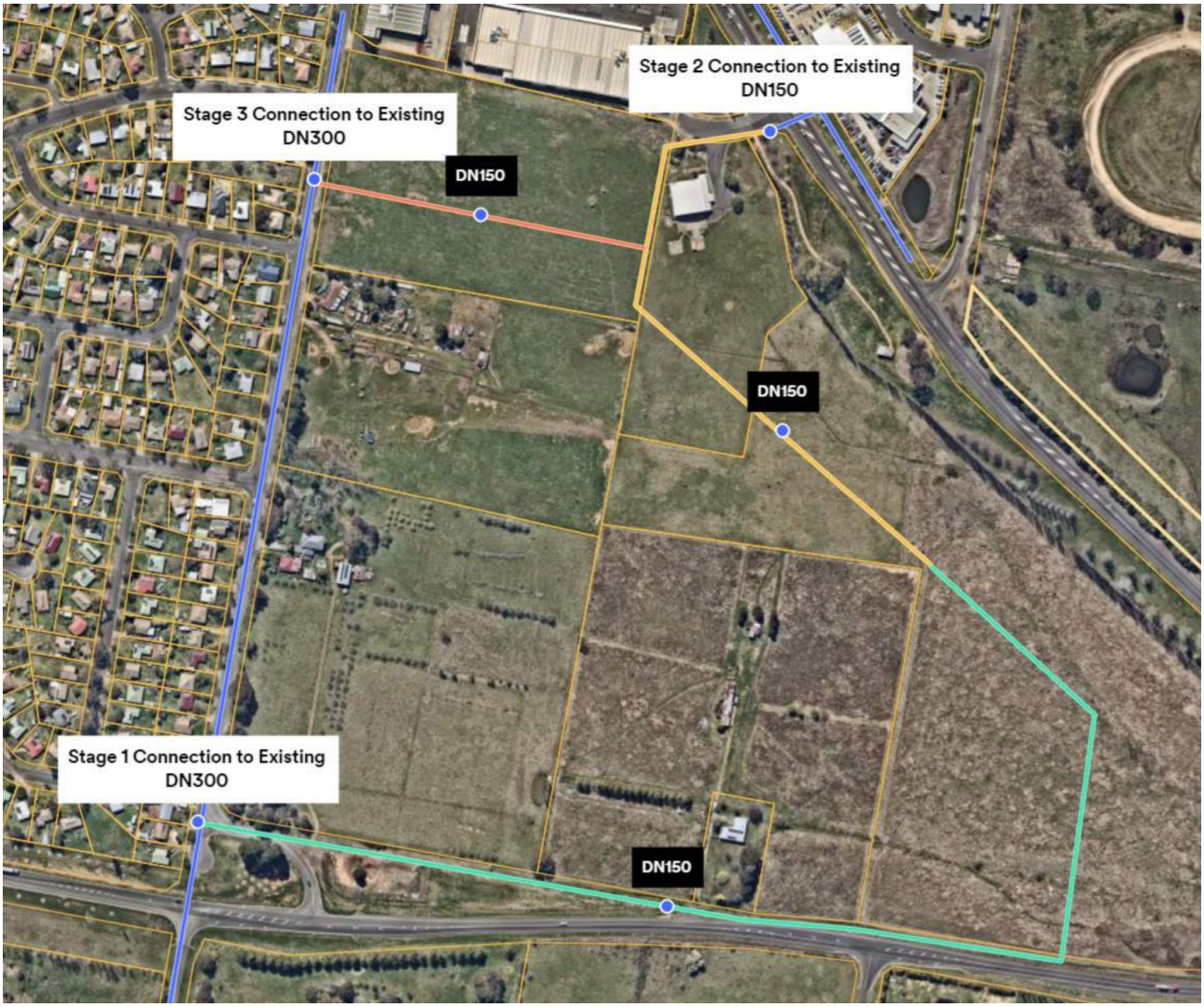


Figure 7: Proposed Water Servicing Strategy (Orange City Council 2024)

4.2 Sewer

4.2.1 Existing Services

The development is not located within an existing sewer catchment. The existing DN300 trunk main near Moad Street is the closest potential point of connection. However, modelling has revealed that there is insufficient capacity in this main to facilitate further loading.

The preferred discharge location is into the existing DN375 AC trunk main near the intersection of Blowes Road and Edwards Street (Refer **Figure 8** overleaf). The existing network in this location can contain an additional 2000ET. However, this main will also collect loads from future development in the OLSP (2702 ET) and Shiralee Development Area (1700 ET).

4.2.2 Proposed Sewerage Loads

Refer to **Table 4** for a summary of the sewer loads for each stage of the proposed development.

Table 4: Summary of the proposed sewerage loads (Orange City Council 2024)

Stage	Dwellings	Sewer Demand (ET)
1a	67	67
1b	60	60
2	85	83
3	118	97
Total	**330**	**307**

4.2.3 Proposed Services

Following the exceedance of the available capacity for the DN375 main, Council has recommended the following sewer infrastructure works would be required to facilitate the future loads from the proposed development and surrounding developments:

1. A new DN375 diversion main running north-south through McNeilly Avenue from the DN375 AC trunk main on Blowes Road to the DN375 VC trunk main located between the railway and Edward Street.
2. A new sewer pumping station (SPS) located in a section of unused road reserve along Dairy Creek Road.
3. New dual sewer rising mains that connects the proposed SPS to the crest of Dairy Creek Road heading west, including:
    - An interim DN110 rising main to service Stages 1a-1b only, and
    - An ultimate DN180 rising main that will replace the DN110 main to service the full development.
4. A new DN300 gravity sewer main that connects the rising mains to the existing sewer network.
5. Under-boring of Dairy Creek Road to connect the gravity sewer mains that will service the proposed development to the SPS.

The trunk main diversion will be delivered by Council and funded via their Developer Servicing Plan. All the other sewer infrastructure listed above will need to be delivered at the developer's cost.

Figure 8 overleaf illustrates the proposed sewer servicing strategy for the development.

Figure 8: Proposed Sewer Servicing Strategy (Orange City Council 2024)

Note the sewer pumping station location is indicative and Council advised it is capable of being relocated within the Site at the detailed design stage.

The development also shares a catchment with three adjoining lots (refer to **Figure 8** above) with development potential (130 & 148 Lone Pine Ave and 84 Dairy Creek Road) and the provision of sewer capacity must be available to potentially service this land. Preliminary sewer infrastructure sizing was undertaken by Orange City Council in accordance with WSAA to determine any additional upsizing requirements to facilitate servicing the entire catchment.

The preliminary sewer pump stations calculations are shown in **Table 5** overleaf.

The calculations conclude that the ultimate DN180 rising main will have sufficient capacity to facilitate loading from the adjoining lots, with no further upsizing required.

Table 5: Preliminary SPS Modelling results for the Proposed Development and Adjoining Lots (Orange City Council 2024)

		Redmond Place			+ Adjoining Lots
		Interim (Stage 1a)	Interim Limit (Stage 1a + 1b)	Ultimate	Ultimate
LOADINGS					
Pump Station Loading	ET	63	121	331	540
Design Flow	L/s	6.2	8.9	15.7	24.4
PUMP STATION					
Diameter	m	2.2	2.2	2.2	2.2
Depth	m	5.80	5.80	5.80	5.80
Pump Starts / hour	No.	1.2	1.9	3.6	5.5
Pump Duty Flow	L/s	8.9	8.9	15.7	24.4
RISING MAIN					
SRM Specification		DN110 PE100	DN110 PE100	DN180 PE100	DN180 PE100
RM Total Length	m	1000	1000	1000	1000
Detention Time	hr	3.5	1.9	1.4	0.9
Velocity	m/s	1.08	1.08	0.94	1.45
Pump Duty Head	m	46.3	46.3	38.4	46.4

4.3 Water and Sewer Contributions

Orange City Council's 2023-2024 water and sewer development contributions that apply to the proposed development are summarised in **Table 6 and 7** below.

As the proposed development intends to deliver approximately 266 lots, the maximum contribution charges applicable would be roughly $2.3 million for water and $1.4 million for sewer. The overall contribution would be approximately $3.7 million.

Note this value will increase by 4.7% in July 2024 and will need to be paid prior to the issue of a Construction Certificate.

Table 6: 2023-2024 Water Development Contributions (Orange City Council 2024)

Name	Year 22/23 Last YR Fee (incl. GST)	Year 23/24 Fee (excl. GST)	GST	Fee (incl. GST)	Statutory	GST
1 bedroom dwelling	$4,173.30	$4,306.85	$0.00	$4,306.85	N	N
2 bedroom dwelling	$6,444.15	$6,650.35	$0.00	$6,650.35	N	N
3+ bedroom dwelling	$8,667.40	$8,944.75	$0.00	$8,944.75	N	N
Standard lot	$8,667.40	$8,944.75	$0.00	$8,944.75	N	N

Table 7: 2023-2024 Sewer Development Contributions (Orange City Council 2024)

Name	Year 22/23 Last YR Fee (incl. GST)	Year 23/24 Fee (excl. GST)	GST	Fee (incl. GST)	Statutory	GST
1 bedroom dwelling	$2,320.80	$2,395.05	$0.00	$2,395.05	N	N
2 bedroom dwelling	$3,548.25	$3,661.80	$0.00	$3,661.80	N	N
3+ bedroom dwelling	$5,323.00	$5,493.35	$0.00	$5,493.35	N	N
Standard lot	$5,323.00	$5,493.35	$0.00	$5,493.35	N	N

5. Electricity

5.1 Existing Services

The Site is fronted by a 66kV HV line along Mitchell Highway. Extending from this main, there are multiple 11kV LV feeders that cross into the Site that are available for connection, including:

1. One 11kV feeder running along Redmond Place, and
2. Another 11kV feeder crossing the Site from Dairy Creek Road.

Refer to **Figure 9** below for details.

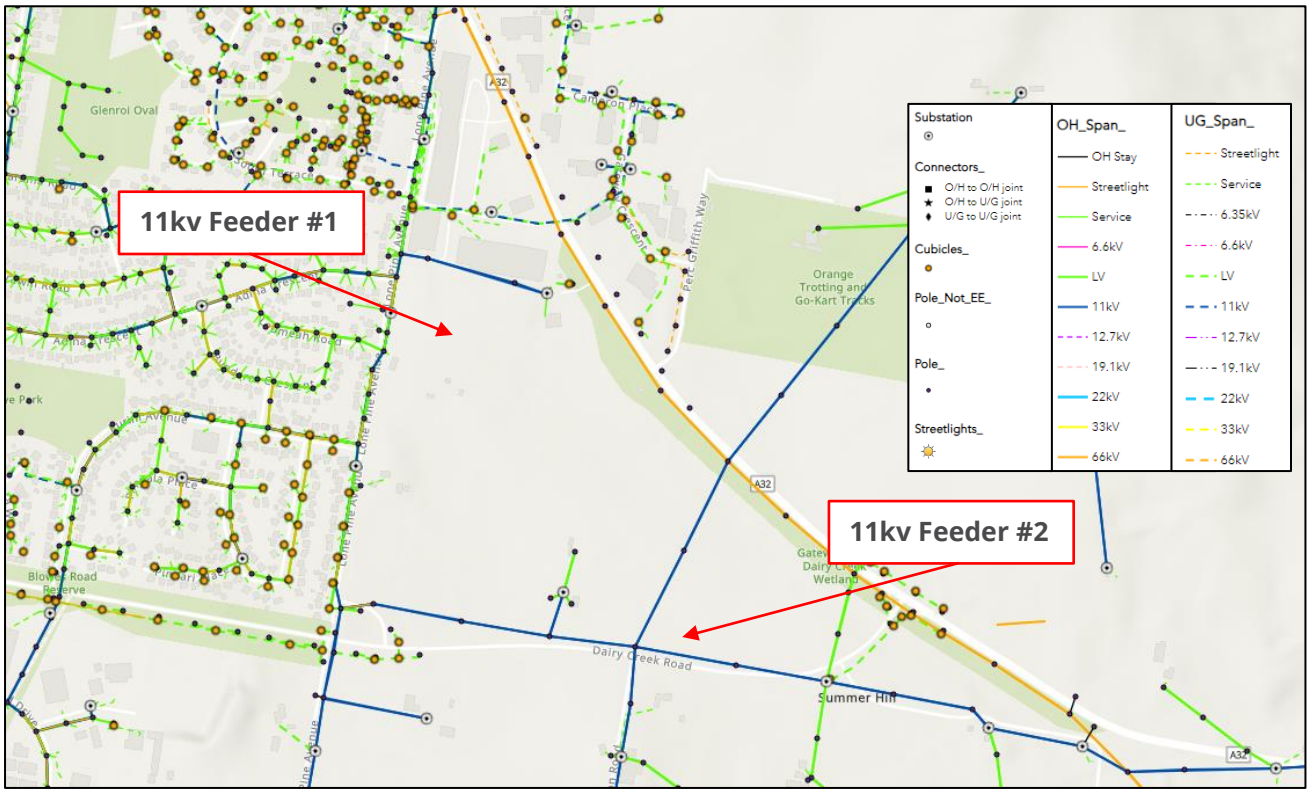


Figure 9: Existing electricity infrastructure servicing the Site (Essential Energy 2024)

5.2 Proposed Services

A Preliminary Planning Assessment Enquiry has been lodged with Essential Energy (dated 29 May 2024 – Refer **Appendix B**) and outlines the capacity of the existing system and necessary augmentations required to facilitate the proposed development.

The indicative development connection points into the existing network will be:

1. Pole OR.BZ.20 (Feeder ORS3B8) adjacent to 154 Lone Pine Avenue.
2. A suitable pole between Pole 9I104.1 through 9I453.2 along Dairy Creek Road (Refer **Figure 10**).

Essential Energy's Assessment determined the proposed development will have a load of 1.4-1.5MVA and the existing 11kV Distribution Feeders (ORS3B6 and ORS3B8) can readily support this increased load.

The Assessment also advised the following augmentation of assets will need to be funded and delivered by the proponent at the detailed design stage:

- The current overhead power lines along Redmond Place, spanning 260m from Pole OR.BZ.11 to Substation 10-9I249, will need to be removed. The LV reticulation network that will be constructed to service the Site must also service the properties north of Stage 3 that are supplied via this substation.
- Stage 1b will impact the 11kV overhead assets traversing the Site (from Poles 9I104.1 to OB.38). The proposed development will need to maintain this 11kV supply, likely through its relocation and/or undergrounding.
- Additional LV overhead assets that span further east across Stage 1a will be impacted. These impacts need to be managed, likely through the relocation and/or undergrounding of these assets.
- HV Protection augmentation is required as part of Stage 1A. This includes relocating Recloser 10-R602 downstream of pole 9I453.1 and installing a new HV fuse site beyond Recloser 10-R12987.

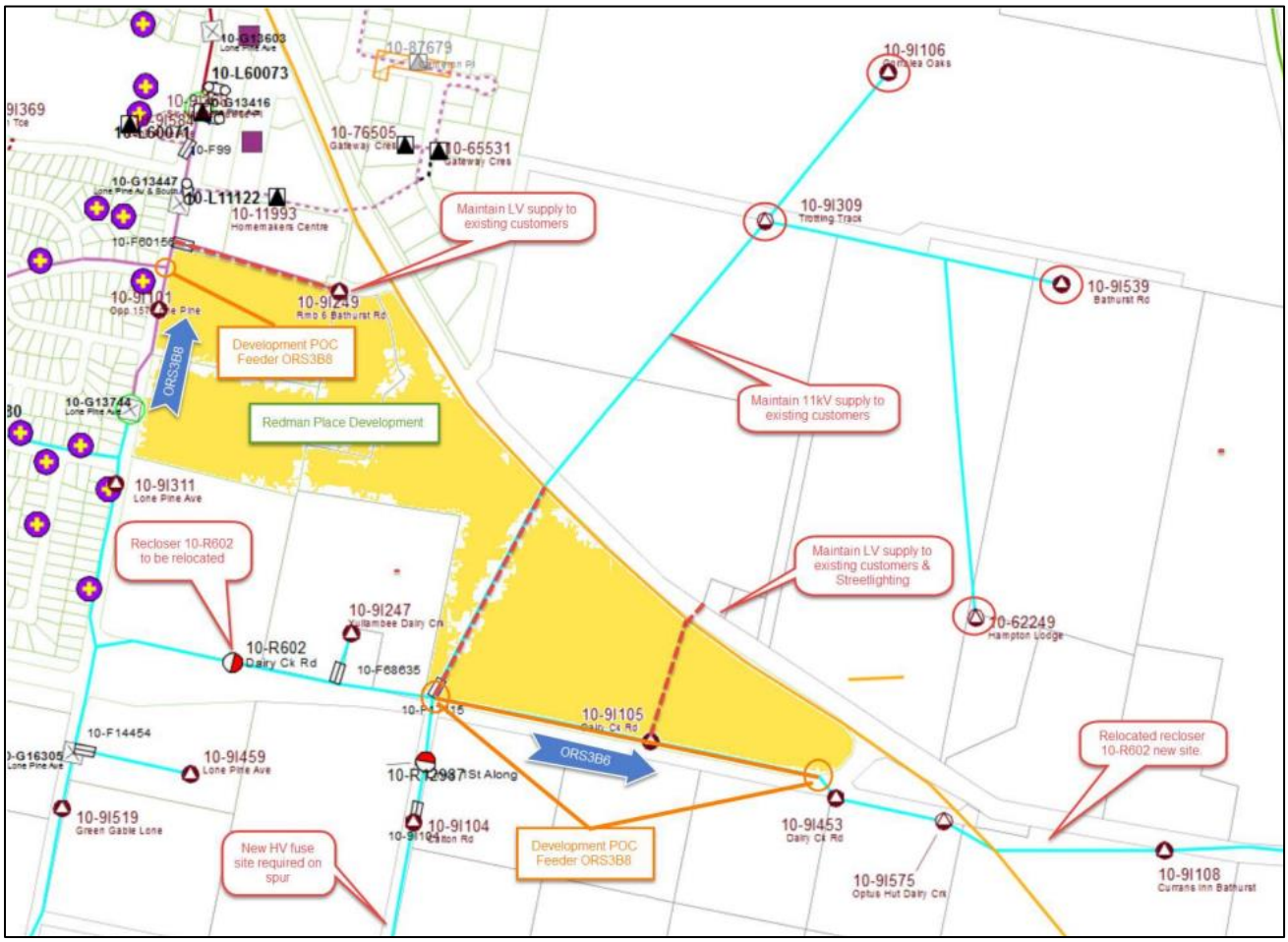


Figure 10: Existing and Proposed electricity infrastructure to service Site (Essential Energy 2024)

It is noted that the Proponent intends to underground and potentially relocate any existing overhead assets traversing the Site. This will ensure the connections to surrounding properties are maintained and the assets are safeguarded through the design of the proposed development, once rezoned.

All asset augmentations and relocations will be investigated further during the detailed design phase.

6. Gas

A Before You Dig Australia search has identified the gas infrastructure surrounding the Site. The Site has access to a 210kPa medium pressure gas main fronting and connecting into 154 Lone Pine Avenue, near Stages 1 and 2. Refer to **Figure 11** below for details.

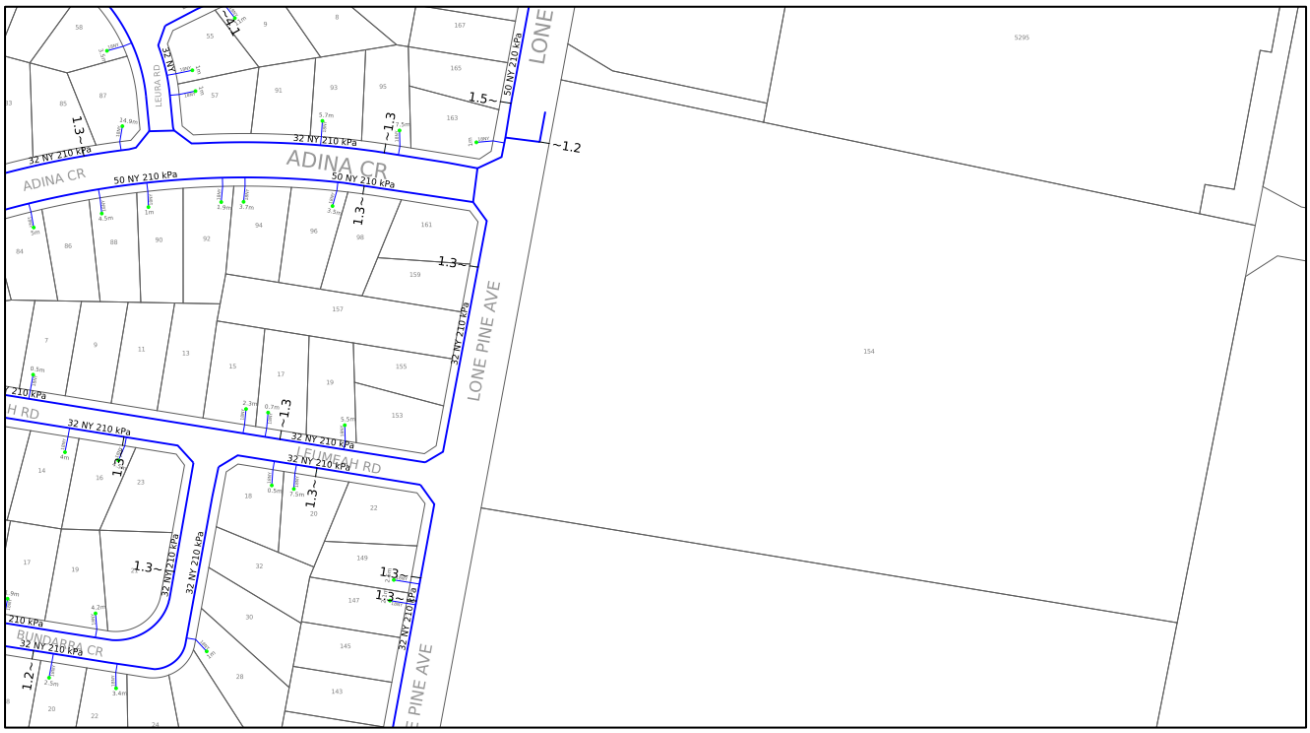


Figure 11: Existing gas infrastructure servicing the Site (Jemena 2024)

In an email from Jemena dated 8 February 2024 (Refer **Appendix C**), it was confirmed that:

- The current natural gas network can just support the volumes generated by the proposed development.
- Jemena does not reserve capacity for any specific project and will review any applications at time of receipt.

Landcom are aiming to achieve a minimum 5 star GBCA rating for the development. If a decision is made to deliver gas to the development, Landcom will need to lodge a formal connection application with Jemena to determine detailed servicing requirements and reconfirm capacity is still available. An ASP/Trench Provider will need to be nominated to excavate a shared trench to accommodate multiple new utilities and to enable Jemena's contractor to install the gas pipeline extensions.

The development will be subject to minor contributions that will be determined during the detailed application phase. Low density residential lots are typically charged $700-$1,000 per lot in the Orange LGA. Charges for medium and high-density dwellings will likely be reduced due to savings from construction efficiencies and lower capital costs.

7. Telecommunications

NBN Co. is the default Statutory Infrastructure Provider (SIP) providing most Australian premises with broadband and voice telephone services. According to the NBN Co. network map (Refer **Figure 12**), telecommunication services are available for the entirety of the Site, which is serviced by NBN's fixed wireless infrastructure.

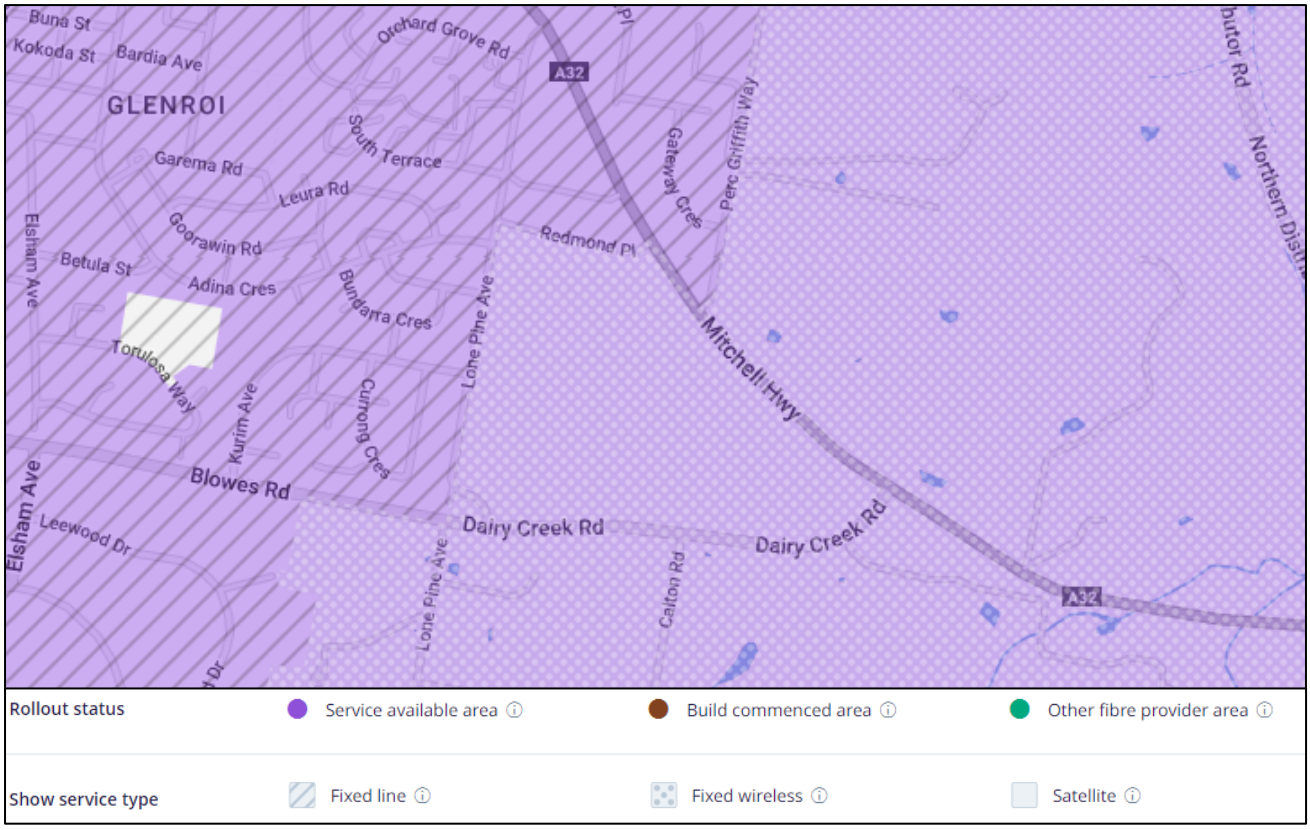


Figure 12: Existing NBN infrastructure servicing the Site (NBN Co. 2024)

However, considering the scale of the proposed development and its subdivision into approximately 266 lots, extensions to the existing fixed line service will be required to enable fibre to each new property.

A BYDA search of the Site shows an underground Optus IOF cable that traverses the Site and runs parallel with Mitchell Highway. This fibre optic cable is not suitable for connection.

NBN Co. has multiple 20-100mm PVC conduits containing copper/fibre cables surrounding the Site that are suitable for connection. The nearest connection points to the Site are located along Lone Pine Avenue near Stage 3, within Stage 2 from Mitchell Highway and along Dairy Creek Road near Stage 1a. The preferred connection point by the NBN will likely be from Lone Pine Avenue and conduit/cable extensions will be in accordance with NBN design and build guidelines.

Further investigation and detailed design will be required to determine the location, staging and extent of infrastructure. An NBN designer will be engaged at the detailed design stage to facilitate the reticulation of telecommunication services throughout the proposed development, and connection to the existing infrastructure allowing for a point of connection for each proposed lot.

8. Stormwater

The Site is mostly vacant and does not have any measures to convey stormwater on Site. Stormwater that does not permeate through the Site is assumed to create overland flow that eventually flows into the pit and pipe network along Dairy Creek Road and Mitchell Highway.

In order to manage stormwater runoff for the proposed development, the following stormwater infrastructure will be required:

- Two bio-retention basins (B01 and B02) approximately 600sqm and 500sqm in area, respectively;
- One open water body pond (WL01) approximately 2,630m² in area;
- A detention basin that will include approximately 14,900m³ of storage with an approximate 11,000m² footprint;
- A constructed channel and WSUD vegetation through the open space / drainage reserve fronting Mitchell Highway to convey stormwater within the Site; and
- A 6 metre wide swale spanning across the frontage of Dairy Creek Road.

This infrastructure is considered suitable to effectively drain and treat the stormwater surface run-off anticipated to be generated by the proposed development.

The bioretention basins will also minimise the footprint required for stormwater infrastructure and will provide significant benefits including urban cooling, habitat for native fauna and the potential for stormwater harvesting and reuse on Site for irrigation purposes. Refer to **Figure 13** below for details.

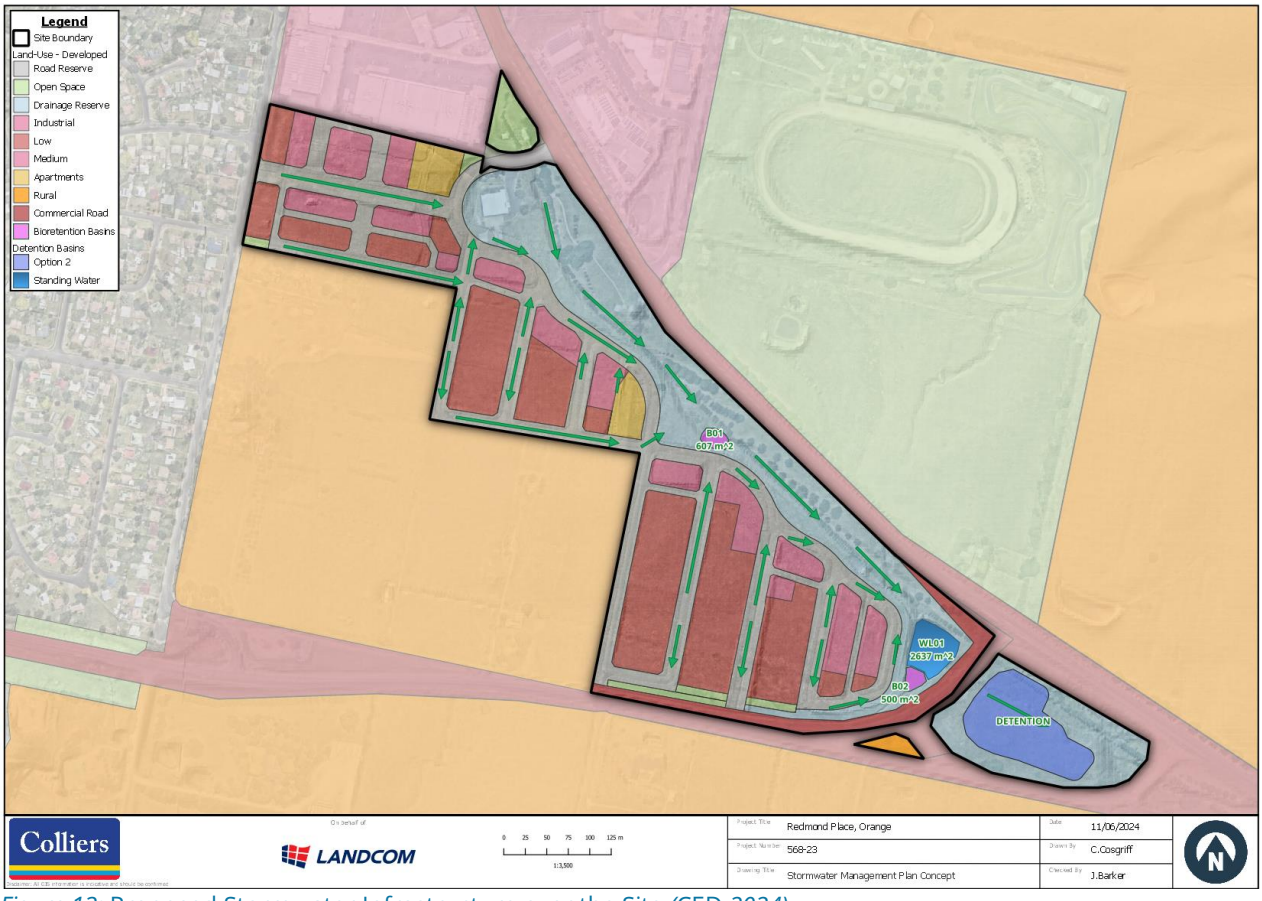


Figure 13: Proposed Stormwater Infrastructure over the Site *(CED 2024)*

9. Conclusion

This Infrastructure Servicing Assessment has demonstrated that the proposed development at Redmond Place, Orange, once rezoned, will have appropriate arrangements in place to provide water, sewerage, electricity, gas, telecommunication and stormwater management service provisions.

In summary, the following steps are required to progress the development of the Site once rezoned:

1. Progress architectural plans and subdivision plans for each stage of the development.
2. Prior to construction commencing, submit formal applications with the following utility authorities to recheck available capacity and determine detailed connection requirements – Orange City Council, Essential Energy, Jemena and NBN Co.
3. Construct the necessary infrastructure upgrades as required by each utility authority, which at this stage is summarised as follows:
    - Water – Watermain extensions to connect into two separate existing mains on Lone Pine Avenue and Redmond Place.
    - Sewer – New trunk main diversion, rising main, trunk gravity main and SPS within the Site and along Dairy Creek Road.
    - Electrical – Removal, relocation and undergrounding of 11kV feeders traversing the Site.
    - Stormwater – Provide two bioretention basins, one open water body pond, detention basin, drainage channel and swale.
    - All services – Construct necessary extensions from the existing network to provide reticulation services to each proposed lot.

References

- Before You Dig Australia, 2024.
- Essential Energy, 2024, Network Information Portal, <https://essentialenergy.maps.arcgis.com/apps/webappviewer/index.html?id=947af3fb3749427e97a4824dcbd49980>.
- Essential Energy, 2024, Enquiry Planning Assessment (Case-00194439).
- NBN, 2024, Rollout Map, <https://www.nbnco.com.au/learn/rollout-map#accordion-7bc66b71ce-item-9ebf443e9d>.
- Nearmap 2024, <https://apps.nearmap.com/maps>.
- Oculus 2024, Redmond Place, Orange Masterplan Report.
- Orange City Council, 2024, Technical Memorandum – Revision 5 dated 4 June 2024.

Appendix A – Orange City Council Technical Memorandum: Preliminary Water and Sewer Servicing Strategy (Revision 5, dated 4 June 2024)

Technical Memorandum

TO	WATER & SEWER STRATEGIC MANAGER
FROM	WATER & SEWER STRATEGIC PLANNING ENGINEER
DATE	21 September 2023
REVISION	5 (4 June 2024)
TITLE	Redmond Place Development - Preliminary Water & Sewer Servicing Strategy

Executive Summary

The purpose of this technical memo was to investigate water and sewer servicing for the proposed residential development in Redmond Place Orange, referred to as the *Redmond Place Development*.

It was found that the existing water reticulation network has sufficient capacity for the development. Several connection points to the existing system have been identified which are to be triggered based on the interim staging plan.

It has also been identified that the development is in the vicinity of the DN375 Spring Creek to Icely Road WTP pipeline. Although not shown on the interim concept master plan, it appears that the proposed development will be clear of this main. It must be accurately identified during the Development Application stage and appropriately protected during construction.

With respect to sewer reticulation servicing, a new sewer pump station (SPS) & rising main will be required at the south-eastern corner of the development site. The SPS is to service both the Redmond Place Development and have capacity provision for the adjoining parcel of land (130 & 148 Lone Pine Ave and 84 Dairy Creek Road). Initial calculations suggest that an interim & ultimate sewer rising main is required, which are to discharge into a DN300 sewer gravity main at the high point on the Southern Feeder Road (SFR) and gravitate to the existing manhole on the corner of Elsham Ave & SFR. A DN375 diversion sewer gravity main must be constructed in the medium to long-term (*Bloomfield Precinct Development Assessment Report 2019)*, depending on development progression in the Shiralee and Orange Life Science Precincts (OLSP). This diversion main is identified in Council's Capital Works Program as part of the Developer Servicing Plan and will be funded & delivered by Council.

The preliminary sewer pump stations parameters were calculated to determine potential upsizes required to facilitate the adjoining lots in the sewer catchment. It was found that the pump station diameter and ultimate rising main will have sufficient capacity to facilitate the whole catchment.

Below is a summary of the preliminary sewer pump station design parameters:

		Redmond Place			+ Adjoining Lots
		Interim (Stage 1a)	Interim Limit (Stage 1a + 1b)	Ultimate	Ultimate
LOADINGS					
Pump Station Loading	ET	63	121	331	540
Design Flow	L/s	6.2	8.9	15.7	24.4
PUMP STATION					
Diameter	m	2.2	2.2	2.2	2.2
Depth	m	5.80	5.80	5.80	5.80
Pump Starts / hour	No.	1.2	1.9	3.6	5.5
Pump Duty Flow	L/s	8.9	8.9	15.7	24.4
RISING MAIN					
SRM Specification		DN110 PE100	DN110 PE100	DN180 PE100	DN180 PE100
RM Total Length	m	1000	1000	1000	1000
Detention Time	hr	3.5	1.9	1.4	0.9
Velocity	m/s	1.08	1.08	0.94	1.45
Pump Duty Head	m	46.3	46.3	38.4	46.4

Table ES.1 – Preliminary Sewer Pump Station Design Parameters

1 Introduction

The proposed residential development of the Council owned land on Redmond Place (referred to as "the development") has triggered an assessment of the water and sewer networks for facilitation of the additional load generated by the development. The purpose of this preliminary servicing strategy is to assess existing network capacities and propose a preliminary water & sewer servicing strategy. The strategy is based on concept master plan design from *Oculus* titled "Interim Master Plan Update" dated 26/04/2024 (unspecified revision number).

2 System Loadings

2.1 Development Loading Analysis

The additional water and sewer load produced from the development was assessed using the Water Directorate guideline *Section 64 Determinations of Equivalent Tenements (2017)*. The Equivalent Tenement (ET) determinations were determined based on the *Interim Master Plan* and are summarised below for each stage:

Stage	Water (ET)	Sewer (ET)
1a	60	67
1b	57	60
2	70	83
3	77	97
Total	**264**	**307**

Table 2.1 – ET Loadings

The *Oculus Interim Staging Plan* and associated ET calculations can be found in Appendix A.

2.2 Provision for Adjoining Land

The development shares a catchment with three adjoining lots with development potential (130 & 148 Lone Pine Ave and 84 Dairy Creek Road). These lots are not currently zoned for development however the *WSAA Regional NSW Gravity Sewerage Code (1.2.5 Concept Design)* specifies that the concept plan shall have provision for future expansion, as determined by the Water Authority.

It shall be a requirement of the development to make capacity provision within the sewerage network to potentially service these lots through the upsizing of sewer gravity mains. This will significantly reduce the costs and community impacts should these developments proceed in the future. The lot yield estimated from this adjoining land is estimated to be 12 lots/Ha which equates to approximately 209 ET.

3 Water Supply Servicing Strategy

The development is located in the East Orange Boosted Zone (EOBZ), which is a network supplied from a water booster station near the decommissioned Spring Creek Water Filtration plant. The booster station is fed from a DN375 which connects directly to Icely Road WTP. For the purpose of this capacity assessment, the focus zone will be the EOBZ. The current EOBZ is shown below in Figure 1 (Red):

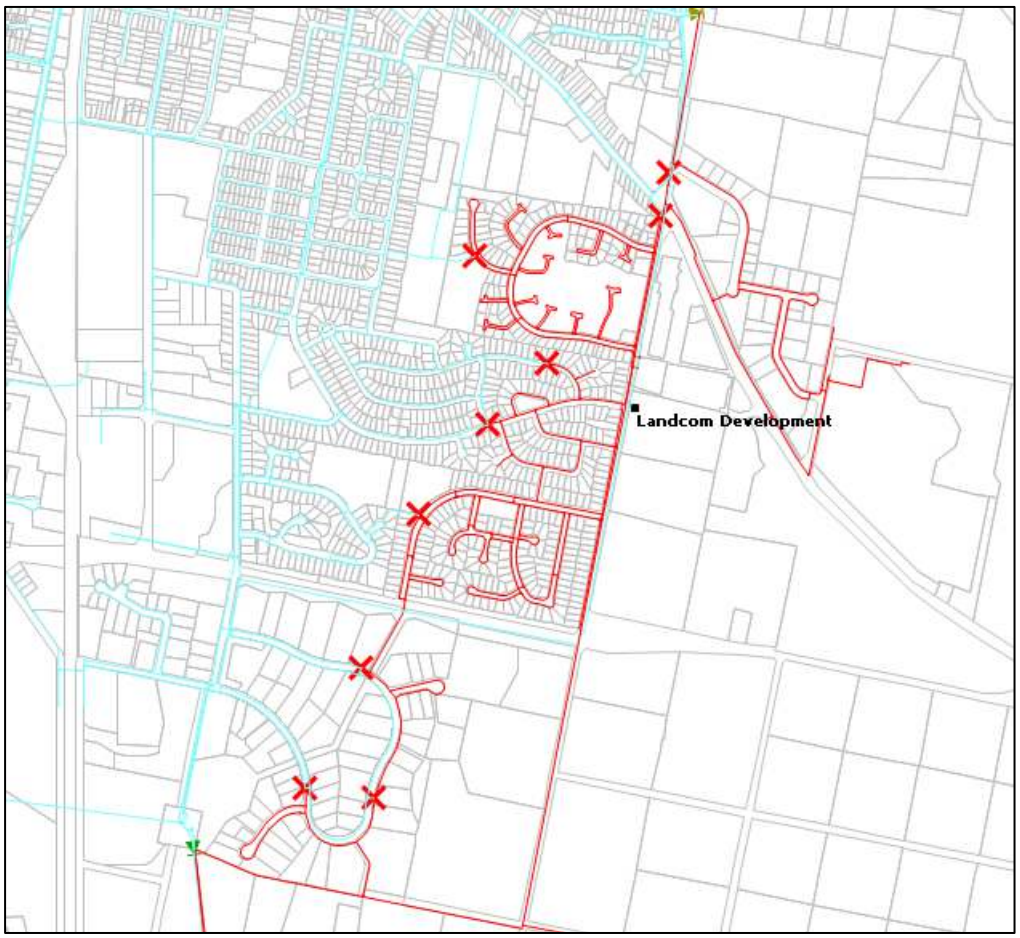


Figure 3.1 – East Orange Boosted Zone (Red)

3.1 Design and Assessment Criteria

The following Levels of Service are applicable to the design of the reticulated water supply system:

1. *Water available to use* - Peak day demand of 1700 L/tenement/day.
2. *Adequate pressure available* - Provide pressures between 20 and 80 m head of water in the reticulation system whilst conveying a minimum of 6 litres per minute per residential connection under normal conditions.
3. *Water available for fire-fighting* - Water will be available from reticulation fire hydrants for firefighting at minimum flow rates as set out in Local Government Regulations and the conditions established by the NSW Fire and Rescue (minimum 12m residual pressure at 10 L/s)

The system capacity will be assessed using the following key performance indicators:

- Pipe head-loss per unit distance (m/km) - acceptable result <3 m/km, with a desirable result being <1 m/km.
- Node residual pressure (m) - acceptable result considered to be >20 m, with a desirable result being >30

3.2 Base Model Scenario

The existing water supply network was designed to cater for the current development within the East Orange area. It is noted that no developments were identified in the *Orange Housing Strategy* for this area or has this development been previously considered in any other water reticulation servicing strategies.

Below are the results of the EOBZ Peak Day scenario:

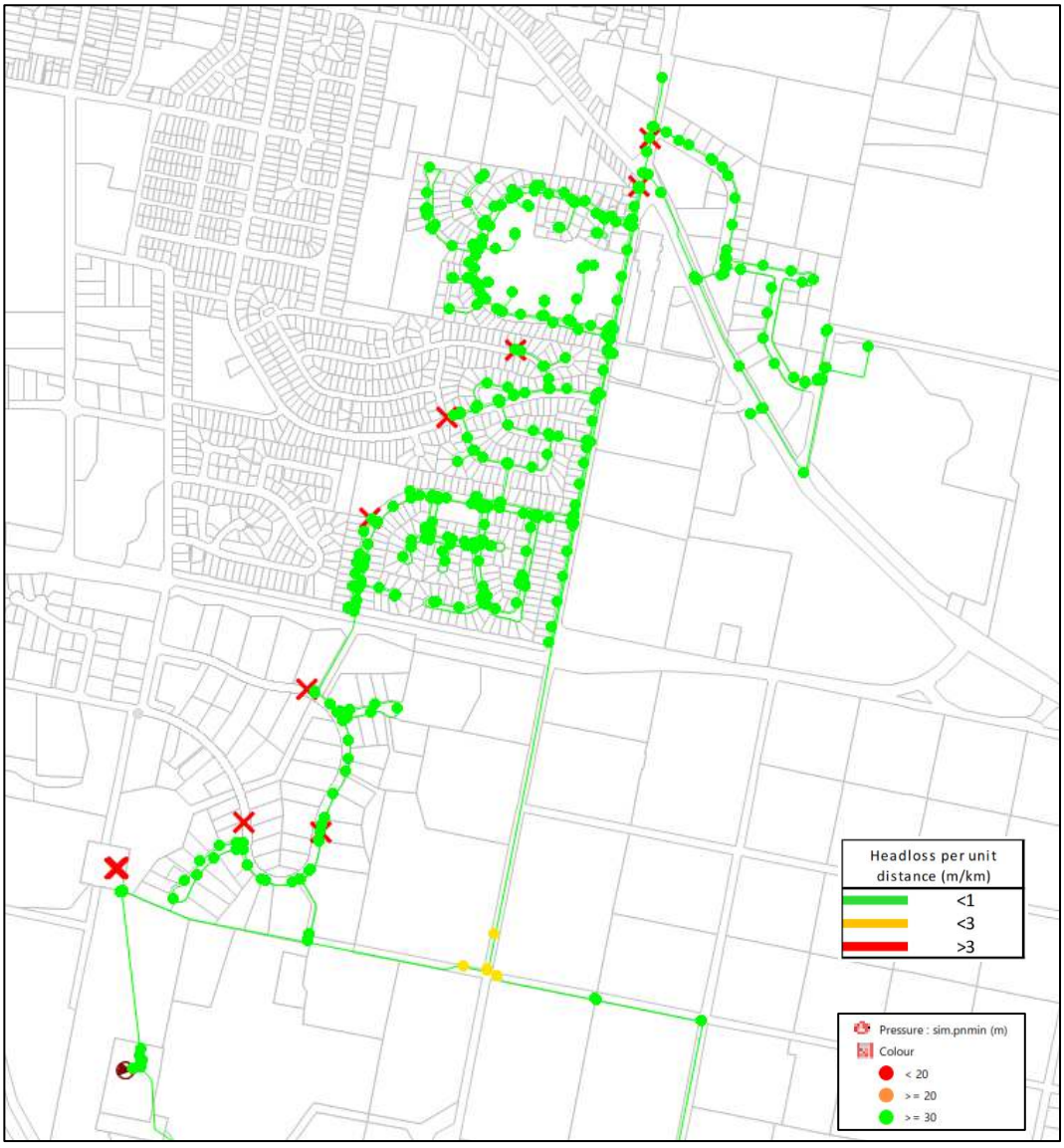


Figure 3.2.1 – EOBZ Model Results

The modelling results show that the existing water supply network is sufficiently sized for the existing load, with no links showing potential capacity issues. The residual node pressures are also compliant with the criteria specified in Section 4.1.

An assessment was undertaken on the East Orange Booster station to determine a typical diurnal flow profile through the pump station to verify the model results. It was found that the modelled network satisfactorily reflected an expected peak day flow through the EOBZ.

The actual flows in comparison to the base model are shown below:

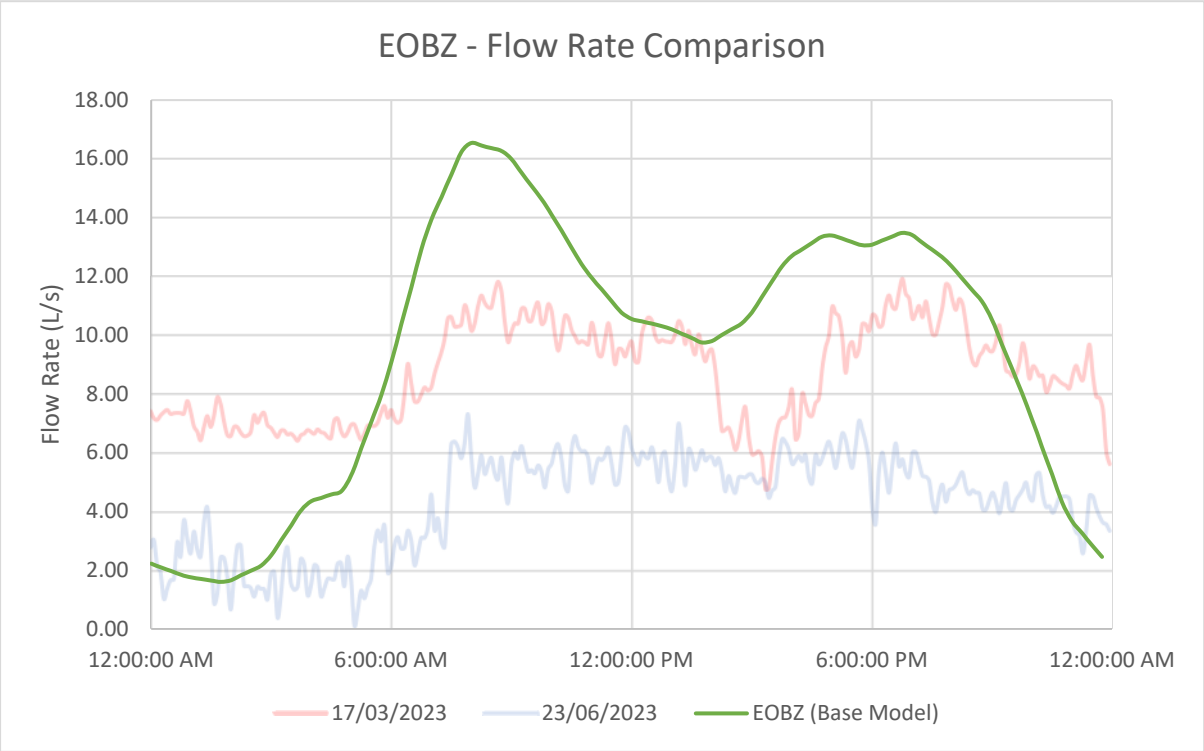


Figure 3.2.2 – EOBZ Network Comparison

3.3 Redmond Place Development Scenario

The Redmond Place development was modelled with three connections to the existing water supply network, with the connections to be triggered based on release of stages of the development. The connection locations adopted in the model are shown below:

Figure 3.3.1 – Connections to Council's Water Supply Network

Below are the results of the East Orange Boosted Zone Peak Day simulation with the inclusion of the load from the ultimate development (additional 283 ET):

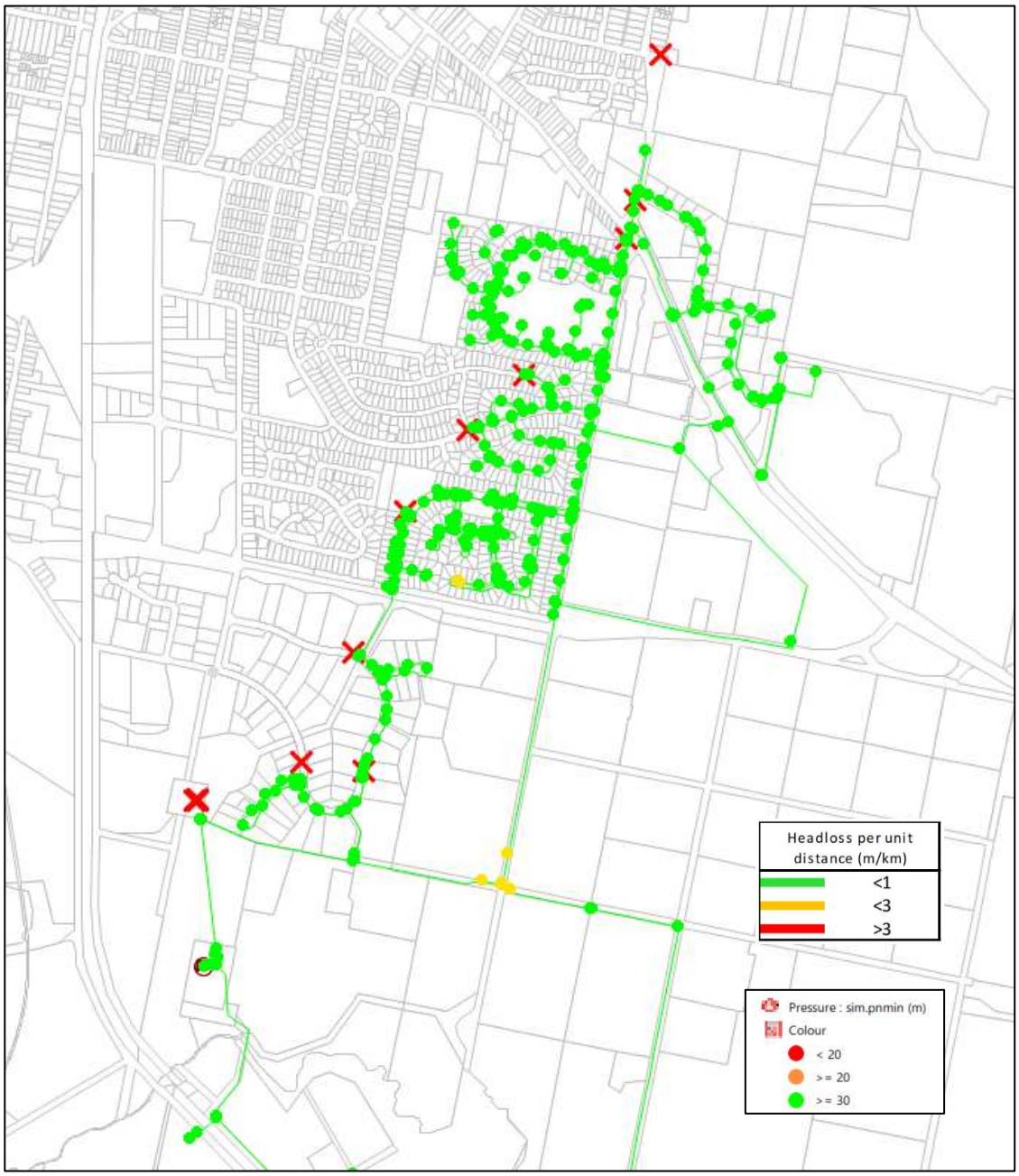


Figure 3.3.2 – Ultimate Development Model Results

As shown in results above, there is sufficient capacity in the existing network to facilitate the development. The peak day flow comparrison is shown below which includes the results from the EOBZ with the full development load:

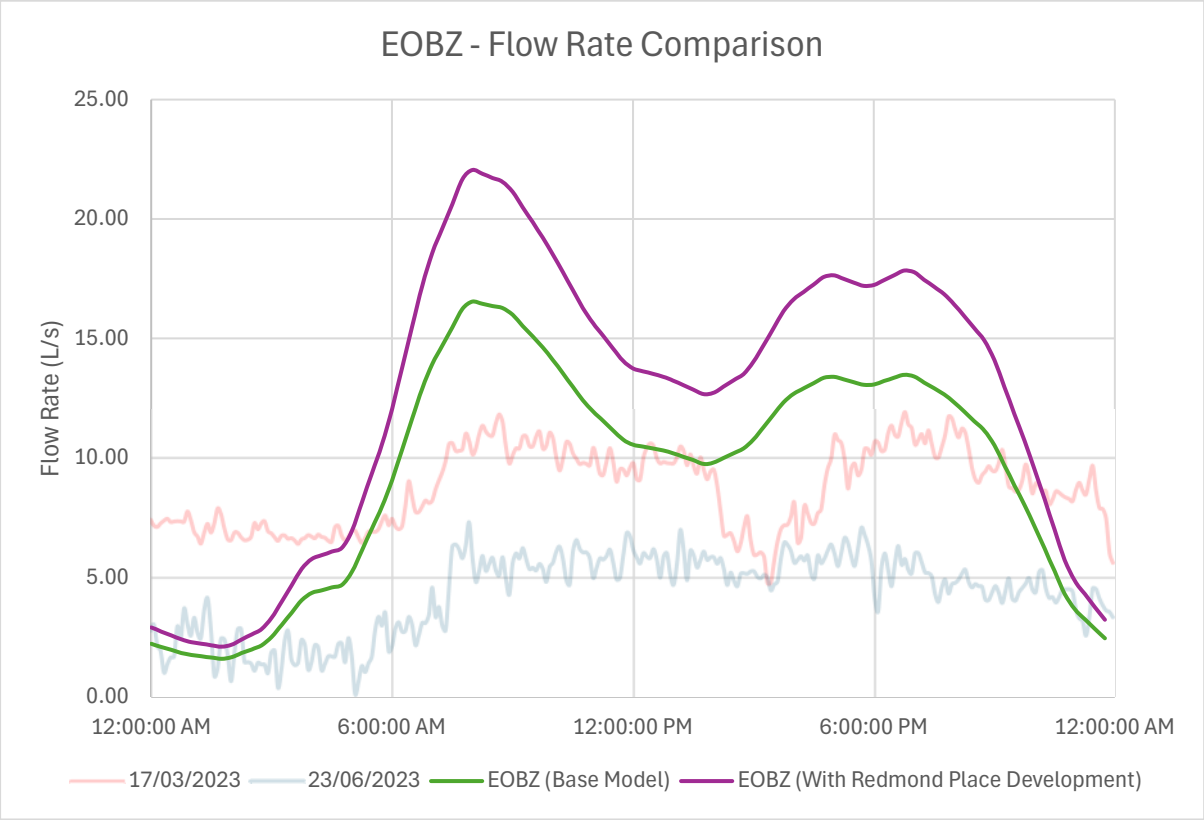


Figure 3.3.3 – Redmond Place Development Model Flowrate Comparison

The critical node was found to be in Pindari Place, though there was only a minimum pressure differential of 1.59m at peak hour. Below is a comparison of the two scenarios at the critical node:

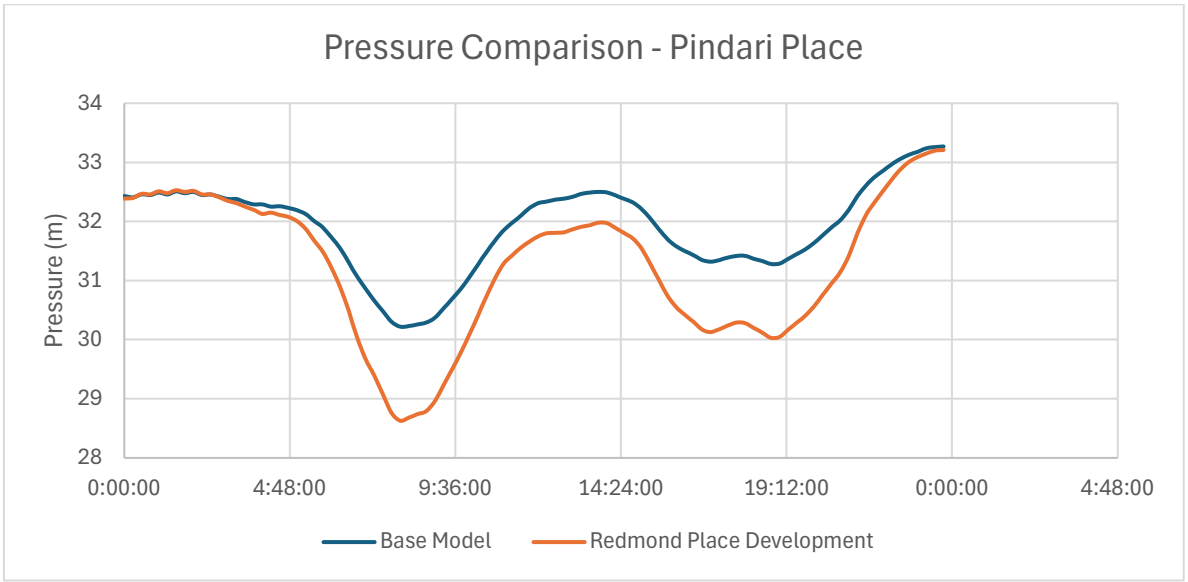


Figure 3.3.4 – Pressure Comparison Pindari Place

3.4 Infrastructure Upgrades

As identified in Section 3.3, the existing water reticulation network has sufficient capacity to service the development. The only network upgrades required are extensions to the development site from the DN300 water main on Lone Pine Avenue (Stage 1a & 1b), Redmond Place (Stage 2) and North Lone Pine Avenue (Stage 3). The preliminary water main sizes through the development are assumed to be DN150 water mains, which are to be confirmed in the detailed servicing strategy.

3.5 Spring Creek to Icely Road WTP Pipeline

The current concept design proposes development in the vicinity of the existing Spring Creek to Icely Road WTP pipeline (DN375). This is a recently constructed main (2020) which is an important supply in the water supply network. Orange City Council's Water Supply Policy does not permit trunk water mains to be located in private property due to the high consequence risk to people and property.

The approximate location of the pipeline is shown below:

Figure 3.5 – Approximate location of the Spring Creek Pipeline

The Interim Master Plan Update (Oculus 2024) appears to show the development clear of the existing DN375 trunk main. This main will need to be accurately located during the Development Application phase and appropriate measures put in place during construction to ensure it is protected during construction.

4 Sewer Servicing Strategy

4.1 Concept Servicing Plan

The development is not located within an existing sewer catchment, with the site falling to the southeast. The existing sewer catchment to the west is primarily a residential reticulated network which discharges into dual DN375 trunk mains.

A simulation was undertaken with the proposed development discharging into the existing DN300 vitrified clay pipe (VC) near Moad Street which is the closest potential trunk main connection. The results showed that there was insufficient capacity in this main to facility further loading. Furthermore, this main is flagged for renewal which would likely need to be undertaken through relining given the construction difficultly, which will further reduce the capacity of this main. The results of this simulation can be found in Appendix B.

The preferred discharge location is into the existing manhole near the intersection of the Elsham Ave and the SFR. To reduce detention time and ensure there are no on-going operational issues with the rising main (i.e. scouring out), the rising main must discharge into a DN300 sewer gravity main at the top of the SFR which is to connect to the existing manhole on the corners of Elsham Ave and the SFR.

The trunk network in this area main collects load from the southern portion of the network and will facilitate future development in the OLSP (2702 ET) and Shiralee Development Area (1700 ET). A sewer servicing strategy was undertaken by Urban Water Solutions for this area (*Bloomfield Precinct Development Assessment Report 2019*) which found that the existing network in this location has capacity for an additional 2000 ET (including the Shiralee development area). Following the exceedance of this limit, the report recommended that a diversion main from the DN375 AC main into the DN375 VC main would be required. A recent study conducted by OCC (*Shiralee Water Augmentation – Infrastructure Delivery 2023*) found that the full capacity of Shiralee (1700 ET) was unlikely to be achieved in the next five years. The executive summary of the UWS report can be found in Appendix C.

See Figure 4.1 below for the preliminary sewer servicing strategy for the development.

Figure 4.1 – Preliminary Sewer Servicing Strategy

4.2 Provision for Adjoining Lots

The development shares a catchment with three adjoining lots with development potential (130 & 148 Lone Pine Ave and 84 Dairy Creek Road) and provision must be made in the infrastructure capacity to potentially service this land. Preliminary sewer infrastructure sizing was undertaken in accordance with WSAA to determine any additional upsizing requirements to facilitate servicing the entire catchment.

The preliminary sewer pump stations parameters are shown below, with the full calculations found in Appendix D:

		Redmond Place			+ Adjoining Lots
		Interim (Stage 1a)	Interim Limit (Stage 1a + 1b)	Ultimate	Ultimate
LOADINGS					
Pump Station Loading	ET	63	121	331	540
Design Flow	L/s	6.2	8.9	15.7	24.4
PUMP STATION					
Diameter	m	2.2	2.2	2.2	2.2
Depth	m	5.80	5.80	5.80	5.80
Pump Starts / hour	No.	1.2	1.9	3.6	5.5
Pump Duty Flow	L/s	8.9	8.9	15.7	24.4
RISING MAIN					
SRM Specification		DN110 PE100	DN110 PE100	DN180 PE100	DN180 PE100
RM Total Length	m	1000	1000	1000	1000
Detention Time	hr	3.5	1.9	1.4	0.9
Velocity	m/s	1.08	1.08	0.94	1.45
Pump Duty Head	m	46.3	46.3	38.4	46.4

Table 4.2 – Preliminary SPS Parameters

As shown in the table above, preliminary calculations suggest that the sewer pump station diameter is sufficiently sized to facilitate the development and the adjoining lots. Given the large detention times in the sewer rising main in the interim, dual rising mains are required to service the development (DN110 PE100 & DN180 PE100). Calculations also showed that the ultimate rising main will have sufficient capacity to facilitate loading from the adjoining lots, with no further upsizing required.

Appendix A – Oculus Staging Plan and Detailed ET Calculations

4.6 Staging

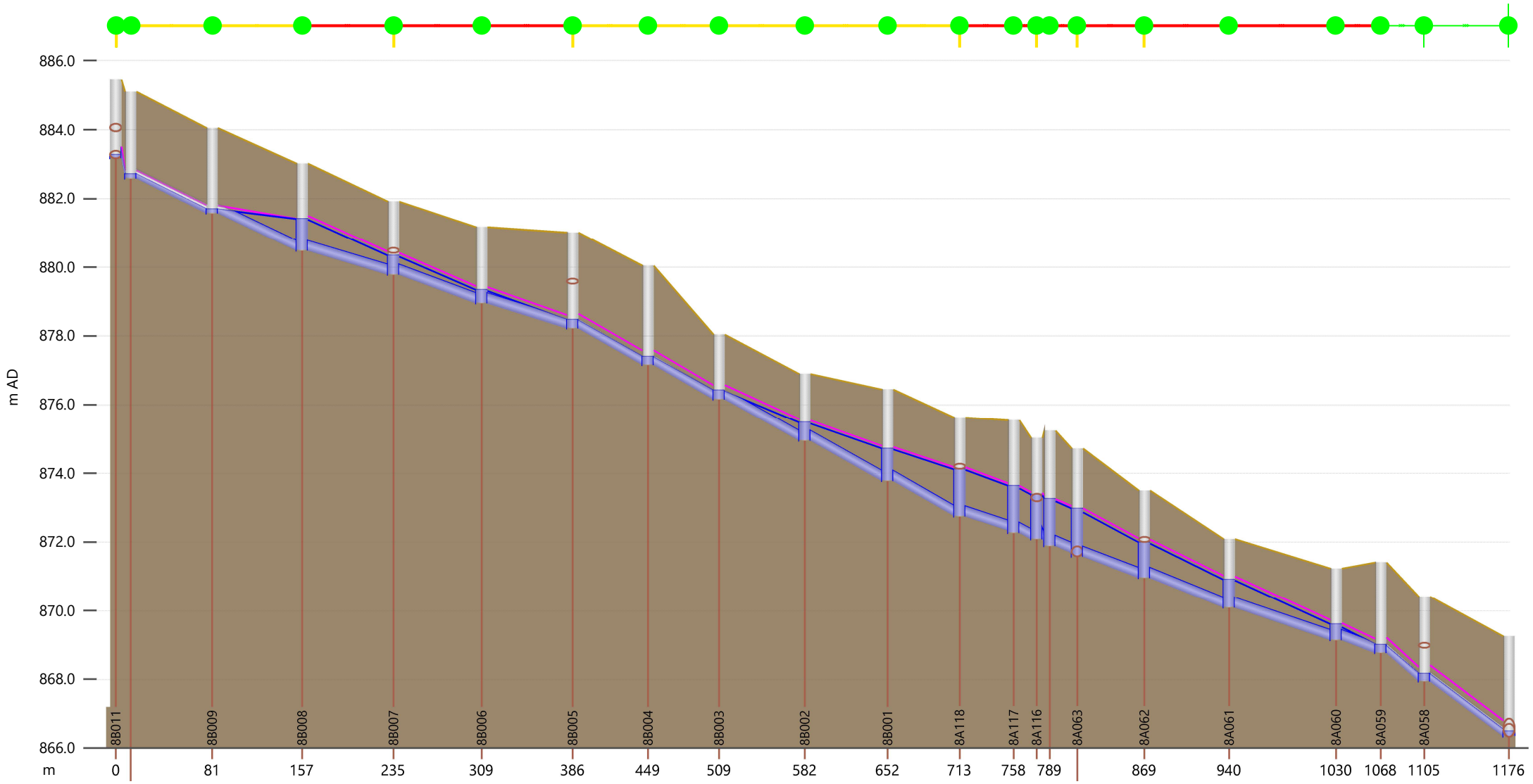
Staging Breakdown

	Stage 1A	Stage 1B	Stage 2	Stage 3
Apartments				
area	-	-	0.24ha	0.31ha
dwellings	-	-	29	37
Medium Density (215m² average lot)				
dwellings	37	16	26	51
150 - 210m² Lots	3	10	17	37
210 - 270m² Lots	34	6	9	14
Low Density (422m² average lot)				
dwellings	30	44	37	23
300 - 400m² Lots	5	13	23	13
400 - 500m² Lots	19	28	14	10
500 - 600m² Lots	4	1	-	-
600m² + Lots	2	2	-	-
Total				
developable area	2.26ha	2.25ha	2.25ha	2.25ha
dwellings	67	60	92	111

	Density	No.	W Rate	S Rate	W ET	S ET
Stage 1a	Orange	3	0.8	1	2.4	3
	Red	34	0.8	1	27.2	34
	Green	5	1	1	5	5
	Blue	19	1	1	19	19
	Dark Purple	4	1	1	4	4
	Purple	2	1	1	2	2
	Subtotal	***67***			***59.6***	***67***
Stage 1b	Orange	10	0.8	1	8	10
	Red	6	0.8	1	4.8	6
	Green	13	1	1	13	13
	Blue	28	1	1	28	28
	Dark Purple	1	1	1	1	1
	Purple	2	1	1	2	2
	Subtotal	***60***			***56.8***	***60***
Stage 2	Orange	17	0.8	1	13.6	17
	Red	9	0.8	1		
	Green	23	1	1	23	23
	Blue	14	1	1	14	14
	Dark Purple	0	1	1	0	0
	Purple	0	1	1	0	0
	Appartments	29	0.67	1	19.43	29
	Subtotal	***92***			***70.03***	***83***
Stage 3	Orange	37	0.8	1	29.6	37
	Red	14	0.8	1		
	Green	13	1	1	13	13
	Blue	10	1	1	10	10
	Dark Purple	0	1	1	0	0
	Purple	0	1	1	0	0
	Appartments	37	0.67	1	24.79	37
	Subtotal	***111***			***77.39***	***97***
	Total	***330***			***263.82***	***307***

Stage	Water (ET)	Sewer (ET)
1a	60	67
1b	57	60
2	70	83
3	77	97
Total	**264**	**307**

Appendix B – DN300 Model Results



Link		8B010.1	8B009.1	8B008.1	8B007.1	8B006.1	8B005.1	8B004.1	8B003.1	8B002.1	8B001.1	-	-		-	8A063.1	8A062.1	8A061.1	-	-	8A058.1	
pfc (m3/s)		0.119	0.118	0.093	0.103	0.096	0.127	0.127	0.127	0.127	0.127	0.093	-		-	0.103	0.108	0.101	0.097	0.147	0.147	
DS flow (m3/s)		0.05478	0.05527	0.12086	0.11558	0.11306	0.12214	0.12214	0.11805	0.10512	0.10185	-	-		-	0.13674	0.13555	0.13563	-	-	0.14620	

Node		-	8B009	8B008	8B007	8B006	8B005	8B004	8B003	8B002	8B001	8A118	-			-	8A062	8A061	8A060	-	8A058	-
flood dep (m)		-	-0.766	0.000	-0.000	-0.158	-0.914	-1.000	-0.000	0.000	-0.233	-0.034	-			-	-0.309	-0.346	-1.292	-	-2.199	-
vol.lost (m3)		0.0	0.0	4.0	8.7	0.0	0.0	0.0	6.0	84.9	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0
inflow (m3/s)		-	0.00000	0.09198	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-	-			-	0.00000	0.00010	0.00083	-	-	-

Section for Network - SOURA Ultimate v2 - SPS2 10l/s + SPS1 30l/s_Trotting Track at 00 00:45:00

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Appendix C – Bloomfield Precinct Development Assessment Report 2019 (Executive Summary)

Executive Summary

Introduction

This report assesses the impact that the proposed development within the Bloomfield Orange Life Sciences Precinct (OLSP) has on the sewerage and water supply systems and identifies augmentation options to cater for the additional demands.

Sewerage System

Current Situation

The 2013 hydraulic model of the sewerage system was used as the platform for this analysis. This model was updated with the agreed future loadings for the Bloomfield, Orange Life Sciences Precinct. This equated to an additional 2700 equivalent tenements (ET), or an additional 1,216 kL of sewage per day. The DPI development and Spring Hill flows were not included in the base model and were not added for this analysis. Flows from these areas will need to be managed with onsite storage and potentially interlocked pump stations. The design standard considered for this assessment was containment of 1 in 2-year average recurrence interval storms as defined by Australian Rainfall and Runoff 1987.

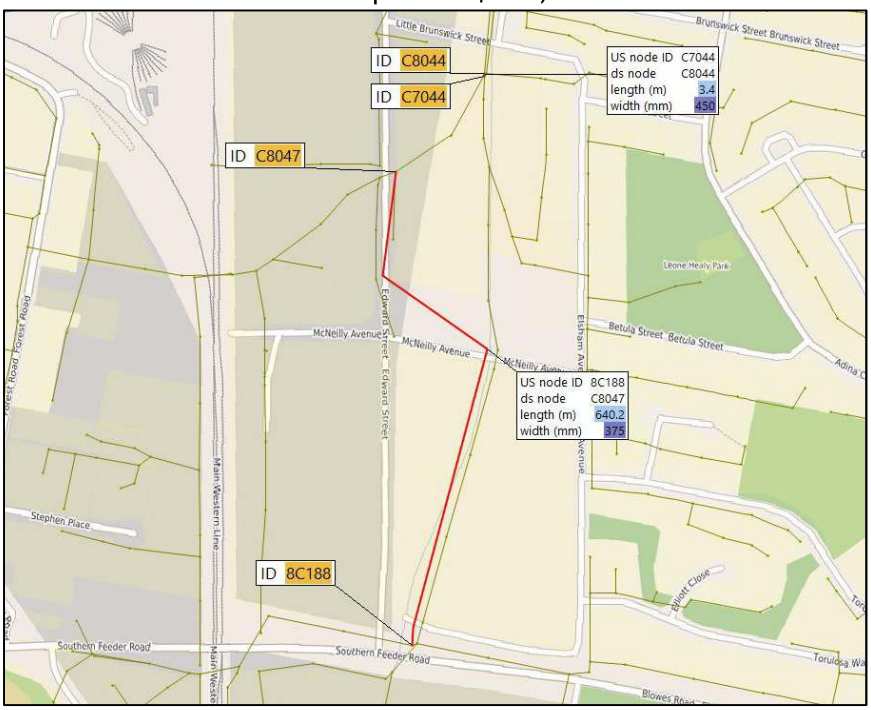
Future Situation

The following upgrades were added to the network model to allow connection of future growth to the Orange sewerage network. These included:

Development Name	Future Estimated Pump Duty	Rising Main	Gravity Sewer
Agricultural Research SPS	5 L/s	340m DN63	1200m DN150
Residential SPS	10 L/s	350m DN81	300m DN225
Mental Health Accommodation	-	-	512m DN225
Shiralee (995 ET)	SPS1 upgrade to 15 L/s SPS2 upgrade to 32 L/s	-	-

Two options were developed to achieve containment of the future flows from Bloomfield:

- *Storage at the Sports Precinct*
  This option requires the construction of approximately 57 kL of storage and an orifice to limit flows to the downstream network to 80 L/s.
  The final storage volume required is highly sensitive to the amount of inflow/infiltration in the upstream catchment.
  The estimated cost for this option is $245,000.
- *Conveyance Upgrade*
  This option was modelled as shown in Figure 9 and comprises a DN450 cross connection, approximately 5m long, between the two DN375 sewers at MH C7044 and approximately 650m of DN375 sewer from the Orange South Feeder Road along Edward St to MH C8047.
  The estimated cost for this option is $506,000.



Recommendations

- The model predicts that the existing sewerage network can contain the development of 995 ET in the Shiralee Precinct and 1020 ET in the OLSP before storage is required.
- The preferred option should be tested on the updated sewerage model when complete (2020 Calibration).
- Survey of critical manhole levels (6B008, 8C189, C7049, C9054).
- Secure land for the preferred option.
- Arrange for the installation of a depth/flow monitor at manhole 8C196 to provide evidence of the requirement to undertake the network upgrade(s). By reviewing changes in peak flow rates this may also assist in developing an understanding of likely timing for future augmentations and the appropriate infiltration parameters to be used in future modelling.

Appendix D – Preliminary Sewer Pump Station Calculations

		Redmond Place			+ Adjoining Lots
		Interim (Stage 1a)	Interim Limit (Stage 1a + 1b)	Ultimate	Ultimate
LOADINGS					
Pump Station Loading	ET	63	121	331	540
EP/ET	-	2.5	2.5	2.5	2.5
EP	-	158	303	828	1350
Area	Ha	21	21	21	39
C factor	-	1.1	1.1	1.1	1.1
P(wet)	-	1	1	1	1
ADWF	L/s	0.3	0.6	1.7	2.8
d	-	5.64	4.75	3.69	3.29
PDWF	L/s	1.9	3.0	6.4	9.3
EP/Area	-	7.4	14.2	38.8	34.9
A(effective)	Ha	4.7	6.6	10.8	18.7
I(1,2)	mm/hr	24.4	24.4	24.4	24.4
f(size)	-	1.08	1.08	1.08	1.00
f(containment)	-	1.0	1.0	1.0	1.0
I(effective)	mm/hr	26.3	26.3	26.3	24.5
GWI	L/s	0.5	0.5	0.5	1.0
IIF	L/s	3.8	5.3	8.8	14.1
Design Flow	L/s	6.2	8.9	15.7	24.4
PUMP STATION					
Diameter	m	2.20	2.20	2.20	2.20
Depth	m	5.80	5.80	5.80	5.80
Surface Level RL	m	893.00	893.00	893.00	893.00
Incoming Sewer Invert RL	m	889.00	889.00	889.00	889.00
TWL RL	m	888.70	888.70	888.70	888.70
BWL RL	m	887.70	887.70	887.70	887.70
Invert Level	m	887.20	887.20	887.20	887.20
Control Depth	m	1.00	1.00	1.00	1.00
Control Volume	kL	3.80	3.80	3.80	3.80
Max Pump Starts / hour	-	10	10	10	10
Pump Starts / hour	-	1.24	1.89	3.60	5.45
Station Duty Flow	-	6.2	8.86	15.73	24.37
No. of Duty Pumps	-	1	1	1	1
Pump Duty Flow	L/s	8.9	8.9	15.7	24.4
Station Pipework Diameter (DN100 SS)	mm	114	114	114	114
Station Minor Loss K = 4	m	0.2	0.2	0.5	1.2
RISING MAIN					
SRM Specification		DN110 PE100	DN110 PE100	DN180 PE100	DN180 PE100

RM Total Length	**m**	1000	1000	1000	1000
RM Length to High Pt	**m**	1000	1000	1000	1000
RM Internal Diameter	**mm**	102.0	102.0	146.2	146.2
RM Flow	**L/s**	8.9	8.9	15.7	24.4
Detention Time	**hr**	3.5	1.9	1.4	0.9
Velocity	**m/s**	1.08	1.08	0.94	1.45
Min Velocity Required	**m/s**	0.90	0.90	0.95	0.95
Friction Coeff. Min k	**mm**	0.27	0.27	0.35	0.16
Friction Factor Min (f)	**-**	0.0271	0.0271	0.0260	0.0218
RM Minor Loss Factor (K)	**-**	3.0	3.0	3.0	3.0
RM Minor Loss	**m**	0.18	0.18	0.13	0.32
Friction Loss to Discharge Pt	**m**	15.9	15.9	8.0	16.0
Friction Loss Gradient	**m/Km**	15.9	15.9	8.0	16.0
RM Invert @ Discharge Pt	**m**	919.0	919.0	919.0	919.0
Static Head	**m**	30.4	30.4	30.4	30.4
Pump Duty Head	**m**	46.3	46.3	38.4	46.4

Appendix B – Essential Energy Enquiry Planning Assessment, Case-00194439 (dated 29 May 2024)

ENQUIRY PLANNING ASSESSMENT

1. Connection Application

An enquiry request has been received from an applicant exploring connection to Essential Energy's distribution network for the purposes of connecting the Redman Place development project. Project details are included within Table 1 below:

Table 1: Summary of connection details

Connection Details	Description
Project Identification	Case-00194439
Proponent	Landcom – Redman Place Orange
Location	3 Redmond Pl Orange, including 154 Lone Pine Avenue through to 5255 Mitchell Highway
Load	1.4 – 1.5MVA Stage 1A - 67 dwellings Stage 1B - 60 dwellings Stage 2 - 92 dwellings Stage 3 - 111 dwellings
Customer POC	Poles 9I104.1 through to 9I453.2
Essential Energy Feeder	ORS3B6_Peisley St Sth
Connection Method	HV/LV Underground Reticulation Development infrastructure
Installation Details	The proposed development over the Site will include a total of 330 dwellings (over 266 lots). The dwelling mix includes low density detached dwellings, medium density dwellings (townhouses) and apartments. Refer to Figure 3 for Yield Analysis Table.

2. Connection Study Scope

Contestable Planning's assessment has been conducted using a network normal configuration. The project specific assessment considers the thermal rating, voltage constraints, stability, power quality and asset ratings of existing connection assets.

The assessment has been undertaken in compliance with Essential Energy Connection Policy CEOP2513.06

3. Customer Network Connection Details

The proposed Redman Place development is situated between Essential Energy 11kV Distribution Feeders ORS3B8_Edward St (Lone Pine Ave), and ORS3B6 Piesley St (Dairy Creek Rd).

Indicative development connection points into the existing EssE network:

- A suitable pole/site between Poles 9I104.1 through 9I453.2 (Feeder ORS3B6), adjacent to Lot 200/DP1288388.
- Pole OR.BZ.20 (Feeder ORS3B8), adjacent to Lot 1/DP15367. (Ring out for last stage)

4. Network Capacity Assessment

Technical assessment of the network indicates a capacity of 1.4 - 1.5MVA to support the Redman Place development via 11kV Distribution Feeders ORS3B6 and ORS3B8 is readily available. Steady State studies confirm network thermal capacity and voltage stability is maintained within Essential Energy standards.

Based on a network risk assessment all connection works have been deemed contestable. The project has no non-contestable works to be carried out by Essential Energy. Design and construction of the electricity network shall be in accordance with design manuals CEOM7097 Overhead and CEOM7098 Underground.

The proposed development area impacts on existing distribution assets and customer connection arrangements. Consideration shall need to be given to augmenting these assets and are deemed customer funded works:

- Customers supplied via Substation 10-9I249 (near Lot 6/DP1031236), will need to be incorporated into the developments LV reticulation. It is expected that the current overhead assets spanning poles OR.BZ.11 to Sub 10-9I249 will need to be removed approx. 260m. This would be associated with Stage 3 works.

- Stage 1B shall impact on 11kV overhead network assets spanning poles 9I104.1 through OB.38 approx. 360m. The development will need to make provision to maintain 11kV supply to customers supplied via Substations 10-9I309, 10-9I106, 10-9I539 and 10-62249, Northwest of the Mitchell Hwy.

- Consideration shall need to be given to any impact the development may have on the existing LV overhead network and Streetlighting circuit supplied via Substation 10-9I105 at the intersection of Dairy Creek Rd and Mitchell Hwy.

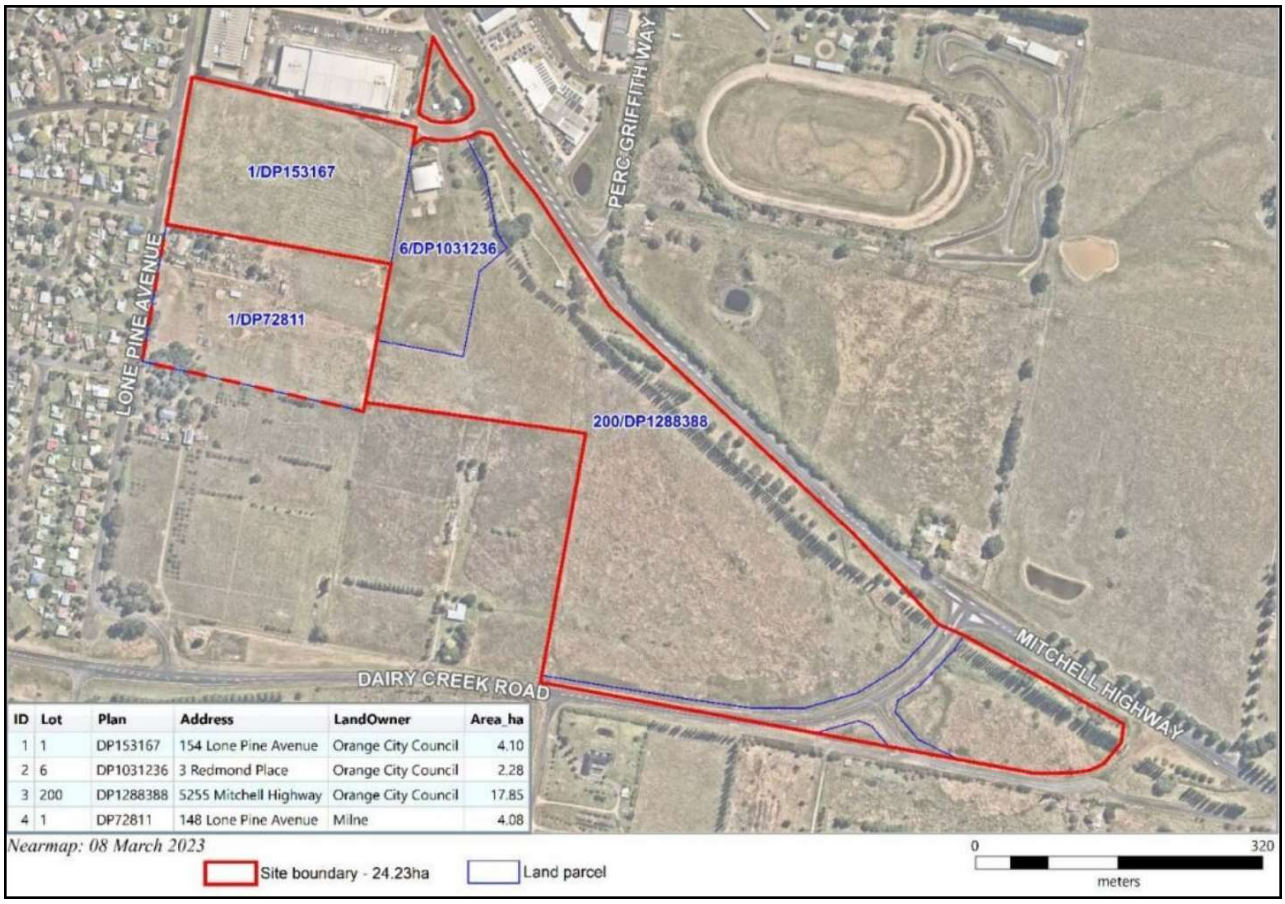
- High Voltage (HV) Protection augmentation required as part of Stage 1A. 1st line Recloser 10-R602 will need to be relocated to a pole downstream pole 9I453.1. New HV fuse site required beyond recloser 10-R12987 due to recloser 10-R602 being relocated, site to be confirmed in DIP.

Please refer to Figure 4 in section 5. Supporting Evidence which depicts the EssE network and associated works areas.

5. Supporting Evidence

The following figures have been included to complement or provide additional information relating to the proposed development.

Figure 1: Proposed Redman Place Development Location



ID	Lot	Plan	Address	LandOwner	Area_ha
1	1	DP153167	154 Lone Pine Avenue	Orange City Council	4.10
2	6	DP1031236	3 Redmond Place	Orange City Council	2.28
3	200	DP1288388	5255 Mitchell Highway	Orange City Council	17.85
4	1	DP72811	148 Lone Pine Avenue	Milne	4.08

Figure 2: Proposed Development Staging

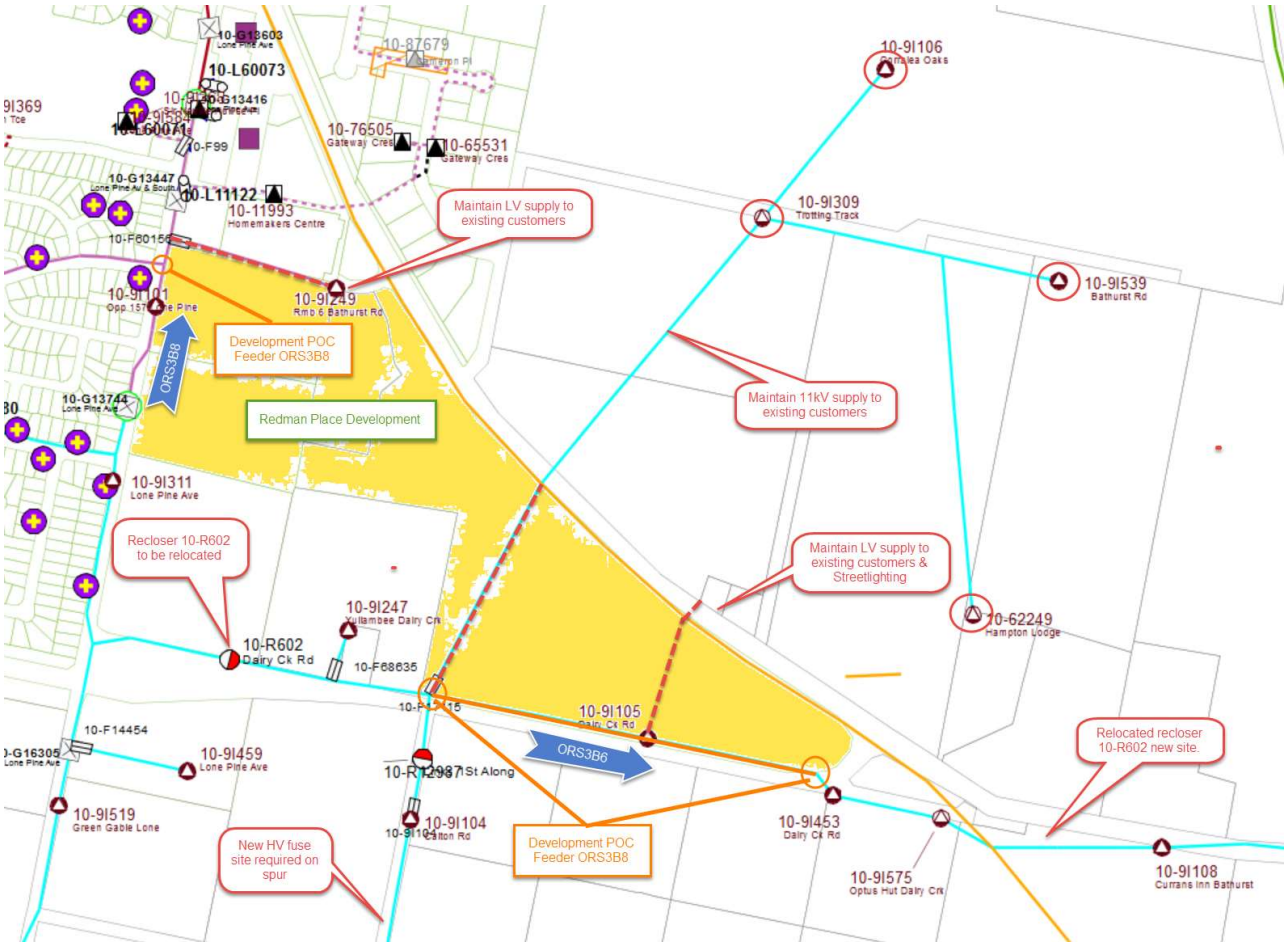
Figure 3: Proposed Yield Analysis Table

4.6 Staging

Staging Breakdown

	Stage 1A	Stage 1B	Stage 2	Stage 3
Apartments				
area	-	-	0.24ha	0.31ha
dwellings	-	-	29	37
Medium Density (215m² average lot)				
dwellings	37	16	26	51
150 - 210m² Lots	3	10	17	37
210 - 270m² Lots	34	6	9	14
Low Density (422m² average lot)				
dwellings	30	44	37	23
300 - 400m² Lots	5	13	23	13
400 - 500m² Lots	19	28	14	10
500 - 600m² Lots	4	1	-	-
600m² + Lots	2	2	-	-
Total				
developable area	2.26ha	2.25ha	2.25ha	2.25ha
dwellings	67	60	92	111

Figure 4: Essential Energy Smallworld GIS



Appendix C – Email correspondence from Jemena (dated 8 February 2024)

Geroulas, Nicholas

From: Vincenzo Piscioneri <Vincenzo.Piscioneri@zinfra.com.au>
Sent: Thursday, 8 February 2024 7:32 AM
To: Geroulas, Nicholas; Zachary Kennett
Cc: Miller, Adrian
Subject: RE: Re Jemena Technical Enquiry - Redmond Place Orange
Attachments: Redmond Place Orange - Development Summary.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Good morning Nicholas

The Capacity team have modelled the development and can advise that the current natural gas network can just support the volumes contained in the attached summary

Jemena does not reserve Capacity for any specific project and will review any applications at time of receipt

Thank you

Enzo Piscioneri (MAIPM) CPPM
Project Manager - | Jemena Gas Network
T: 0298678062
E: Vincenzo.piscioneri@zinfra.com.au

"We acknowledge the Traditional Owners of the land on which we operate and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging."

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