

For

AEA HOTELS

**1 FOUNTAINDALE RD, THE ROBERTSON
HOTEL, ROBERTSON NSW
DEVELOPMENT ASSESSMENT REPORT
WATER AND SEWER MODELLING**



12 JUNE 2020



Contents Amendment Record

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1 Introduction

Urban Water Solutions (UWS) was commissioned by AeA Hotels to assess the impact on the existing water and sewerage systems of a proposed commercial development at 1 Fountaindale Rd, The Robertson Hotel, Robertson NSW.

Wingecarribee Shire Council (WSC) is the local water authority providing potable water supply and reticulated sewerage services.

The proposed development will consist of various accommodation and function facilities.

This report details the impact of the proposed development on the existing WSC water and sewerage systems at full build out, incorporating this development, and is subject to approval by WSC.

1.1 Location

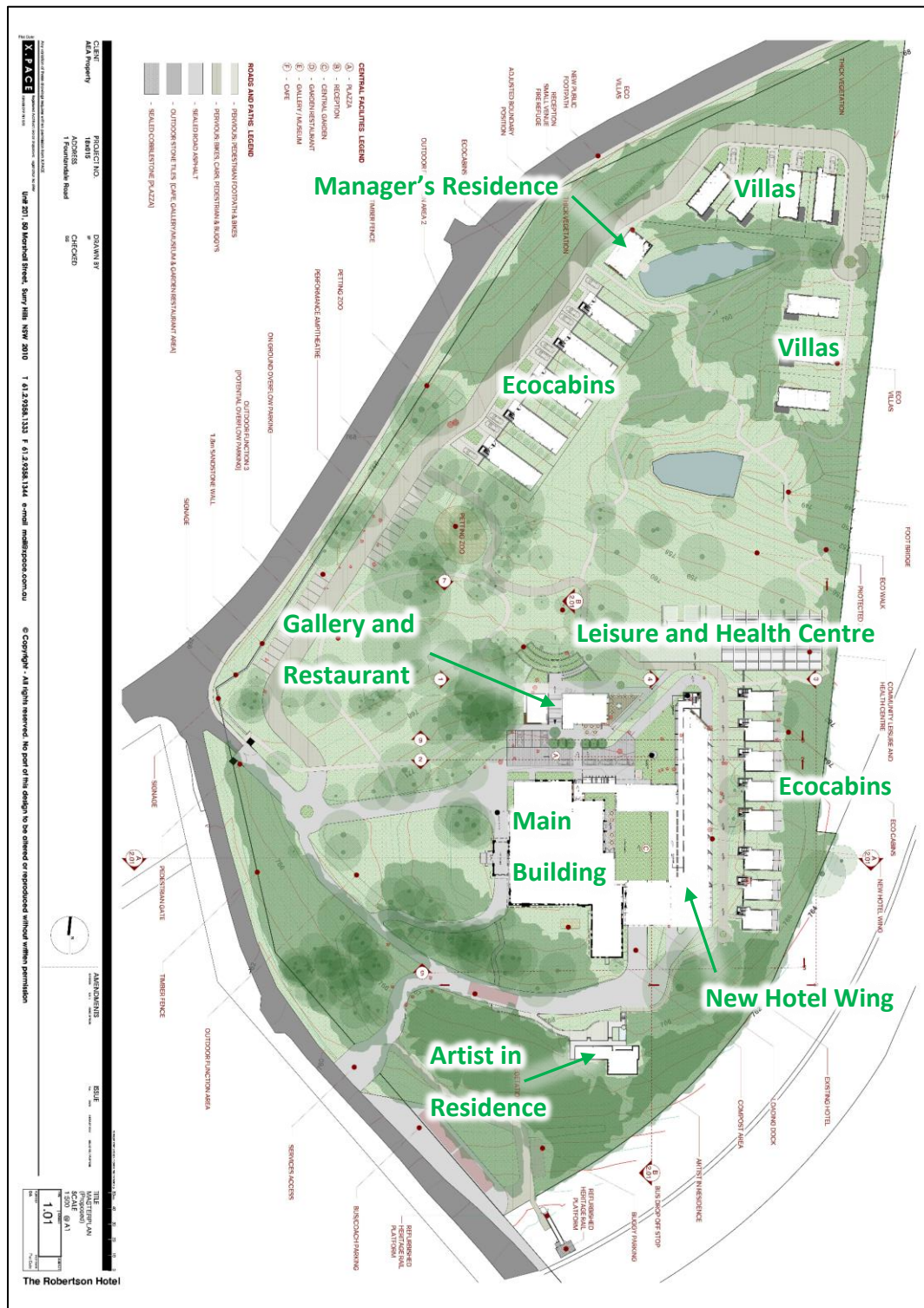
The development site is at 1 Fountaindale Rd, The Robertson Hotel, Robertson NSW and has a total site area of approximately 5.0 ha, and a total floor area of approximately 2,385m² plus accommodation for up to 380 people.

A locality plan is presented in Figure 1-1 with a proposed site plan provided in Figure 1-2.

Figure 1: Development Location



Figure 2: Site Plan



Source: Masterplan (Proposed), Issue 1.01, X.Pace – 003105DE.001.pdf

Details of the proposed buildings within the site are provided in Table 1 below.

Table 1: Building Details

Facility	Proposed Use	Building Area (m ²)	Number Bedrooms
Villas and Eco Cabins, Main Building, New Hotel Wing	Short Term Accommodation		186
Five restaurants /function rooms	Food Preparation and Service	933	
Café	Food Preparation and Service	200	
Bar/Lounge	Food & Beverage	288	
Massage Rooms	Health Services	3 treatment rooms	
Spa/Pool/Gym	Activity	996 / Capacity of 70 patrons	
Art Gallery/Health Centre	General	150	

2 Sewerage System

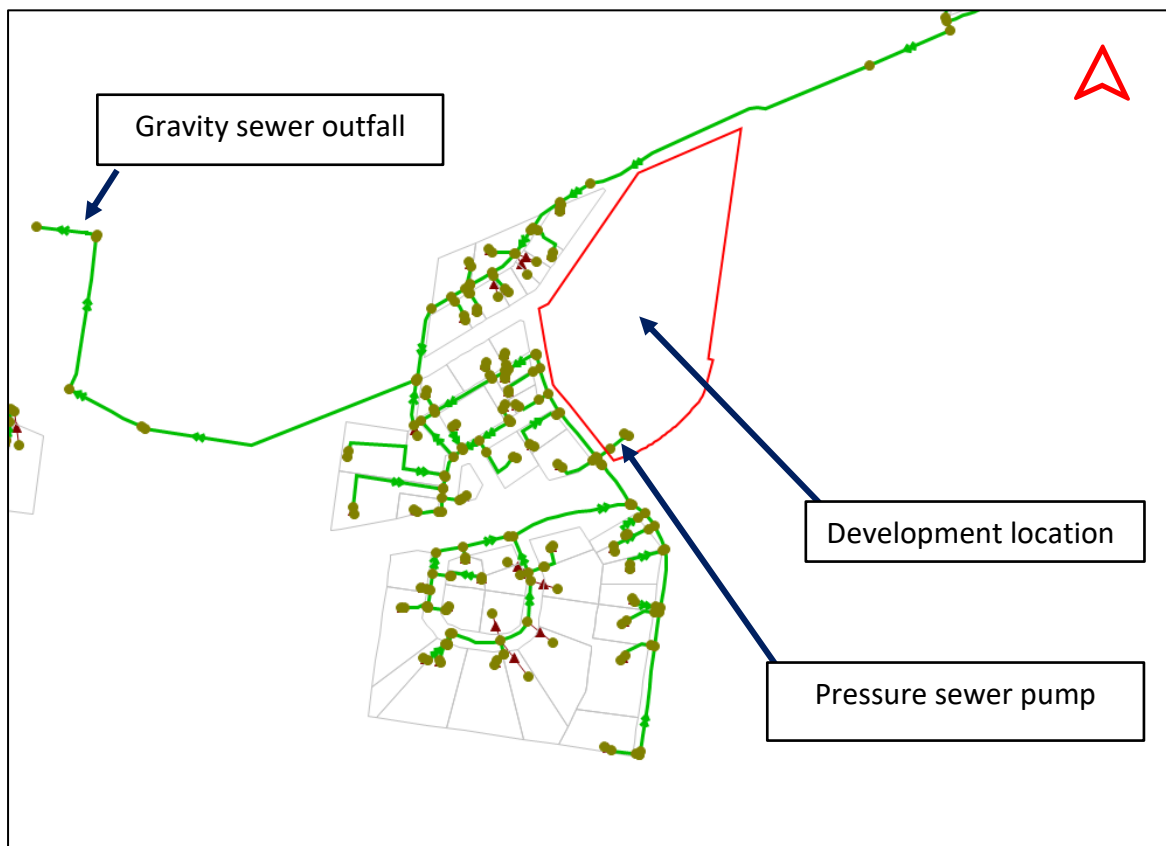
2.1 Background

The Robinson InfoWorks ICM hydraulic model was used to assess the system performance and impact of flows from the proposed development. This model of the pressure sewer system (PSS) was built in 2016. The PSS discharges into the Robinson gravity sewerage network. The gravity section of the network has not been modelled and has not been considered as part of this assessment.

Details of the proposed development were incorporated into the hydraulic model. Figure 3 displays the development location.

The development is currently serviced by the existing pressure sewer network and it has been assumed that the new development would utilise the existing PSS connection.

Figure 3: Development Site and Sewer Connection Point



2.2 WSC Design Standards

The Wingecarribee Shire Council (WSC) design standards applied in the assessment are as follows:

Sewer Design Standards		
<u>Sewer Loading</u> <i>ET Sewage Loading</i>	140	<i>kL/annum</i>
<u>Pumping Station</u> <i>Emergency storage Detention time</i>	8 hr ADWF as per WSA 02 code	
<u>Other Requirements</u> 1. <i>There should be no dry weather overflow from the system</i> 2. <i>There should be no dry or wet weather overflow from a pumping station</i> 3. <i>Refer S64 Determination of ET Guidelines for loading estimate for commercial and industrial developments</i> 4. <i>Wet weather allowance - Inflow/infiltration (I/I): Provide 2% of the total area as a notional wet weather contribution to the sewerage system</i> 5. <i>The WSA02 2002 2.3 Sewerage Code of Australia (Table 4.3) requires a minimum sewer size of 225mm DN for commercial and industrial lots >300m².</i>		

Sewer Loading (1 Fountaindale Rd, The Robertson Hotel, Robertson NSW)	
Dry Weather Sewage Flow	
Category - Entertainment/Function Space (includes Restaurant, Café, Art Gallery) Use Food Preparation / Amenity	12.8 ET
Category – Pub/Bar/Lounge	14.4 ET
Category – Accommodation – Hotel Room	83.7 ET
Category – Accommodation – Permanent (Manager’s Residence and Artist in Residence)	2.0 ET
Category – Medical Centre (Massage Rooms)	1.9 ET
Category – Spa, Pool and Gymnasium No guidance provided in S64 Determination of ET Guidelines (Assume 10% of capacity)	7.0 ET
Total Number of Equivalent Tenements	121.8 ET
Estimated Daily Sewage Loading	46.8 kL/d
Instantaneous Sewage Loading	0.54 L/s
Wet Weather Flow No inflow/infiltration (I/I) has been allowed for this model as it is a pressure sewer system.	

2.3 Existing WSC System Performance

The performance of the existing system was assessed with several different performance indicators:

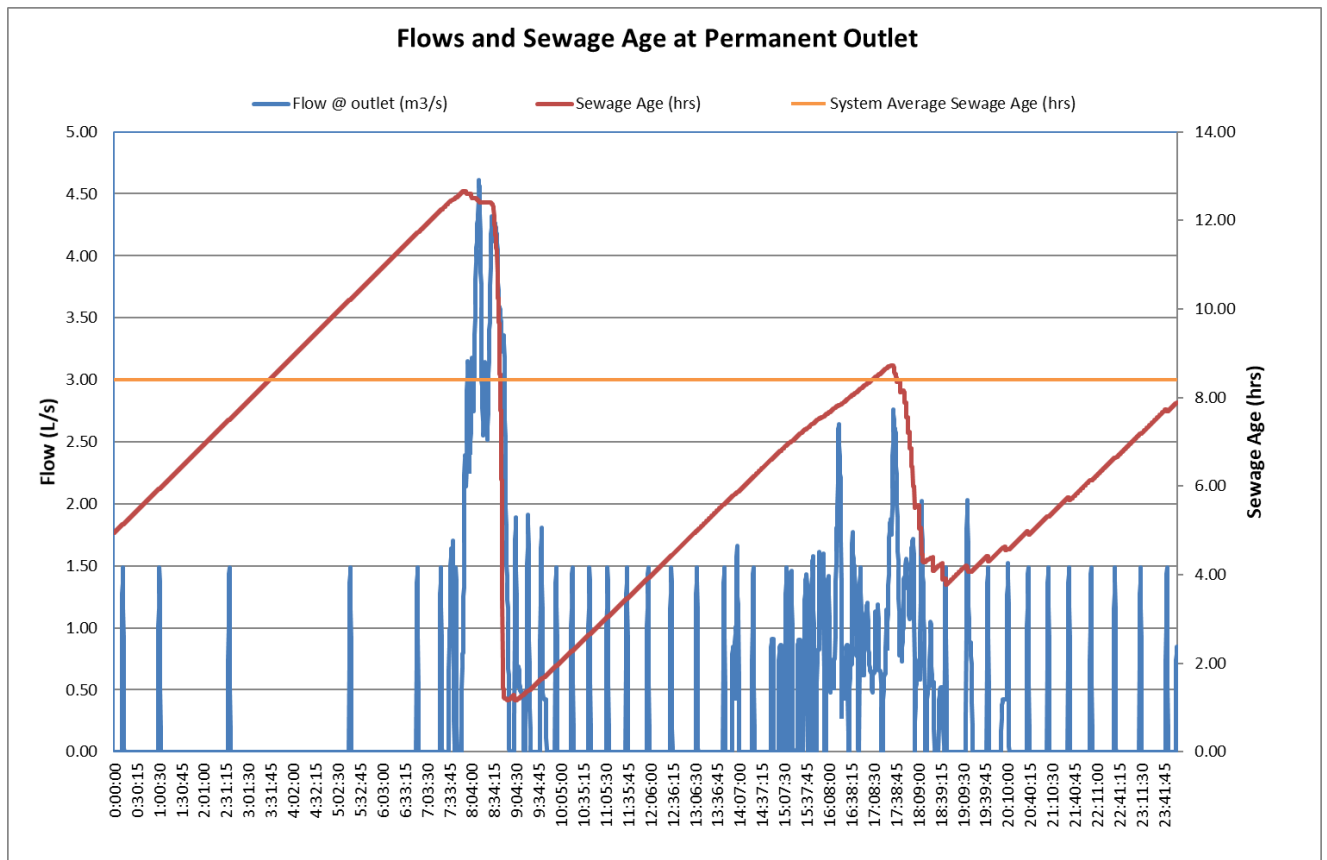
- Sewage age less than 8hrs
- Pipeline velocities greater than 0.6m/s and less than 3.5m/s
- Impact of prolonged power outage

Sewage Age – Existing System

The sewage age of the existing system fluctuates over the course of an average day. The maximum age of sewage in the system occurs at 7:30am when the age reaches just over 12hrs. The average age of sewage in the system is approximately 8hrs. Figure 4 displays the sewage age over an average day.

The age of the sewage indicates a high risk of septicity and associated odour issues in the existing system as the maximum sewage age exceeds 8 hours and is not compliant with WSAA guidelines.

Figure 4 Existing System Sewage Age



System Velocities – Existing System

The WSAA pressure sewer code states the following:

- No pressure pipe velocity shall exceed 3.5m/s, and will typically be less than 2.5m/s,
- Minimum flow velocity of 0.6m/s must be achieved at least once in 24hrs.

No pipe in the existing system exceeds 3.5m/s and all pipes achieving flushing velocity of 0.6m/s at least once during a day.

Prolonged Power Outage – Existing System

A prolonged power outage simulation was undertaken to determine the system's ability to contain sewage during a 24hr power outage.

Analysis was undertaken on the system's ability:

- to store 24hrs of flow in the wet wells and
- to pump down the stored flows and normal day to day use.

The existing system can pump down 24hrs of storage however the Robertson Hotel current wet well configuration of 3kL storage is unable to store 24hrs of flow. The Robertson Hotel requires an additional 5.6kL to contain a 24hr power outage.

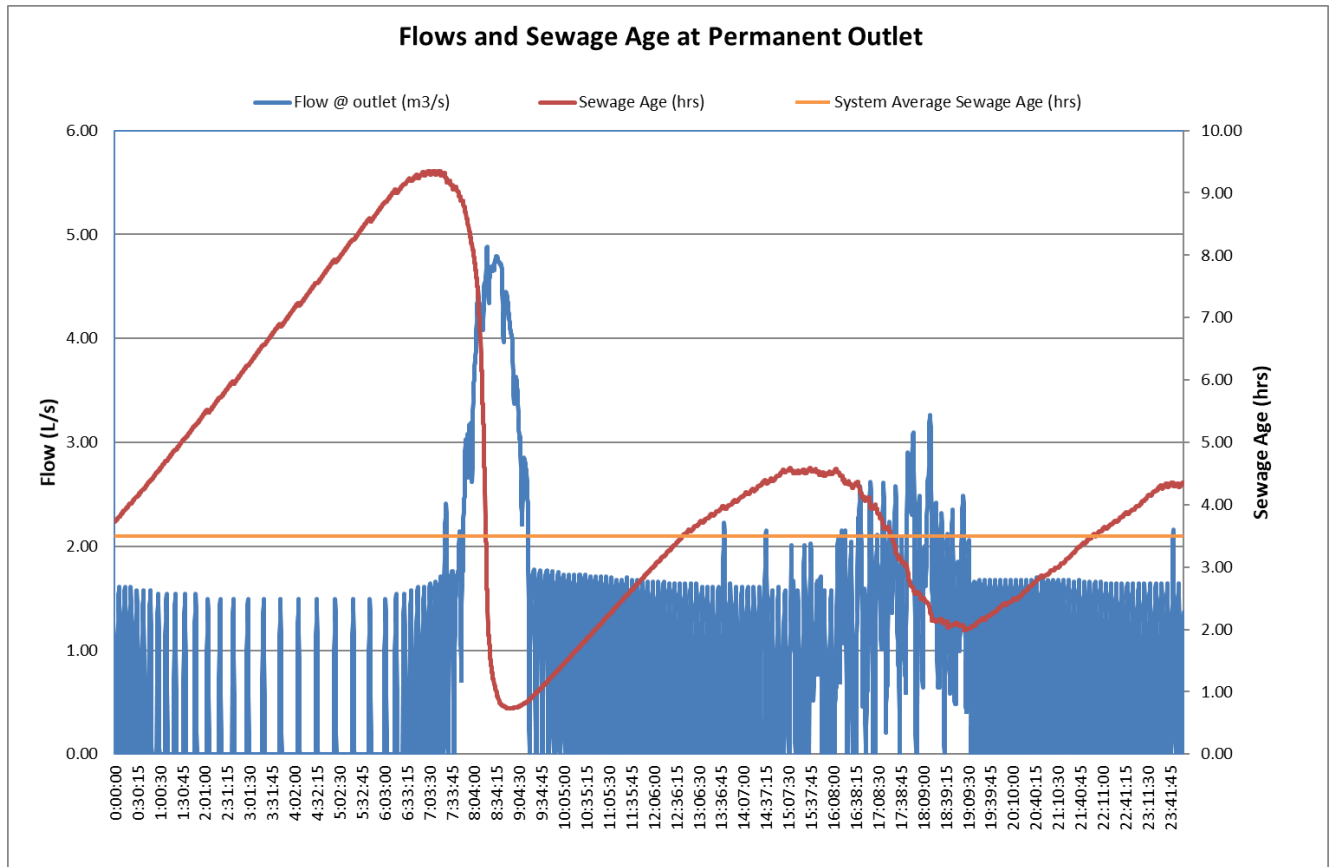
2.4 WSC System Performance including the Development

The model was updated to include the proposed development and the performance of the WSC network was reassessed.

Sewage Age – Development

The sewage age of the existing system fluctuates over the course of an average day. The maximum age of sewage in the system occurs at 7:30am when the age reaches just over 9hrs. The average age of sewage in the system is approximately 3.5hrs. The age of the sewage in the system with the development indicates a significant decrease in septicity or odour risk. Figure 5Figure 4 displays the sewage age over an average day.

Figure 5 Post Development Sewage Age



System Velocities – Existing System

No pipe in the development system exceeds 3.5m/s and all pipes achieving flushing velocity of 0.6m/s at least once during a day.

Prolonged Power Outage – Existing System

The development system can pump down 24hrs of storage however the Robertson Hotel wet well configuration is unable to contain 24hrs of development flow. The hotel will need an additional 51kL of storage to contain 24hrs of flow.

Adding the storage required to contain 24hrs of sewage does not cause the system to flood at any new location.

2.5 Sewer Assessment Summary

The addition of the development improves sewage age in the PSS by reducing it to under 4 hours. Should WSC require containment of flows for a 24hour period (in the event of a power outage) it is recommended that the hotel add new wet wells and/or additional storage. Alternately an independent power source could be utilised.

3 Water Supply System

3.1 Introduction

WSC provided an InfoWorks WS Pro hydraulic model of the water supply system to assess the impact of the additional demand from the development at 1 Fountaindale Rd, The Robertson Hotel, Robertson NSW on the water supply network.

Analysis of the existing and future network was undertaken for the Ultimate Maximum Day Demand (MDD) scenario.

3.2 WSC Design Standards

The following Wingecarribee Shire Council (WSC) design standards were applied in this assessment:

Water		
<u>Demand</u>		
Average Day Demand per person	260	L/person/day
Average Day Demand per dwelling	684	L/dwelling/day
Max Day Demand per dwelling	3000	L/dwelling/day
Max Hour / MDD Factor	2.76	
<u>Pressure</u>		
Minimum pressure required at the domestic meter	12	m
Maximum pressure should be less than	120	m
Fire flow – Residential	10 L/s	at 15m residual pressure in the water main
Fire flow - Commercial	20 L/s	
<u>Velocity & Headloss</u>		
Maximum velocity in mains	2 ¹	m/s
Target maximum head loss in mains	5 m/km ²	for reticulation mains
Target maximum head loss in mains	3 m/km	for trunk mains
<u>Reservoir</u>		
Total storage	24hr PDD	ML
Reserve storage at the lowest operating range	12hr PDD	ML

1 Velocities in the reticulation network < 2 m/s. Velocities exceeding this value should be approved by WSC. For fire fighting, velocities up to 4.0 m/s are acceptable.

2. These are target values and can be exceeded in certain circumstances in consultation with WSC.

The development demand was estimated using information provided by the client to determine the equivalent tenement (ET) loading.

Water Demand Estimate	
1 Fountaindale Rd, The Robertson Hotel, Robertson NSW	
Category - Entertainment/Function Space (includes Restaurant, Café, Art Gallery) Use Food Preparation / Amenity	12.8 ET
Category – Pub/Bar/Lounge	8.6 ET
Category –Accommodation – Hotel Room	55.8 ET
Category – Accommodation – Permanent (Manager’s Residence and Artist in Residence)	2.0 ET
Category – Medical Centre (Massage Rooms)	1.2 ET
Category – Spa, Pool and Gymnasium No guidance provided in S64 Determination of ET Guidelines (Assume 10% of capacity)	7.0 ET
Total Number of ET	87.4 ET
Average Day Demand (ADD) Total	59.8 kL/d
Max Day Demand (MDD) Total	262.2 kL/d
Max Hour Demand (MHD) Total	30.2 kL/hr

- Category from the Water Directorate Report: Section 64 Determinations of Equivalent Tenements Guidelines (2017)
- 1 Standard ET = Town Water Usage of 230 kL/annum (630 L/ET/d)

3.1 Hydraulic Modelling

The development at 1 Fountaindale Rd, The Robertson Hotel, Robertson NSW is geographically located within the Robertson Res Zone (RES-WC10). The development is supplied as shown in Figure 3-1.

It has been assumed that the Robertson Hotel development will connect into the 100mm AC water pipe along Fountaindale Rd where the existing Robertson Hotel customer point (JM00372) is connected as shown in Figure 3-2.

Figure 3-1: Overview of the Development and Water Supply Network

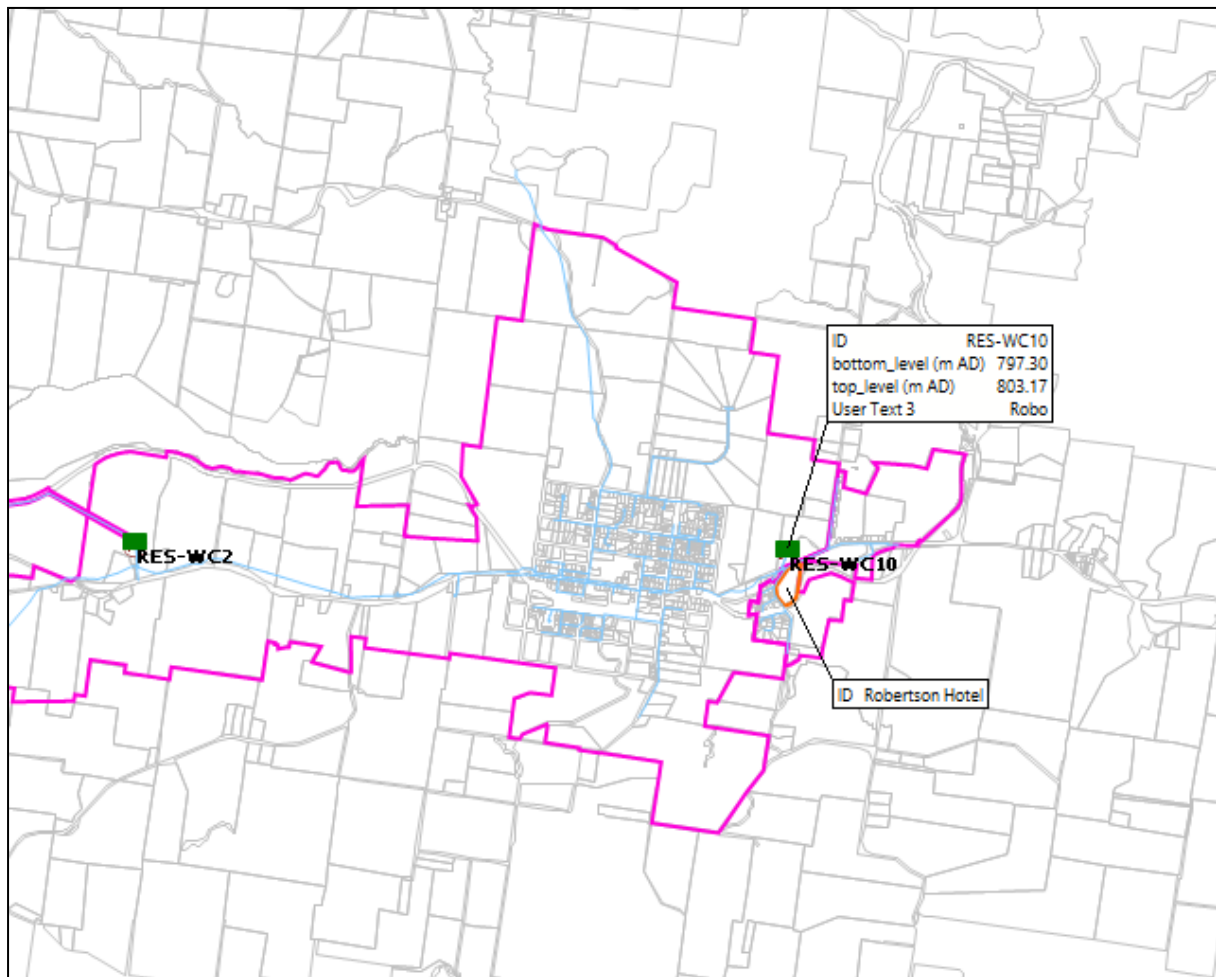
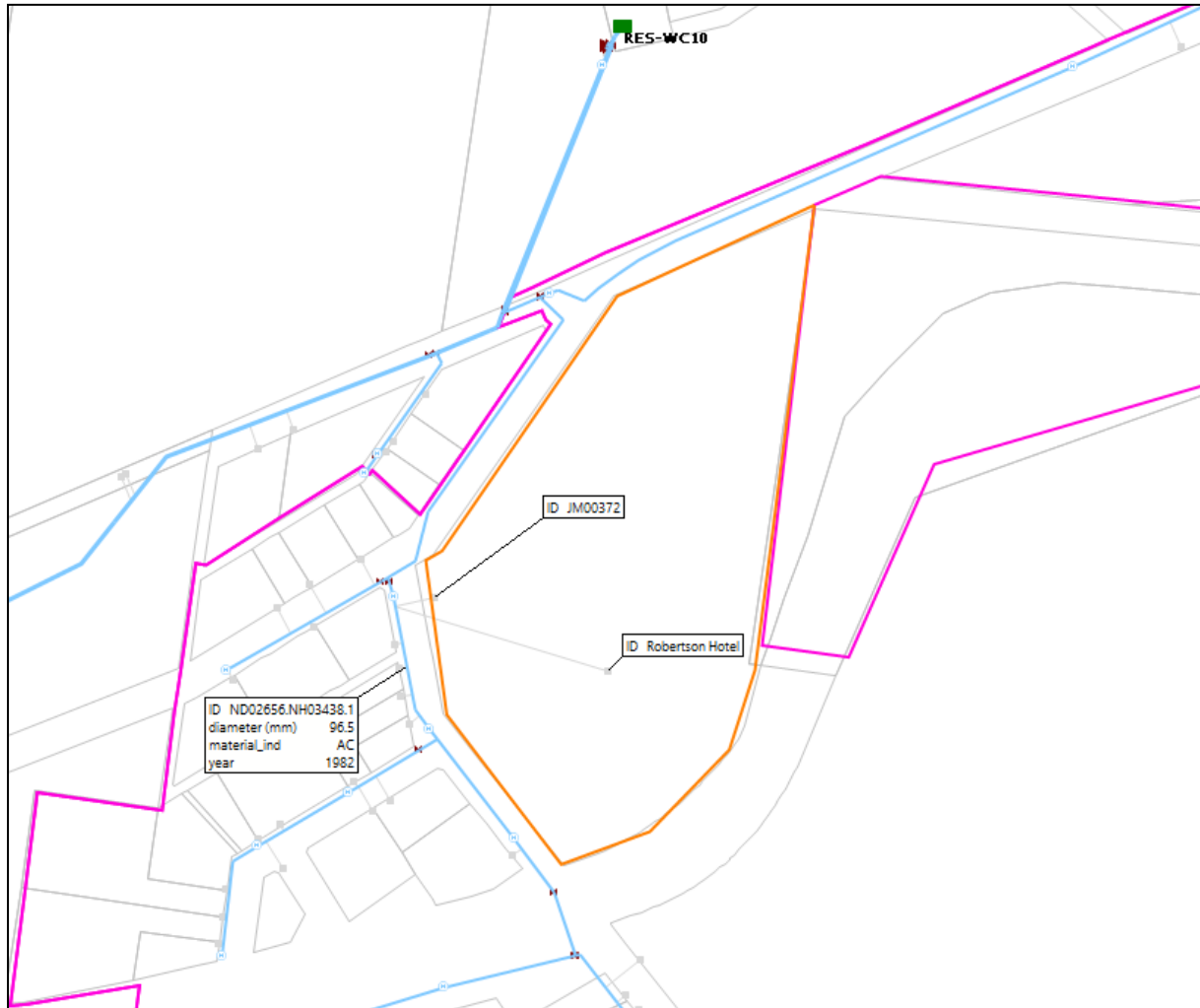


Figure 3-2: Detailed Development layout and Water Supply Connection



3.1.1 Model Configuration

WSC's InfoWorks WS Pro v4.0.5 model database has been configured to conform with WSC's Development Assessment Template.

Model items used are:

- Demand Diagram – MDD PHF 3.0 + Growth 0.01,
- Demand Scaling – MDD 2.0x AD + Growth, and
- Alternative Demand item – ALTD Growth Sites 0.01 Growth Sites + 1.0 MVEC 0.04 (with additional development lots added)

3.2 System Performance Results

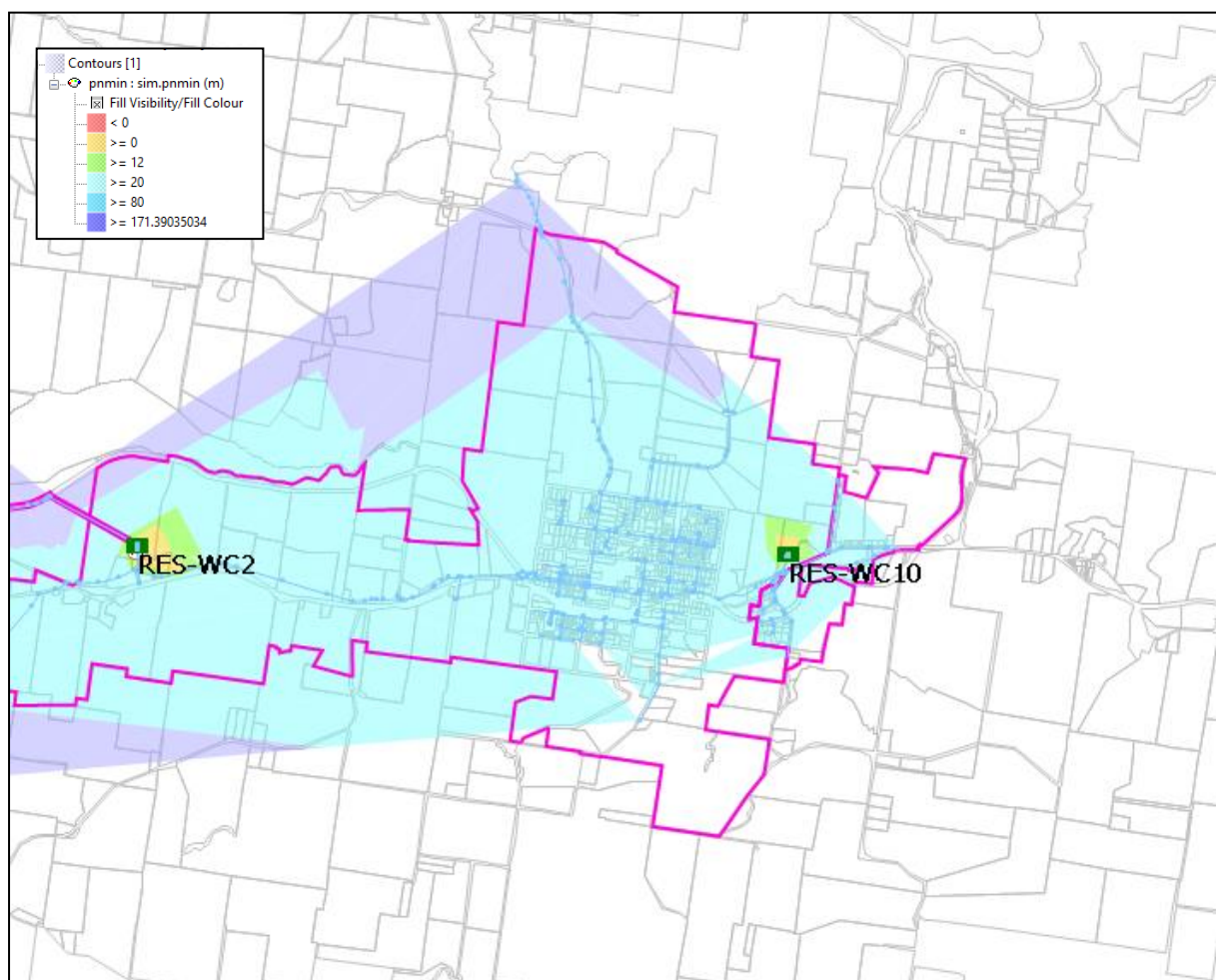
3.2.1 Existing System Performance

Minimum Pressures

The minimum pressures within the Robertson Zone (RES-WC10) exceed 12m at all nodes containing modelled customer demand.

Figure 3-3 shows the minimum pressure contours in the network base case.

Figure 3-3: Pressure Contours – Base Case



Reservoir Storage

The development is geographically located within the Robertson zone (RES-WC10).

The Robertson Reservoir (RES-WC10) has a storage volume of 680 kL.

The MDD for the ultimate scenario for Robertson zone pre-development is 87 kL/day thus the reservoir storage (680 kL) meets the WSC requirement for a minimum of 24 hours of MDD. The Robertson zone is also partially supplied by RES-WC2 when RES-WC10 is filling.

The minimum reservoir operating volume (440 kL) meets the requirement for reserve storage (greater than 12 hours of MDD).

Peak Velocity and Headloss

No pipes or valves experience pipe velocities above 2 m/s or headlosses in the Robertson zone (RES-WC10) in the existing model.

3.2.2 System Performance including Development

The results of the hydraulic modelling indicate that the additional demand from the development impacts on the system pressure in the Robertson zone (RES-WC10) however does not cause the failure of any assessment criteria.

Minimum Pressures

The minimum pressures within the Robertson zone (RES-WC10) exceed 12m at all nodes containing modelled customer demand.

The demand node with the lowest pressure in the Robertson zone (RES-WC10) is NV02412Y (Customer Point JM00380) where the post development minimum pressure is predicted to be 23.0m (maximum pressure of 25.6m). The address for the customer point is 1 The Old Road. This node is impacted by the additional loading from the development at 1 Fountaindale Rd, The Robertson Hotel, Robertson NSW.

Figure 3-4 shows the minimum pressure contour with the inclusion of the additional development.

Figure 3-5 shows the difference in pressure in the water supply network due to this development. All the demand nodes experiencing the largest decrease of minimum pressure (6-7m) have a resultant post-development minimum pressure of at least 28.8 m.

Figure 3-4: Pressure Contours – Base Case + Development

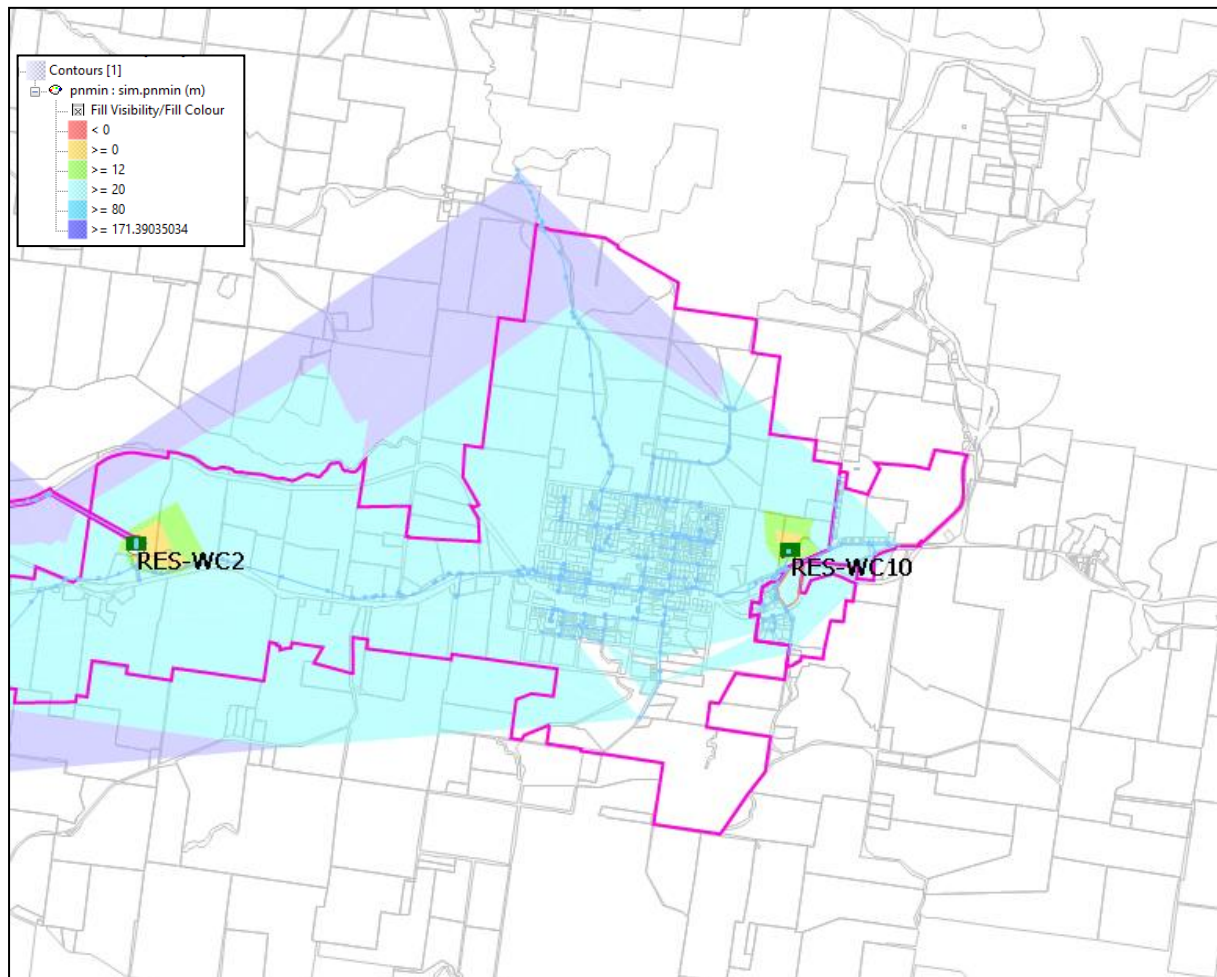


Figure 3-5: Pressure Contour Difference

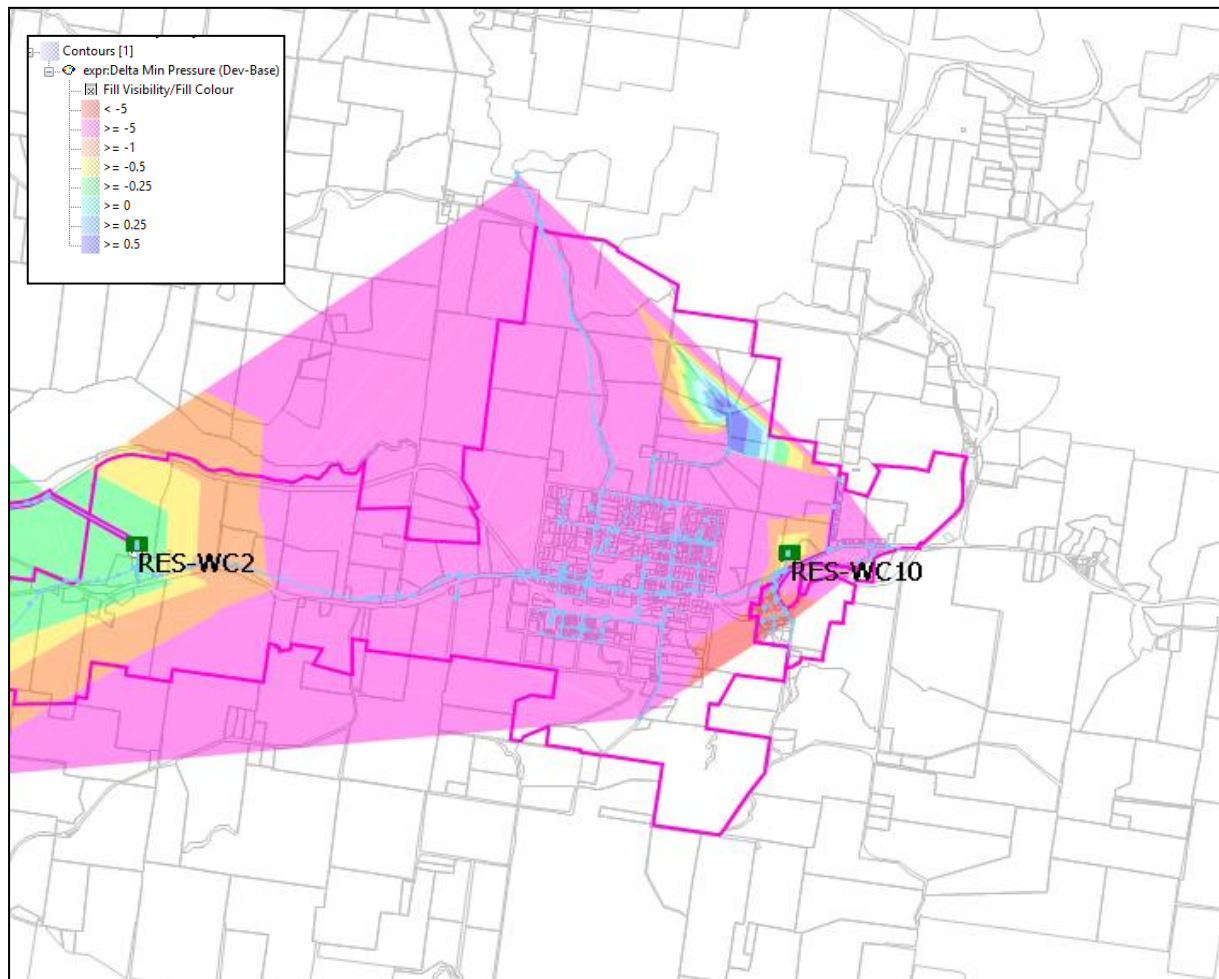
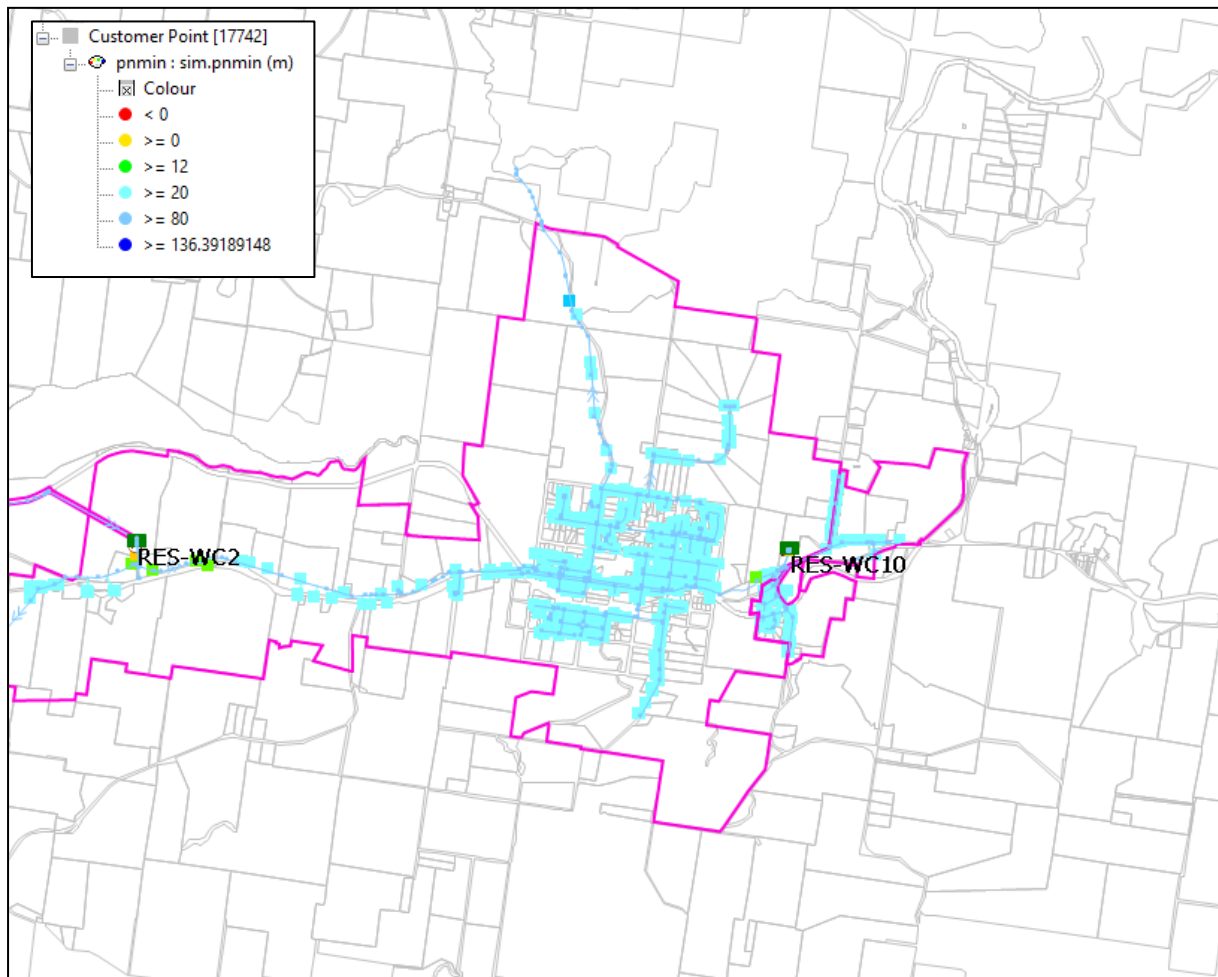


Figure 3-6: Minimum Pressure Customer Points – Base Case + Development



Reservoir Storage

The MDD for the ultimate scenario for Robertson zone post-development is 349 kL/day thus the reservoir storage (680 kL) meets the WSC requirement for a minimum of 24 hours of MDD. The Robertson zone is also partially supplied by RES-WC2 when RES-WC10 is filling.

The minimum Robertson Reservoir (RES-WC10) operating volume at (440 kL) meets the requirement for reserve storage (greater than 12 hours of MDD).

Pipe Velocity & Headloss

No pipes experience a pipe velocity above 2 m/s or headlosses above 3 m/km due to the additional loading from the new development.

3.3 Fire Flow

A simulation was run to confirm that the development can be serviced with a 20L/s fire flow occurring at 19:00 (the peak demand time), while maintaining a residual pressure in the WSC supply main.

The nearby hydrants (shown in Figure 3-7) were tested with results shown in Table 2.

Figure 3-7: Hydrant Test Locations

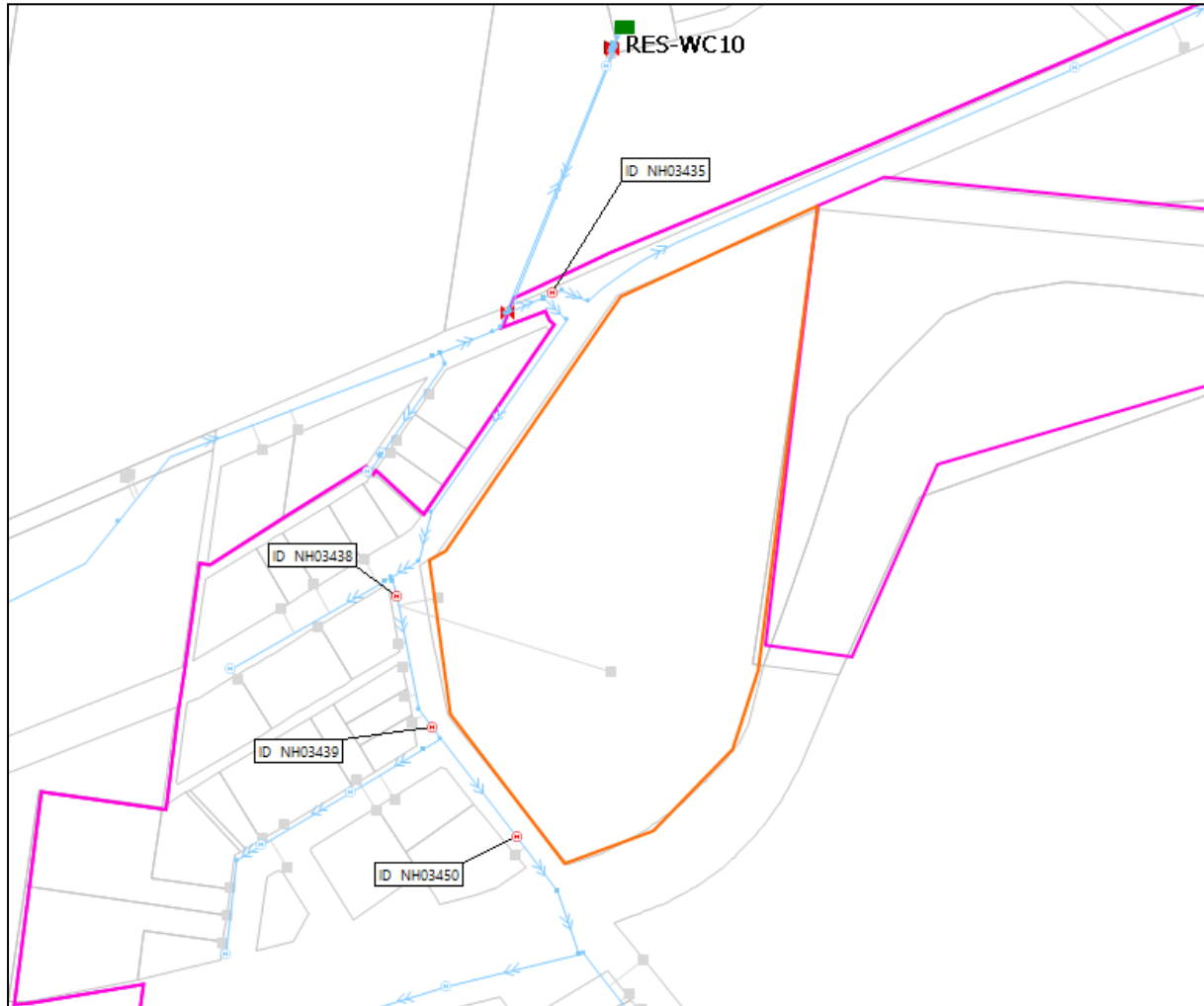


Table 2: Fire Flow Summary Results

Node Tested	Location	Results (20L/s and maximum hydrant flow)
NH03435	Hydrant on Ranelagh Street 142mm UPVC main	20.0 L/s @ 19.7 m 26.6 L/s @ 15.0 m
NH03438	Hydrant on Fountaindale Road 96mm AC main	17.4 L/s @ 15.0 m
NH03439	Hydrant on Fountaindale Road 96mm AC main	12.6 L/s @ 2.9 m
NH03450	Hydrant on Fountaindale Road 96mm AC main	13.1 L/s @ 3.1 m

Only the hydrant along the Ranelagh Street main was able to provide the required fire flow to the proposed development at 15.0 m pressure. The high roughness and small diameter of the Fountaindale Road main likely correlates to the high pressure drops from the large amounts of flow.

Further assessment showed upgrading approximately 315m of DN100 mains in Table 3 (shown in Figure 3-8) to DN150 PVC (142.7mm) pipe would make the model compliant with the fire flows. Table 4 presents the subsequent fire flow results for the upgraded pipe model.

Table 3: Pipe Upgrades

Asset ID	Model Reference	Initial Diameter	Upgraded Diameter
NP01227	ND02654.NH03439.1	96.5	142.7
NP01540	ND02655.ND02696.1	98.0	142.7
NP01227	ND02656.NH03438.1	96.5	142.7
NP01540	ND02696.ND02697.1	98.0	142.7
NP01540	ND02697.ND02698.1	98.0	142.7
NP01540	ND02698.NV02399X.1	98.0	142.7
NP01227	NH03438.NV02405X.1	96.5	142.7
NP01227	NH03439.ND02656.1	96.5	142.7
NP01540	NV02399Y.ND02659.1	98.0	142.7
NP01227	NV02405Y.ND02655.1	96.5	142.7

Figure 3-8: Pipe Upgrade Locations

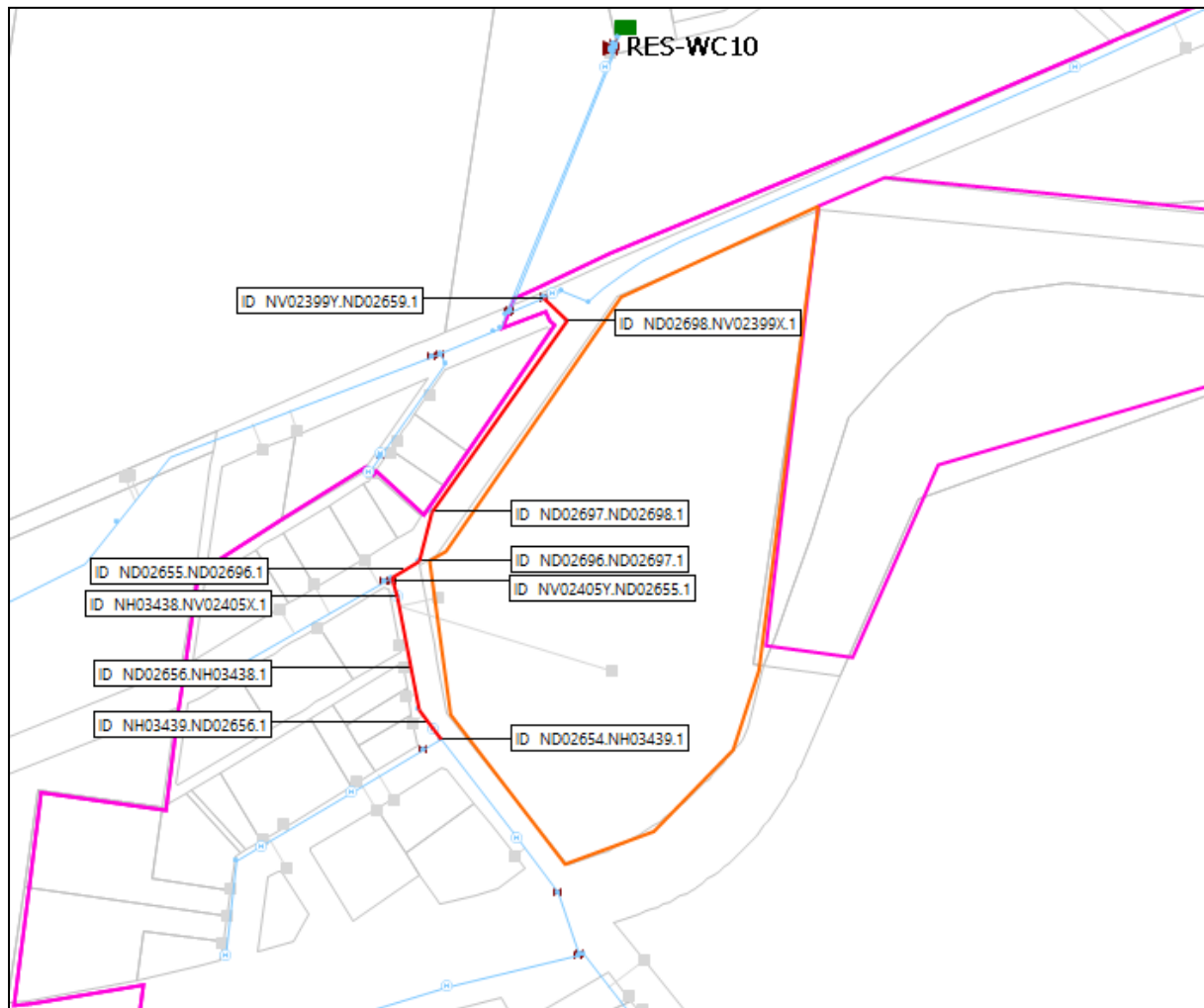


Table 4: Upgraded Pipe Model Fire Flow Summary Results

Node Tested	Location	Results (20L/s and maximum hydrant flow)
NH03435	Hydrant on Ranelagh Street 142mm UPVC main	20.0 L/s @ 19.7 m 26.6 L/s @ 15.0 m
NH03438	Hydrant on Fountaindale Road 96mm AC main	20.0 L/s @ 28.6 m 33.32 L/s @ 15.0 m
NH03439	Hydrant on Fountaindale Road 96mm AC main	20.0 L/s @ 22.2 m 25.4 L/s @ 15.0 m
NH03450	Hydrant on Fountaindale Road 96mm AC main	20.0 L/s @ 19.6 m 22.2 L/s @ 15.0 m

3.4 Water Supply Assessment Summary

The analysis showed there is an impact from the proposed development at 1 Fountaindale Rd, The Robertson Hotel, Robertson NSW on the overall performance of the water supply network.

Pressures decrease over a significant portion of the zone during MDD, however they do not drop below 20m.

Some hydrants near the proposed Robertson Hotel development cannot provide the required fire flow without the pressure dropping below the tolerance level. It will be necessary for approximately 315m of pipe to be upgraded to ensure compliance.