LYSAGHT

MOMENTUM PLANNING AND DESIGN
PROPOSED PRIVATE PLAN CHANGE
ENGINEERING SERVICING REPORT
PENCARROW ESTATE
1491 STATE HIGHWAY 2
PONGAKAWA
REVISION 5

Client Momentum Planning and Design

Project Pencarrow Estate, 1491 State Highway 2, Pongakawa

LCL Ref 225216

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1	02/05/22	Draft for comment	JH	DH	DH
2	26/05/22	For Private Plan Change	JH	DH	DH
3	22/07/22	Water Modelling Added	JH	DH	DH
4	01/09/22	Minor Amendments	JH	DH	DH
5	12/12/22	Amendments to number of lots	JH	DH	DH

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APPENDICES

1.0 INTRODUCTION

Lysaght Consultants Ltd ("Lysaght") was engaged by Momentum Planning and Design to provide a high-level engineering servicing review for a Private Plan Change consent application for a proposed residential development at 1491 State Highway 2, Pongakawa. The scope of the review included:

- Flood Levels
- Stormwater Discharge
- Wastewater Reticulation
- Potable and Fire Fighting Water Provisions

The review was undertaken in general accordance with the requirements of Western Bay of Plenty District Council's ("WBOPDC") Development Code ("DC"), NZS 4404:2012, relevant NZ Standards and standard engineering practice.

1.1 Site Description

SITE LOCATION:	1491 State Highway 2, Pongakawa LOT 1 AND LOT 2 DPS 79072
DESCRIPTION AND TOPOGRAPHY:	The site is located between SH2 and the township of Pongakawa, with access off Arawa Road. The existing 17 Ha site slopes gently to the northeast towards neighbouring properties. The site is generally flat with levels between 5 and 8m RL but has a bank to the northeast that drops from 8 to 4m RL.
EXISTING STRUCTURES:	The underlying parcel is predominantly pasture but contains several buildings. The portion of the site to be developed contains an existing dwelling and several farm buildings, which will be removed to enable construction of the proposed road.
PROPOSED DEVELOPMENT:	It is proposed to submit a Private Plan to rezone the property from rural to residential land, to enable the land to be developed into as many as 130 residential lots and accompanying access roads. Approximately 12.4Ha of land is to be rezoned, with approximately 8.2Ha of this land developable.
SURROUNDING PROPERTIES:	Rural properties, and residential properties to the southeast, along Arawa Road.

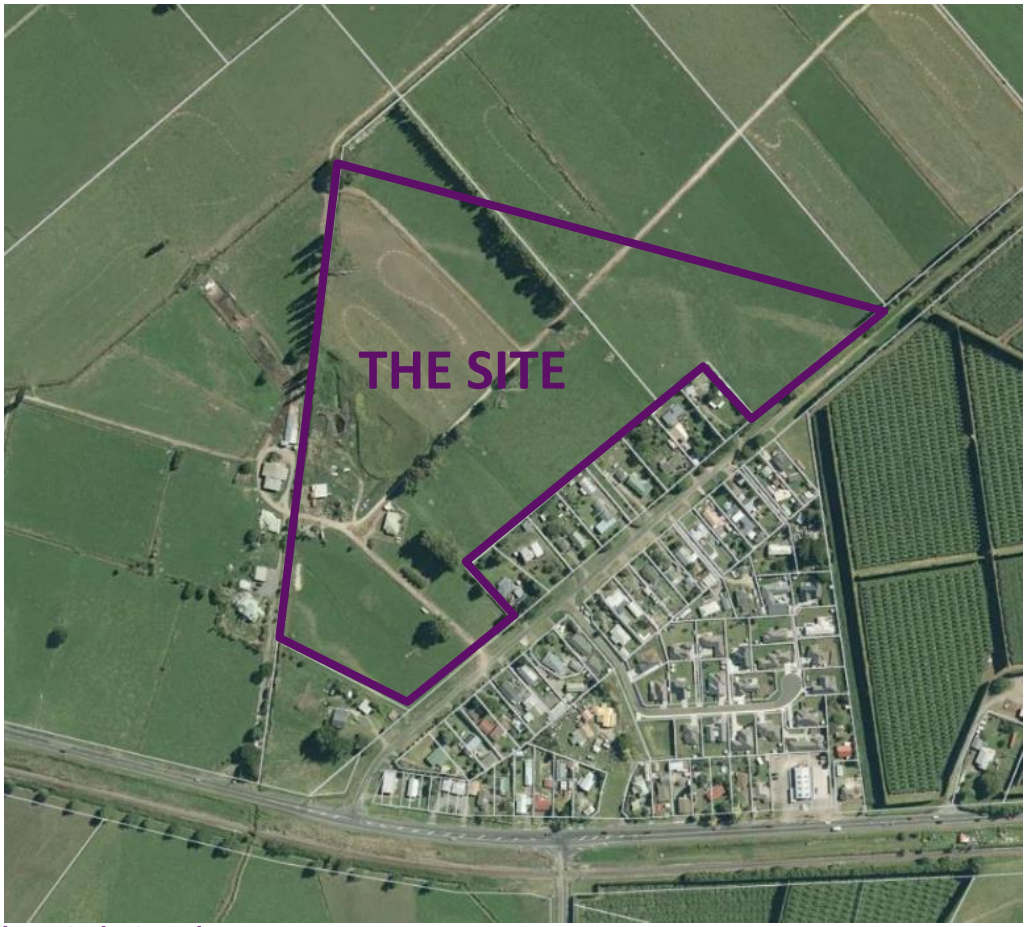


Figure 1: Site Location

Figure 2: Draft structure plan proposal

2.0 EARTHWORKS AND GEOTECHNICAL INVESTIGATIONS

A detailed Geotechnical Investigation has been undertaken by CMW Geosciences, with their "Geotechnical Investigation Report for Plan Change" ("GIR"), *TGA2021-0096AC Rev 0*, dated 11th of February 2022, confirming that the site is geotechnically suitable for rezoning and residential development. Specifically designed foundations will be required for all residential buildings due to the potential for liquefaction and lateral spreading on site.

The report indicates that stormwater disposal to soakage may be possible in the more elevated parts of the site, however no soakage testing has been undertaken. Further testing is required to determine the suitability of soakage for stormwater discharge from the proposed residential dwellings. Section 5.0 of this report discusses stormwater disposal in more detail.

3.0 TRANSPORTATION

A preliminary Transportation Assessment Report ("TAR") has been undertaken by Harrison Transportation, dated December 2022, and has been appended as part of the wider plan change application. This report recommends the following road upgrades be constructed due to the increase in traffic on Arawa Rd due to the development:

- The Arawa Rd carriageway be widened to 8.5m to the intersection with the proposed new road entrance to the Plan Change area.
- A left turn deceleration lane be provided at the intersection of Arawa Rd with State Highway 2, with a length appropriate for the design speed of the road.

All roading design and construction is to be in accordance with the WBOPDC Development Code and Austroads guidelines, in terms of both the off-site roading upgrades recommended in the TAR, and the site's internal roading infrastructure.

4.0 FLOODING

Flood mapping from WBOPDC's online maps shows that the site is subject to flooding in intense rainfall events. As shown inFigure 3 below, the flooding appears primarily to be within two significant overland flow paths through the west of the site, and a minor section of flooding through the east of the site. The significant overland flow paths link to the wider flood plains north of the site, which are shown in Figure 4. This figure shows that there is extensive flooding in the region that reaches from the proposed development site to the coast, a distance of 5.5km, with a total flood plain area of 3,758Ha (according to WBOPDC Map query), not including the area of the ocean which the flood plain links to. Therefore, the 2Ha of flood plain measured within the site is considered to be negligible in relation to the overall capacity of the flood plain. From flood mapping data sent through by WBOPDC, the maximum flood level on site is 6.5m RL (NZVD) in a small, ponded section in the middle of the site, however the two major overland flow paths have maximum flood levels of 5.93 and 4.72m RL (NZVD) respectively. The flood levels drawing can be found in Appendix 1. Infilling on site may need to be undertaken to raise road and building pad levels above adjacent flood levels to ensure sufficient freeboard is achieved.

Figure 3: Flood mapping on site (from WBOPDC Maps)

Figure 4: Flood mapping in the wider area

An estimate of the flood storage displacement generated by the development has been presented in Table 1 below. The figures are based on an assumed average flood depth of 0.5m within the areas on site identified as floodable (approximately 42,000m²), for a total volume of displacement of 21,000m³. When spread across the flood plain downstream, the resulting displacement is approximately 0.53mm

TABLE 1: FLOOD IMPACT CALCULATIONS	
Displaced flood volume based on assumed flood level + 0.5m factor of safety	21,000m³
Downstream flood plain area from WBOPDC Maps	3,758Ha
Indicative Increase in downstream flood depth due to site filling	0.56mm

Note that the increase in floodwater depth calculated in the table assumes that the flood plain is not contiguous with the ocean, which is not actually the case. The actual effect of filling within a floodplain that is contiguous with the ocean of effectively infinite area is infinitesimally small. It is clear, based on this very conservative flood estimate, that the downstream effects of filling the site will be less than the +15mm allowance generally accepted by Bay of Plenty Regional Council ("BOPRC") as the trigger for a "More than Minor" effect. The filling is highly unlikely to increase the risk of flooding of existing downstream buildings. It is noted however that filling of existing overland flow paths on site would block flow through the site and result in flooding of upstream properties. Therefore, the functionality of the overland flow paths on site will be maintained by constructing grassed channels through the site, which will maintain the capacity and entry and exit points of overland flow through the site.

Management of flood hazards on site is not considered a significant constraint for development of the site given the existing site elevation and location adjacent to very large flood plain.

5.0 STORMWATER DESIGN

5.1 Existing Discharge

Stormwater runoff from the site currently flows overland to an existing constructed watercourse that runs along the north-western boundary of the site. This watercourse flows to the northeast of the site to a small farm pond, as shown in Figure 5 below. It is expected that in significant storm events this pond overtops, and stormwater flows across the adjacent properties, as WBOPDC flood mapping indicates.

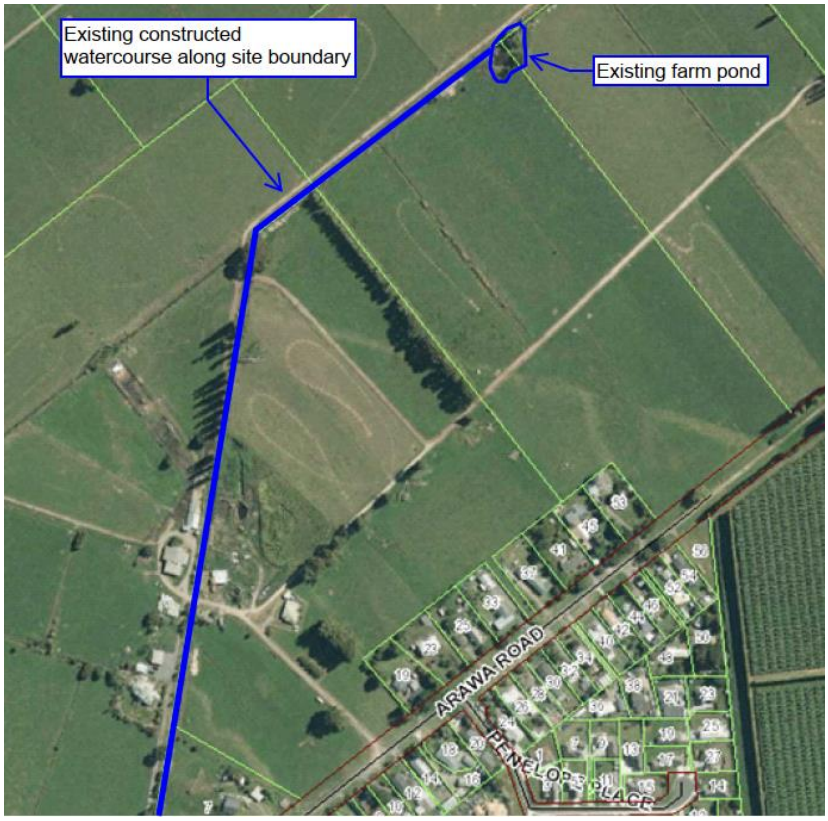


Figure 5: Existing stormwater disposal network

5.2 Primary storm event discharge (10% AEP)

There is no reticulated stormwater network available to the site. Due to soakage testing results on nearby sites, it is proposed that stormwater from residential sites on site will be discharged to soakage. Soakage rates in the underlying soils on site are expected to be in the order of 200mm/hr, based on previous soakage testing in these soils at Pongakawa. The development of the nearby Penelope Place indicates that disposal of primary stormwater to on site soakage is feasible in the soils present at site. An example soakage design has been presented in Appendix 3, which shows an indicative sizing for a soakage system for an individual residential lot. A design soakage rate of 100mm/hr has been used for this calculation, after a factor of safety of 0.5 has been applied to the assumed soakage rate. Rainfall data has been taken from WBOPDC Development Code Rainfall Intensity Charts, using the SW3A data for rural Zone A areas. Table 2 below summarises the assumptions and results of this soakage calculation.

TABLE 2: EXAMPLE SOAKAGE DESIGN SUMMARY

Soakage Rate	100mm/hr
Catchment Area	210m^2 (assuming 160m^2 dwelling and 50m^2 hardstand/driveway area)
Design Storm	10yr, 60minute storm
Required design criteria	Storage for 10yr, 60minute storm provided, system draining within 24hrs
Required system dimensions	5.72m x 1.60m x 1.28m (L x W x D) Base area 9.15m^2

Grassed yard areas are expected to bypass the soakage systems and flow to the roads within the site. Runoff from the yards, berms and roads will be collected in catchpits and piped to the stormwater pond as shown in Figure 2. From the pond, stormwater will be discharged to the adjacent constructed watercourse, as per the existing scenario. It is expected that the peak flows rates running off the site in primary storm events will not be increased as a result of the development, due to the soakage systems for the residential lots compensating for the increase of impervious areas in the roads. It is however expected that the peak flow rates off site in secondary events will be increased. The stormwater pond shown in Figure 2 will mitigate this increase in runoff in secondary storm events, which will control the outlet flow back to pre-development flow rates. This will be discussed further in Section 5.4.

Since the outlet flow from the stormwater pond will be changing the flow into the constructed watercourse to a point discharge, the watercourse will need to be upgraded at this point to prevent erosion of the watercourse banks in large storm events.

A rough Rational Method calculation estimating primary runoff peak flow rates from the developable area of the site has been presented in Table 3 below.

TABLE 3: RATIONAL METHOD PEAK PRIMARY FLOWS OFF-SITE

CATCHMENT	ASSUMED AREA	RUNOFF COEFFICIENT	PEAK RUNOFF IN 10YR, 10 MINUTE STORM EVENT (150.1mm/hr)	DISCHARGING TO
Existing	8.15Ha	0.35	**1.19m³/s**	Off-site overland
Buildings and driveways	50% of site 4.08Ha	0.95	1.62m³/s	Soakage
Grass/yard areas	2.57Ha	0.35	0.38m³/s	Off-site overland
Roads	1.5Ha	0.95	0.59m³/s	Off-site overland
			0.97m³/s	**Total off-site post-development**
			-18%	**Change in peak flow off site**

5.3 Water quality storm event treatment

The proposed stormwater pond will provide treatment for the "first flush" of contaminants from the road runoff. The rainfall rate for the water quality storm event has been taken as 10mm/hr, as per the Auckland Design Manual GD01 recommendations. This results in a constant flow rate of 64.6./s for the water quality storm event, from the contributing road and grassed yard catchments.

5.4 Secondary storm event discharge (up to 1% AEP)

In storm events exceeding the 10% AEP event, individual soakage systems within residential lots will overflow to the roads within the site, adding to the runoff generated from the site. Therefore, a stormwater attenuation pond is proposed within the reserve on the northwest site boundary. Hydraulic calculations have been carried out using DRAINS software, suggesting that a pond of approximately 3,500m³ storage would be sufficient to attenuate runoff from the developed site to pre-development rates in all 1% AEP storms (climate change adjusted to 2130). This model is overly

conservative as it has been set up to assume all flows are directed to the pond, rather than primary flows going to soakage.

The proposed pond within the draft structure plan provided (Figure 2) has a design capacity of 3,634m^3, indicating there is sufficient capacity to provide the necessary attenuation. Further, were the pond to be designed with a wetland or similar within it, then treatment could also be provided for.

5.5 Overland Flow from Upstream Properties

Additional runoff is expected to enter the site from the residential properties along Arawa Rd, which will contribute to the overland flow path flows on site. Figure 6 below shows the additional catchment draining through the site to be approximately 10.2Ha and shows the location of the three overland flow paths. The catchment further upstream of the site is effectively diverted clear of the site by State Highway 2.

The three overland flow paths on site will be upgraded with original capacities maintained as part of the development. A rough Rational Method calculation has been presented in Table 4 below, estimating the total peak flow rate post-development through each of the overland flow paths on site. Results show that peak flow rates will be approximately 1.36m^3/s through OLFP 1, 6.41m^3/s through OLFP 2 and 1.10m^3/s through OLFP 3.

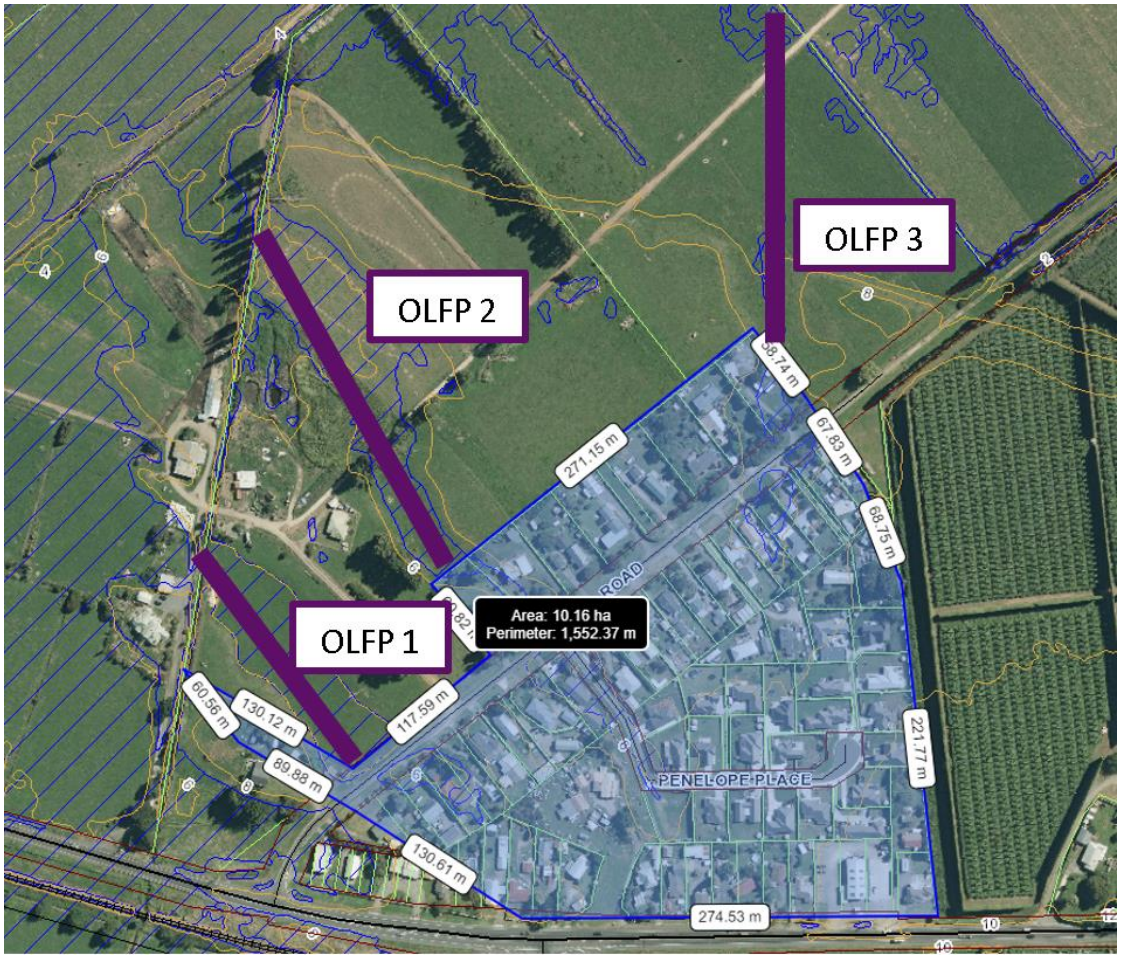


Figure 6: Additional catchment from neighbouring properties and OLFP diversions

TABLE 4: PEAK SECONDARY FLOW RATES IN OVERLAND FLOW PATHS (RATIONAL METHOD)

OVERLAND FLOW PATH	CATCHMENT FROM SITE (INCL. GREEN SPACES)	ADDITIONAL CATCHMENT FROM ACROSS ARAWA ROAD	ASSUMED RUNOFF COEFFICIENT*2	PEAK RUNOFF IN 100YR, 10 MINUTE STORM EVENT (223mm/hr) *1
OLFP 1	0.9Ha (10%)	2.0Ha (20%)	0.75	1.35m^3/s
OLFP 2	6.7Ha (75%)	7.1Ha (70%)	0.75	6.41m^3/s
OLFP 3	1.3Ha (15%)	1.0Ha (10%)	0.75	1.10m^3/s

*1: Rainfall intensity of 223/hr taken from WBOPDC Development Code SW3A Rainfall Intensity Table, which includes adjustment for climate change to the year 2040

*2: Runoff coefficient increased from primary event as the ground is assumed to be waterlogged in the secondary storm event, increasing runoff. This coefficient also allows for some discharge to soakage within the catchment.

Table 5 below shows examples of channel shapes capable of conveying the necessary runoff for each overland flow path on site. However, alternative channel profiles (for example, wider and shallower) could also be used to achieve the same result. Each channel is assumed to be a grassed channel with a Manning's roughness coefficient of 0.03, and 150mm of freeboard has been added to the flow depth to calculate the required channel depth.

TABLE 5: OLFP REQUIRED CHANNEL DIMENSIONS

OVERLAND FLOW PATH	CHANNEL SHAPE	ASSUMED GRADE	ASSUMED BASE WIDTH	FLOW DEPTH	REQUIRED CHANNEL DEPTH	RESULTING CHANNEL WIDTH
OLFP 1	Triangular	0.5%	N/A	650mm	800mm	4.8m
OLFP 2	Trapezoidal	1%	1.3m	830mm	980mm	7.2m
OLFP 3	Triangular	0.5%	N/A	600mm	750mm	4.5m

In addition to this, culverts will also be required along OLFP 2 as the flow path crosses roads in the development. These are to be designed during the detailed design phase.

Flowmaster calculations showing the required channel dimensions presented in Table 5 above are shown below in Figures 7-9 below. Sketches of the channel dimensions are presented in Figure 10 below.

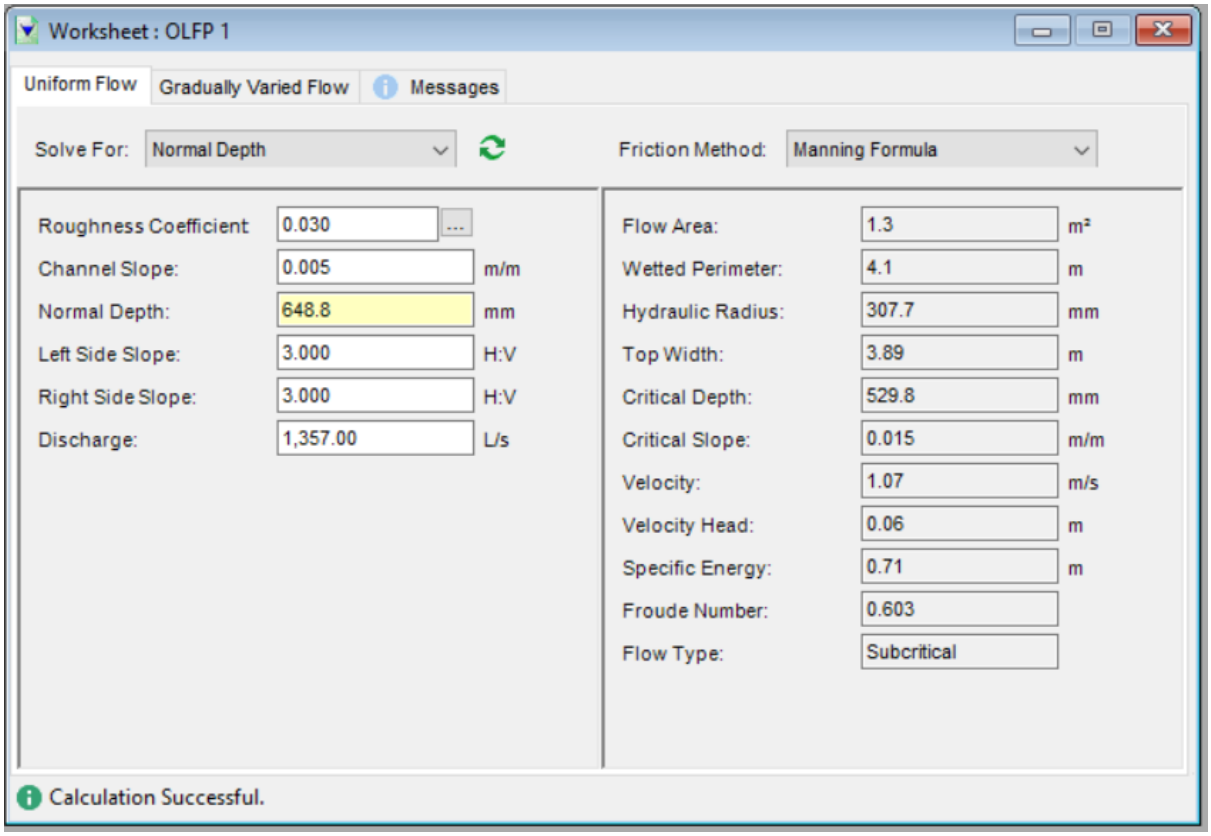


Figure 7: Flowmaster results of required flow depth for OLFP 1 in the secondary storm event, assuming a 0.5% channel grade triangular channel (no bottom width)

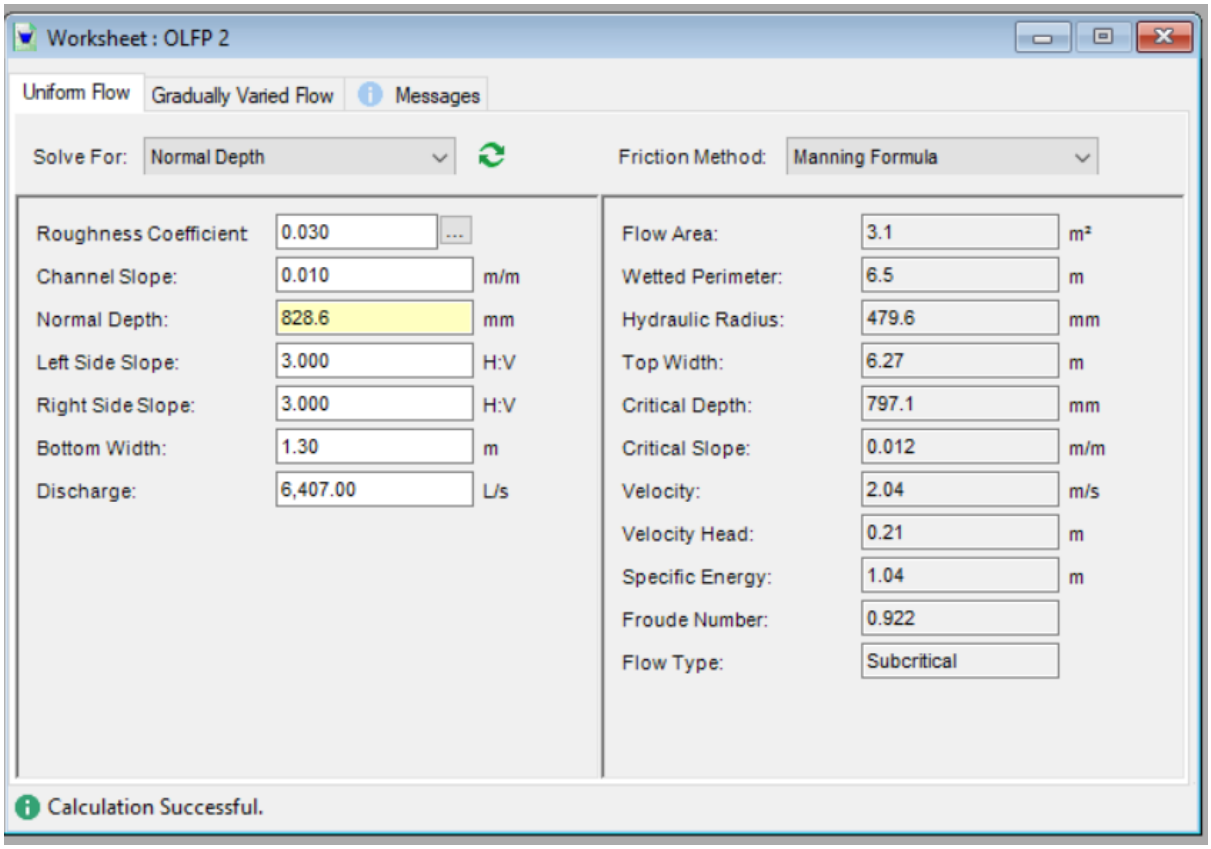


Figure 8: Flowmaster results of required flow depth for OLFP 2 in the secondary storm event, assuming a 1.3m base width and 1% channel slope in a trapezoidal channel

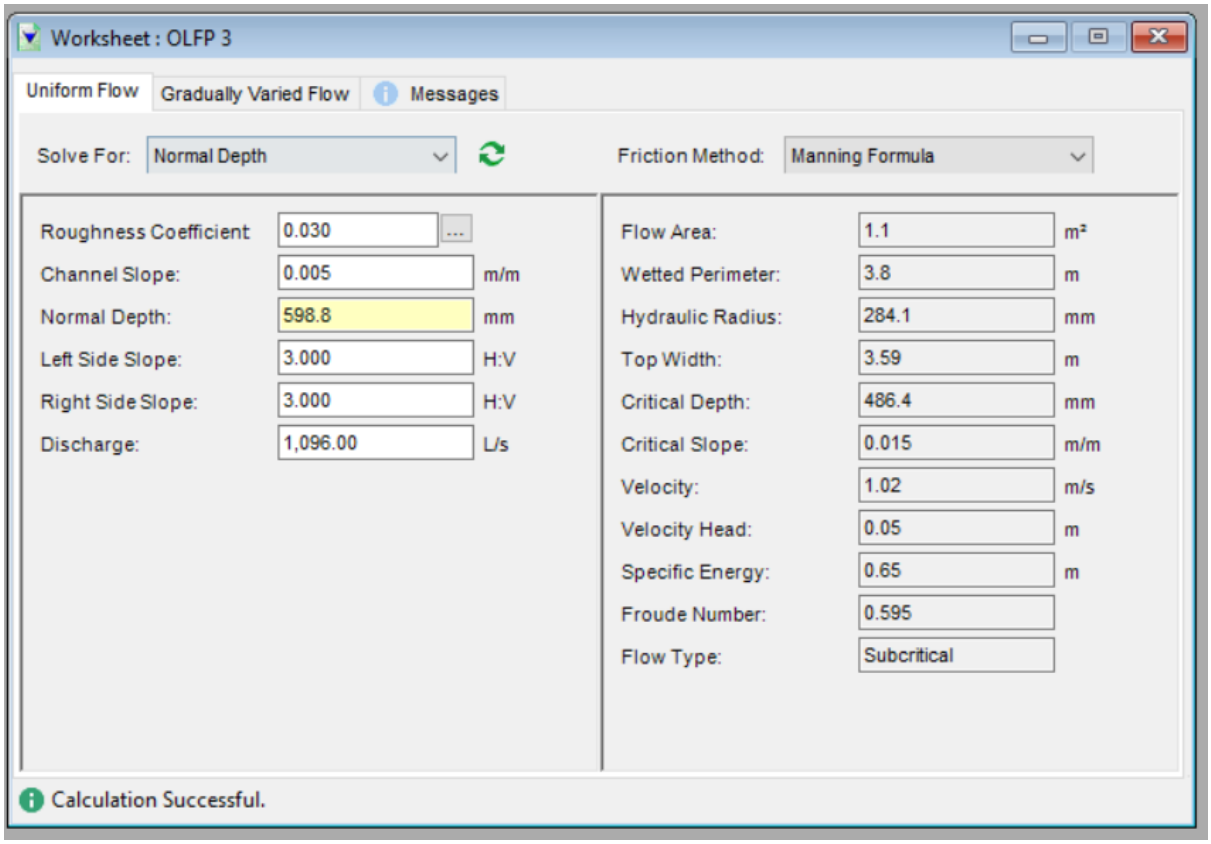


Figure 9: Flowmaster results of required flow depth for OLFP 3 in the secondary storm event, assuming a 0.5% channel grade triangular channel (no bottom width)

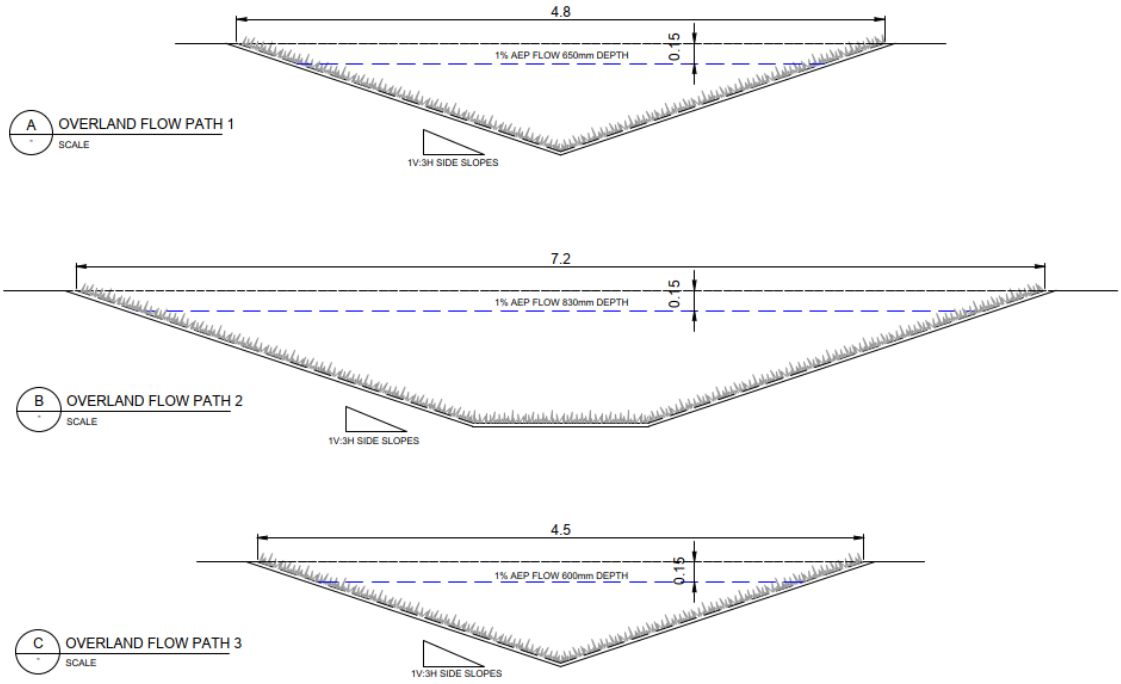


Figure 10: Sketches of overland flow paths 1-3

6.0 WASTEWATER

The wastewater demand from the proposed development has been calculated and is shown in Table 6 below, assuming 130 residential houses with an average occupancy of 3 persons/dwelling, and 1600m^2 of medium water using commercial buildings is to be constructed. Full wastewater calculations are presented in Appendix 4.

TABLE 6: WASTEWATER FLOW CALCULATIONS	
Average Dry Weather Flow	1.10 L/s
Average Daily Flow	95.4 m^3/d
Peak Wet Weather Flow	5.52 L/s

WBOPDC's GIS system shows that there is no public wastewater reticulation within Pongakawa, and therefore wastewater will be treated and disposed of on-site. A pressurised liquid-only sewer system is proposed, and a preliminary design has been undertaken by Innoflow, which has been attached in Appendix 4. Innoflow's design includes 3 stages of 35 lots, with a peak flow rate of 35,000L/d per stage, or a peak of 105m^3/day for the entire site. This calculation varies from peak flows derived from the Development Code, however, are deemed to be more accurate as they are based on real world observations of the application of these wastewater systems in similar developments. It is noted that Innoflow's design is based on a previous version of the plan change report with only 105 total lots, however due to the large area assigned for the wastewater treatment and disposal field in the structure plan it is expected the extra demand from additional lots can be serviced by this area. Updates to the wastewater report will be undertaken as part of the detailed design process for the development.

CMW's GIR confirms that the soils present at the site are suitable for use for wastewater disposal, with some enabling works potentially needing to be undertaken. Those works may include the establishment of a fill raft to create separation between the disposal field and groundwater, and pre-loading to minimise the risk of settlement compromising the integrity of the disposal field infrastructure.

Wastewater will undergo primary treatment via septic tanks within individual lots, which will be installed by homeowners at the time of building. Effluent is then pumped from the septic tank systems to mainlines within road berms, which transport the wastewater to secondary treatment. After secondary treatment the treated wastewater will be discharged via drip irrigation to a disposal field. The disposal zone is shown in orange in Figure 11 below.

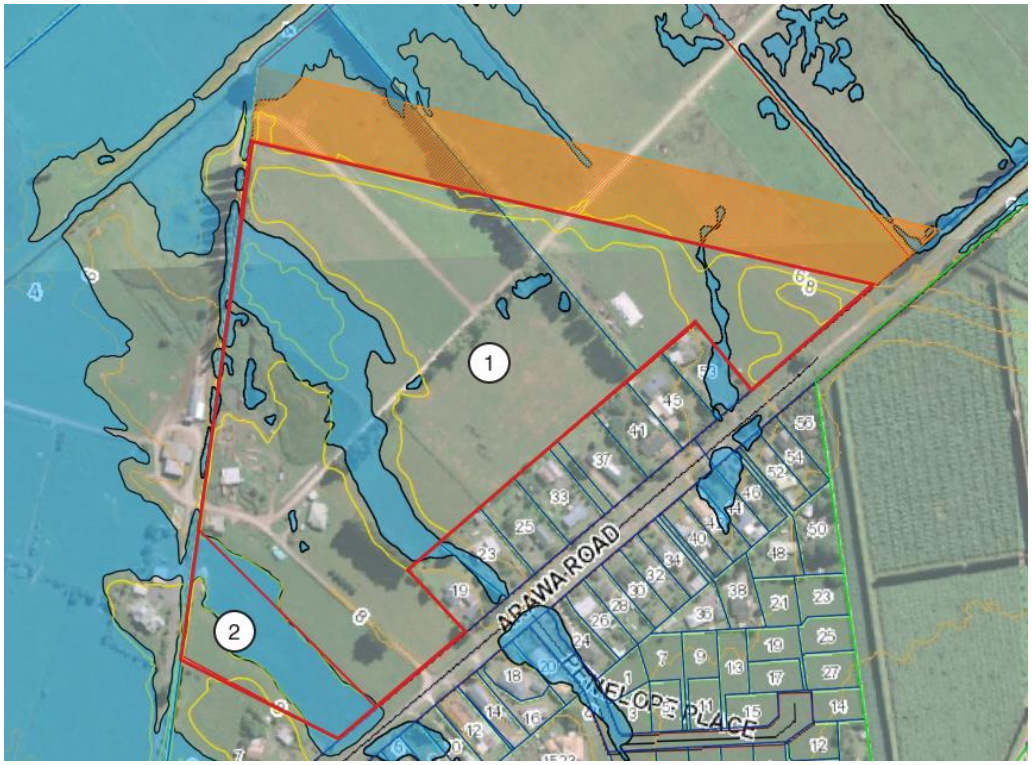


Figure 11: Site map showing wastewater disposal field location and extent

7.0 WATER SUPPLY

Section 7.4.1 of WBOPDC's Development Code requires a domestic supply allowance of 220l/person/day with a peak hour peaking factor of 5. Total demand from the development has been presented in Table 7 below, assuming 130 residential houses with an average occupancy of 3 persons/dwelling and 1600m^2 of medium water using commercial buildings is to be constructed.

TABLE 7: WATER DEMAND CALCULATIONS	
Average Demand	1.23 L/s
Average Daily Demand	106.5 m^3/d
Peak Hour Demand	6.17 L/s

WBOPDC's GIS confirms that a 50mm ID MDPE rider main is located within the berm on the northern side of Arawa Road alongside the site. This rider main is ring fed from an 80mm ID MDPE water main located within the berm on the southern side of Arawa Rd. A 100mm ID MDPE water main runs alongside SH2 to the south of the site.

The recent development of Penelope Place made use of a reservoir and pump at the entrance to the site, to allow the delivery of the necessary pressure to the dwellings and fire hydrant within. It is therefore considered unlikely that the proposed development could be supplied from the existing network in Arawa Road without the use of a similar reservoir and pump system. Whilst WBOPDC's DC doesn't provide specific guidance on how many dwellings can be serviced by watermains of given diameter, NZS4404:2010 does. Table 6.2 of that standard states that generally, a single ended 100mm

feed like the one feeding the Arawa Road catchment can serve 10 rural residential lots. There are already more than 30 residential lots connected to the main.

A water supply model has been created to demonstrate how the development could be serviced, which is discussed in further detail in sections 7.3 and 7.4 below. In short, the existing watermain arrangement cannot supply the proposed development without either:

1. Upgrading the 100mm ID main connecting the Arawa Road development to Maniatutu Road (a 2km long length of watermain) to a 225mm OD MDPE main.
2. The provision of a reservoir and pump arrangement at the connection point to the development.

Both options have been explored in the modelling discussion in sections 7.3 and 7.4, and both are hydraulically feasible.

Internal to the development, firefighting supply will be designed to comply with SNZ PAS 4509, with hydrants located at 135m maximum spacing (in accordance with the WBOPDC DC for residential areas).

7.1 Water Pressure Testing

To demonstrate the feasibility of each of the options above, water pressure testing was carried out on the 100mm main in SH2, and a water model was built based on its findings. Pressure testing was undertaken for a 48-hour period between 9:30am, 13/07/22 and 9:30am, 15/07/22, at the air valve 90m west of the SH2/Arawa Road intersection. The pressure varied between 627.4kPa and 562.9kPa, as shown in Figure 12 below.

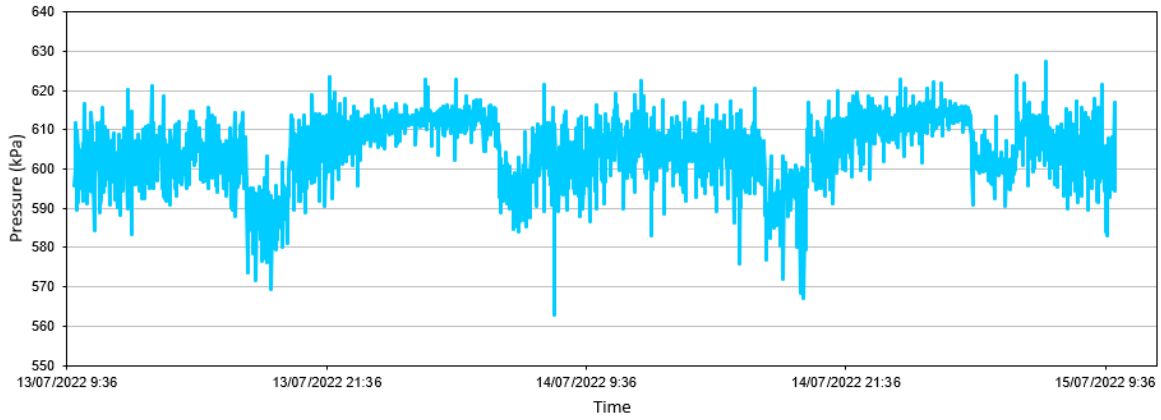


Figure 12: Pressure monitoring results, provided by Alec Coory of Rolec. Monitoring was undertaken at the air valve on the pipe bridge 90m west of the SH2/Arawa Road intersection.

For simplicity and conservatism, a pressure of 510kPa was adopted for use in static models built with EPANet, to demonstrate code compliance even at the lowest ebb of pressure over the 48-hour period, and with an additional reduction of 50kPa to allow for the fact that the readings were taken in winter (where demand is lower than in the summer months). Notably, for most of the monitoring run, pressure was consistently between 590kPa and 615kPa.

7.2 Existing Network Model

Figure 13 below shows the model of the existing network. That model contains all existing mains with diameters and lengths in accordance with the data available on WBOPDC's MAPI GIS database. Elevations at each node of the model were estimated using MAPI contours. Given the flat landform in the area, the relative elevations of the nodes are not considered critical to the way the model functions. Demand from existing properties was derived using table 3.2 of AS/NZS 3500.1:2003, which provides the probable simultaneous demand ("PSD") for multiple dwellings. For example, the node east of the Arawa Road/SH2 intersection (at the bottom of the figure) represents the demand from the 29 properties serviced by that main, and table 3.2 of AS/NZS 3500.1:2003 states that the PSD for 29 lots is 3.32 l/s. For the five rural properties along the line from Maniatutu Road to the Arawa Road area, the PSD has been doubled, to represent their likely heightened demand. A Hazen-Williams roughness coefficient of 150 has been adopted for all pipes, representative of plastic pipes.

The demand for the Penelope Place development was derived differently, given that it is served by an internal main with a reservoir and pump at the development entry point. For that development, the daily demand was derived based on the Development Code parameters and averaged across a 24-hour period to represent the trickle feeding of the reservoir.

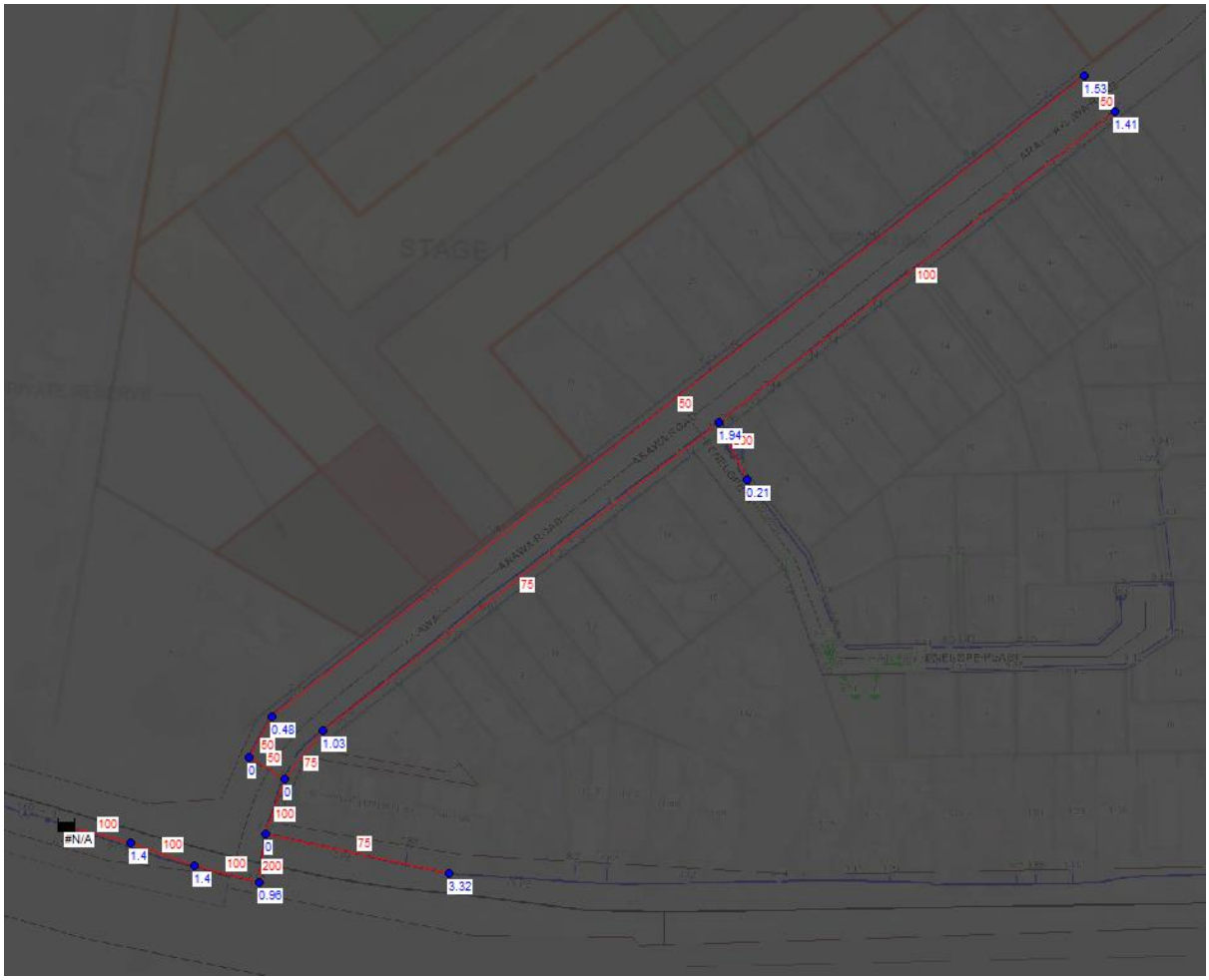


Figure 13: Screenshot of the EPANet water pressure model for the existing network. Red lines/text denote pipes and their respective diameters (in mm), blue dots/text represent nodes in the network and their estimated demand (in l/s). The green reservoir at bottom left represents the 100mm main in SH2, with 63m head within it (560kPa and 7m elevation).

To model the 2km long (not drawn to scale in the figure) 100mm ID MDPE main feeding the area from the west, the reservoir at the bottom left of the figure was set with a head of 100m, given that hydraulic calculations suggest that approximately 41m of head are lost along the 2km length of pipe. Therefore, the pressure within the main at the testing location is 59m (or an internal pressure of 51m as per the pressure testing detailed in section 7.1, given the elevation at that location of 8m).

Figure 14 below shows the modelling results of the pre-development model, with pressures at each node shown in green text. Note that in this model no firefighting has been modelled, as there are no hydrants present within the network other than the one at the cul-de-sac head of Penelope Place. That hydrant is not considered relevant to the functioning of the wider area in terms of pressure, as it is within a development served by a reservoir and pump. At no point within the model does the water pressure drop below 54m.

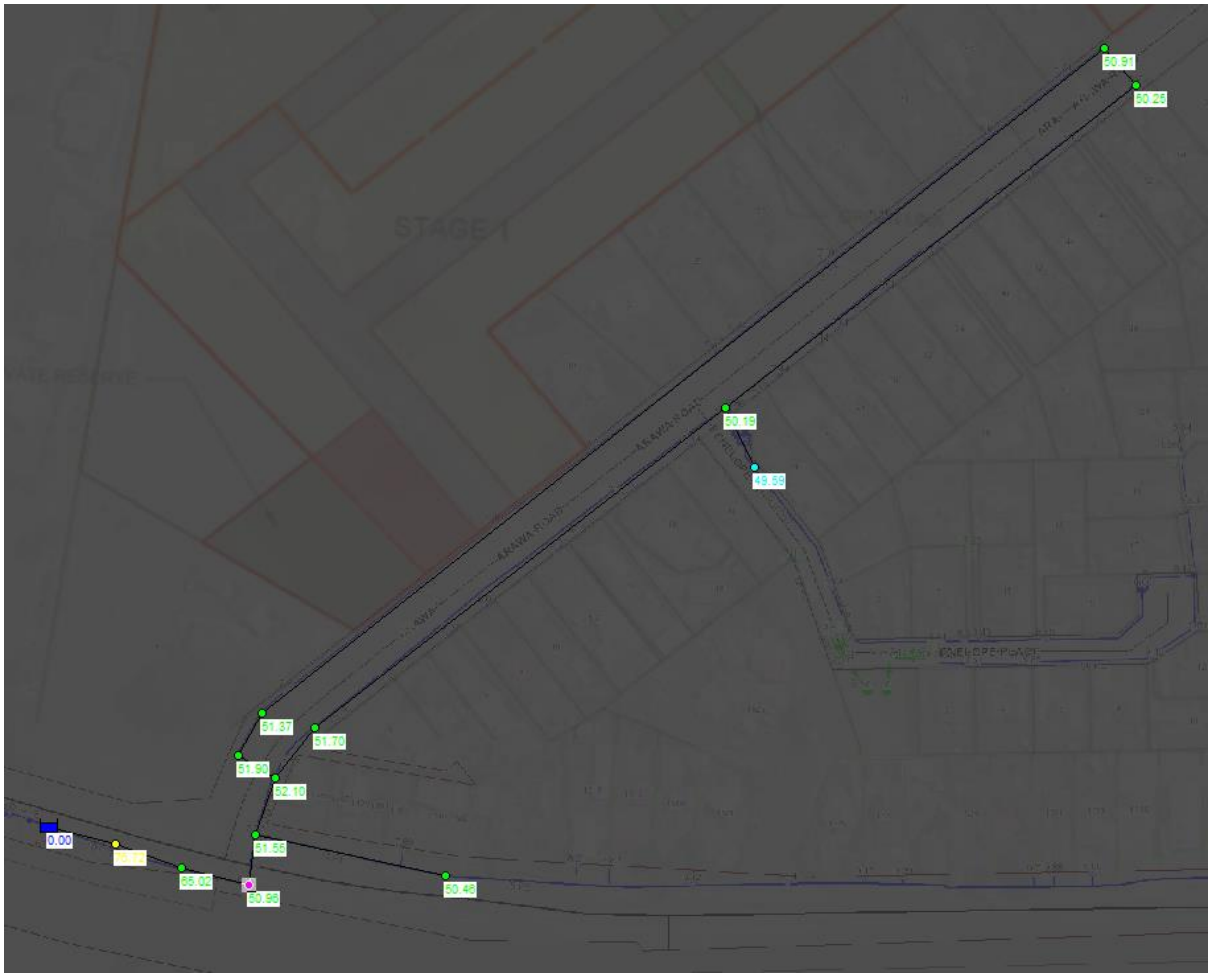


Figure 14: Screenshot of the EPANet water pressure model for the existing network. Black lines denote pipes green dots/text represent nodes in the network and their modelled pressure (in metres head).

7.3 Option 1 – State Highway 2 Watermain Upgrade

Figure 15 below shows the model that was constructed for this option, with existing mains within SH2, Arawa Road, and Penelope Place included, as well as a conceptual representation of a reticulation network within the proposed development. The blue text represents estimated demand, and the red text denotes pipe diameter. The demand at each node of the existing network is as per the pre-development model. The demand for the proposed plan change area was also largely derived using

table 3.2 of AS/NZS 3500.1:2003, with the proposed 130 lots evenly distributed throughout the development, and the commercial area included at the appropriate node. Of note are the following model features:

- There are two open hydrants within the proposed development, each delivering 12.5 l/s in accordance with SNZ PAS4509-2008.
- The 2km main (not drawn to scale in the figure) from Maniatutu Road to the development area has been modelled as having been upgraded to a 225mm OD MDPE pipe as part of the proposed development (SDR13.6, PN12.5, with an internal diameter of 191mm). By iteration, this was deemed the minimum diameter to provide a code compliant level of service to the development.
- The connection from the main to the development will be a 140mm OD MDPE pipe, which was deemed the minimum diameter to provide a code compliant level of service to the development.

Figure 15: Screenshot of the EPANet water pressure model for Option 1. Red lines/text denote pipes and their respective diameters (in mm), blue dots/text represent nodes in the network and their estimated demand (in l/s). The blue reservoir at bottom left represents the 100mm main in SH2, with 63m head within it (560kPa and 7m elevation).

The pipework within the plan change area is generally a standard layout with a 100mm main on one side of the road and a 50mm ridermain on the other.

Figure 16 below shows the modelling results, with the text representing the pressure at each node within the network. As shown, the residual pressure across the proposed network remains above the WBOPDC DC mandated 10m while the two fire hydrants are running, and the pressure within the existing Arawa Road doesn't drop below 63m (compared with the 50m in the pre-development model). Therefore, the option of upgrading the main from Maniatutu Road is considered a suitable solution to enable water to be supplied to the proposed plan change area.

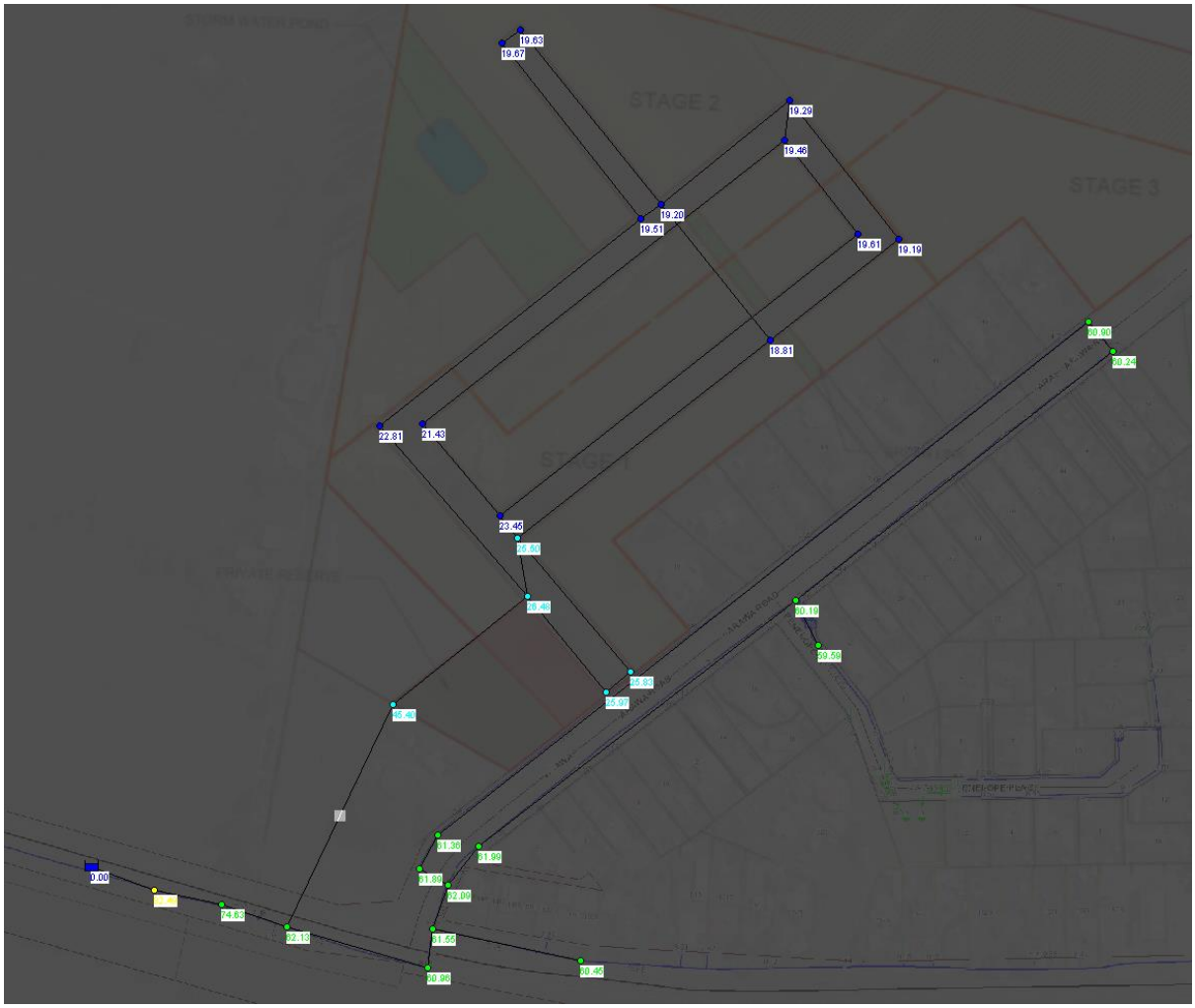


Figure 16: Screenshot of the EPANet water pressure model for Option 1. Blue and Green dots/text represent nodes in the network and their modelled residual pressures when two fire hydrants are each drawing 12.5l/s within the proposed plan change area.

The system could further be improved by upgrading the 75mm and 50mm mains in Arawa Road, but those upgrades aren't considered necessary to enable the development of the plan change area.

7.4 Option 2 – Reservoir and Pump at Development Connection Point

This option requires no off-site upgrades, but instead the installation of a reservoir and pump at the connection point to the plan change area, in a similar vein to what was done at the Penelope Place development. As for the previous two models, the existing network and the pressure monitoring results are incorporated. The average demand of the development (refer to section 7.0) of 1.23 L/s has been adopted (and rounded up to 1.3l/s) as the trickle feed rate required to keep the reservoirs full, and it has been assumed that 48 hours of emergency storage is to be provided, which equates to

225m³. In addition to that volume, a further 45m³ of storage is proposed for use as firefighting storage. The exact storage arrangement has not been explored in detail here, but it could be achieved by way of a series of above ground tanks (Devan plastic tanks or similar), or by way of one larger reservoir (Kliptank or similar). Either way, the storage must be arranged such that the fire fighting storage is available at all times, even in the unlikely event of the potable supply being exhausted. Figure 17 below is a diagrammatic representation of how that might be achieved.

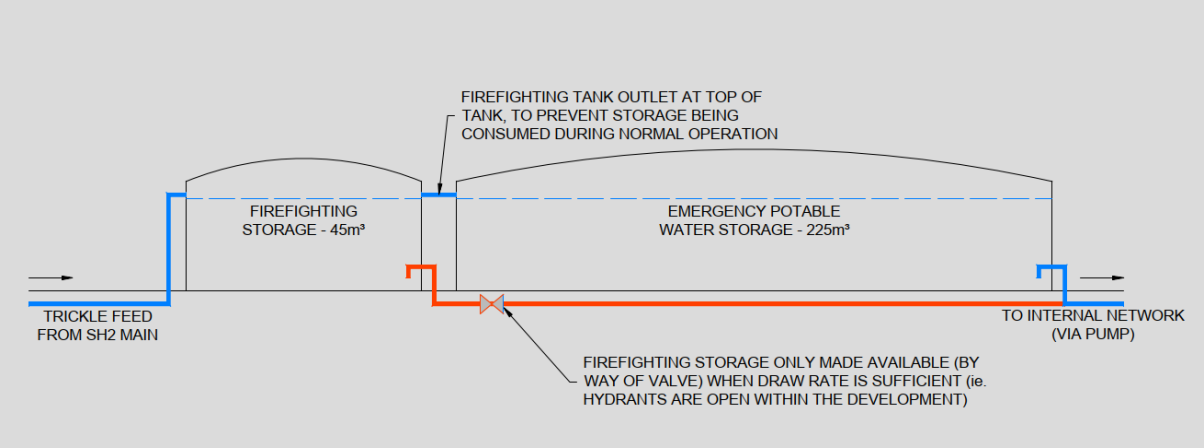


Figure 17: Diagrammatic representation of a potential conceptual reservoir arrangement at the site entrance.

Based on initial discussions with Pump and Valve Specialties Limited ("Pump and Valve"), the pump station would likely consist of a number of pumps operating in parallel, such that their collective duty can be matched to what is required by the development at any one time (be it peak hourly demand, low flow situations, or firefighting flows). When firefighting flow is required, the pump station would be programmed to engage all of its pumping capacity, and to open the valve on the firefighting storage outlet line, such that that storage can be drained during such an emergency.

Further, Pump and Valve indicated that the flow rate and head characteristics of the network are within the capabilities of readily available pumps, and that a system of pumps operating efficiently within their pump curves could be designed to suit such a situation.

Figure 18 below shows the model that was constructed for this option, which is the same as that for option 1, with the exception of the SH2 main upgrade not being in place, and the reservoir and pump system being incorporated. Key features of the model include:

- There are two open hydrants within the proposed development, each delivering 12.5 l/s in accordance with SNZ PAS4509-2008.
- The 2km main from Maniatutu Road to the development area remains at 100mm internal diameter.

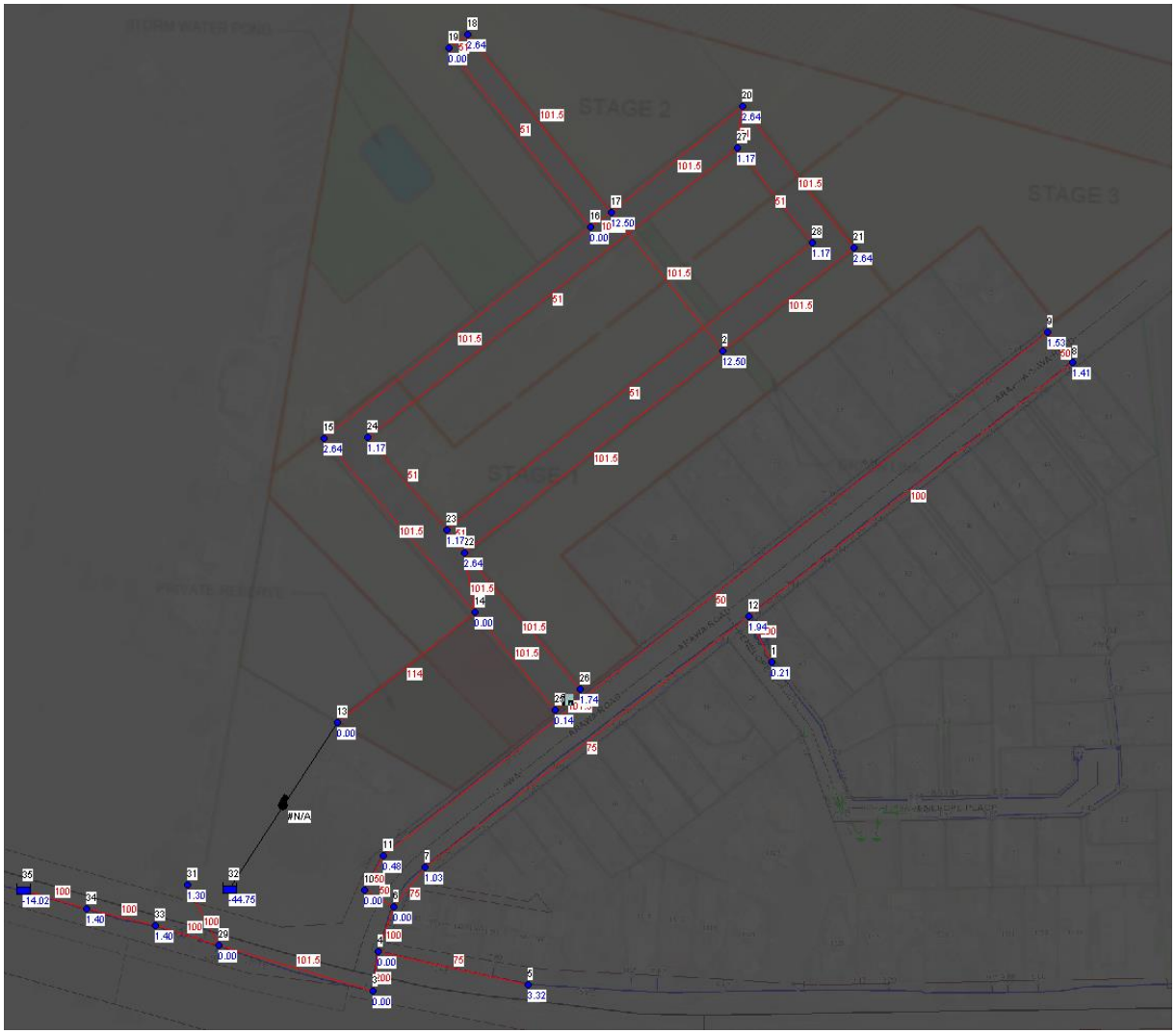


Figure 18: Screenshot of the EPANet water pressure model for Option 2. Red lines/text denote pipes and their respective diameters (in mm), blue dots/text represent nodes in the network and their estimated demand (in l/s). The black reservoirs at bottom left represents the 100mm main in SH2, with 100m of theoretical head within it, 2km from the site, and the proposed reservoir to supply the proposed plan change area.

- In terms of the hydraulics of the wider network, the development draws only 1.3 l/s, which is representative of the trickle feed into the development reservoir.
- The internal reservoir has been represented in the model, with only approximately 2m of pressure within it (the approximate height of an assumed tank, above ground level).
- EPANet has modelled a theoretical pump curve for the pump supplying the development. The pumping parameters required have been discussed with Pump and Valve and understood to be within a normal operating range for watermain pump applications.

Figure 19 below shows the modelling results for Option 2, with the pressure at each node shown (whilst two hydrants are drawing from the network within the development).

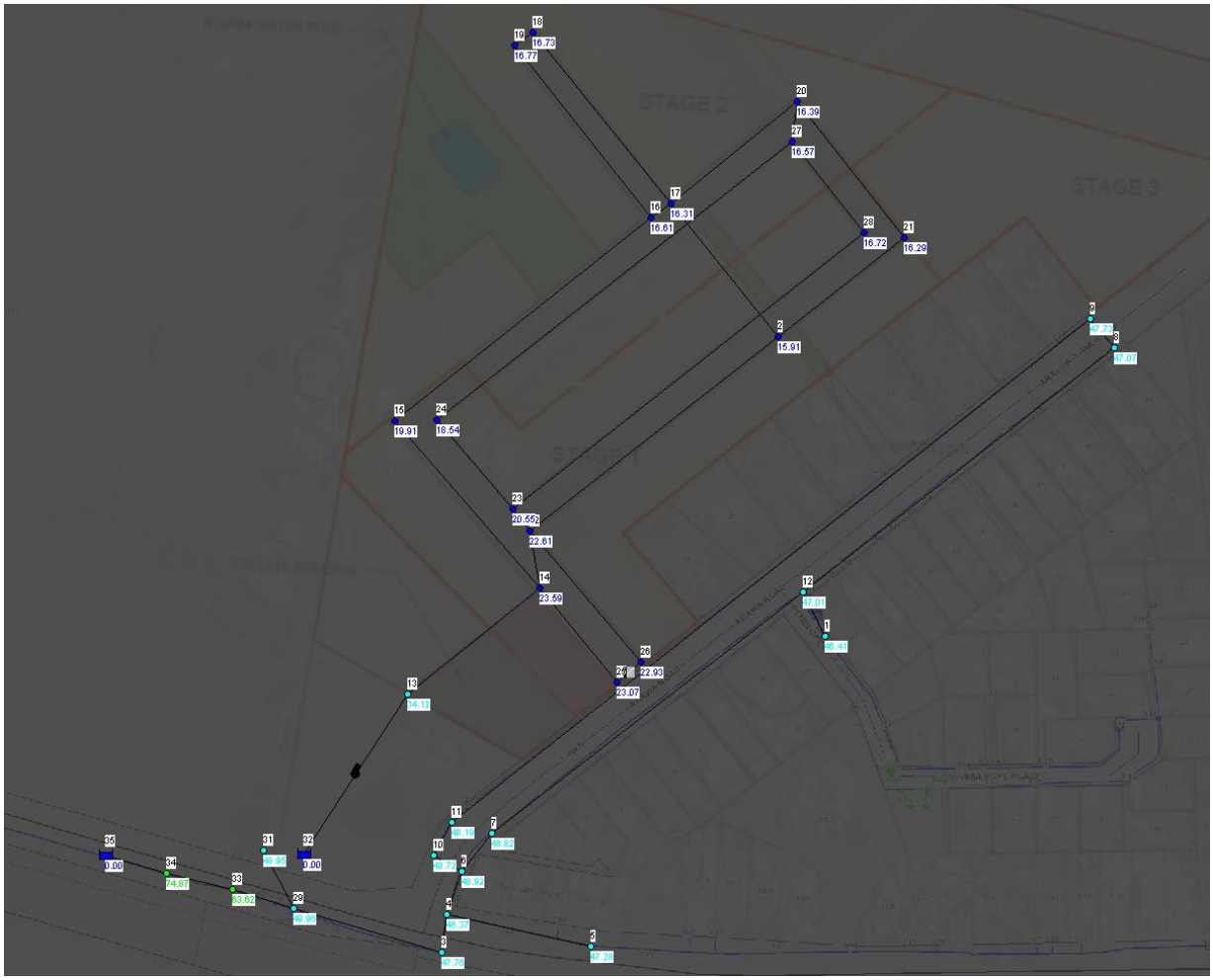


Figure 19: Screenshot of the EPANet water pressure model for Option 2. Blue and Green dots/text represent nodes in the network and their modelled residual pressures when two fire hydrants are each drawing 12.5l/s within the proposed plan change area.

As per the figure, the pressure within the main remains above 10m in all cases and is therefore compliant with the WBOPDC DC. Further, the pressure within the existing mains in Arawa Road and Penelope Place do not drop below 46m (compared to 54m in the pre-development scenario).

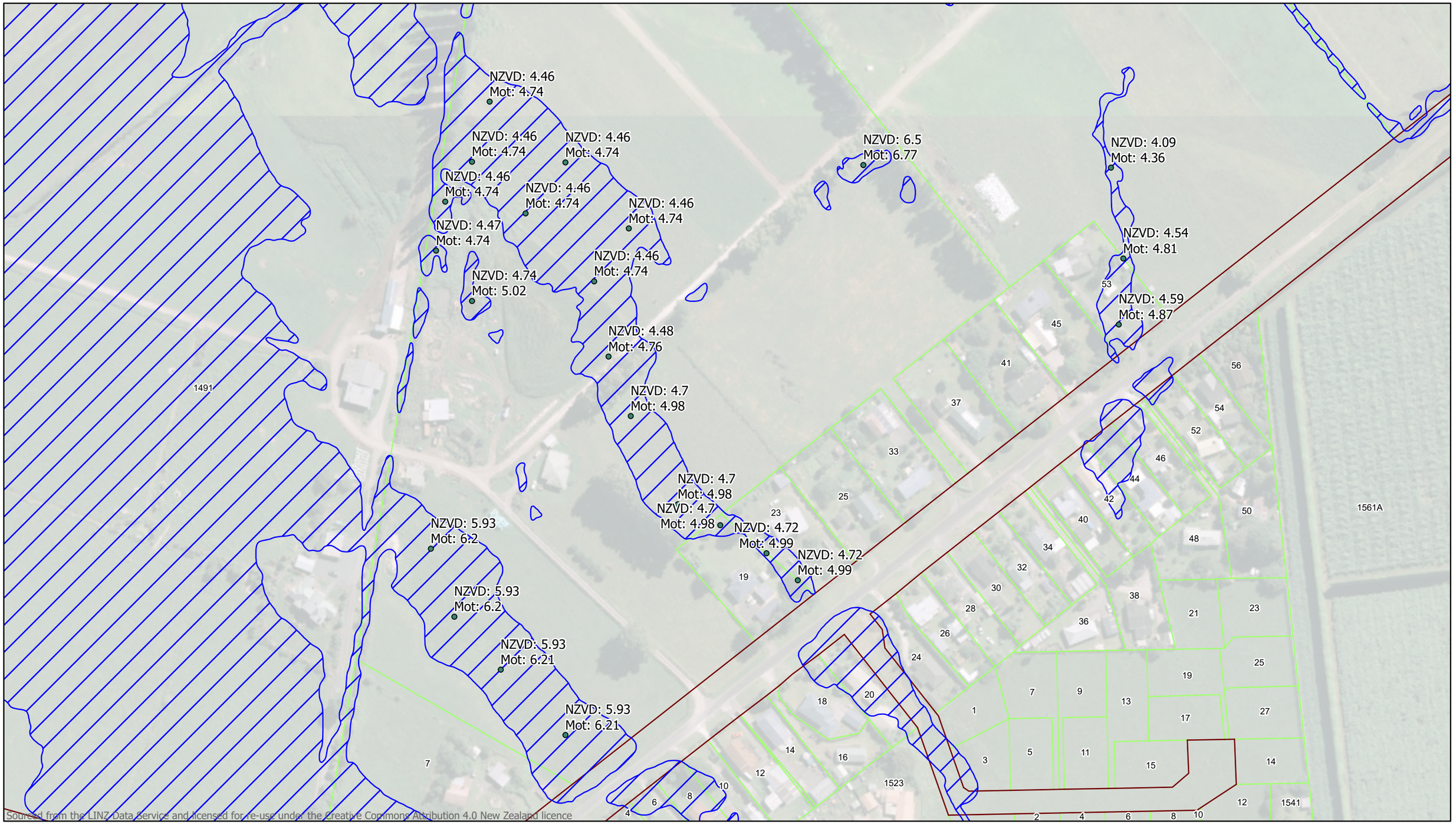
Sensitivity analysis was carried out on the existing network, and whilst the proposed development theoretically needs only a 1.3l/s trickle feed to operate, as much as 3.7l/s could be taken from the existing network at the point of supply without the pressure in the existing mains dropping below 30m of pressure, the minimum required by the WBOPDC DC.

Therefore, a reservoir and pump solution such as the one described here is considered a suitable solution to provide water to the proposed plan change area without compromising the functionality of the existing infrastructure.

8.0 POWER, GAS & TELECOMMUNICATIONS

MPAD are undertaking a review of power, telecommunication and gas services availability. Feedback has been received from Powerco confirming that the development can be supplied from the infrastructure in the vicinity of the site, with the provision of one or two new transformers. The email from this communication has been attached in Appendix 6. Responses from telecommunications and gas providers are still being sought.

APPENDIX 1 – FLOOD LEVELS DRAWING



Produced using ArcMap by the Western Bay of Plenty District Council GIS Team.
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Location of services is indicative only. Council accepts no liability for any error.
Archaeological data supplied by NZ Archaeological Assoc/Dept. of Conservation.

Email: gis@westernbay.govt.nz
Date: 14/09/2021
Operator: mbl
Map:

Scale (A3) : 1:7,500

Western Bay of Plenty District Council

Flood Levels

N

APPENDIX 2 – GEOTECHNICAL INVESTIGATION REPORT

REFER TO SEPARATE DOCUMENT

APPENDIX 3 – PRELIMINARY STORMWATER CALCULATIONS

DETAILED SOAKAGE SYSTEM DESIGN - CRATE SYSTEM - RAINSMART MODULAR TANK

Project No: 225216
Client: Momentum Planning & Design
Site: 1491 State Highway 2, Pongakawa
Date: 21/04/2022

System Details

Catchment Area	210	m^2			
Volumetric Runoff Coefficient	0.9		Impervious Area Runoff Factor	0.00095	m/min
Soil K_h	100	mm/hr	per Geotech reccomendations	57	
Crate Width	0.4	m		28.5	
Crate Height	1.28	m	per Manufacturers specs		
Crate Length	0.715	m			
No. Crates Wide	6				
No. Crates Long	7				
Width of Infiltration Area	2.4	m			
Length of Infiltration Area	5.005	m			
Depth of Storage	1.28	m			
Porosity/Void Ratio	0.95		Use 0.95 for crate system		
Base Area Included In Calc	Yes				
Side Area Included In Calc	Yes				
Permeable Side Area	100%		Utilise this factor where part of trench side wall not permeable i.e. use 20% if only 20% of trench in permeable soil strata		

System Calcs

Base Area	12.01	m^2
Side Area	9.48	m^2
Total Infiltration Area	21.49	m^2
Effective Storage Volume	14.61	m^3

Storm Duration	Storm Mean Intensity (10yr)	Volume in (m^3)	Volume Soaked (m^3)	Additional Storage Required (m^3)	Percentage of Storage provided (%)	Time to Drain (hrs)	Drains within 24hrs?
10	150.10	4.7	0.4	4.4	334%	2.0	
20	99.00	6.2	0.7	5.5	265%	2.6	
30	91.90	8.7	1.1	7.6	192%	3.5	
60	66.80	12.6	2.1	10.5	139%	4.9	**Yes**
120	44.90	17.0	4.3	12.7	115%	5.9	
360	24.30	27.6	12.9	14.7	100%	6.8	
720	15.90	36.1	25.8	10.3	142%	4.8	
1440	10.40	47.2	47.2	0.0		0.0	
2880	6.40	58.1	58.1	0.0		0.0	

APPENDIX 4 – PRELIMINARY WASTEWATER CALCULATIONS

WASTEWATER - DEVELOPMENT DEMAND

Project No: 225216
Client: Momentum Planning and Design
Site: 1491 State Highway 2, Pongakawa
Date: 9/12/2022

Residential wastewater demand

Dwellings	130	
Occupancy	3	people
Demand	220	l/p/day
Population	390	people
ADWF	85800	l/d
	85.8	m3/d
Peaking Factor	5	
PWWF	4.97	l/s

Commercial wastewater demand

Area	1600	m2	
Assumed discharge	6	l/m2/d	*Taken from Auckland Design Manual Wastewater code of practice, assumed industry - medium water users*
ADWF	9600	l/d	
	9.6	m3/d	
Peaking Factor	5		
PWWF	0.56	l/s	

Total Wastewater demand

Average Daily Flow	**95.40**	**m3/d**
Peak Residential	4.97	l/s
Peak Commercial	0.56	l/s
Total Peak	**5.52**	**l/s**

Project Name: Pencarrow - Stage 1: 35 Lots (1-35)
Qpeak = 35,000 LPD

Wastewater Treatment Plant & Land Application System

SCHEDULE OF PRICES
17.01.2022

Tenderer : Innoflow Technologies NZ Limited

Item	Description	Unit	Quantity	Rate	Amount
A	**PRELIMINARY & GENERAL**				
A1.1	**Establishment & Engineering:** establishment/disestablishment costs, general freight, hiab to place pods, health & safety, insurances, Includes design, design drawings and commissioning of the full system by Innoflow. Additionally, provision of sign off documentation by drainlaying contractors and electricians, and an electronic management plan and as-built schematic of the system will be provided upon completetion and final payment of the system.	LS	1	$19,500.00	$19,500.00
B	**PRIMARY TREATMENT**				
B1.3	**Septic Tanks: (35 x 4,000 L Prelos Processor Tanks).** Tanks includes (1) 750mm x 450mm riser & lid, inlet junction, pump, effluent filter, floats, and control panel. Price includes supply of materials, delivery and installation (all concurrently), excluding gravity drains into each tank and mains power from building to control panels. **THESE ARE PURCHASED BY THE HOMEOWNERS AT THE TIME OF BUILDING AND DO NOT FORM PART OF THIS CONTRACT. THEREFORE, ONE OF INSTALLS AND INDIVIDUAL PRICING CAN BE**	LS	35	$17,513.93	$612,987.72
B1.4	**Service Connections and Service Laterals.** Supply only of 35 x 32 mm PE from tank to mainline, including a service lateral containing check valve and isolating valve and toby box.	LS	35	$612.77	$21,447.05
C	**SECONDARY TREATMENT**				
C1.1	**1 x 55 m³ Pre-Anoxic Tank:** Includes 2 x 450 mm tall PVC access risers & lids, and 1 x PF100552 filtrate return pump and associated fittings. Price includes supply of materials, delivery and installation.	LS	1	$58,164.61	$58,164.61
C1.2	**1 x 55 m³ Recirculation Tank:** Includes 2 x 450 mm tall PVC access risers & lids, 1 x flow inducer tower, 2 x PF501512 recirculation pumps and associated fittings, 3-float switch assembly, MM4-FRP splitter valve and all internal plumbing & connection to tanks . Price includes supply of materials, delivery and full installation.	LS	1	$66,413.01	$66,413.01
C1.3	**1 x 400 AdvanTex Packed Bed Reactors (4 x AX100 Pod):** including all underdrain plumbing connections, activated carbon vent fan. Price includes supply of materials, delivery and full installation.	LS	1	$203,020.82	$203,020.82
C1.4	**1 x 25 m³ Post-Anoxic Tanks (Stage 2 Anoxic Process)** Includes 2 x 450 mm tall PVC access risers & lids, 1 x PF100552 mixing pump, 3-float swich assembly and associated fittings. Price includes supply of materials, delivery and installation.	LS	1	$23,874.76	$23,874.76
C1.5	**1 x 25 m³ Recirculation Tanks (Stage 2):** Includes (2) 610mm x 450mm risers & lids, 1 x flow inducer tower, 1 x PF500752 recirculation pump, MF3P Float switch assembly, MM4-FRP splitter valve and all internal plumbing & connection to tanks . Price includes supply of materials, delivery and full installation.	LS	1	$32,456.15	$32,456.15
C1.6	**1 x AdvanTex Packed Bed Reactor (1 x AX100 Pod):** Including all underdrain plumbing connections. Price includes supply of materials, delivery and full installation.	LS	1	$60,895.32	$60,895.32
C1.7	**1 x Carbon Dosing System:** Including 200 L drum or 1000 L IBC container, dosing pump, and all pipework and controls. Price includes supply of materials, delivery and installation. Price does not include chemicals (i.e. carbon supply).	LS	1	$16,483.11	$16,483.11
C1.8	**1 x Alkalinity Dosing System:** Including skid mounted dry chemical feed hopper, auger and eductor, controls and all associated pipework and control fitings. Price includes supply of materials, delivery and installation. Price does not include chemicals (i.e. soda ash supply).	LS	1	$27,133.73	$27,133.73
D	**TERTIARY TREATMENT**				
D1.1	**Ultra Violet Disinfection Unit:** Includes wall mounted pressure UV unit for tertiary treatment of effluent. Price includes supply of materials and installation. Note: UV must be installed in a weather proof enclosure.	LS	1	$46,535.71	$46,535.71

E	**LAND TREATMENT**				
E1.1	**1 x 55 m³ Treated Effluent Storage Tank:** Includes 2 x 450 mm tall PVC access risers & lids, 1 x flow inducer and PF300712 effluent pump, 3 float switch assembly and associated fittings. Price includes supply of materials, delivery and full installaton.	LS	1	$63,804.85	$63,804.85
E1.2	**Land Treatment System:** Including pulse water meter, header pipe and 7000 m² surface laid Netafim pressure compensating drip irrigation line. Drip line system includes the supply and installation with 500 m of header pipe, 1 x 6 sector sequencing valve in PVC access riser and lid, and surface laying of 7000 linear meters of pressure compensating dripper line. Installation includes all fittings, dripline laterals at 1 m spacing, emmiters at 0.5 m centres and a dripper rate of 1.6 L/Hr.	LS	1	$32,821.38	$32,821.38
F	**CONTROLS & ELECTRICAL**				
F1.1	**Remote Telemetry (TCOM) Control Panel:** Includes panel with various functions including remote monitoring capability, electronic logging of effluent flows, pump run times and alarm logs with audible and visual alarm features. Note: monthly connectivity and monitoring charges shall apply with this panel.	LS	1	$51,071.43	$51,071.43
F1.2	**Electrical Hookup:** Includes wiring and splicing of all internal components of the wastewater treatment plant, including pumps, floats and water meter(s) to the control panel. Includes supply of material, trenching and electrical sign off documentation. Note: This price excludes the supply and connection of mains power, including any transformers, meter/distribution boards, power company fees and/or inspections**.**	LS	1	$19,613.69	$19,613.69
	TOTAL PRICE (excluding GST)				$1,356,223.34
	ADDITIONAL OPTIONS				
1.0	**Control Shed**: Includes a small shed under 10 m². Style, colour and construction methods shall vary and are subject to local availability.	LS	1	$38,821.43	$38,821.43

This pricing schedule was prepared

for: Momentum Planning & Design

by: Innoflow Technologies NZ Limited

Tags & Exclusion

1 No costs have been allowed for gravity/pressure pipes into septic tanks and/or grease traps.

2 Price assumes that sewer invert level (relative to ground level) at the first tank of the wastewater treatment plant is no deeper than 650mm. The tanks quoted in this price are rated for a burial depth of no more than 300mm soil cover.

3 Any costs required for stormwater diversion, excavation stabilisation, foundation improvements and groundwater control, such as but not limited to; de-watering, benching, shoring and ground improvements, including any investigation works is not included in our price.

4 It is assumed that all tanks shall be founded on natural ground with a minimum bearing capacity of no less than 100 kPA. No cost to achieve this bearing capacity if improvements are required have been allowed in our price.

5 No costs have been allowed for drilling, compaction and excavation through unsuitable ground such as rock/boulders, peat/swamp conditions, running sands, or any other material that cannot be excavated using standard methods.

6 All weather access to the wastewater treatment plant site is required at all times during installation. Price assumes full access to site (position of installation) with a 20 tonne digger and large hiab transporter to excavate holes and place tanks . No allowance has been made for specialist lifting and transport equipment such as cranes if hiab access to place tanks in ground is not available due to safety, collapsing excavation, or any other reason.

7 Excavated spoil not used for backfill from any excavation shall be left onsite next to that particular excavation. It is assumed that all soil excavated during tank installations shall be suitable as backfill material and used as such. Not costs have been allowed to modify excavated material or import aggregate for backfill purposes. Furthermore, no costs have been allowed to remove or truckaway excess spoils from any excavation location.

8 Reinstatement of tank and plant excavation works, trenching and/or drip line ploughing excludes any reinstatement works and materials including but not limited to bark/mulch, topsoiling, turfing/grass seeding and any other landscaping material.

9 No costs have been allowed for the supply and connection of mains power to the system control panel(s).

10 No costs have been allowed for the importation of potable water to fill tanks. An adequate supply of water for filling tanks shall be provided at no cost to Innoflow during installation.

11 Price does not include supply and/or installation of a weather proof control shed.

12 No costs have been allowed to create, modify and/or improve site access to any work location, and demolition/removal and reinstatement/replanting of fences/vegetation or any kind of barrier to access construction site(s) for installation is not included.

13 Price assumes permit and council consents will be fully prepared by others prior to works starting and that it will be the clients responsibility to provide original copies to Innoflow prior to works commencing onsite.

14 No costs have been allowed for any post commissioing Council requirements and/or treatment plant proof of performance. including but not limited to gaining Code Compliance Certificate (CCC), issuing Construction Review Statement (PS4) and influent or effluent quality sampling and analysis.

15 Price includes surface laying of dripline irrigation. Price does not include supply of mulch, bark or planting. Price does not include any site preparation works such as clearing of the irrigation area, mowing and spraying.

16 Price does not include antifloation measures on tanks. These can be provided if needed as an additional cost.

17 Price is valid for 4 weeks (subject to any currency adjustments if required) and there is a 3 month lead time from acceptance of contract (i.e. contract signing and payment of deposit).

18 25% deposit of contract is due on acceptance of quote. 75% is due upon goods onsite/installation of the system. Late payments shall incur an interest charge.

19 Price does not include ongoing maintenance and telemetry management. A separate maintenance contract shall be entered in to between you and Innoflow's dedicated service company (S3 Limited). That contract shall cover standard preventative maintenance visits, compliance testing, alarm management, connectivity charges, and any other services mutually agreed on such as but not limited to chemical supply, grounds maintenance, compliance reporting, etc.

20 Price does not include compliance and costs associated with operating under a sub-contract agreement with a head civil contractor. Should this be required, Innoflow shall be provided with the head contract terms and conditions and shall be entitled to reprice as deemed necessary.

21 Price presented is for budgeting purposes only. Any formal agreement on price shall include factors such as fluctuations in USD exchange rates, supplier price increases, and any contract compliance costs such as but not limited to defects liability periods and retention money.

Project Name: Pencarrow - Stage 2: 35 Lots (36-70)
Qpeak = 35,000 LPD (In addition to Stage 1 flows)

Wastewater Treatment Plant & Land Application System

SCHEDULE OF PRICES
17.01.2022

Tenderer : Innoflow Technologies NZ Limited

Item	Description	Unit	Quantity	Rate	Amount
A	**PRELIMINARY & GENERAL**				
A1.1	**Establishment & Engineering:** establishment/disestablishment costs, general freight, hiab to place pods, health & safety, insurances, Includes design, design drawings and commissioning of the full system by Innoflow. Additionally, provision of sign off documentation by drainlaying contractors and electricians, and an electronic management plan and as-built schematic of the system will be provided upon completetion and final payment of the system.	LS	1	$19,500.00	$19,500.00
B	**PRIMARY TREATMENT**				
B1.3	**Septic Tanks: (35 x 4,000 L Prelos Processor Tanks).** Tanks includes (1) 750mm x 450mm riser & lid, inlet junction, pump, effluent filter, floats, and control panel. Price includes supply of materials, delivery and installation (all concurrently), excluding gravity drains into each tank and mains power from building to control panels. **THESE ARE PURCHASED BY THE HOMEOWNERS AT THE TIME OF BUILDING AND DO NOT FORM PART OF THIS CONTRACT. THEREFORE, ONE OF INSTALLS AND INDIVIDUAL PRICING CAN BE**	LS	35	$17,513.93	$612,987.72
B1.4	**Service Connections and Service Laterals.** Supply only of 35 x 32 mm PE from tank to mainline, including a service lateral containing check valve and isolating valve and toby box.	LS	35	$612.77	$21,447.05
C	**SECONDARY TREATMENT**				
C1.1	**1 x 55 m³ Pre-Anoxic Tank:** Includes 2 x 450 mm tall PVC access risers & lids, and 1 x PF100552 filtrate return pump and associated fittings. Price includes supply of materials, delivery and installation.	LS	1	$58,164.61	$58,164.61
C1.2	**1 x 55 m³ Recirculation Tank:** Includes 2 x 450 mm tall PVC access risers & lids, 1 x flow inducer tower, 2 x PF501512 recirculation pumps and associated fittings, 3-float switch assembly, MM4-FRP splitter valve and all internal plumbing & connection to tanks . Price includes supply of materials, delivery and full installation.	LS	1	$66,413.01	$66,413.01
C1.3	**1 x 400 AdvanTex Packed Bed Reactors (4 x AX100 Pod):** including all underdrain plumbing connections, activated carbon vent fan. Price includes supply of materials, delivery and full installation.	LS	1	$203,020.82	$203,020.82
C1.4	**1 x 25 m³ Post-Anoxic Tanks (Stage 2 Anoxic Process)** Includes 2 x 450 mm tall PVC access risers & lids, 1 x PF100552 mixing pump, 3-float swich assembly and associated fittings. Price includes supply of materials, delivery and installation.	LS	1	$23,874.76	$23,874.76
C1.5	**1 x 25 m³ Recirculation Tanks (Stage 2):** Includes (2) 610mm x 450mm risers & lids, 1 x flow inducer tower, 1 x PF500752 recirculation pump, MF3P Float switch assembly, MM4-FRP splitter valve and all internal plumbing & connection to tanks . Price includes supply of materials, delivery and full installation.	LS	1	$32,456.15	$32,456.15
C1.6	**1 x AdvanTex Packed Bed Reactor (1 x AX100 Pod):** Including all underdrain plumbing connections. Price includes supply of materials, delivery and full installation.	LS	1	$60,895.32	$60,895.32
D	**TERTIARY TREATMENT**				
D1.1	**Ultra Violet Disinfection Unit:** Included at Stage 1	LS	1	$0.00	$0.00
E	**LAND TREATMENT**				
E1.1	**1 x 55 m³ Treated Effluent Storage Tank:** Includes 2 x 450 mm tall PVC access risers & lids, 1 x flow inducer and PF300712 effluent pump, 3 float switch assembly and associated fittings. Price includes supply of materials, delivery and full installaton.	LS	1	$63,804.85	$63,804.85

E1.2	**Land Treatment System:** Including pulse water meter, header pipe and 7000 m² surface laid Netafim pressure compensating drip irrigation line. Drip line system includes the supply and installation with 500 m of header pipe, 1 x 6 sector sequencing valve in PVC access riser and lid, and surface laying of 7000 linear meters of pressure compensating dripper line. Installation includes all fittings, dripline laterals at 1 m spacing, emmiters at 0.5 m centres and a dripper rate of 1.6 L/Hr.	LS	1	$32,821.38	$32,821.38
F	**CONTROLS & ELECTRICAL**				
F1.1	**Remote Telemetry (TCOM) Control Panel:** Included at Stage 1	LS	1	$0.00	$0.00
F1.2	**Electrical Hookup:** Includes wiring and splicing of all internal components of the wastewater treatment plant, including pumps, floats and water meter(s) to the control panel. Includes supply of material, trenching and electrical sign off documentation. Note: This price excludes the supply and connection of mains power, including any transformers, meter/distribution boards, power company fees and/or inspections**.**	LS	1	$19,613.69	$19,613.69
	TOTAL PRICE (excluding GST)				$1,214,999.36

This pricing schedule was prepared

for: Momentum Planning & Design

by: Innoflow Technologies NZ Limited

Tags & Exclusion

1 No costs have been allowed for gravity/pressure pipes into septic tanks and/or grease traps.

2 Price assumes that sewer invert level (relative to ground level) at the first tank of the wastewater treatment plant is no deeper than 650mm. The tanks quoted in this price are rated for a burial depth of no more than 300mm soil cover.

3 Any costs required for stormwater diversion, excavation stabilisation, foundation improvements and groundwater control, such as but not limited to; de-watering, benching, shoring and ground improvements, including any investigation works is not included in our price.

4 It is assumed that all tanks shall be founded on natural ground with a minimum bearing capacity of no less than 100 kPA. No cost to achieve this bearing capacity if improvements are required have been allowed in our price.

5 No costs have been allowed for drilling, compaction and excavation through unsuitable ground such as rock/boulders, peat/swamp conditions, running sands, or any other material that cannot be excavated using standard methods.

6 All weather access to the wastewater treatment plant site is required at all times during installation. Price assumes full access to site (position of installation) with a 20 tonne digger and large hiab transporter to excavate holes and place tanks . No allowance has been made for specialist lifting and transport equipment such as cranes if hiab access to place tanks in ground is not available due to safety, collapsing excavation, or any other reason.

7 Excavated spoil not used for backfill from any excavation shall be left onsite next to that particular excavation. It is assumed that all soil excavated during tank installations shall be suitable as backfill material and used as such. Not costs have been allowed to modify excavated material or import aggregate for backfill purposes. Furthermore, no costs have been allowed to remove or truckaway excess spoils from any excavation location.

8 Reinstatement of tank and plant excavation works, trenching and/or drip line ploughing excludes any reinstatement works and materials including but not limited to bark/mulch, topsoiling, turfing/grass seeding and any other landscaping material.

9 No costs have been allowed for the supply and connection of mains power to the system control panel(s).

10 No costs have been allowed for the importation of potable water to fill tanks. An adequate supply of water for filling tanks shall be provided at no cost to Innoflow during installation.

11 Price does not include supply and/or installation of a weather proof control shed.

12 No costs have been allowed to create, modify and/or improve site access to any work location, and demolition/removal and reinstatement/replanting of fences/vegetation or any kind of barrier to access construction site(s) for installation is not included.

13 Price assumes permit and council consents will be fully prepared by others prior to works starting and that it will be the clients responsibility to provide original copies to Innoflow prior to works commencing onsite.

14 No costs have been allowed for any post commissioing Council requirements and/or treatment plant proof of performance. including but not limited to gaining Code Compliance Certificate (CCC), issuing Construction Review Statement (PS4) and influent or effluent quality sampling and analysis.

15 Price includes surface laying of dripline irrigation. Price does not include supply of mulch, bark or planting. Price does not include any site preparation works such as clearing of the irrigation area, mowing and spraying.

16 Price does not include antifloation measures on tanks. These can be provided if needed as an additional cost.

17 Price is valid for 4 weeks (subject to any currency adjustments if required) and there is a 3 month lead time from acceptance of contract (i.e. contract signing and payment of deposit).

18 25% deposit of contract is due on acceptance of quote. 75% is due upon goods onsite/installation of the system. Late payments shall incur an interest charge.

19 Price does not include ongoing maintenance and telemetry management. A separate maintenance contract shall be entered in to between you and Innoflow's dedicated service company (S3 Limited). That contract shall cover standard preventative maintenance visits, compliance testing, alarm management, connectivity charges, and any other services mutually agreed on such as but not limited to chemical supply, grounds maintenance, compliance reporting, etc.

20 Price does not include compliance and costs associated with operating under a sub-contract agreement with a head civil contractor. Should this be required, Innoflow shall be provided with the head contract terms and conditions and shall be entitled to reprice as deemed necessary.

21 Price presented is for budgeting purposes only. Any formal agreement on price shall include factors such as fluctuations in USD exchange rates, supplier price increases, and any contract compliance costs such as but not limited to defects liability periods and retention money.

Project Name: Pencarrow - Stage 3: 70 Lots (71-105)
Qpeak = 35,000 LPD (Combined total flow = 105,000 LPD)

Wastewater Treatment Plant & Land Application System

SCHEDULE OF PRICES
17.01.2022

Tenderer : Innoflow Technologies NZ Limited

Item	Description	Unit	Quantity	Rate	Amount
A	**PRELIMINARY & GENERAL**				
A1.1	**Establishment & Engineering:** establishment/disestablishment costs, general freight, hiab to place pods, health & safety, insurances, Includes design, design drawings and commissioning of the full system by Innoflow. Additionally, provision of sign off documentation by drainlaying contractors and electricians, and an electronic management plan and as-built schematic of the system will be provided upon completetion and final payment of the system.	LS	1	$19,500.00	$19,500.00
B	**PRIMARY TREATMENT**				
B1.3	**Septic Tanks: (35 x 4,000 L Prelos Processor Tanks).** Tanks includes (1) 750mm x 450mm riser & lid, inlet junction, pump, effluent filter, floats, and control panel. Price includes supply of materials, delivery and installation (all concurrently), excluding gravity drains into each tank and mains power from building to control panels. **THESE ARE PURCHASED BY THE HOMEOWNERS AT THE TIME OF BUILDING AND DO NOT FORM PART OF THIS CONTRACT. THEREFORE, ONE OF INSTALLS AND INDIVIDUAL PRICING CAN BE**	LS	35	$17,513.93	$612,987.72
B1.4	**Service Connections and Service Laterals.** Supply only of 35 x 32 mm PE from tank to mainline, including a service lateral containing check valve and isolating valve and toby box.	LS	35	$612.77	$21,447.05
C	**SECONDARY TREATMENT**				
C1.1	**1 x 55 m³ Pre-Anoxic Tank:** Included at Stage 1 and 2.	LS	1	$0.00	$0.00
C1.2	**1 x 55 m³ Recirculation Tank:** Includes 2 x 450 mm tall PVC access risers & lids, 1 x flow inducer tower, 2 x PF501512 recirculation pumps and associated fittings. Price includes supply of materials, delivery and full installation.	LS	1	$28,198.72	$28,198.72
C1.3	**1 x 200 AdvanTex Packed Bed Reactors (2 x AX100 Pod):** including all underdrain plumbing connections, activated carbon vent fan. Price includes supply of materials, delivery and full installation.	LS	1	$109,271.25	$109,271.25
C1.4	**1 x 25 m³ Post-Anoxic Tanks (Stage 2 Anoxic Process)** Included at Stage 1 and 2.	LS	1	$0.00	$0.00
C1.5	**1 x 25 m³ Recirculation Tanks (Stage 2):** Included at Stage 1 and 2.	LS	1	$0.00	$0.00
C1.6	**1 x AdvanTex Packed Bed Reactor (1 x AX100 Pod):** Including all underdrain plumbing connections. Price includes supply of materials, delivery and full installation.	LS	1	$54,491.32	$54,491.32
D	**TERTIARY TREATMENT**				
D1.1	**Ultra Violet Disinfection Unit:** Included at Stage 1 and 2	LS	1	$0.00	$0.00
E	**LAND TREATMENT**				
E1.1	**1 x 55 m³ Treated Effluent Storage Tank:** Includes 2 x 450 mm tall PVC access risers & lids, 1 x flow inducer and PF300712 effluent pump, 3 float switch assembly and associated fittings. Price includes supply of materials, delivery and full installaton.	LS	1	$25,611.13	$25,611.13
E1.2	**Land Treatment System:** Including pulse water meter, header pipe and 7000 m² surface laid Netafim pressure compensating drip irrigation line. Drip line system includes the supply and installation with 500 m of header pipe, 1 x 6 sector sequencing valve in PVC access riser and lid, and surface laying of 7000 linear meters of pressure compensating dripper line. Installation includes all fittings, dripline laterals at 1 m spacing, emmiters at 0.5 m centres and a dripper rate of 1.6 L/Hr.	LS	1	$59,419.38	$59,419.38
F	**CONTROLS & ELECTRICAL**				
F1.1	**Remote Telemetry (TCOM) Control Panel:** Includes panel with various functions including remote monitoring capability, electronic logging of effluent flows, pump run times and alarm logs with audible and visual alarm features. Note: monthly connectivity and monitoring charges shall apply with this panel.	LS	1	$0.00	$0.00

F1.2	**Electrical Hookup:** Includes wiring and splicing of all internal components of the wastewater treatment plant, including pumps, floats and water meter(s) to the control panel. Includes supply of material, trenching and electrical sign off documentation. Note: This price excludes the supply and connection of mains power, including any transformers, meter/distribution boards, power company fees and/or inspections**.**	LS	1	$8,440.13	$8,440.13
	TOTAL PRICE (excluding GST)				$939,366.70
	ADDITIONAL OPTIONS				
1.0	**Control Shed**: Includes a small shed under 10 m². Style, colour and construction methods shall vary and are subject to local availability.	LS	1	$0.00	$0.00

This pricing schedule was prepared

for: Momentum Planning & Design

by: Innoflow Technologies NZ Limited

Tags & Exclusion

1 No costs have been allowed for gravity/pressure pipes into septic tanks and/or grease traps.

2 Price assumes that sewer invert level (relative to ground level) at the first tank of the wastewater treatment plant is no deeper than 650mm. The tanks quoted in this price are rated for a burial depth of no more than 300mm soil cover.

3 Any costs required for stormwater diversion, excavation stabilisation, foundation improvements and groundwater control, such as but not limited to; de-watering, benching, shoring and ground improvements, including any investigation works is not included in our price.

4 It is assumed that all tanks shall be founded on natural ground with a minimum bearing capacity of no less than 100 kPA. No cost to achieve this bearing capacity if improvements are required have been allowed in our price.

5 No costs have been allowed for drilling, compaction and excavation through unsuitable ground such as rock/boulders, peat/swamp conditions, running sands, or any other material that cannot be excavated using standard methods.

6 All weather access to the wastewater treatment plant site is required at all times during installation. Price assumes full access to site (position of installation) with a 20 tonne digger and large hiab transporter to excavate holes and place tanks . No allowance has been made for specialist lifting and transport equipment such as cranes if hiab access to place tanks in ground is not available due to safety, collapsing excavation, or any other reason.

7 Excavated spoil not used for backfill from any excavation shall be left onsite next to that particular excavation. It is assumed that all soil excavated during tank installations shall be suitable as backfill material and used as such. Not costs have been allowed to modify excavated material or import aggregate for backfill purposes. Furthermore, no costs have been allowed to remove or truckaway excess spoils from any excavation location.

8 Reinstatement of tank and plant excavation works, trenching and/or drip line ploughing excludes any reinstatement works and materials including but not limited to bark/mulch, topsoiling, turfing/grass seeding and any other landscaping material.

9 No costs have been allowed for the supply and connection of mains power to the system control panel(s).

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Prelos™

Covered by
patent number:
10,392,281

Prelos™ (Pressurized Liquid-Only Sewer)
is based on four decades of proven community sewer solutions.

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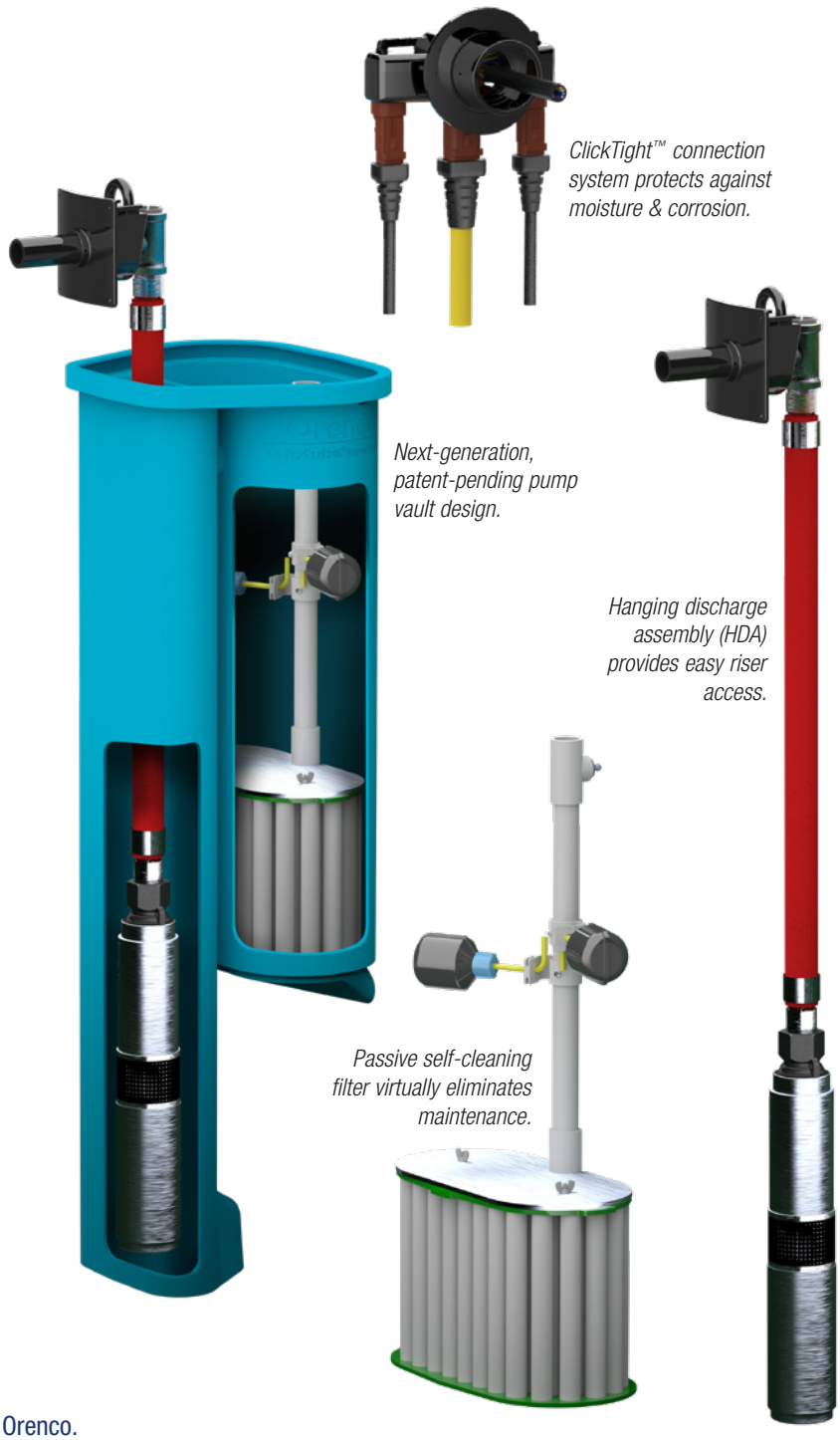
The Prelos™ Processor

- Complete, high-quality package
  - – Compatible, long-lifespan components
  - – Minimal inventory requirements
  - – Easy to maintain
  - – Low power consumption
- Single line item that's easy to specify
- Unique meander tank design for superior solids removal
- Optional industry-leading, extended 10-year limited pump warranty
- Lightweight, easily rebuildable effluent pump that can last 25+ years[1]
- Single riser and lid provide access to all components

The Prelos Sewer

- Pressurized liquid-only (effluent) sewer technology
- Eliminates the need for scouring velocities
- Small-diameter, liquid-only sewer lines have minimal burial depth and follow grade
- Minimal community disruption during installation
- 24- to 48-hr. reserve storage in each on-lot tank[2]
- Documented low life-cycle costs[3]
- Deferred capital costs on slow build-out developments
- Allows for smaller, lower-cost, highly efficient treatment plants[4]

1. *As seen in Elkton, Oregon liquid-only (effluent) sewer system.*
2. *Based on average flow of 150 gpd (568 L/day)/household.*
3. *Bill Cagle, Terry Cargil, and Roger Dickinson, "20-Year Life Cycle Analysis of an Effluent Sewer (STEP) System," 14 (paper presented at the Water Environment Federation Technical Exhibition and Conference, Chicago, IL, October 2013).*
4. *As seen in Montesano, Washington liquid-only (effluent) sewer system.*



ClickTight™ connection system protects against moisture & corrosion.

Next-generation, patent-pending pump vault design.

Hanging discharge assembly (HDA) provides easy riser access.

Passive self-cleaning filter virtually eliminates maintenance.

For more information, contact Orenco.

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APPENDIX 5 – PRELIMINARY WATER SUPPLY CALCULATIONS

WATER SUPPLY - DEVELOPMENT DEMAND

Project No: 225216
Client: Momentum Planning and Design
Site: 1491 State Highway 2, Pongakawa
Date: 9/12/2022

Residential water demand

Dwellings	130		
Occupancy	3	people	
Demand	220	l/p/day	
Population	390	people	
Average Daily Demand	85800	l/d	
	85.8	m3/d	
Peaking Factor	5		
Peak Hour Demand	4.97	l/s	

Commercial water demand

Area	1600	m2	
Assumed demand	1.5	l/s/Ha	*From WBOPDC DC*
Average Daily Demand	20736	l/d	
	20.7	m3/d	
Peaking Factor	5		
Peak Hour Demand	1.20	l/s	

Total Water Demand

Residential	4.97	l/s
Commercial	1.20	l/s
Total	**6.17**	**l/s**

APPENDIX 6 – POWERCO COMMUNICATIONS

Jordy Hardacre

To: Daniel Hight
Subject: RE: Pongakawa - Plan Change for Residential Development - Power Supply

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From: Evans Chogumaira <Evans.Chogumaira@powerco.co.nz>
Sent: Thursday, 28 April 2022 6:03 pm
To: CIW Planning Eastern <CIW.PlanningEastern@powerco.co.nz>
Cc: Gabriel Lim <Gabriel.Lim@powerco.co.nz>; Customer Works Eastern <CustomerWorksEastern@powerco.co.nz>
Subject: RE: Pongakawa - Plan Change for Residential Development - Power Supply

Hi

The proposed development can be connected to the existing network by extending the 11kV feeder (PKW1 Tainui feeder) from the boundary into the subdivision and installing one transformer (or two transformers if needed to manage LV voltage drop). This is based on total expected demand of 460kW from:

- 85-90 dwellings: approx. 360kW, and
- allowing 100kW for the commercial area.

Given the long term timeline for the development (up to 10 years), if other developments are committed and delivered in this area ahead of this residential development then potentially it may be necessary to upgrade the upstream network.

Regards

Evans

From: Customer Works Eastern <CustomerWorksEastern@powerco.co.nz>
Sent: Thursday, 28 April 2022 9:34 am
To: CIW Planning Eastern <CIW.PlanningEastern@powerco.co.nz>
Subject: FW: Pongakawa - Plan Change for Residential Development - Power Supply
Importance: High

Hi Team,

Can you please review the below and attached and provide Richard with feedback.

Many thanks,

Zoe Huygen
Customer Works Co-Ordinator
DDI +64 7 928 5652
Level 2, 152 Devonport Road, Tauranga 3110 | PO Box 13 075, Tauranga 3141
www.powerco.co.nz

From: Richard Coles <richard@mpad.co.nz>
Sent: Thursday, 21 April 2022 8:37 am
To: Customer Works Eastern <CustomerWorksEastern@powerco.co.nz>
Subject: Pongakawa - Plan Change for Residential Development - Power Supply
Importance: High

Good morning,

We are writing to you on behalf of our clients Kevin and Andrea Marsh who wish to rezoned their land from Rural to Residential. This is located on the north western side of Arawa Road opposite the existing residential zone.

The development area is area 1 on the attached plan where geotechnical investigations have been completed confirming the land is suitable for urban development. The ultimate development of this area following the plan change will likely take 10 years with approximately 85 to 90 dwellings established. There will also be a small commercial site (circ 2000m2) that will include a general store and also a doctors surgery.

Please note that the subdivision will occur in 3 Stages with the first stage with approximately 35-40 dwellings, the commercial site and a wastewater package treatment plant.

We are seeking some high level feedback in terms of the power reticulation in the area and to understand what upgrades may be necessary to service the Plan Change Area – stage 1 works in particular.

If you have any questions then please do not hesitate to contact me.

Kind Regards

Richard Coles
Director/Planner MNZPI
0274 325 154 richard@mpad.co.nz
www.mpad.co.nz

MOMENTUM
PLANNING AND DESIGN

LYSAGHT

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PO Box 13484, Tauranga 3141
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