PROPOSED PLAN CHANGE

INFRASTRUCTURE REPORT

RAYMOND BULL & BLACK SWAMP ROAD MANGAWHAI

MANGAWHAI EAST

October 2024

REPORT 1838 – 3

ASPIRE CONSULTING ENGINEERS
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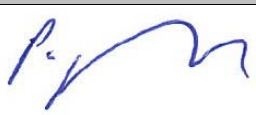
Revision History

Revision Nº	Prepared By	Description	Date
Rev 1	Holly Robins	Peer Review Update	30/05/2025
Rev 2	Phil Fairgray	Issue for notification	01/07/2025

Document Acceptance

Action	Name	Signed	Date
Prepared by	P Fairgray		24/10/2024
Reviewed by	E Peters		24/10/2024
Approved by	E Peters		24/10/2024

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1.0 Introduction and Proposal:

Aspire Consulting Engineers have been engaged by Cabra Mangawhai Ltd and Pro Land Matters Company Ltd to prepare an Infrastructure Report for the proposed Mangawhai East Private Plan Change (MEPPC).

The MEPPC is a total area of approximately 94 ha and is approximately 700m east of the Mangawhai Village. The site is bounded on the western boundary by the Mangawhai Harbour and is bisected by Black Swamp Road. The topography is low lying and flat north of Black Swamp Road and rolling hills to the south of Black Swamp Road.

Figure 1 is an existing aerial of the MEPPC area.

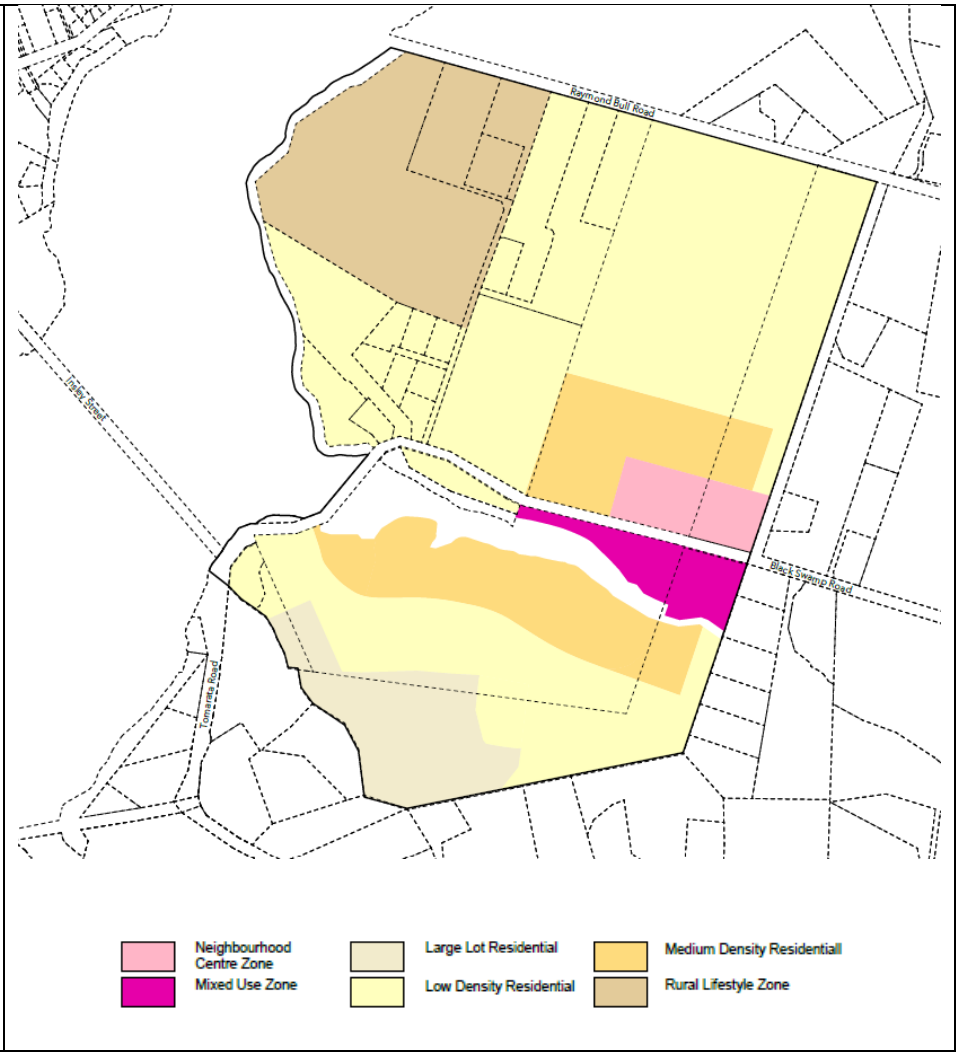
Fig. 1 Existing aerial of the site

The proposal seeks to rezone the 94 ha site from 'Rural' (under the Kaipara District Plan) to a combination of Residential Zones, Neighbourhood Centre Zone and a Business Mixed Use Zone. A portion of land is proposed to be zoned Rural Residential and will be subject to the Coastal Hazard Overlay. Sites in this area are anticipated to range from 5,000m^2 to 8,000m^2.

The Residential Zones will allow for up to approximately 750 lots comprising of the following size ranges:

- Medium Density Residential Zone (600 m² min or 400 m² min as part of integrated development)
- Low Density Residential Zone (750 m² min)
- Large Density Residential Zone (1500 – 3000 m²)
- Rural Residential Zone (5,000 – 8,000m²)

Fig. 2
Proposed Zoning Plan



The assessments and analysis undertaken by Aspire have demonstrated that all infrastructure required to facilitate future development of the land in accordance with this plan change can be managed either within site or within road reserve and will still be subject to full Resource Consent Process.

On this basis we see no reason as to why this plan change should not proceed from an engineering perspective.

2.0 Earthworks:

Generally, there will be earthworks required within the Plan Change area to create roading subgrades and building platforms to facilitate development. The platforms will need to be flood free (above 1% AEP storm event) and above the coastal inundation level (SLR + VLM). Flooding matters are discussed further in the Stormwater Management Report prepared by Aspire Consulting Engineers Ltd and Coastal inundation is addressed in a report prepared by Davis Coastal Consultants.

The Davis Coastal Consultants report Ref 24022 dated August 2024, states that the predicted SLR and VLM are 1.71 and 0.52 m respectively. For the purposes of the Plan Change, this equates to a coastal inundation level of RL 3.7m (NZVD 2016). The report states that further site specific assessment may refine the extent, degree and available mitigation of coastal hazards.

Th extent of the Coastal Hazard Overlay has been identified to encompass the land area where a greater level of filling would be required to achieve the required building platforms to avoid coastal hazard risk. The volume and area of fill that would be required in this area is greater than in the areas further inland and adjacent to Black Swamp Road. We anticipate that fill depths of approximately 2.0 m may be required to achieve the required building platform levels in the Coastal Hazard Overlay area, whereas in the areas identified as subject to coastal hazard and erosion hazard, that are outside the proposed Overlay, we expect fill levels to be approximately 1.0 m to achieve the required building platform levels.

All earthworks will be designed and completed in accordance with Auckland Councils Guidelines for Land Disturbing activities (GD05) and geotechnical recommendations. Provisions to achieve this outcome are proposed to be included in the Mangawhai East Development Area provisions.

As there are varied ecological features within the Plan Change area, the earthworks and roading design will be undertaken in consultation of an Ecologist to achieve good environmental and community outcomes. The Development Area provisions include riparian and wetland setback Standards.

Geotechnical investigations and reporting have been undertaken for the Plan Change area by Initia Geotechnical Specialists and Wiley Geotechnical Ltd. The recommendations in these reports will be considered during the future earthworks design phase.

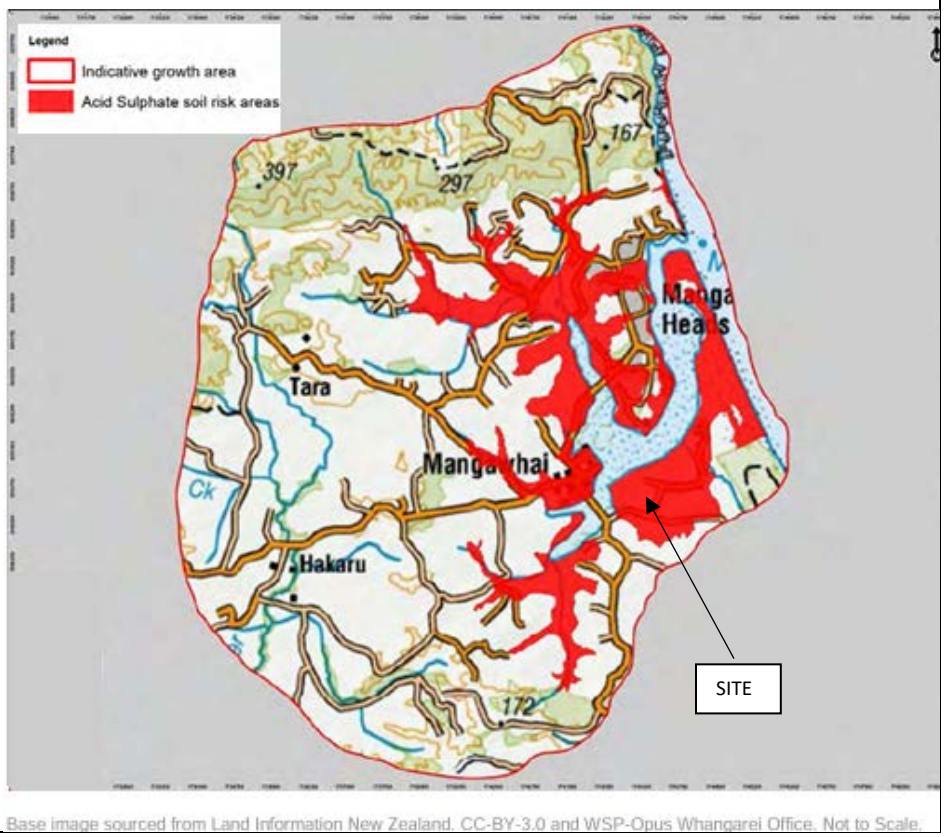
No earthworks modelling has been undertaken as part of the preparation of this report. The site topography is gentle and no considerable concerns and/or constraints around earthworks design have been identified or that would impact the outcome of the Plan Change.

The presence of acid sulphate in soils can cause corrosion to concrete structures and infrastructure that is in contact with acidic soil and/or groundwater. Stormwater and wastewater pipes and concrete foundations can be at risk as these can be exposed to moving groundwater flow and infiltration.

A contamination investigation has been completed as part of the Plan Change, the area is located within an area noted for Acid Sulfate soils. At the time or resource consent, further investigations will be undertaken to identify the presence of acid sulphate in this area, and mitigation measures should be implemented depending on the magnitude of the results. There are standard design solutions to address any issues that may be present when resource consents are obtained for land development in the future.

Below is an extract showing potential acid sulphate soil.

Fig. 3
Proposed Zoning Plan



The proposed earthworks will be shown as part of Resource Consent applications. Earthworks is likely to be staged due to the size of the Plan Change and as there are numerous property owners. They will be assessed against the assessment criteria by Kaipara District Council and Northland Regional Council.

3.0 Erosion and Sediment Controls:

Erosion and sediment controls are to be installed prior to the commencement of any earthworks on the site and maintained for the full duration of the works. These are standard requirements secured as part of resource consents.

Typical silt control measures will be utilised including silt fences, topsoil bunding, clean water diversion bunds and decanting earthbunds and sediment retention ponds all designed in accordance with Auckland Councils GD05 document. There are no features of the plan change area that would warrant different or greater measures to be employed.

As earthworks are completed, they should be stabilized with aggregate, straw mulched or re-grassed.

These will be assessed at time of Resource Consent against the current standard assessment criteria.

4.0 Roading

The Plan Change area is serviced by existing public roads, Black Swamp Road and Raymond Bull Road. The proposed new residential and commercial development will involve a new public roading network. The new public roading network will also include walking and cycling provisions.

The roads will have carriageways generally between 6.0-7.0m wide. New roads will have 1.5m wide concrete footpaths on both sides.

Road longitudinal gradients to the north of Black Swamp Road will generally be between 0.5% to 4% and to the south of Black Swamp Road will have a maximum longitudinal gradient of 12.5%.

Final road cross sections will be determined at the Resource Consent stage and will generally be in accordance with Kaipara District Council Engineering Standards.

Please refer to Commute Transportation Consultants Report to support this application.

5.0 Stormwater

Aspire has prepared a proposed Stormwater Management Plan that outlines the overall potential impacts and management strategy for stormwater generated from the Plan Change.

The Plan Change area has two main catchments. There is a central tidal tributary separating the northern and southern catchments.

The northern catchment is significantly flat with farm drains intersecting stormwater and channelizing approximately half of the area north towards Raymond Bull Road. The remaining southern areas within the northern catchment discharge toward the tidal tributary.

The southern catchment has reasonable falls through the site and is channelized through established overland flow paths towards the tidal tributary.

Fig. 4 Existing Catchment Plan

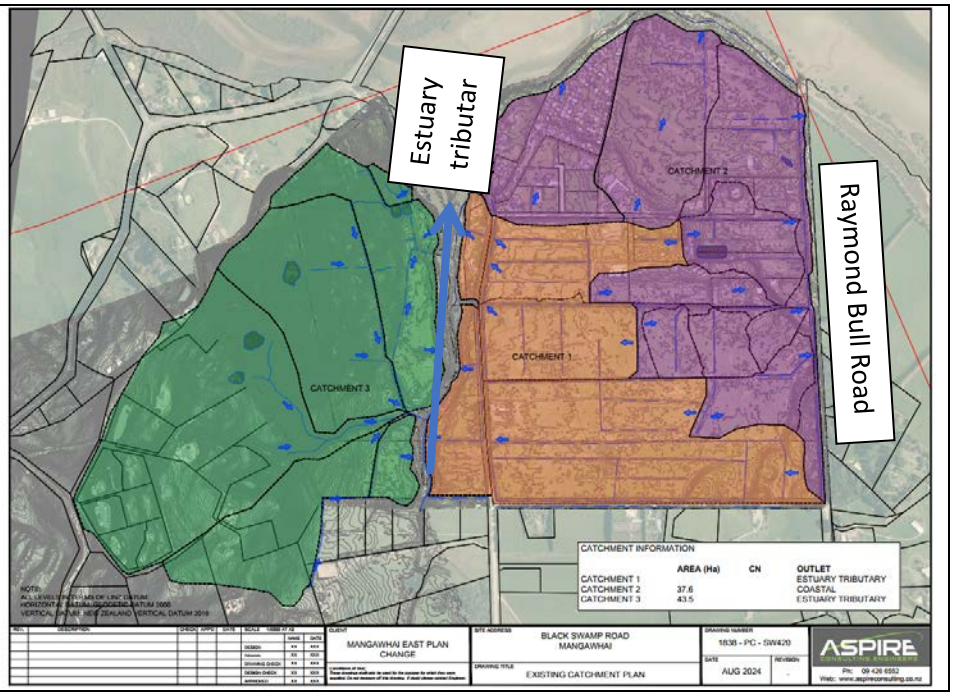
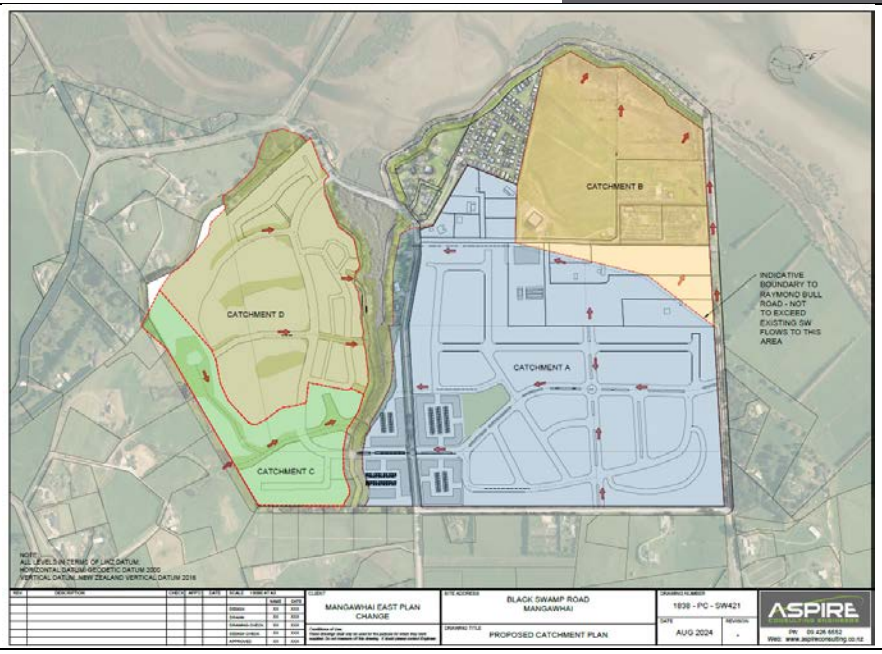


Fig. 5
Proposed Catchment Plan



Coastal inundation will be a governing factor in how the development is managed. The Coastal Flood Hazard Zone 2 produced from Northland Regional Council and shown in Figure 6, identifies the area susceptible to coastal inundation in a 1 in 100-year storm event, taking into account projected sea level rise over the next 100 years. For further information on coastal hazards, please refer to the Davis Coastal Coastal Hazard Assessment. Their coastal inundation plan is in figure 7.

To mitigate this risk, measures such as raising existing ground levels and defining minimum floor levels for future lots, will need to be implemented to avoid future coastal inundation.

Fig. 6
NRC extract with Coastal inundation extents shown

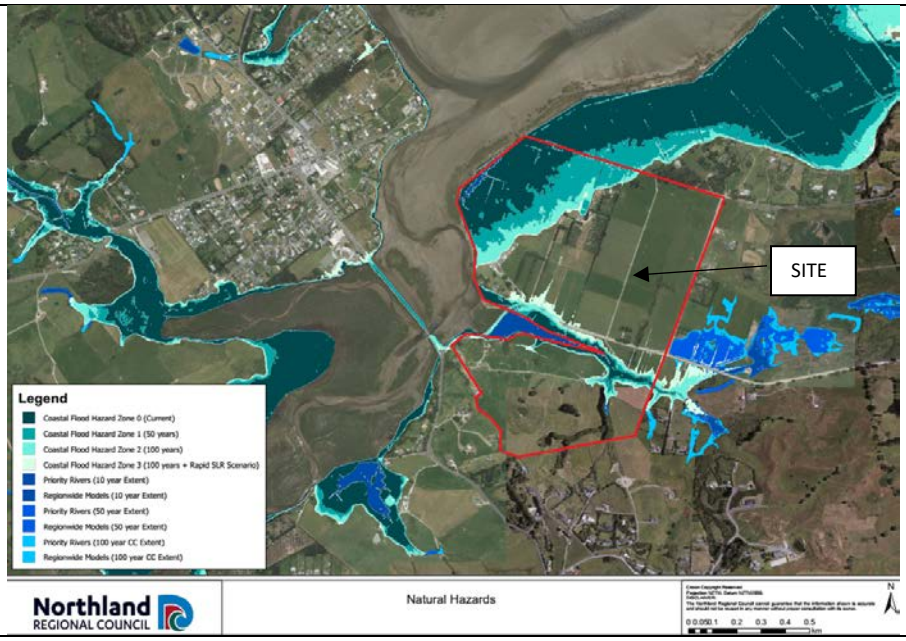
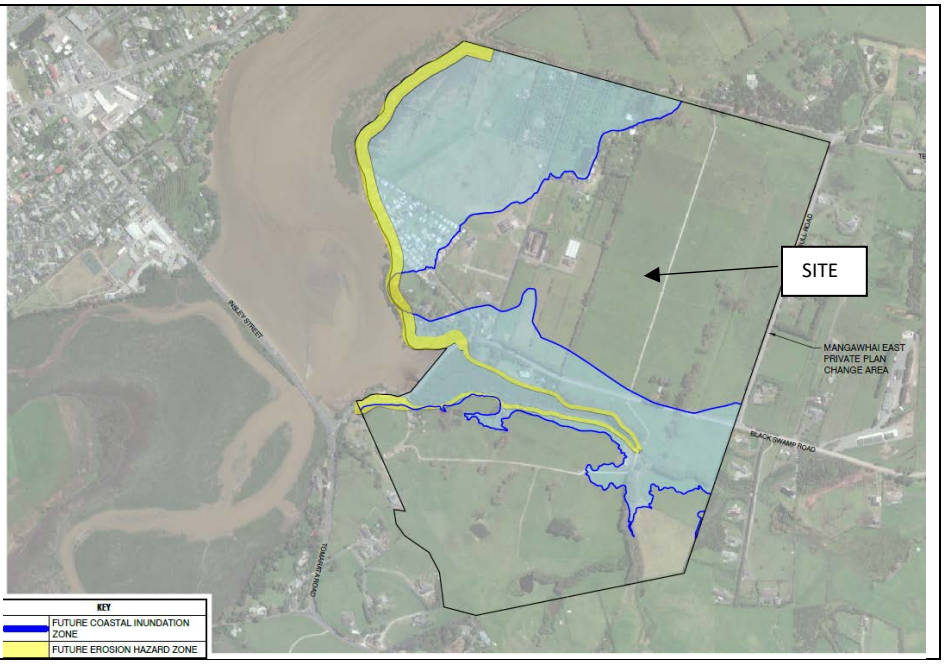


Fig. 7 Davis Coastal Consultants, Coastal inundation extents assessment for the PC	

The Plan Change area is located within flood plain areas noted by the NRC natural hazard maps. The flood maps are publicly available and are based on the Design Modelling Hakaru Catchment (M08) report, dated May 2021 prepared by Water Technology Pty Limited undertaken on behalf of Northland Regional Council.

The maps indicated that the northern portions of the Plan Change area near the coastal edge and the tidal tributary and are noted as being influenced by the Priority Rivers 100yr CC extent and Region wide models. The flood maps align very closely to the coastal inundation extents also published by NRC.

In discussions with the hydraulic modelling team from Water Technology Pty Ltd, the modelling team confirmed that the flood modelling:

> *"The final model was based on NZVD, with the following level adopted:*
>
> *Without climate change: 1.311m RL at Marsden Point:*
>
> - *I believe this is 1396mm OTP*
> - *With climate change: 2.511m RL at Marsden Point.*
>
> *The 1.2m allowance for sea level rise was only included in the climate change scenario."*

On this basis we can conclude that the model is based on the tailwater conditions influenced by the coastal sea level rise rather than flooding impacts within the coastal marine area. Areas of flooding outside of the coastal inundation are not present within the Plan Change area.

The Plan Change area has several stormwater considerations which will be carefully managed for future development options.

Consideration is required for the following Principles:

- Water Quality – Ensuring contaminants are not discharged to the receiving environment. Typically relating to stormwater generating surfaces (roads etc) which are subjected to contamination.
- Stream Hydrology –
    - Retention – The discharge to ground for smaller events with the aim of recharging the groundwater.
    - Detention – Storage and slow release of a 24hr storm event with the aim of alleviating scour and maintaining hydraulic neutrality for the stream health.
- Flooding frequency and Management 10 % and 1 % AEP
    - 10% AEP event – More frequent/nuisance flooding. Typically required where sites are reticulated with SW network downstream to alleviate extra flows to the networks.
    - 1% AEP event – Larger storm event and protection of buildings and structures.

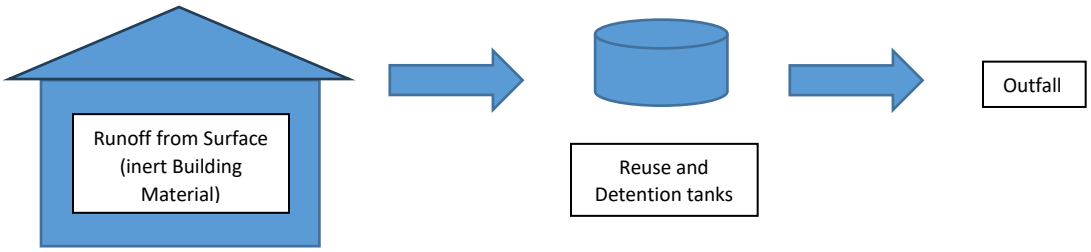
The following table outlines the initial Principles of Stormwater Management from the site.

Performance Criteria	Appropriate for the site?	Catchment and Description	Reason
Water Quality	Y	Entire Plan Change area Newly formed public roads. Carparking relating to Neighbourhood and Mixed-Use areas. All roofs required to be inert building materials	Impervious areas and potentially contaminating surfaces will be created as part of future developments. Excludes driveways and hardstand surfaces within residential lots.
Stream Hydrology			
Groundwater Recharge (retention)	Y	Northern Catchment Only required if peat material is kept in place.	Will be required in the northern catchment and will be required to ensure no long-term drawdown of groundwater level.
Detention	Y	Northern Catchment Southern Catchment (C & D) Required to maintain existing hydraulic flows to wetlands and salt marshes. Only required if within a wetland catchment. To be assessed at resource consent stage.	Northern catchment discharges towards tidal salt marshes and wetland adjacent to tidal tributary. Southern Catchment C and D discharges toward tidal tributary with wetland margins.
Flooding			
10% AEP	N	Entire Plan Change area	Not required as no downstream reticulation or properties. Discharge is at the tidal boundary.
1% AEP	N	Entire Plan Change area	Not required due to discharge of development to the tidal boundary.

A treatment train approach is considered the Best Practicable Option (BPO) for future developments.

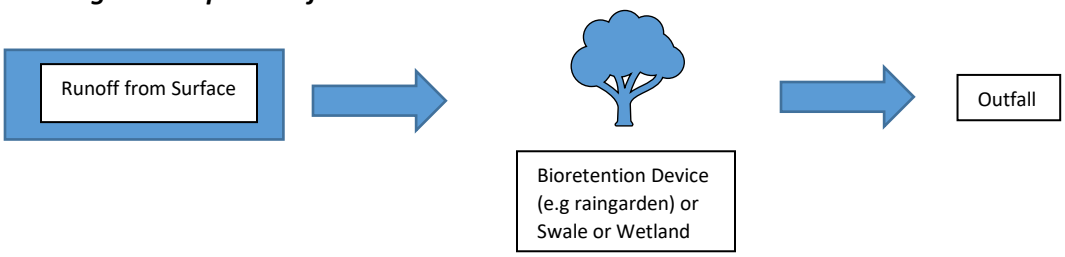
The stormwater treatment train below has been identified as being appropriate for the development:

Roof areas



- Water Quality – Entire Catchment - Inert Building Materials
- Groundwater Recharge -
  - Northern Catchment (A and B) - Inground recharge pit required in if peat remains in place.
- Hydraulic Neutrality for Wetlands –
  - Southern Catchment (C Only) and Northern Catchment (A and B). Either Detention Tanks or subdivision landform changes to catchments to ensure hydraulic neutrality is maintained if within a catchment of a wetland.

Roading and Carpark Surfaces



- Water Quality - Entire Catchment – Raingardens, treatment swale, wetland
- Groundwater Recharge – Northern Catchment (if peat remains in place) - Soak pit incorporated into raingardens or wetlands
- Hydraulic Neutrality for Wetlands – Northern Catchment and Southern Catchment (C & D) - Road catchments to discharge to channel areas post treatment. Subdivision catchments to be changed to ensure neutrality of flows.

Overland flowpaths need to be modelled to ensure conveyance of the 1% AEP storm event for all catchments.

Overland flow paths through the northern section of the Plan Change area will need to be managed either through formal channels or within road corridors acting as overland flow paths for the site.

The Stormwater Management Plan 1838-2 is included in **Appendix A** of this report.

6.0 Wastewater

The Mangawhai and Mangawhai Heads are primarily serviced by low pressure wastewater systems, discharging into gravity networks which feed into network pump stations and conveyed to the wastewater treatment plant on Thelma Road South.

There is no current public wastewater connection for the Mangawhai East Plan Change area but Water Acumen and Aspire have investigated several wastewater solutions.

Below in Fig 8 is 'The current Residential Zone and area possibly serviced by the wastewater network in the near future from Fig 3-3.1 of the Mangawhai Spatial Plan, December 2020.

Fig. 8
Current and Possible areas to be services by the wastewater network from Mangawhai Spatial Plan, December 2020.

ABOVE FIG. 3-3-1: The current Residential Zone and area possibly serviced by the wastewater network in the near future

Although it is indicative, it shows part of the Mangawhai East Plan Change area is within the future possible wastewater serviced area. Due to the existing natural hazards within the Plan Change area which limits development, it is considered that the complete proposed Plan Change is in keeping with the Spatial Plan.

Based on the proposed yield and KDC Standard's for wastewater design, Water Acumen have calculated the average dry weather flow is estimated to be 9.61 l/sec, peak wet weather flow of 48.08 l/sec and an emergency storage volume of 415 m^3.

It is proposed that a public network be extended throughout the Mangawhai East Plan Change area to service the proposed development. The proposed network will be consistent with the balance of Mangawhai, being a combination of low-pressure wastewater systems and gravity systems.

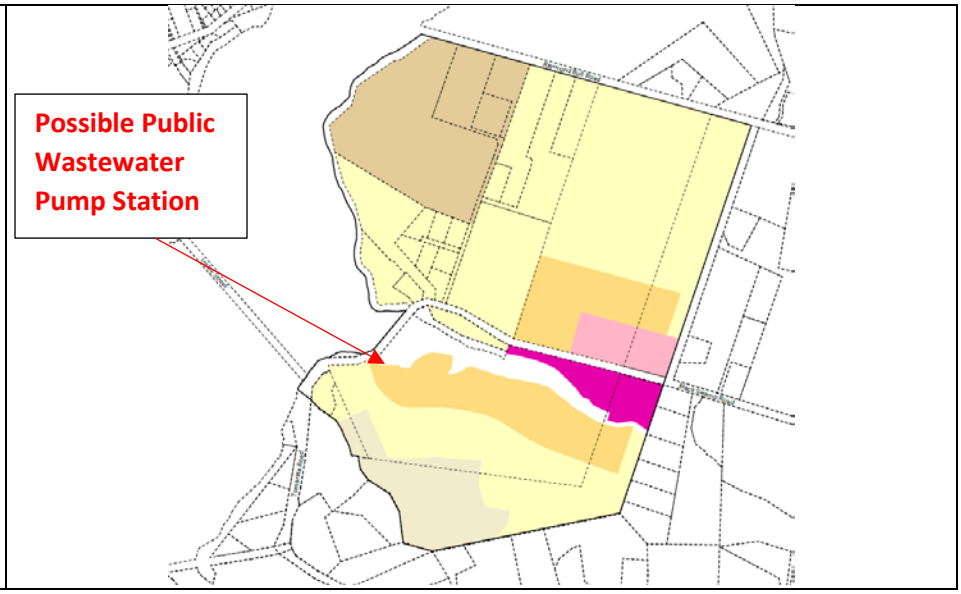
Other solutions such as onsite land disposal have been considered and although could work satisfactorily, we consider connecting to the public wastewater network to be the best solution.

The gentle to sloping surface terrain, to the south of Black Swamp Road will suit the wastewater network to be a gravity network of 100mm dia uPVC lot connections feeding into 150 mm diameter uPVC pipes and concrete manholes discharging into a new public pump station.

The wastewater network to the north of Black Swamp Road will be a low-pressure wastewater network as the surface terrain is very flat, with high ground water making it impractical for a gravity network. The low-pressure wastewater network will discharge into a new public pump station. Each new lot will be provided with a boundary kit.

Below is the possible location for the proposed public wastewater pump station.

Fig. 9
Possible Public Wastewater Pump Station Location



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There is a staged approach to the wastewater reticulation.

Stage 1: Construct a new public pump station within the Plan Change area and install a dual rising main to the existing Longview Street pump station (PS-VA) until the pump station reaches capacity.

Stage 2: Undertake off-peak pumping. Utilise the storage capacity within the new Plan Change pump station to only pump to the Longview Street pump station (PS-VA) off-peak. This can allow for approximately 200 dwellings.

Stage 3: Construct new infrastructure to the wastewater treatment plant in line with the WSP recommendations with a few amendments. A summary of this is below:

Code	Asset	WSP Proposal	Revised Proposal
MP-5	PS-VA	60 L/s @44m pump head* 60 L/s @36m pump head**	110 L/s @51m pump head* 110 L/s @47m pump head**
Mp-5	Pipe #1 990m long	Replace with 200 ID	Duplicate with 200 ID
	Pipe #2 365m long		**Duplicate with 200 ID**
MP-2	PS-VD	55 L/s @12m pump head* 55 L/s @13m pump head***	55 L/s @18m pump head* 55 L/s @11m pump head***
MP 6-1	Pipe #3 1,100m long	Replace with 300 ID	Duplicate with 300 ID
MP6-3	PS-OF	170 L/s @12m pump head*	220 L/s @14m pump head*
MP6-3	Pipe #4 440m long	Replace with DN 400 PE	Duplicate with DN 400 PE

Refer to Appendix C for Wastewater upgrade plans demonstrating the above table.

The servicing options memo from Water Acumen and related correspondence is attached in **Appendix B**.

7.0 Water Supply

There is no potable water supply in Mangawhai and the existing properties in Mangawhai rely on rainwater collection and storage for onsite use.

We understand that KDC have been investigating options to reticulate Mangawhai with potable, non-potable and firefighting water supply. The water solution for the Mangawhai East Plan Change must not rely on KDC providing public water supply and not preclude connection to a public water supply if it came available.

Water Acumen and Aspire have investigated several water solutions.

It is proposed that properties have rainwater collection into tanks and re-use for potable and non-potable water.

Below in Fig 10 is Table C12 from the Auckland Regional Council Countryside Living Toolbox which has indicative water tank sizes for the number of bedrooms in relation to the roof area.

Fig. 10
Indicative water tank sizing

Table C12
Minimum Tank Size for RDC Homes Having Tanks as Sole Water Source

Usable Roof Area (m^2)	Bedrooms				
	1	2	3	4	5
100	20	50			
120	15	35	75		
140	10	30	60		
160		20	50		
180			45	75	
200			35	65	
220			30	55	90
240			30	50	80
260				45	70
280				40	65
300				35	60

Colours indicate units of 25 cubic metres (5,000 gallons):

1 x 25 m^3	2 x 25 m^3	3 x 25 m^3	4 x 25 m^3

As an example, a 4 bedroom house with a 240 m² roof requires 2 x 25000 L tanks as their sole water supply.

This is a standard practice approach and used in multiple developments where municipal supply is not available. The size of the roof and subsequent tank sizing does have a direct correlation to the number of occupancy (hence demand) so we do believe this to be a suitable solution as presented and directly uses previous Regional Council guidance.

KDC have removed the need to comply with the NZ Fire Service Code of Practice (SNZ PAS 4509:2008) at time of building and has introduced a new risk-based approach to help with assessment of subdivision applications. The new approach aims to help Council and applicants understand if there are potential fire hazards which may need to be considered at the time of subdivision consent applications, where sufficient firefighting water is not supplied.

Three options for the provision of firefighting water have been identified for this Plan Change:

1. Reticulated from Borehole and stored in a central reservoir
2. Buried tanks
3. On-plot firefighting water (Plan Change 4, 10,000 l water for firefighting)

Options will be further developed and detailed and the proposed method for the provision of firefighting water will be provided at Resource Consent stage and/or Engineering Plan Approval stages.

The Reticulated from Borehole option would have a reservoir installed on elevated land at the southern corner of the Plan Change area and then piped reticulation with fire hydrants throughout the Plan Change.

The Buried Tanks option would be 45m³ buried water tanks at approximately 180m centres and contained within road reserve. The tanks would have a fire hose coupling and be always full of water.

For the on-plot tanks option, in line with Plan Change 4, 10,000l firefighting water tanks would be provided at each property for firefighting purposes.

The Water Acumen memo discusses further options of the piped reticulation also to be used for non-potable use.

The servicing options memo and related correspondence is attached in **Appendix B**.

8.0 Power and Telecom

Discussions have been had with Vector regarding power, Northpower regarding both power and fibre and Tuatahi regarding fibre. All have stated that the current infrastructure in the Plan Change area is insufficient but confirmed that the networks can be extended to service the Plan Change if it is successful. The final designs and connection locations are to be completed as part of the Engineering Approval Process phase.

9.0 Conclusion

The proposed Plan Change application demonstrates that all infrastructure requirements can be managed through onsite means or proposed upgrades to public infrastructure within the area and will not affect or inhibit future development.

On this basis we see no reason as to why this plan change should not proceed from an engineering aspect.

ATTACHMENTS:

APPENDIX A: STORMWATER MANAGEMENT PLAN
APPENDIX B: WATER ACUMEN – WATER & WASTEWATER SERVICING MEMO
APPENDIX C: WASTEWATER UPGRADE PLANS

APPENDIX A: ASPIRE – STORMWATER MANAGEMENT PLAN (Bound Separately)

APPENDIX B: WATER ACUMEN – WATER & WASTEWATER SERVICING MEMO

water acumen

Memorandum 02

WA Ref:	WA/022
Date:	1 July 2025
To:	Burnette O'Connor, The Planning Collective
cc:	Duncan Unsworth, Cabra Developments / Jackson Worsfold, Pro Land Matters Company / Lennon Wiltshire, Sam Property / Phil Fairgray, Aspire
From:	Robert White
Re:	Black Swamp, Mangawhai – Water and Wastewater Servicing.

Black Swamp, Mangawhai – Water and Wastewater Servicing.

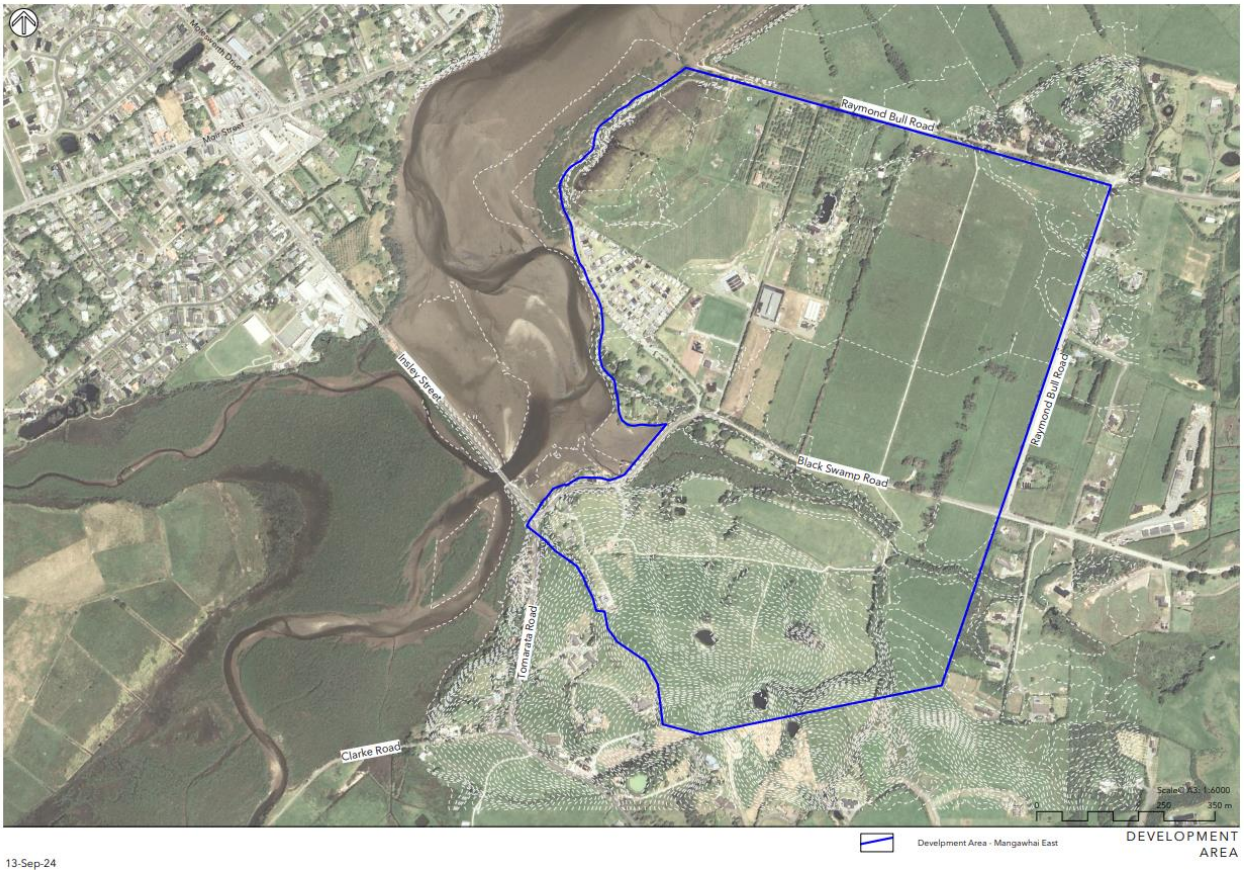


Figure 1: Plan Chage Area

The Plan Change Area is approximately 93 ha.

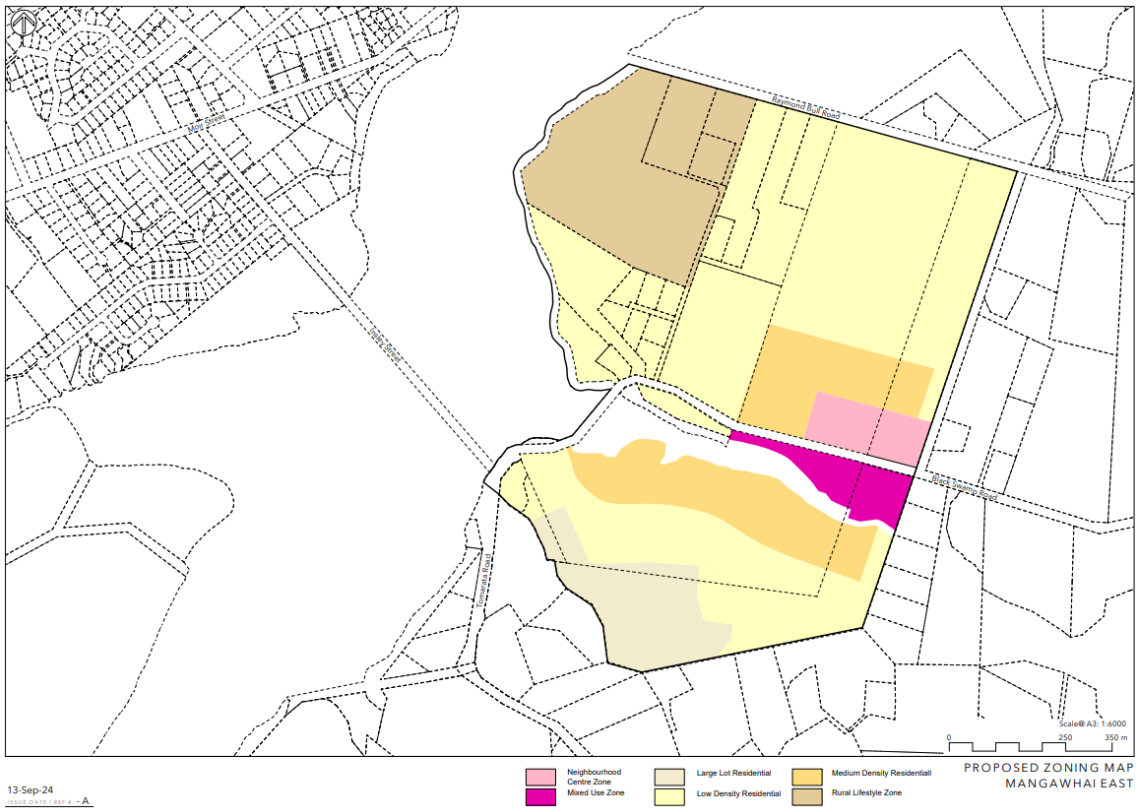


Figure 2: Zoning Map

	m^2	ha	Lots (HUE)
Large Lots	66,950	6.695	37
Low Density	513,630	51.363	530
Medium Density	125,650	12.565	207
Rural Lifestyle	146,870	14.687	14
		85.31	788

Table 1: Number of Lots - residential

	m^2	ha	Household Equivalent Units/ HEU
Neighbourhood Centre	26,550	2.66	109
Mixed Use	22,350	2.24	92
			201

Table 2: Non-residential Housing Unit Equivalents (HUE)

Approximately 2ha is identified as riparian margin etc.

The area also includes the following properties that are serviced (or proposed to be serviced) via the Riverside Holiday Park WWPS and rising main:

	m^2	ha	Lots (HUE)
Riverside Holiday Park	28,222	2.82	107
Low Density - Existing	26,080	2.608	8
37 Black Swamp Road	13,731	1.3731	1
			116

Table 3: Existing Riverside Development Area (HUE)

Existing Water Infrastructure

Properties in Mangawhai / Mangawhai Heads rely on rainwater collection and onsite storage for domestic use. In times of low rainfall water is purchased from water supply companies and brought in by tanker.

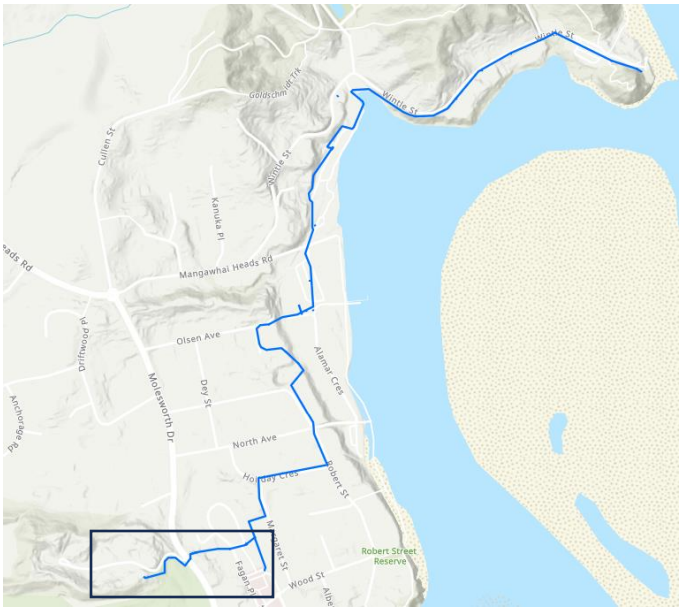


Figure 3: Existing water reticulation – Mangawhai Heads

A limited number of council properties and two fire hydrants in Mangawhai Heads are serviced via a reticulated system. This system is from a borehole feeding into two storage tanks (timbertank), located at an elevate level.

The majority of the pipework is 50mm ID (50 PVC / 63DN MDPE), with 100mm pipework between the borehole and the tanks.

Figure 4: Water reticulation (Borehole to timbertanks, with two fire hydrants).

Black Swamp - Water Servicing

Residential / domestic

It is proposed that all properties to have rainwater collection and storage tanks for domestic / potable use.

Firefighting

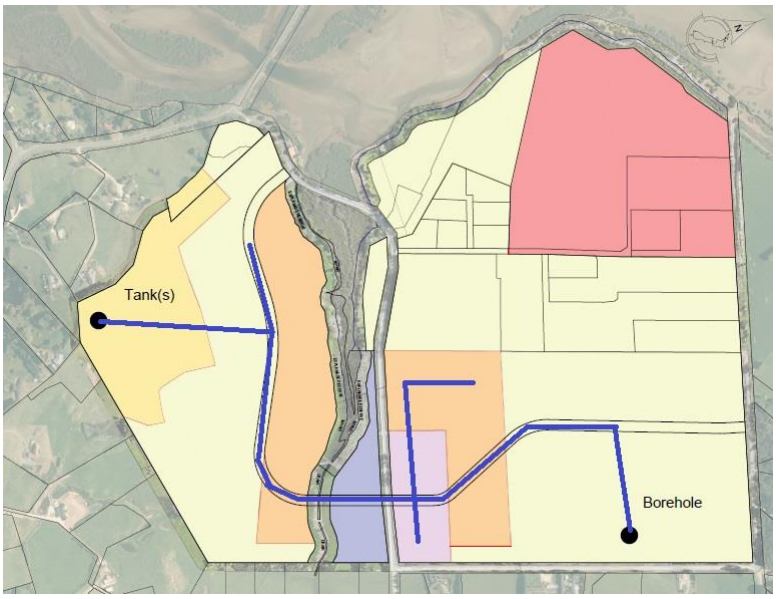
KDC have removed the need to comply with the NZ Fire Service Code of Practice at time of building, and has introduced a new risk-based approach to help with assessment of subdivision applications. The new approach aims to help Council and applicants understand if there are potential fire hazards which may need to be considered at the time of subdivision consent applications, where sufficient firefighting water is not supplied.

Three options for the provision of firefighting water have been identified:

1. Reticulated from Borehole
2. Buried tanks
3. On-plot firefighting water

Options will be further developed and detailed and the proposed method for the provision of firefighting water will be provided at Resource Consent stage and/or Engineering Plan Approval stages.

Reticulated Firefighting from borehole



It is proposed to match the existing Kaipara District Council Mangawhai Heads reticulation set-up, with a local borehole(s) feeding into a reservoir, with reticulation feeding fire hydrants within the Neighbourhood Centre, mixed use area, medium density housing area, and to the extent that design flows and pressures can be achieved.

Figure 5: Fire Reticulation

The proposal is as follows:

- Onsite borehole(s) feeding elevated reservoir
- Reservoir (>100m^3) at ~32mRL
  - Min. 2 x 45m^3 for FW2 firefighting capacity
- Gravity reticulation for firefighting
  - Pipework sized to ensure booster pump station not required (O&M implications and cost)

Borehole yield(s) and water quality are to be determined.

Provisional hydraulic analysis is as below, demonstrating that a pressure head of 10m could be achieved at fire hydrants with a gravity system.

- Reservoir 32mRL
- Ground Level 10mRL
- Available head 22m

	Length (m)	ks (mm)	SDR	Diameter DN (mm)	Diameter ID (mm)	Flow (L/s)	Velocity (m/s)	H_L (m)	Reservoir - GL (m)	Available Head (m)
Pipe #1	1000	0.06	13.6	180.00	153.53	25.00	1.35	11.16	22.00	10.84
Pipe #2	1500	0.06	13.6	200.00	170.59	25.00	1.09	9.89	22.00	12.11

As identified above, 25 L/s in a 200DN PE pipe 1,500m long results in a headloss of ~10m resulting in available head of 12m.

Figure 6: Potential fire reticulation layout

The responsibility for operation and maintenance costs are to be discussed and agreed between the developer and Council.

There are a number of boreholes within the Plan Change area, a number of which are recognised by Northland Regional Council.

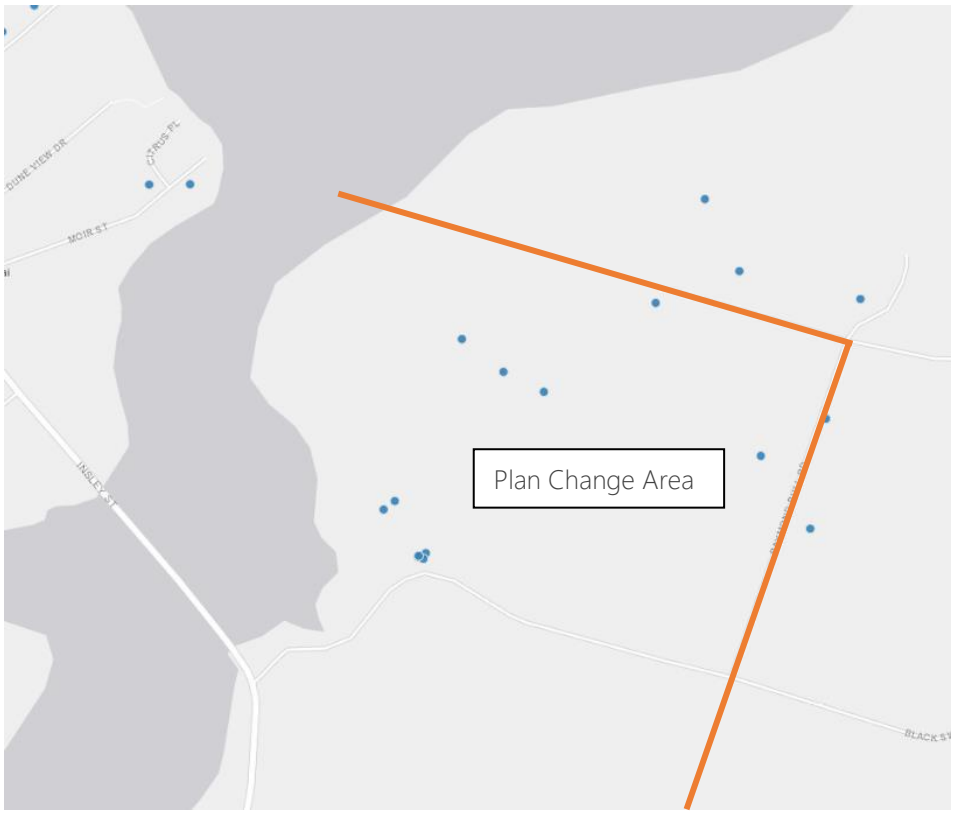


Figure 7: Borehole Locations

Buried Tanks

Buried tanks with 45m^3 capacity would be provided at a maximum of 180m separation.

This is as adopted for Awatiro Drive, Kaukapakapa.

Figure 8: Firefighting Tank Locations, Awatiro Drive Kaukapakapa.

On-plot firefighting water

In line with Plan Change 4, 10,000l firefighting water tanks would be provided at each property for firefighting purposes.

Non-potable supply.

The option to provide a non-potable supply to properties will be considered at the Resource Consent stage, based on available borehole yield, borehole water quality and subject to legislation permitting and Kaipara District Council agreeing that the infrastructure would be vested in KDC.

Non-potable water could be utilised for flushing toilets, laundry and garden watering, reducing demand on rainwater collection and providing resilience to those properties serviced.

The option would be based on:

- Daily Borehole capacity and quality (to be confirmed).
    - Non-potable supply provided to defined properties (for toilet flushing etc.) – provides resilience / reduces demand on rainwater collection / roof tanks
    - i.e., Allow 300 l/property/day to defined number of properties to be connected (i.e., if borehole has a consent for 100m^3/day, 330 DUE could be serviced).
- All properties adjacent to the fire main to be constructed with dual water pipe inlets – for potable and non-potable supply (to allow for future connection of all properties if further (unlimited) source of non-potable water* is identified).
- Properties could be constructed with a small tank and booster pump to be filled via non-potable reticulation – with backup connection to rainwater tank in the case of no reticulated non-potable water. (i.e., opposite of Hobsonville setup which has small rainwater tanks, filled from the mains during dry periods).

Data from Hobsonville, Auckland, where homes have rainwater tanks servicing toilets, laundry and garden watering suggest that these homes use 30% less water than the Auckland average[1].

Similar results could be expected in Mangawhai, reducing demand on rainwater tanks for domestic supply if a "third pipe" arrangement was established.

*Third Pipe System and recycled water

Should KDC establish a water treatment plant at Mangawhai Wastewater Treatment Plant site and reticulate water for firefighting it would also increase resilience (i.e., recycled water could be used for non-potable uses, reducing demand on rainwater collection systems).

This would require

- "Water Recycling" plant at the existing Wastewater Treatment Plant
- Reservoir and booster pump station
- Reticulation (pipeline) to Mangawhai (and Mangawhai Heads) – to meet fire flow requirements
    - Offtake to Mangawhai Central
- Trickle feed pipe from Mangawhai to Black Swamp Reservoir
    - i.e., reservoir filled over 24 hours / overnight.

This provides use for WWTP effluent, rather than disposing to land, provides water for firefighting and resilience (reduces demand on rainwater collections / household water tanks).

[1] *https://hobsonvillepoint.co.nz/about/living-sustainably/*

Wastewater:

Existing Infrastructure

Mangawhai and Mangawhai Heads are predominantly serviced by pressure sewer systems, feeding into gravity networks, which feed into network pump stations. Wastewater is then conveyed through to the wastewater treatment plant located off Thelma Road South.

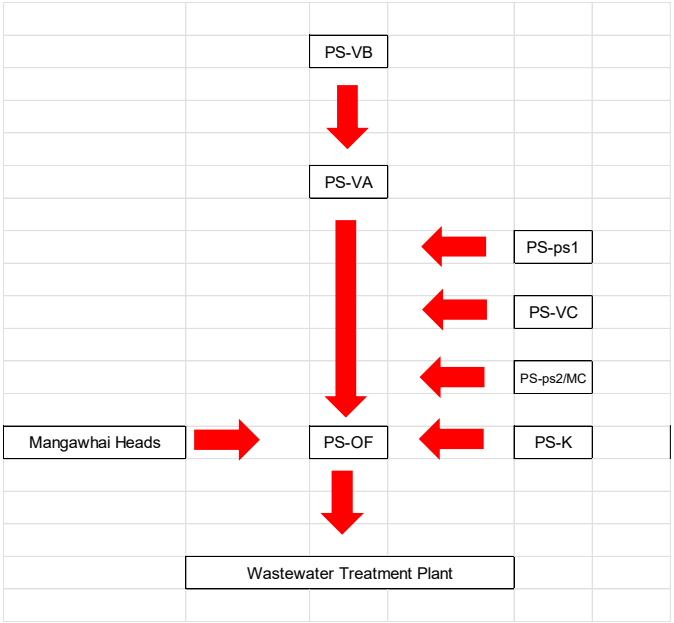


Figure 8: Pump station schematic

Mangawhai is serviced via a mixture of gravity, pump-ups (single properties pumping into a gravity pipe) and pressure sewer networks. All flows are conveyed to Longview Street Wastewater Pump Station (PS-VA), which then pumps flows to Thelma St (PS-OF) WWPS, which in turn pumps flows to the wastewater treatment plant.

It is noted that small pressure sewer catchments at Hill View Lane (PS-ps1) and a network WWPS at Sunlea Lane (PS-VC) connect directly into the Longview Street WWPS rising main. It is also noted that properties within the Mangawhai Central (PS-ps2/MC) development also currently connect directly into the Longview Street WWPS rising main.

This is not considered standard practice, mixing network pump stations and household pressure sewer pumps pumping into a single rising main.

Information received on the Longview Street WWPS identifies that the pump installed are "standard" centrifugal pumps (Grundfos SE1.80.100.220.2), with a max pump head of 46m pump head and a max flow of 202m^3/hr (56L/s).

Theoretical calculations suggest that the pumps operate at a duty point in the order of 36 L/s at 39m pump head (assuming that no other pump stations or household pumps are operating).

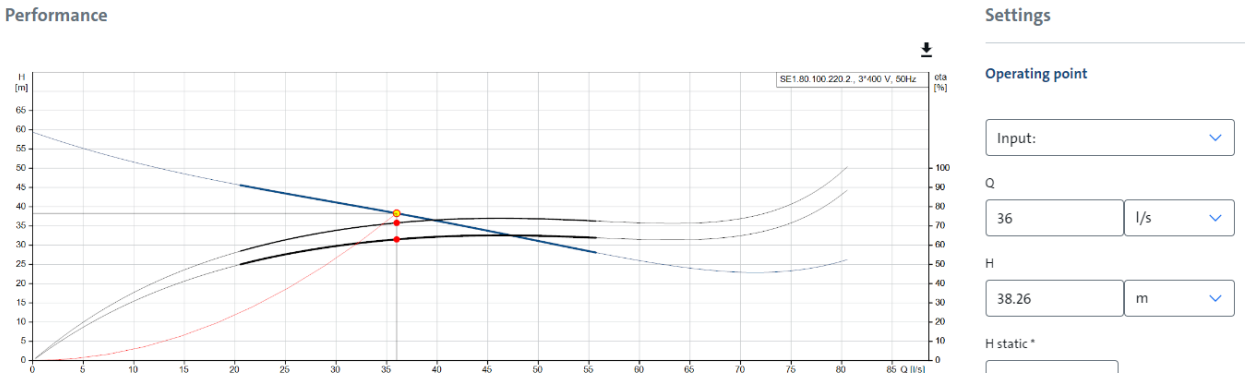


Figure 9: Pump Curve

However, as the pumps installed at the WWPS are standard centrifugal pumps they are likely to be adversely affected by the other network pump station and the pressure sewer pumps directly connected to the rising main. This may not be an issue currently, with the relatively small number of household / commercial pressure sewer pumps connected to the line, but is likely to become a problem with an increasing number of properties connected (i.e., with the further development of Mangawhai Central). Pressure sewer pumps are typically positive displacement pumps and are capable of working up to (and beyond) 75m pump head.

A more conventional approach would be for Mangawhai Central having a terminal WWPS, either pumping independently to Thelma Rd WWPS, or also receiving flows from Longview Street WWPS and then pumping through to Thelma Rd WWPS.

It is noted that the WSP report identifies a new wastewater pump station for Mangawhai Central, (PS-VD) with this pump station pumping directly into the Longview (PS-VA) rising main, as detailed below.

Based on the standards of 4 people per dwelling, flows of 210 L/person/day and a wet weather peak factor of 5, the current duty point of 36 L/s equates to servicing 740 Dwelling Unit Equivalents.

Mangawhai WWTP

Stage one of a plan to expand Mangawhai's wastewater treatment plant capacity is reported to be complete, with stage two well underway, catering for projected community growth to at least 2030. The first of the two stages has increased Mangawhai Wastewater Plant's capacity by 550 to 3,550 connections.

KDC Proposed Wastewater Upgrade

It is noted that upgrades to the wastewater infrastructure servicing Mangawhai have been proposed to service anticipated growth.

The WSP report Mangawhai Wastewater Modelling, Wastewater Servicing Strategy, dated 16 December 2022 identified the following required upgrades to service planned growth, excluding the Black Swamp plan change area:

Code	Asset	Existing	Proposed Upgrades
MP-5	PS-VA	35 L/s @50m pump head	60 L/s @44m pump head* 60 L/s @36m pump head**
Mp-5	Pipe #1 990m long	150 uPVC	Replace with 200 ID
	Pipe #2 365m long	200 uPVC	200 uPVC
MP-2	PS-VD		55 L/s @18m pump head* 55 L/s @11m pump head***
MP 6-1	Pipe #3 1,100m long	250 uPVC	Replace with 300 ID
MP6-3	PS-OF	100 L/s @17m pump head	170 L/s @12m pump head
MP6-3	Pipe #4 440m long	250 uPVC	Replace with DN400 PE

*With both PS-VA and PS-VD both operating
**With PS-VA operating PS-VD not operating
***With PS-VD operating PS-VA not operating

Table 5: Proposed Upgrades (WSP Report)

It is noted that the WSP recommendations include the proposed WWPS PS-VD, servicing the Mangawhai Central development, pumping directly into the rising main from PS-VA. This is not a standard approach and results in pumps pumping against each other when both pump stations are operating. It is recommended that PS-VD has a separate rising main to PS-OF

Wastewater design criteria

7.2 Design Criteria

7.2.1 Design Flows

The following requirements shall be met:

(a) Domestic wastewater flows shall be calculated in accordance with NZS4404:2010 clause 5.3.5, domestic wastewater flows for reticulated wastewater systems on the following basis:

i. Average Dry Weather Flows – 210 litres / day / person

ii. Number of Persons per Household Equivalent – 4.

(b) Industrial flow and Trade Waste shall be calculated as follows:

i. When the industrial waste and Trade Waste from a particular industry are known, these shall be used for the sewer design;

ii. When this information is not available, the dry weather flow rates shown in Table 7.1 may be used as a design basis for industrial area.

Table 7.1: Default dry weather flows from industrial areas

Minimum Design Flow	*Flow Rates (l/s/ha)*
Light Water Usage	*0.4*

7.7.6 Emergency Storage Design

All pump stations shall have a gravity storage chamber capable of holding at least twelve hours average dry weather flow

Black Swamp – Wastewater servicing approach

The plan change area generally slopes down from a ridge along the southwest of the site towards Black Swamp Road, with the land to the east of Black Swamp Road relatively flat.

This lends itself to gravity reticulation of the slope southwest of Black Swamp Road with the remainder serviced via pressure sewer, feeding into a terminal wastewater pump station at the western / northwestern corner of the area, south of Black Swamp Road.

It is also recommended that pressure sewer systems should always discharge at the highest point in the pressure sewer network to ensure that the pipes always remain full, even when no pump is operating.

Figure 10: Site topography

Servicing of the development

It is proposed that the wastewater infrastructure would consist of:

- Terminal Wastewater Pump Station (WWPS) in western area of the site (Black Swamp WWPS)
- Area southwest of Black Swamp Road predominantly serviced via gravity to the WWPS
- Remaining area (north of Black Swamp Road) as pressure sewer system discharging into the gravity network south of Black Swamp Road, at a higher point than any point in the network. A pressure sewer network is recommended due to:
    - Flat land
    - Soft ground / high groundwater table

The proposed Black Swamp WWPS would connect to the existing Longview Street WWPS, via new rising main(s) approximately 1,700m long.

Figure 11: Rising Main – Black Swamp to Longview Street

It is anticipated that the Longview Street WWPS and rising main currently have some capacity, ahead of the proposed upgrades listed above.

2018 census data was used to estimate the current population served by the Longview Street WWPS:

2013 507 people (214 dwellings at 2.36 people per dwelling)

2018 936 people (396 dwellings identified in the census, equating to 2.36 people per dwelling)

2023 projected 1,362 people (577 dwellings at 2.36 people per dwelling), assuming same number of additional dwellings between 2018 and 2023 as between 2013 and 2018.

Figure 12: Mangawhai 2018 Census block

Dwelling occupancy status for private dwellings in Mangawhai and Kaipara District, 2018 Census

	Mangawhai (count)
Occupied dwelling	396
Unoccupied dwelling	153
Dwelling under construction	24
Total private dwellings	573

Figure 13: Extract from 2018 Census data.

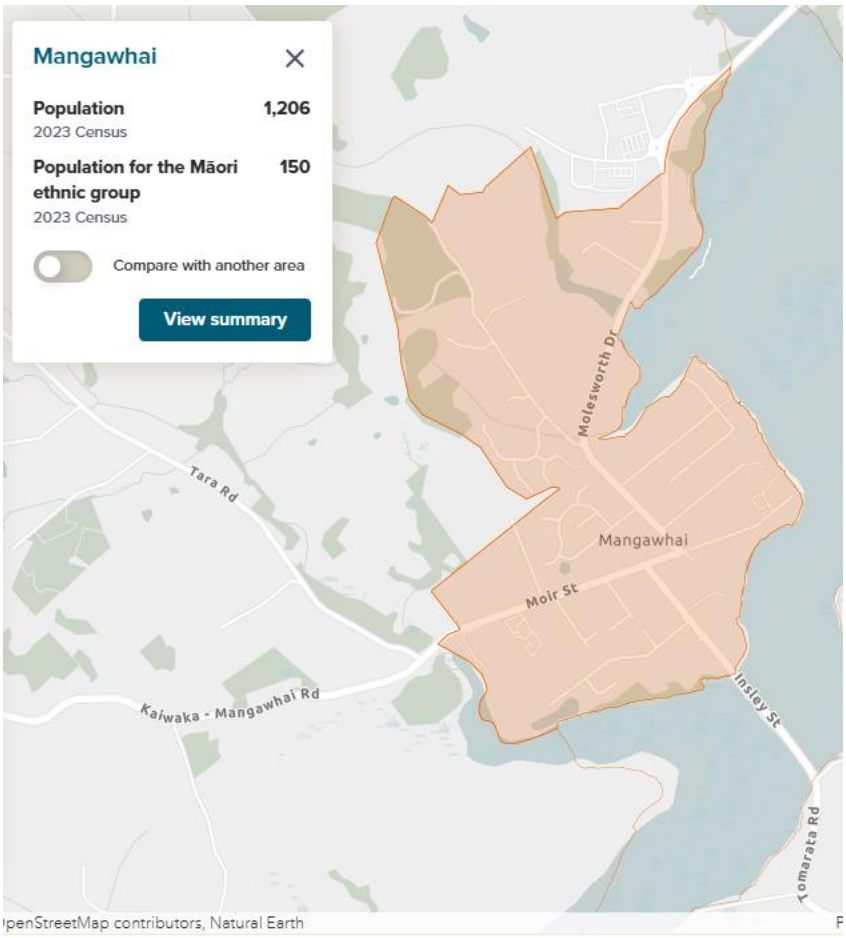


Figure 14: Mangawhai 2023 Census block

https://tools.summaries.stats.govt.nz/places/UR/mangawhai

Population 1,206

Dwellings 714

Subsequent to release of the 2023 census data, the projected of 1,362 people is noted to be conservative, although total dwellings have increased from 573 to 714.

The theoretical capacity of the Longview Street WWPS is as below:

	DUE	People / DUE	L/p/day	ADWF (L/s)	PWWF pf	PWWF (L/s)
Existing WWPS Capacity	741	4	210	7.20	5	36.00

Table 64: Estimated existing system capacity

Black Swamp Design Flows

Adopting KDC design criteria, projected flows from the Black Swamp plan change area are as below:

	DUE	People / DUE	L/p/day	ADWF (L/s)	PWWF pf	PWWF (L/s)	Emergency Storage (m^3)
Large Lots	37	4	210	0.36	5	1.80	16
Low Density	530	4	210	5.15	5	25.76	223
Medium Density	207	4	210	2.01	5	10.06	87
Rural Lifestyle Zone	14	4	210	0.14	5	0.68	6
						38.31	331

	DUE	People / DUE	L/p/day	ADWF (L/s)	PWWF pf	PWWF (L/s)	Emergency Storage (m^3)
Neighbour Centre	109	4	210	1.06	5	5.30	46
Mixed Use	92	4	210	0.89	5	4.47	39
						9.77	84
						48.08	415

Table 7: Wastewater design flows

Stage 1 – Standard Operation

Until Longview Street WWPS and rising main are operating at capacity, flows could be directed from the Plan Change area to the WWPS for onward conveyance to the wastewater treatment plant.

Stage 2 - Off-peak pumping.

Once normal "capacity" is reached, it is anticipated that there is still capacity in the Longview Street WWPS and rising main during off-peak periods, i.e., between 10:00 and 16:00 and 22:00 and 06:00.

The proposal is to hold flows in operational storage at Black Swamp WWPS, with treatment – either manganese hydroxide or Air / O_2 / O_3 - to keep wastewater in an aerobic state, to minimise issues with regards to odour and septicity.

The WWPS would have been constructed with the ultimate emergency storage required for the plan change area, only requiring a part for emergency storage for the initial development. The remainder would be used as operational storage, holding flows during peak periods, discharging to Longview Street WWPS (PS-VA) when capacity was available.

It is estimated that this would allow at least in the order of 200 homes / Housing Unit Equivalent (HUE) to be serviced.

	HUE	Average Dry Weather Flow	Emergency Storage	Available Operational Storage	Storage – Hours of ADWF
Ultimate Development	906	830 m^3/day	415 m^3		
Black Swamp – Stage 1	200	168 m^3/day	84 m^3	333 m^3	~48 hours

Table 8: Operational Storage

This is considered to provide the following advantages:

- Existing off-peak capacity is utilised in existing network
- Emergency storage capacity is ultimately required
- Both KDC (through Developer Contributions) and the developer (through selling lots) have funds available before pipe / pump station upgrades are required.
- When infrastructure is upgrades, there is sufficient flow to allow it to operate efficiently.

Stage 3 – Infrastructure Upgrade

When the Longview Street WWPS was at full capacity existing infrastructure would be upgraded in line with the WSP recommended upgrades, modified as below.

Code	Asset	WSP Proposal	Revised Proposal
MP-5	PS-VA	60 L/s @44m pump head* 60 L/s @36m pump head**	110 L/s @51m pump head* 110 L/s @47m pump head**
Mp-5	Pipe #1 990m long	Replace with 200 ID	Duplicate with 200 ID
	Pipe #2 365m long		Duplicate with 200 ID
MP-2	PS-VD	55 L/s @12m pump head* 55 L/s @13m pump head***	55 L/s @18m pump head* 55 L/s @11m pump head***
MP 6-1	Pipe #3 1,100m long	Replace with 300 ID	Duplicate with 300 ID
MP6-3	PS-OF	170 L/s @12m pump head*	220 L/s @14m pump head*
MP6-3	Pipe #4 440m long	Replace with DN 400 PE	Duplicate with DN 400 PE

Table 9: Revised Proposed Upgrades

As previously highlighted, it is noted that pressure sewer pumps within the Mangawhai Central development connect directly to the Longview Street WWPS rising main, which is likely to impact on the Longview Street WWPS performance. This would be overcome by the construction of the proposed WWPS to service Mangawhai Central, either pumping independently to Thelma Street WWPS or also receiving flows from Longview Street WWPS and conveying the combined flows to Thelma Street WWPS.

The Longview Street WWPS pumps are Grundfos centrifugal pumps, with a maximum pump head of 45m. Pressure sewer pumps are rated to operate continuously at 56m, but can work at significantly higher pressures. An increasing number of pressure sewer pumps connected to the shared rising main are likely to have a negative impact on the operation of the Longview WWPS.

When the Longview Street WWPS pumps are operating at the maximum head of 45m, the anticipated flow rate is projected to be 21.5L/s, which equates to peak wet weather flow from 442 HUE.

Existing Development Area – Riverside Committee

Construction of a terminal wastewater pump station within the Black Swamp plan change area would also facilitate the servicing of the Riverside Committee area. The pressure sewer network could be redirected to the new WWPS rather than the Riverside Holiday Park WWPS.

Standalone Local Wastewater Treatment Solution

Whilst not being the preferred option, should connection to the Council wastewater system not be accepted by Council, a standalone private wastewater treatment plant with local effluent disposal would be developed for approval at Resource Consent stage.

This option is as consented and constructed for the Karaka North Village development and accepted as the servicing solution for Auckland Private Plan Change PC 88: Beachlands South.

Conclusions and Recommendation

Options to service the plan change area for both water and wastewater have been identified and are feasible.

Water

Domestic supply would be provided via individual on-lot rainwater collection and storage.

Firefighting water would be provided by one or more of the following options:

- Buried fire water tanks (45m^3 at max 180m centres)
- On-plot firefighting water (10,000l per property)
- A reticulated firefighting system installed within the higher density areas, supplied by local borehole(s) and a reservoir located at a higher elevation.

Options would be detailed, for approval as part of the Resource Consent stage.

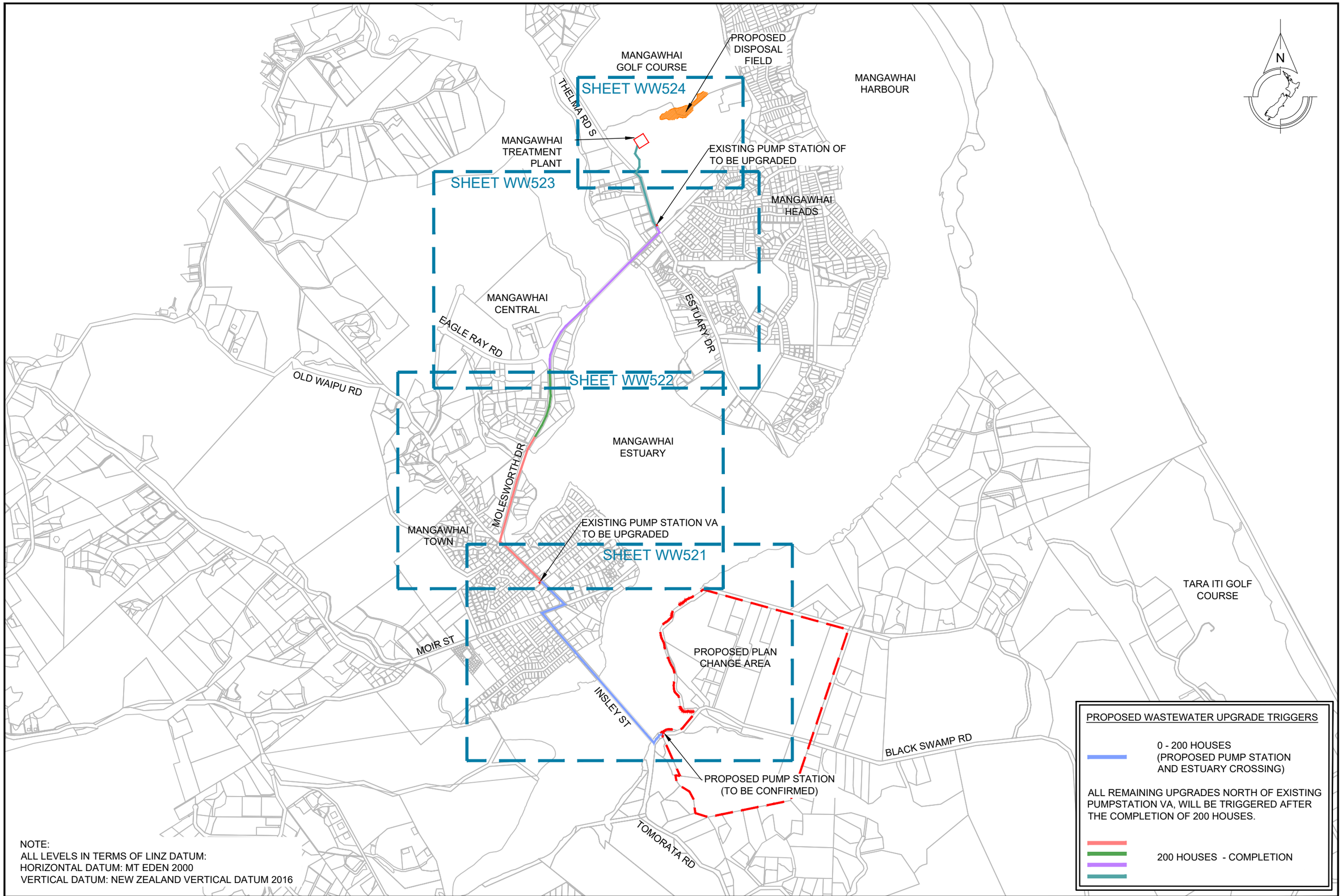
Wastewater

Properties would be serviced via gravity or pressure sewer reticulation, discharging to a terminal wastewater pump station at the western edge of the Black Swamp development.

Flow would be conveyed from the proposed WWPS to the existing Longview Street WWPS, initially during off-peak periods when capacity was available within the existing infrastructure.

Ultimately, the existing infrastructure would be upgraded to service the currently anticipated development within the catchment, including the Black Swamp area, with the Longview Street WWPS upgraded (or duplicated) and the existing rising main from Longview Street WWPS to Thelma Road WWPS and the WWTP duplicated, generally in line with the recommendations of the WSP report Mangawhai Wastewater Modelling, Wastewater Servicing Strategy, dated 16 December 2022, but with pipes duplicated rather than replaced.

APPENDIX C: WASTEWATER UPGRADE PLANS



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ALL LEVELS IN TERMS OF LINZ DATUM:
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VERTICAL DATUM: NEW ZEALAND VERTICAL DATUM 2016

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					DRAWING CHECK	PF	29/05/25
					DESIGN CHECK		
					APPROVED	PF	29/05/25

CLIENT
MANGAWHAI EAST PLAN CHANGE

SITE ADDRESS
BLACK SWAMP ROAD
MANGAWHAI

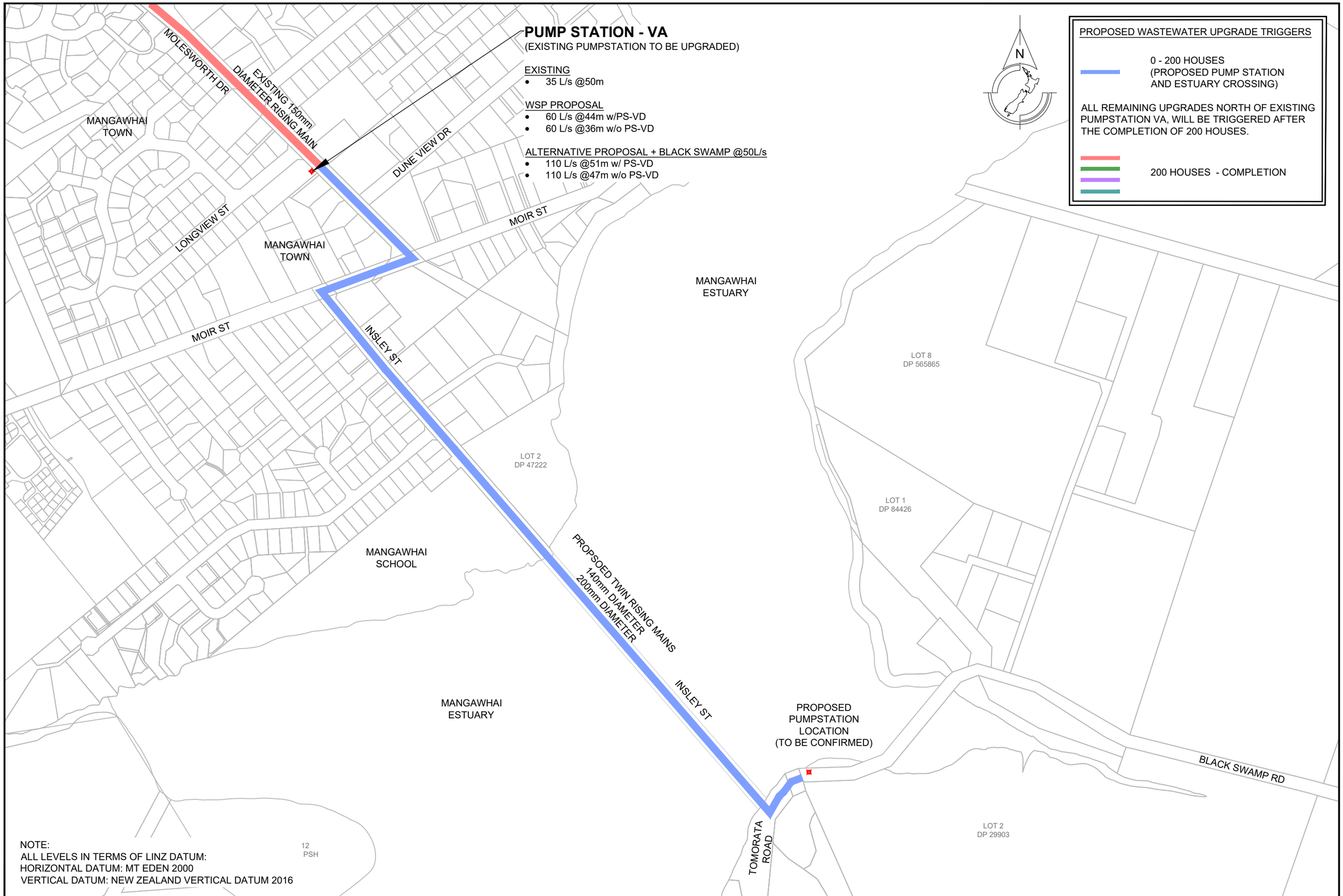
DRAWING TITLE
PROPOSED WASTEWATER UPGRADE PLAN (OVERALL)

DRAWING NUMBER
1838 - PC - WW520

DATE
MAY 2025

REVISION
-

ASPIRE CONSULTING ENGINEERS
Ph: 09 426 6552
Web: www.aspireconsulting.co.nz



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CLIENT
MANGAWHAI EAST PLAN CHANGE

SITE ADDRESS
BLACK SWAMP ROAD
MANGAWHAI

DRAWING TITLE
PROPOSED WASTEWATER UPGRADE PLAN (SHEET 1 OF 4)

DRAWING NUMBER
1838 - PC - WW521

DATE
MAY 2025

REVISION
-

ASPIRE CONSULTING ENGINEERS
Ph: 09 426 6552
Web: www.aspireconsulting.co.nz

PROPOSED WASTEWATER UPGRADE TRIGGERS

0 - 200 HOUSES
(PROPOSED PUMP STATION AND ESTUARY CROSSING)

ALL REMAINING UPGRADES NORTH OF EXISTING PUMPSTATION VA, WILL BE TRIGGERED AFTER THE COMPLETION OF 200 HOUSES.

200 HOUSES - COMPLETION

N

LOT 4
DP 39468

EXISTING 200mm DIAMETER RISING MAIN

PIPE 2 - 365m LONG

EXISTING
- EXISTING 200mm uPVC

ALTERNATIVE PROPOSAL + BLACK SWAMP @50L/s
- KEEP EXISTING 200mm
- ADDITIONAL 200 ID

MANGAWHAI ESTUARY

LOT 700
DP 602666

MOLESWORTH DR

PIPE 1 - 990m LONG

EXISTING
- EXISTING 150mm uPVC

WSP PROPOSAL
- REPLACE WITH 200ID

ALTERNATIVE PROPOSAL + BLACK SWAMP @50L/s
- KEEP EXISTING 150mm
- ADDITIONAL 200ID

OLD WAIPU RD

EXISTING 150mm DIAMETER RISING MAIN

LOT 2
DP 128514

LOT 2
DP 498654

PEARSON ST

MOLESWORTH DR

EXISTING 150mm DIAMETER RISING MAIN

PUMP STATION - VA
(EXISTING PUMPSTATION TO BE UPGRADED)

EXISTING
- 35 L/s @50m

WSP PROPOSAL
- 60 L/s @44m w/PS-VD
- 60 L/s @36m w/o PS-VD

ALTERNATIVE PROPOSAL + BLACK SWAMP @50L/s
- 110 L/s @51m w/ PS-VD
- 110 L/s @47m w/o PS-VD

DUNE VIEW DR

MANGAWHAI TOWN

NOTE:
ALL LEVELS IN TERMS OF LINZ DATUM:
HORIZONTAL DATUM: MT EDEN 2000
VERTICAL DATUM: NEW ZEALAND VERTICAL DATUM 2016

REV.	DESCRIPTION	CHECK	APP'D	DATE	SCALE 1:5,000 AT A3	NAME	DATE
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					DRAWN	MB	29/05/25
					DRAWING CHECK	PF	29/05/25
					DESIGN CHECK		
					APPROVED	PF	29/05/25

CLIENT
MANGAWHAI EAST PLAN CHANGE

Conditions of Use;
These drawings shall only be used for the purpose for which they were supplied. Do not measure off this drawing. If doubt please contact Engineer.

SITE ADDRESS
BLACK SWAMP ROAD
MANGAWHAI

DRAWING TITLE
PROPOSED WASTEWATER UPGRADE PLAN
(SHEET 2 OF 4)

DRAWING NUMBER
1838 - PC - WW522

DATE
MAY 2025

REVISION
-

ASPIRE CONSULTING ENGINEERS
Ph: 09 426 6552
Web: www.aspireconsulting.co.nz

PROPOSED WASTEWATER UPGRADE TRIGGERS

0 - 200 HOUSES
(PROPOSED PUMP STATION AND ESTUARY CROSSING)

ALL REMAINING UPGRADES NORTH OF EXISTING PUMPSTATION VA, WILL BE TRIGGERED AFTER THE COMPLETION OF 200 HOUSES.

200 HOUSES - COMPLETION

N

PIPE 4 - 440m LONG

EXISTING
- EXISTING 250 uPVC

WSP PROPOSAL
- REPLACE WITH 400 ID

ALTERNATIVE PROPOSAL + BLACK SWAMP @50L/s
- KEEP EXISTING 250 uPVC
- ADDITIONAL 400DN PE

PUMP STATION - OF
(EXISTING PUMPSTATION TO BE UPGRADED)

EXISTING
- 100 L/s@17m

WSP PROPOSAL
- 170 L/s @ 12m

ALTERNATIVE PROPOSAL + BLACK SWAMP @50L/s
- 220 l/s @14m

PIPE 3 - 1,100m LONG

EXISTING
EXISTING 250 uPVC

WSP PROPOSAL
- REPLACE WITH 300 ID

ALTERNATIVE PROPOSAL + BLACK SWAMP @50L/s
- DUPLICATE WITH 200 ID

EXISTING 250mm DIAMETER RISING MAIN

THELMA RD'S

LOCAL PURPOSE RESERVE

MANGAWHAI ESTUARY

LOT 202 DP 604965

LOT 300 DP 591630

MOLESWORTH DR

ESTUARY DR

MANGAWHAI CENTRAL

EXISTING 250mm DIAMETER RISING MAIN

EAGLE RAY RD

MANGAWHAI ESTUARY

LOT 4 DP 39468

NOTE:
ALL LEVELS IN TERMS OF LINZ DATUM:
HORIZONTAL DATUM: MT EDEN 2000
VERTICAL DATUM: NEW ZEALAND VERTICAL DATUM 2016

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DESIGN		
DRAWN	MB	29/05/25
DRAWING CHECK	PF	29/05/25
DESIGN CHECK		
APPROVED	PF	29/05/25

CLIENT
MANGAWHAI EAST PLAN CHANGE

SITE ADDRESS
BLACK SWAMP ROAD
MANGAWHAI

DRAWING TITLE
PROPOSED WASTEWATER UPGRADE PLAN
(SHEET 3 OF 4)

DRAWING NUMBER
1838 - PC - WW523

DATE
MAY 2025

REVISION
-

ASPIRE CONSULTING ENGINEERS
Ph: 09 426 6552
Web: www.aspireconsulting.co.nz

PROPOSED WASTEWATER UPGRADE TRIGGERS

0 - 200 HOUSES
(PROPOSED PUMP STATION AND ESTUARY CROSSING)

ALL REMAINING UPGRADES NORTH OF EXISTING PUMPSTATION VA, WILL BE TRIGGERED AFTER THE COMPLETION OF 200 HOUSES.

200 HOUSES - COMPLETION

N

MANGAWHAI GOLF COURSE

LOT 1 DP 190306

MANGAWHAI GOLF COURSE

LOT 1 DP 450057

MANGAWHAI BOWLING CLUB

THELMA RD S

PROPOSED DISPOSAL FIELD

ALLOT 323 PSH OF MANGAWHAI

MANGAWHAI TREATMENT PLANT

PT LOT 2 DP 450057

EXISTING 250mm DIAMETER RISING MAIN

THELMA RD S

LOT 1 DP 462331

LOT 2 DP 462331

LOT 1 DP 338552

MOLESWORTH DR

LOT 2 DP 179796

PIPE 4 - 440m LONG

EXISTING
- EXISTING 250 uPVC

WSP PROPOSAL
- REPLACE WITH 400 ID

ALTERNATIVE PROPOSAL + BLACK SWAMP @50L/s
- KEEP EXISTING 250 uPVC
- ADDITIONAL 400DN PE

MANGAWHAI ESTUARY

NOTE:
ALL LEVELS IN TERMS OF LINZ DATUM:
HORIZONTAL DATUM: MT EDEN 2000
VERTICAL DATUM: NEW ZEALAND VERTICAL DATUM 2016

REV.	DESCRIPTION	CHECK	APP'D	DATE	SCALE 1:2,500 AT A3	NAME	DATE
					DESIGN		
					DRAWN	MB	29/05/25
					DRAWING CHECK	PF	29/05/25
					DESIGN CHECK		
					APPROVED	PF	29/05/25

CLIENT
MANGAWHAI EAST PLAN CHANGE

SITE ADDRESS
BLACK SWAMP ROAD
MANGAWHAI

DRAWING TITLE
PROPOSED WASTEWATER UPGRADE PLAN (SHEET 4 OF 4)

DRAWING NUMBER
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REVISION
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