HARRISON GRIERSON

Beachlands South Fast Track

Infrastructure Report

Prepared for Beachlands South Limited Partnership

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1.0 Executive Summary

This report supports Beachlands South Limited Partnership's substantive application under the Fast-track Approvals Act 2024 for the Beachlands South project, a listed project intended to deliver significant regional and local benefits through a comprehensively planned urban development at Beachlands. The proposal covers approximately 268.1780ha and seeks approval for the civil, earthworks, stormwater, wastewater, water, roading and utility infrastructure required to enable a staged mixed-use community including residential neighbourhoods, a local centre, employment land, schools, open space and supporting transport and service networks.

The project is proposed to deliver approximately 2,000 dwellings across a range of housing typologies, around 27,000m² of commercial gross floor area, approximately 30,000m² of light industrial gross floor area, education facilities, public open space, walking and cycling networks, and ecological restoration outcomes including the protection of substantial Ecological Protected Area Network (EPAN) areas. The development is supported by staged upgrades to Jack Lachlan Drive and surrounding intersections, a new internal road hierarchy, stormwater treatment and conveyance systems, wastewater collection and treatment infrastructure, potable and non-potable water servicing, and new utility reticulation.

Bulk earthworks are proposed across approximately 118.6ha in six stages, with estimated volumes of 760,000m³ cut and 590,000m³ fill, to create development platforms, road corridors and stormwater infrastructure. The earthworks strategy has been developed to align with Auckland Unitary Plan I458 requirements, staged catchment management and seasonal construction constraints. Secondary earthworks will follow for superlots and apartment sites. Archaeological, contamination, coastal hazard and ecological constraints have been identified and addressed through supporting technical assessments, management plans and mitigation measures.

The report concludes that the proposed civil design framework can service the development while appropriately managing environmental effects. Stormwater infrastructure relies on communal wetlands, raingardens, gross pollutant traps and defined overland flowpaths. Bulk earthworks management will be provided by appropriately sized erosion and sediment control devices in accordance with Auckland Council best practice and adaptive management during construction. Wastewater is proposed to be managed through a gravity drainage system with several pump stations connecting to an onsite treatment solution. Potable water is to be supplied

through existing and enhanced local bores and treatment infrastructure. Power and telecommunications providers have confirmed servicing can be achieved, subject to network extensions and detailed design.

Safety in design principles have been incorporated throughout the consent design, including consideration of construction staging, maintenance access, road safety, retaining structures, trenching, drainage access and pedestrian/cyclist movement. The report identifies a limited number of departures from standards, principally relating to sections of Jack Lachlan Drive and constrained pedestrian/cycle provision, and explains how these are mitigated by the site's topography, alternative design responses and supporting transport measures.

Overall, this report concludes that the proposed earthworks and infrastructure are appropriate to service and enable the staged development of Beachlands South. In engineering terms, the project is feasible, serviceable, and capable of being delivered in a manner that appropriately manages environmental effects while supporting a high-quality, resilient, and well-functioning urban outcome. On that basis, the infrastructure and civil works framework provides a sound and credible basis for the fast-track approvals sought.

2.0 Introduction

2.1 Project Overview

This report has been prepared by Harrison Grierson Consultants Limited on behalf of Beachlands South Limited Partnership (BSLP) in support of its substantive application for approvals under the Fast-track Approvals Act 2024 (FTAA). The application covers approximately 268.1780ha of land under the Auckland Unitary Plan section I458 Beachlands South (AUP I458 BS).

The purpose of this report is to support BSLP's application for approvals for bulk earthworks, proposed erosion and sediment control, stormwater discharge and civil infrastructure including roading, drainage networks and utility installation consistent with best practice and current codes of practice, to urbanise the area to create housing, a local town centre and employment zone, and deliver significant benefits to the Auckland region.

2.2 Qualifications and Experience

My name is Chris Maday. I am Registered Professional Surveyor and Technical Director - Urban Development at Harrison Grierson Consultants Limited. I have 40 years' experience in the field of Land Development.

I have obtained the following qualifications

- Bachelor of Surveying – Otago University
- Post graduate Diploma in Business Administration – Massey University
- Licenced Cadastral Surveyor – Survey and Spatial New Zealand
- Registered Professional Surveyor – Survey and Spatial New Zealand

I am a member of the following

- Survey and Spatial New Zealand
- Project Management Institute

My experience relevant to this project is that I have undertaken design and supervision of several land development projects within the Auckland area some being Airpark Stages 1 and 2-Mangere, Donegal Park and Richmond Park – Flat Bush, West Hills – Westgate, Mangawhai Central – Mangawhai

I confirm that I have read the Code of Conduct for expert witness contained in the Environment Court of New Zealand Practice Note and that I have complied with it when preparing this report. Other than when I state I am relying on the advice of another person, this report is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2.3 Project Description

The Project name is 'Beachlands South' and is included in Schedule 2 of the FTAA as a Listed Project with significant regional or national benefits. The Project location or Site is located across approximately 159.58 hectares of live zoned land and approximately 108.6 hectares

Future Urban zoned land at 110 Jack Lachlan Drive, and 620, 712, 758 and 770 Whitford-Maraetai Road, Beachlands.

In summary, the Project will provide for the development of live zoned land at Beachlands into a comprehensively planned and public transport focussed community to achieve a well-functioning urban environment comprising residential dwellings, a hotel and conference venue, community and commercial activities, protected ecological restoration areas, walking and cycling networks, and community facilities, and enable the potential development of two schools, as well as all associated earthworks and all associated infrastructure including transport facilities, intersection upgrades and roading, telecommunications, power, and water supply, stormwater, and wastewater infrastructure (including any treatment or storage facilities, drainage, pipes, pump stations, outfalls and discharges). A portion of Future Urban zoned land will be used for wastewater management purposes.

Key elements of the Project include:

- Residential activities comprising approximately 2,000 dwellings in a variety of housing types, densities and vacant sites for future residential development;
- Establishment of a commercial local centre supported by employment opportunities within and around the periphery of the local centre and on the Whitford-Maraetai Road frontage comprising approximately 27,000m² of commercial GFA and 30,000m² of light industrial GFA;
- Education facilities comprising the development of both primary and secondary schools;
- Establishment of an EPAN comprising approximately 75 hectares of land within the live zoned area being protected and approximately 55 hectares of land being replanted, restored, maintained and enhanced including preservation of streams and their margins;
- A series of open spaces including a suburban park, neighbourhood parks, the Fairway Reserve, golf course, esplanade reserve and riparian margins;
- Provision of public access to and along the coastal marine area and the creation of a quality coastal pathway;
- Public transport enhancements and integrations including expanded ferry passenger capacity;
- Staged road upgrades including the provision of pedestrian and cycling facilities along Jack Lachlan Drive, the upgrade of Whitford roundabout, a series of intersection upgrades; and
- Establishment of infrastructure to service the project including wastewater, water supply, stormwater, telecommunications and power.

2.4 Site Description & Existing Environment

The site at 110 Jack Lachlan Drive, 620, 712,758 and 770 Whitford Maraetai Road (refer to Figure 1) consists of the current urban zone over the area referred to as the Rydges Formosa Golf Resort and the balance of the site is zoned Future Urban Zone. The site is located near the Pine Harbour Marina, as well as existing residential developments to the North.

Table 1: Legal Description

Legal Description	Record of Title	Area
Lot 2 DP 501271	RT 748626	170.475 ha
Lot 100 DP 504488	RT 759265	79.9444 ha
Lot 4 DP 54105	RT NA6C/674	4.7518 ha

Legal Description	Record of Title	Area
Lot 9 DP 54105	RT NA6C/678	6.1403 ha
Lot 10 DP 54015	RT NA56A/632	6.8665 ha

Fig 1: Extract from Council GIS 2026

The total site area is 268.1780 ha

2.4.1 Current Land Use

The project area is confined by Jack Lachlan Drive to the northeast, Pine Harbour Marina to the north, Tamaki Strait to the west and the existing Golf Club house and northern extents of 620 Whitford Maraetai Road to the south. The predominate activity within the Jack Lachlan Drive site is an eighteen-hole golf course, driving range and 26 accommodation chalets. A significant

portion of that land is unused for recreational activity and predominately maintained as open space and contains existing vegetated gullies and stormwater ponds.

The project areas accessed directly from Whitford Maraetai are predominantly lifestyle blocks and 620 Whitford Maraetai being a farm.

A recent land use consent (LUC 60453761) was granted to undertake bulk earthworks within the stage 1 area. At the time of application one season of earthworks has been undertaken being approximately 25% of the current live urban zone.

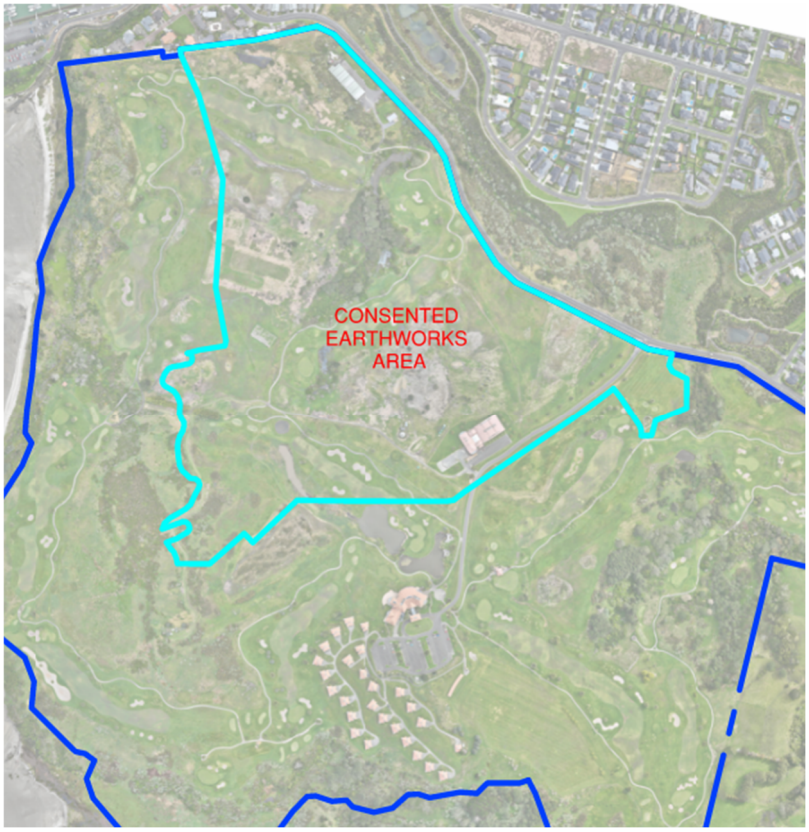

Fig 2: Extent of Consented Earthworks

2.4.2 Site Constraints

There are several constraints within the project area which impact on the proposal these being:

- Archaeological sites
- Contamination
- Coastal setback and erosion
- Natural features being streams and wetlands.

Archaeological Sites

An archaeological report prepared by Clough & Associates has identified known archaeological sites within the Beachlands South area. Fig 3 below indicates the majority of the sites are predominantly along the coastline outside the proposed construction area except for site R11/1445 located within an existing fairway. Clough & Associates have prepared an Archaeological Management Plan and is attached within Appendix 1. The management plan will form part of the contract documents so all personnel associated with the civil works will understand how any archaeological sites and accidental discoveries are be managed in accordance with the plan

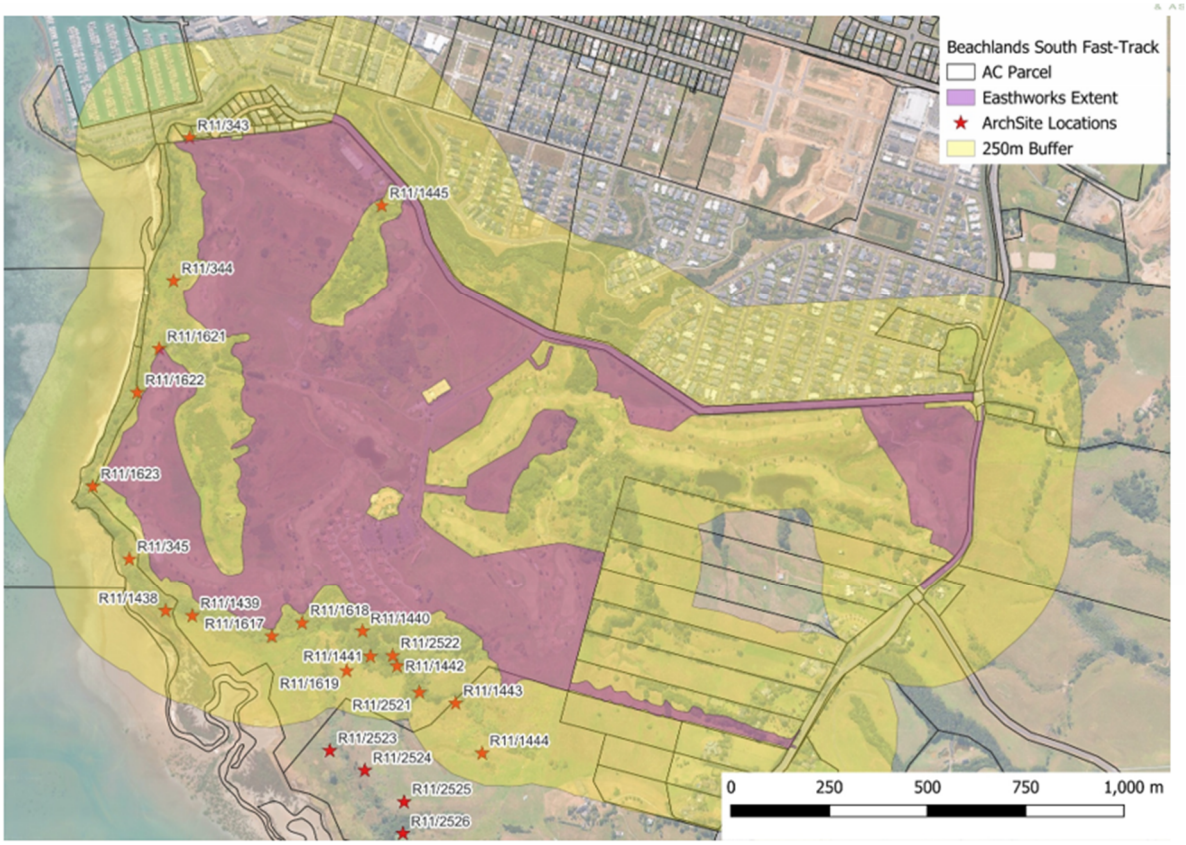

Figure 18. Plan showing recorded archaeological sites within a buffer of 250m (yellow highlight) of project area

Fig 3: Extract from Clough & Associates Report supporting the Fast Track Application

Contamination

The Detailed Site Investigation report prepared by Tonkin + Taylor has identified a potential hazardous area located within the existing workshop area to the north of the site accessed from Jack Lachlan Drive. This area is within the current LUC 60453761 area and remediation works will be undertaken as part of the earthworks consent. Additional sites have been identified being the existing wastewater treatment plant and associated dripper fields Tonkin + Taylor in its reporting has made recommendations for the remediation of those specific areas.

The DSI report makes several general recommendations as follows;

- If geotechnically suitable, spoil from outside the identified HAIL areas can be reused on-site. This should be included into the planning and design of the Site redevelopment to promote environmentally sustainable outcomes and minimise disposal cost.
- If soil is to be removed from the site as part of future development, the implications for offsite disposal are outlined below:

Natural/topsoil material:

- Reported concentrations of contaminants where below the published background concentrations for volcanic soils in Auckland (which is relevant to the site). Soil removed off-site can be disposed as cleanfill.
- Reported concentrations of contaminants where above the published background concentrations for volcanic soils in Auckland (which is relevant to the site). Soil removed off-site is to be disposed at a certified landfill.

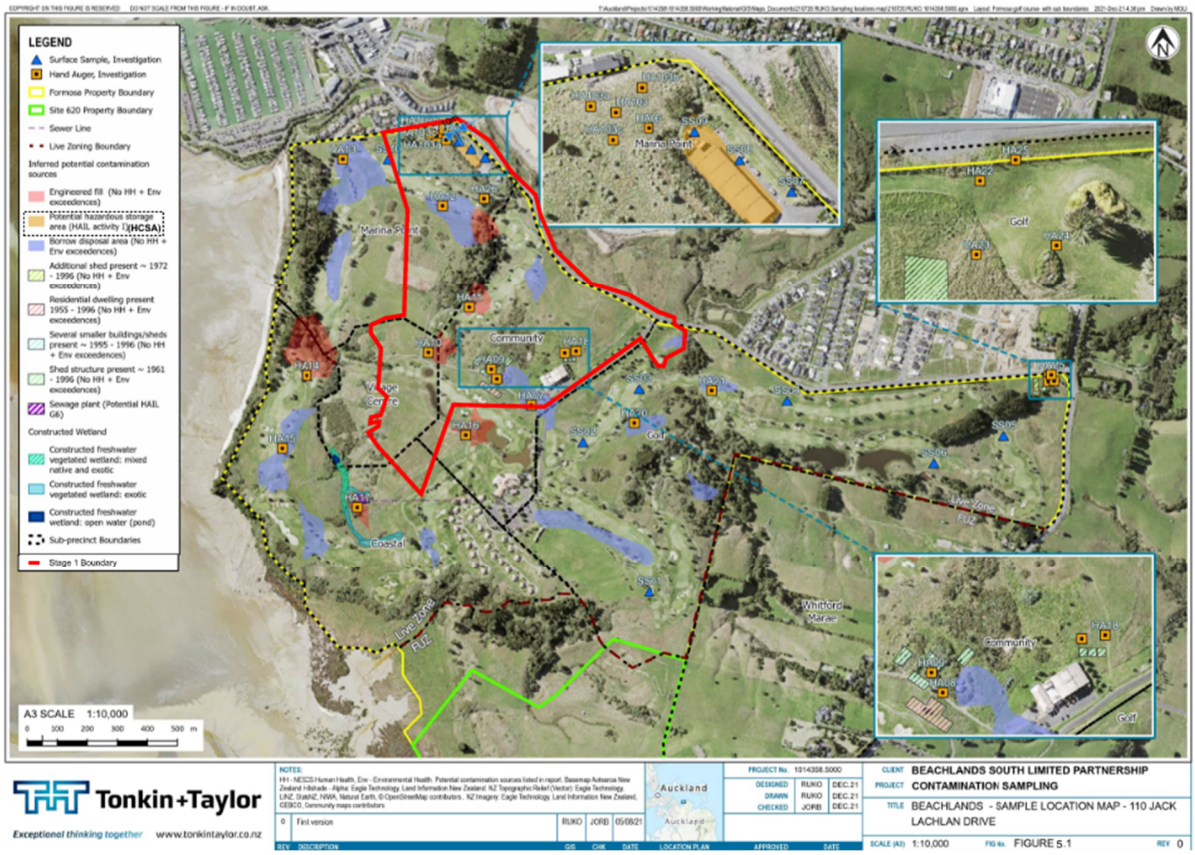

Fig 4: Extract from Tonkin + Taylor Detailed Site Investigation Report – Contamination areas

Refer to the Tonkin + Taylor Contamination Site Management Plan Beachlands South-Fast Track Consent for more detail.

Coastal Setback and Erosion

Tonkin + Taylor has undertaken an assessment of the coastal hazard which has been considered as part of the design. Refer to the Tonkin and Taylor Coastal Risk Assessment Report Update V1.1 for details. All lots and major infrastructure apart from stormwater discharge lines 152 and 153 have been located landward of the 2130 area susceptible to coastal instability and erosion line.

Natural Features

Viridis Environmental Consultants have undertaken a review and prepared an assessment of the natural features. Refer to Viridis Beachlands Fast Track Ecological Impact Assessment June 2026 for further details.

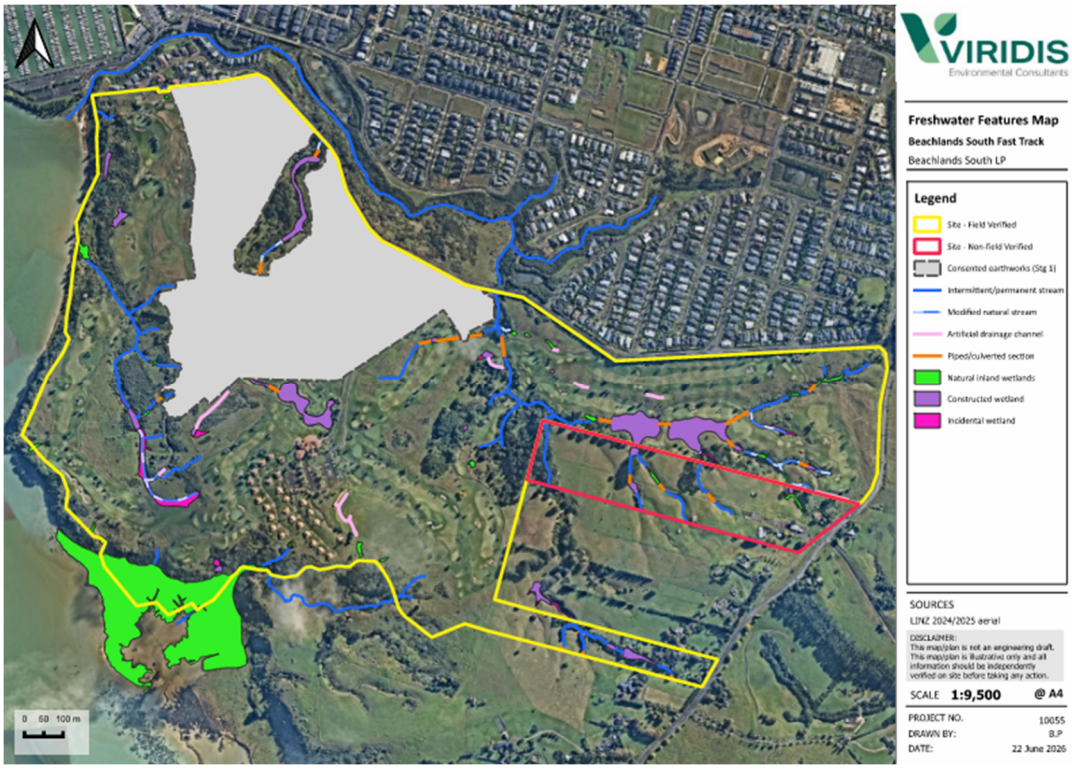

Fig 5: Extract from Ecological assessment prepared by Virdis indicating stream classifications. Update

2.4.3 Topography

The topography of the Site is varied between undulating contours for the golf course through to steep vegetated gullies. The project area slopes in a general north westerly direction with a central spur running from the intersection of 620 and-712 Whitford Maraetai Road towards Tui Brae ranging in elevation 57m to 20m. Where the project area abuts the coast there is a coastal cliff up to 20m in height bisected by existing watercourses discharging to the coast. Drawing series A255591.00-1200 shows the detail of all site features and drawing series A25591.00-1300 provides existing contours.

Vegetation is primarily confined to the identified EPAN areas with specimen trees placed around the golf course as landscape features.

2.4.4 Receiving Environment

The existing site discharges into several freshwater EPAN which have been identified for protection under the current zoning identified as AUP I458 Precinct Plan 2 and shown on drawing A.2555591.00-010.

The western EPAN discharges into the marine environment which itself is an important marine habitat environment classified as a Significant Ecological Areas in the AUP. The north and eastern EPAN's discharge through culverts under Jack Lachlan Drive through to the Angiangi Cresent Stormwater Reserve which discharges to the marine environment adjacent to Pine Harbour Marina. There is a southern EPAN area which is predominantly within the Future Urban Zone (FUZ) where the southern portion of the project area discharges too; this also discharges to the coast.

The Viridis assessment provided for the Fast Track application has identified the following:

High-value or higher-value ecological items identified include:

- **Adjacent coastal/intertidal habitats** – assessed as having high ecological value for coastal and shorebird species, including several Threatened and At Risk species.
- **Terrestrial avifauna habitat** – assessed as moderate ecological value, with the Site used by indigenous birds and potentially by Threatened/At Risk birds.
- **Permanent and intermittent streams** – assessed as moderate ecological value, supporting freshwater habitat, hydrological connectivity and indigenous fish values.
- **Freshwater fish habitat** – assessed as moderate ecological value, with species including longfin eel, īnanga, giant kōkopu and banded kōkopu recorded in the wider area.
- **Coastal fringe wetland** – assessed as moderate ecological value, due to its size, connectivity, ecological function and restoration potential.
- **Native-dominant vegetation / EPAN areas** – generally low to moderate / moderate value, with important connectivity and restoration value.
- **Constructed ponds** – assessed as low to moderate value, but important because they may support wetland birds such as pāteke and dabchick.

Vulnerable species noted include:

- Threatened and at risk birds, including:
    - pāteke / brown teal
    - weweia / New Zealand dabchick
    - New Zealand dotterel
    - Caspian tern
    - banded dotterel
    - banded rail
    - bar-tailed godwit
    - long-tailed cuckoo
    - New Zealand pipit
    - North Island kākā
- Threatened/At Risk freshwater fauna, including:
    - īnanga – Threatened, Nationally Vulnerable
    - longfin eel – At Risk, Declining
    - giant kōkopu – At Risk, Declining
    - banded kōkopu – At Risk, Naturally Uncommon
- Potential indigenous lizards, with habitat considered low to moderate value despite no detections.
- Long-tailed bats, listed as Threatened – Nationally Critical, although the Site is assessed as low value for bats and no bats were detected.

Key ecological risk items identified include:

- **Erosion and sedimentation during bulk earthworks** – assessed as **high magnitude before mitigation**, reducing to low with erosion and sediment controls.
- **Stream reclamation** – residual effect remains moderate, managed through freshwater compensation.

- **Wetland reclamation and potential hydrological loss** – residual effect remains moderate, managed through freshwater compensation.
- **Direct mortality risk to nesting birds** during vegetation or pond-edge clearance.
- **Potential lizard injury or mortality** during vegetation clearance and earthworks.
- **Potential bat roosting risk** during tree felling, although likelihood is low.
- **Fish injury/mortality risk** during stream works, pond removal, dewatering or culvert works.
- **Stormwater discharge effects** on freshwater systems, reduced to low with treatment/attenuation.
- **Wastewater land discharge effects**, considered low but requiring field verification to avoid freshwater and wetland features.

The report proposes the following measures to mitigate and compensate the effects of the change in land use, these being

Avoidance and minimisation through design

- Retain and enhance freshwater features and ecological corridors within the EPAN where practicable.
- Minimise stream and wetland reclamation through scheme design, infrastructure layout and earthworks planning.
- Limit vegetation removal within the EPAN and reinstate temporarily disturbed areas.

EPAN restoration and enhancement

- Restore and manage the EPAN through native revegetation, riparian planting, wetland margin planting, weed control, pest animal control and long-term protection.
- Add approximately 2.60 ha of additional restoration planting adjoining the EPAN, plus reinstate about 0.76 ha of temporary EPAN disturbance being a total of approximately 75 ha being created.

Freshwater compensation

- Compensate for residual stream and wetland losses through restoration and enhancement of approximately **2.943 ha of wetland habitat** within the Site and Waikōpua Creek catchment.
- Use weed control, native wetland planting, buffer enhancement, pest management, monitoring, maintenance and adaptive management.

Erosion and sediment control

- Implement the ESCP, including clean/dirty water diversion, sediment retention ponds, decanting earth bunds, silt fences, flocculation, progressive stabilisation and water-quality monitoring.

Avifauna management

- Avoid tree/shrub clearance during the main bird nesting season where practicable.
- If clearance occurs during nesting season, require ecologist checks within 24 hours and retain buffers around active native bird nests.
- Check pond-edge vegetation for nests at any time of year before clearance.

Lizard management

- Prepare and implement a Lizard Management Plan.
- Use pre-clearance habitat checks, staged vegetation removal, supervised clearance, manual searches, salvage and relocation where indigenous lizards are found.

Bat management

- Prepare and implement a Bat Management Plan.
- Undertake pre-clearance monitoring of potential roost trees in accordance with DOC bat roost protocols before felling.

Native fish management

- Prepare and implement a Native Fish Capture and Relocation Plan before streamworks, pond removal, diversion or dewatering.
- Design culverts to meet relevant fish passage requirements where applicable.

Stormwater management

- Use stormwater treatment, retention and attenuation devices, including communal wetlands/ponds and gross pollutant traps, to reduce contaminant and hydrological effects.

Wastewater discharge safeguards

- Use treated wastewater land application with pressure-compensating dripper irrigation.
- Undertake ecological field verification during detailed design to avoid direct impacts on streams, wetlands and other ecological features.

Long-term management

Implement the Biodiversity Management Plan, monitoring, maintenance, adaptive management and legal protection mechanisms for restoration and compensation areas.

2.4.5 Overland Flowpaths

The Site has numerous overland flowpaths connecting to the existing permanent watercourses. The proposed earthworks as part of reshaping the Site for future development does result in some minor flowpaths being redirected. However, in redirecting flows, current stream and wetland catchments will be maintained wherever possible by directing stormwater flows into the head of streams thereby maintaining base flows and ensuring streams and existing natural wetlands are not adversely affected.

Figure 5 below shows the existing flow paths

Fig 6: Extract from Auckland Council GIS – Existing Overland Flowpaths

3.0 Earthworks

3.1 Bulk Earthworks

Bulk Earthworks are proposed to be undertaken over the Site to modify the landform to allow for roading and housing development. The earthworks are proposed to be staged into six stages allowing for progressive development to be undertaken over the duration of the consent to match the development programme and market conditions.

The bulk earthworks will be undertaken during the Auckland Council prescribed earthwork season being 1st Oct to 30th April and in accordance with Auckland Unitary Plan – I458 Beachlands South (AUP I458) precinct standard I458.6.11

3.1.1 Bulk Earthwork Volumes

The proposed bulk earthworks are volumes across the whole development are

Cut – 756,000m^3

Fill – 588,000m^3

Net Unadjusted Volume – 168,000m^3

Total Earthworks area 118.6000ha

Maximum Cut Depth – 9.00m

Maximum Fill Depth – 10.28m

3.1.2 Earthworks Staging

Compliance with the precinct standard I458.6.11 means there are limits to a maximum cumulative area of 20ha and 15ha within each catchment shown on Precinct Plan 7. To meet the criteria, it is proposed to restrict physical works to the limits prescribed by limiting the Erosion and Sediment Control catchments being opened at any one time within the stages shown. The proposed staging is referring to Drawing A.2515591.00-2150 to 2167 and A.2515591.00-16 and 17.

Earthworks Stage 1 - Sediment Retention pond (SRP) catchments A to L and Decanting Earth bund Catchments 1 to 14, and 29 to 39. This is to permit the completion of earthworks from the consented design to the proposed finished contours constructing six wetlands, roading network and house platforms for Scheme plan stages 1-4,6 and 9. Construction of the Jack Lachlan Drive/Whitford Maraetai Road intersection and secondary site access through #712 Whitford Maraetai Road – Scheme plan stage 8.

Earthworks Stage 2 - SRP catchments K2 and M and Decanting Earth bund Catchments 15 to 17. This is to permit the construction of the light industrial area within Scheme plan stage 5.

Earthworks Stage 3 - SRP catchments N to V and Decanting Earth bund Catchments 18 to 22. This is to permit the progressive development of Scheme plan stages 10 and 11 and allowing for placement of excess material in Scheme plan stage 13.

Earthworks Stage 4 - SRP catchments W to AB and Decanting Earth bund Catchments 23 to 28. This is to permit progressive development of Scheme plan stages 14 to 17.

Earthworks Stage 5 - SRP catchments AC to AD. This is to permit the development of Scheme plan stages 18 and 19.

Earthworks Stage 6 - SRP catchments AG to AJ and Decanting Earth bund Catchments 40 to 48. This is to permit the development to #758 and #770 Whitford Maraetai Road for golf course development.

3.2 Secondary Earthworks

Secondary earthworks are proposed for the superlot developments and multistorey developments to be undertaken at a later stage after bulk earthworks, roading and infrastructure are complete. This will involve earthworks limited to the forming of building platforms, retaining walls and basement carparking to be undertaken by build partners. The extents of these works are shown in Drawings A2515591.00-2200 to 2341

3.2.1 Earthworks Volumes

The table below summarises the volumes for each superlot and apartment building

Table 2: Superlot and Apartment Earthworks Volumes

APARTMENT/ SUPERLOT	EARTHWORK AREA (m^2)	CUT VOLUME (m^3)	FILL VOLUME (m^3)	NET (UNADJUSTED) (m^3)
LOT 1501	1119	2373	0	2373
LOT 1502	1103	2241	0	2241
LOT 1503	847	991	19	973
LOT 1504	1696	3367	0	3367
LOT 1505	957	1659	0	1659
LOT 1506	1045	1920	0	1920
LOT 1507	1587	3120	0	3120
LOT 1508	1280	2180	0	2180
LOT 1509	623	1365	0	1365
LOT 1510	1693	2341	0	2341
LOT 1511	3964	15045	9	15036
LOT 1515	5704	27594	0	27594
LOT 1516	2258	6848	0	6848
LOT 1518	1388	1587	33	1554
LOT 1519	3045	5288	0	5288
LOT 1522	1008	2016	0	2016
STAGE 1A	3024	196	1302	110
STAGE 1B	1750	257	293	36
STAGE 2A	2465.3	20	152	133
STAGE 2B	5401.5	18	580	562
STAGE 2C	4433.6	158	301	143
STAGE 3A-3B	3193	173	442	269
STAGE 3C	1650	150	285	136
STAGE 4A	4094	290	1416	1126

STAGE 5A	3380.4	98	222	124
STAGE 10A	2706	55	26	28
STAGE 10B	1217.5	82	170	89
STAGE 10C	2138.2	238	81	157
STAGE 10D	1910	190	351	161
STAGE 11A	2363	50	815	765
STAGE 11B	1730.9	5	793	788
STAGE 11C	1202.2	88	57	31
STAGE 11D	2455	260	525	265
STAGE 13A	955.4	265	0	265
STAGE 13B	968.2	239	6	232
STAGE 13C	993.3	206	29	177
STAGE 13D	730.8	60	12	47
STAGE 17A	1851	88	101	12
STAGE 17B	1237.2	84	104	20
STAGE 17C	1251.4	283	83	200
STAGE 17D	1267.3	68	98	30
STAGE 17E	1025.1	47	60	13

3.2.2 Earthwork Staging

The staging of the earthworks for the superlots and apartments will not follow any specific sequence other than they will not proceed until title for the underlying subdivision has been obtained.

3.3 Archaeological Discovery

As identified by Clough & Associates report there is one site R11/1445 located within the earthworks area and the following sites R11/344, R11/1621, R11/623 located in close proximity of the earthworks. As part of the management plans for the development and as part of the site induction, all personnel will be made aware of the likelihood of additional sites being located as part of the works and protocols around such discovery.

The following procedure will be adhered to at all times during the earthworks and construction activities.

If kōiwi; (human skeletal remains) are discovered whilst undertaking construction work, then the following procedures shall be undertaken:

- construction work within a 20m radius of the site shall cease immediately including shutting down all earth disturbing machinery and stopping all earth moving activities
- secure the areas of discovery to provide sufficient buffer areas to ensure that the kōiwi remain undisturbed
- inform New Zealand Police, Auckland Council, Mana Whenua and Heritage New Zealand Pouhere Taoonga immediately
- no work shall recommence until approval from relevant parties has obtained

If any Māori cultural artefact/taonga tuturu, object defined in the Protected Objects Act 1975, lava cave or archaeological site is accidentally discovered, the following procedure shall be undertaken:

- immediately cease all works within 20m radius of the discovery
- secure the areas of discovery
- notified Auckland Council, Mana Whenua, and Heritage New Zealand Pouhere Taonga
- any Māori cultural artefact/taonga tuturu/object or archaeological areas within the project area should be left untouched
- no work shall recommence until assessment has been completed and approval is obtained from the relevant parties.

3.4 Construction Management Plan

A draft construction management plan has been prepared and attached in Appendix 1. The plan provides a holistic approach to the following:

- An overview of the project and outline of compliance with statutory obligations and approvals;
- Defines the project objectives and goals of relevance to the construction phase;
- Outlines constraints specific to the construction phase and the project in general;
- Outlines the process for the identification and control of risk specific to the construction phase;
- Outlines health and safety procedure on site during construction;
- Provide guidance for the management of waste generated at the site (including imported packaging materials);and
- Management of construction noise during the construction phase.

This plan provides appropriate methodologies, process and controls required to achieve the development and environmental objectives and sustainability goals in Beachlands South Masterplan Sustainability Strategy.

Prior to each stage of construction commencing, an updated plan will be provided by the Main Contractor.

3.5 Erosion and Sediment Controls

3.5.1 Erosion and Sediment Controls Principles

The erosion and sediment controls principles to be applied to the Project and in accordance with Auckland Unitary Plan – I458 Beachlands South (AUP I458) are as follows:

- Undertake works during the earthworks season, between October and April, where the likelihood of larger rainfall and/or persistent rainfall events is lower.
- Undertake the works over multiple stages to reduce exposed areas.
- Stabilise and reduce exposed catchment areas in advance of significant rainfall events.
- Divert flows from external catchments away from exposed working areas, using clean water diversions.

- Ensure all works are in accordance with Auckland Council GD05 requirements as a minimum standard.
- Ensure all site generated runoff is conveyed to primary treatment devices such as Sediment Retention Ponds (SRP's) for treatment, which afford the greatest level of sediment capture. Water shall be conveyed using dirty water diversions.
- Utilise SRP's as the primary form of treatment device. SRP's are a preferred treatment device as they achieve a greater level of sediment retention performance for treating sediment laden flows. SRP's for this development are proposed to be sized to 3.75% of the catchment area to provide a greater level of service, providing greater storage volume than required by GD05 to reduce the risk of sediment discharge given the sensitivity of the receiving environment.
- Decanting earth bunds (DEB) will be used in minor catchment areas where required. As works proceed, exposed areas where works have been completed will also be stabilised, to reduce the area contributing towards the site generated flows.
- Institute a Chemical Treatment Plan for all SRP's and DEB's to improve the sediment retention efficiency prior to discharges to the receiving environment.
- Apply an Adaptive Management Plan to ensure all devices are maintained and reviewed for efficiency based on sediment discharge loading to receiving environment.

3.5.2 Erosion and Sediment Controls

The combination of control devices listed below are to be implemented for bulk earthwork activities carried out at Beachlands South. All devices shall be constructed in accordance with GD05 best practice. SRPs shall be utilised as the primary treatment device wherever practicable given their greater sediment retention efficiency when compared with other devices. The measures (reference in bracket cross references GD05) that shall be used either for smaller catchments or in conjunction with SRPs are:

- "Clean Water" Diversion Channels and Bunds – (E2.1)
- "Dirty Water" Diversion Channels and Bunds – (E2.2)
- Check Dam – (E2.4)
- Stabilised Entranceways – (E2.6)
- Topsoiling and Grass Seeding – (E3.1)
- Hydroseeding – (E3.2)
- Mulching – (E3.4)
- Sediment Ponds – (F1.1)
- Decanting Earth Bunds – (F1.2)
- Silt Fences – (F1.3)
- Super Silt Fences – (F1.4)
- Silt Socks – (F1.5)

3.5.3 USLE Calculations

As noted in the principles above, SRP's will be the primary treatment device. To determine the effects of the earthworks on the receiving environment common practice is to use the Universal Soil Loss Equation method. This method looks at sediment discharge before, during and stabilisation of each catchment.

Appendix 1 contains the calculations for each catchment and included in the calculations is the impact of using flocculation treatment. A summary of the results is contained in Table 3 and Table 4 below

Table 3: Summary of USLE results without Chemical Treatment

Stage	Nett Sediment Loss without Chemical Treatment (tonnes)			
	Before	During without CTP	Restoration	Diff (post v prior)
Stage 1	3.68	175.30	2.39	174.01
Stage 2	0.4	18.94	0.26	18.80
Stage 3	2.30	109.40	1.49	108.59
Stage 4	2.37	112.94	1.54	112.10
Stage 5	0.58	27.47	0.37	27.27
Stage 6	1.66	79.19	1.08	78.61
Total	10.99	523.24	7.13	519.38

Table 4: Summary of USLE results with Chemical Treatment

Catchment	Nett Sediment Loss with Chemical Treatment (tonnes)			
	Before	During without CTP	Restoration	Diff (post v prior)
Stage 1	3.68	70.12	2.39	68.83
Stage 2	0.4	7.58	0.26	7.44
Stage 3	2.30	43.76	1.49	42.95
Stage 4	2.37	45.17	1.54	44.34
Stage 5	0.58	10.99	0.37	10.78
Stage 6	1.66	31.68	1.08	31.09
Total	10.99	209.27	7.13	205.43

The use of chemical treatment improves the efficiency of the SRP's and DEB's by 252%

3.5.4 Adaptive Management Plan

As noted above, stormwater discharges conveyed from the Site will discharge to sensitive ecological environments. While sediment discharge can occur pre-development, during development and post-development from urbanisation of the land, the development and earthworks phase create the highest potential source for erosion and sedimentation.

To ensure sediment discharge is kept to a minimum, an Adaptive Management Plan approach is being undertaken as an extension of the plan approved under LUC 604543761. This will ensure controls constructed will work as intended and provide inputs or protocols to adapt the controls as the situation may arise.

The Adaptive Management Plan is contained in Appendix 1. The management plan identifies how the plan is to be implemented, and trigger responses required for any rain and sediment discharge events to receiving environments. To aid in its implementation, it is proposed to maintain the existing automated turbidity recording devices already installed within the existing consented area – refer to Adaptive Management plan Appendix B. Additional turbidity monitors

are proposed at key discharge points to be installed prior to earthworks commencing within each of the discharge catchments.

As part of the Adaptive Management Plan both SRP's and DEB's will be chemically treated. Based on onsite testing for the Chemical Treatment Plan for LUC 60453761, current dosing ranges from 2ppm to 6ppm depending on localised soils. Further baseline testing will be undertaken for each catchment prior to installation of each device. A Chemical Treatment Plan is attached in Appendix 1 and catchment tray sizings will be updated with agreement by Council, based on soil testing for each catchment and provided by the Contractor during the course of earthworks over the consented area.

3.6 Retaining Walls

It is proposed to construct both primary and secondary retaining walls as the development progresses.

3.6.1 Primary walls

The primary walls are those that are required to support the land development bulk earthworks and are shown on Drawings A2515591.00 -2500 to 2511. The materiality of the walls is proposed to range from gravity walls systems of Magnum Stone, keystone and gabion walls, to palisade walls and timber retaining walls depending on their location and geotechnical requirements for site stability.

All walls shown on the drawings will be subject to final design and Building Consent approval.

3.6.2 Secondary Walls

The secondary walls are those required for superlot development to support the house construction. The majority of walls will be either keystone or timber and to be constructed by the house builder during house construction. These walls are shown on drawings A2515591.00-2200 to 2290.

4.0 Roading

4.1 Design Parameters

4.1.1 Design Standards

The following design standards have been applied to the proposal

- Auckland Council – The Auckland Code of Practice for Land Development and Subdivision Chapter 3 Transport April 2022
- Auckland Transport - Transport Design Manual, (TDM)
- Austroads Guide to Road Design (Austroads)
- Hughes Traffic and Transport – Beachlands South Fast Track Substantive ITA
- Auckland Council - Stormwater Code of Practice version 4 (SWCOPv4)
- Auckland Unitary Plan – E27 Transport (AUP E27)
- Auckland Unitary Plan – I458 Beachlands South (AUP I458)

4.1.2 Design Speeds

The design speeds have been specified for the internal road network and Jack Lachlan Drive within AUP I458 Appendix 2. The intention of the road speeds is to create a slow speed street environment throughout the proposed development area and provide design criteria for the external road upgrades required.

Table 5: Road Speeds

Road Name	Speed
Jack Lachlan Drive	50 km/hr
Collector Road	40 km/hr
Village Centre Local	40 km/hr
Local Street	30 km/hr
Business Local	30 km/hr
Existing Roads	
Whitford Village Roundabout	50 km/hr
Sandstone Road/Whitford Park Road Intersection	50 km/hr
Trig Road/Whitford Maraetai Road Intersection	60 km/hr

Road Name	Speed
Whitford Road/Sommerville Intersection	50 km/hr
Whitford Maraetai Road	80 km/hr

4.1.3 Design Vehicle Tracking

The design vehicle tracking has been based on the TDM and is dependent on the road classification as specified in the TDM Chapter- Engineering Design Code Urban and Rural roadway design v2 table 2.

4.1.4 Visibility for Safety

The traffic report has addressed visibility for Safety and where changes were required these were made to ensure compliance with the TDM and Austroads.

4.1.5 Design for Maintenance

No manholes or utility cover lids are located within the carriageway.

4.2 Road Reserve and Widths

The AUP I458 specifies minimum road widths for the internal roading network and Jack Lachlan Drive. Refinement of the cycle network and proposed public transport network as resulted in several minor adjustments. The following road reserve and widths are proposed as part of the development.

Table 6: Road Reserve and Widths

Name	Reserve Width AUP I458 Min	Proposed Width	Carriage way
Jack Lachlan Drive	23.0m min	20.6m min 24.36m max	7.0m
Collector Road	23.0m min	23.0m	7.0m
Village Centre Local	20.0m min	20.0m min 23.0m max	6.0m min 7.0m max
Local Street	16.0m min	16.6m min 17.2m max	6.0m
Business Local	17.0m min	17.0m	6.6m

Refer to drawing A2515591.00 3500-3255 for detailed cross sections.

4.3 Horizontal Alignment

The proposed development includes the upgrading of several external intersections and Jack Lachlan Drive, as well as several new internal roads.

All external intersection upgrades and road approaches are maintaining their current alignments within existing road corridors/road reserve boundaries.

All new roads are compliant with Austroads chapter 3.

All roads have been designed with localised widening at bends to accommodate truck and bus movements as specified in the AT TDM.

4.4 Vertical Alignment

The vertical alignment has been designed in accordance with Austroads Road Design Part 3: Geometric design Table 8.7 and Fig 8.9 to determine minimum "k" values for crest and sag curves. The design speed used for each road is based on Table 7 above plus 10km/hr.

Table 7: Minimum K Values

Design Speed	Crest	Sag
30km/hr Posted 40km/hr Design	Desirable minimum: 3.5 Absolute minimum: 2.9	Desirable minimum: 3 Absolute minimum: 1
40km/hr Posted 50km/hr Design	Desirable minimum: 6.8 Absolute minimum: 5.4	Desirable minimum: 4 Absolute minimum: 2
50km/hr Posted 60km/hr Design	Desirable minimum: 11.8 Absolute minimum: 9.2	Desirable minimum: 6 Absolute minimum: 3
60km/hr Posted 70km/hr Design	Desirable minimum: 19.1 Absolute minimum: 14.6	Desirable minimum: 8 Absolute minimum: 4
80km/hr Posted 90km/hr Design	Desirable minimum: 42.9 Absolute minimum: 31.8	Desirable minimum: 13 Absolute minimum: 6

4.4.1 Jack Lachlan Drive

The steepest vertical grade on Jack Lachlan Drive is 7.9%. The designed minimum vertical k values are below design standard of Austroads due to topography with the lowest being 5.4 for crests. A departure from standard is required for this over vertical curve.

4.4.2 Collector Roads

The steepest grade on the internal local roads is 8.0%. The k values are above the minimums specified in Austroads

4.4.3 Industrial Road

The steepest grade on the industrial road is 8.0%. The k values are above the minimums specified in Austroads

4.4.4 Local Roads

The steepest grade on the internal collector roads is 8.0%. The k values are above the minimums specified in Austroads.

4.4.5 Common Owned Access Lots (COAL)

Where COAL's grade below the public road corridor they will have a minimum 4m platform at maximum grade of 5% adjacent to the road reserve, to satisfy Table E27.6.4.4.1 and provide adequate sightlines to observe pedestrians or oncoming traffic.

Maximum longitudinal grades have been designed to be a maximum of 20%.

Changes of grades greater than 12.5% have been designed to have a transition to avoid vehicles striking the ground.

4.5 Cross Fall

All roads have carriageways with 3% cross fall, and berms and footpaths have 2% cross fall.

Common access lots either have a single cross fall where this benefits the local topography, to enable better vertical geometry changes or alternatively have a 3% cross fall towards the centre of the access lot to provide for easy transition into garages or car pads. Overland flowpaths (OLFPs) have been checked for all roads and access lots to ensure flow widths remain within the road and COAL corridors.

4.6 Intersection Design

Vehicle tracking has been undertaken on all intersections to ensure compliance with the TDM. All intersections have been designed with compound curves.

Internal roundabouts have concrete aprons to allow for trucks and buses to utilise the apron to facilitate easier transiting .

4.7 Road Drainage

The stormwater discharge from the development is subject to a private discharge consent. The applicant is lodging a private SMP for approval under this Fast Track application and concurrently in discussions with Council to seek agreement to adopt the SMP under Auckland Council's Region Wide Network Discharge Consent (NDC) if possible. To comply with the NDC, a comprehensive Stormwater Management Plan (HG R001-A2001228-SMP-JMSC) (SMP) has been developed and attached separately.

This plan outlines how stormwater quality and quantity will be managed on-site through the application of best practice methods.

Runoff from impervious surfaces within the road reserve will be captured by catchpits and conveyed through a pipe network. The runoff will then pass through a Gross Pollutant Trap (GPT) before being discharged into communal wetlands. These wetlands will provide treatment, retention, and detention of stormwater flows. Depending on the discharge point the following will occur for storm events

- Discharge toward Jack Lachlan Drive exceeding the 1%AEP, excess flows will bypass the wetlands and discharge directly to the stream outlets or via OLP.
- Discharges to the stream network discharging to the coast exceeding 10%AEP, excess flows will bypass the wetlands and discharge directly to stream outlets
- Discharges directly to the coast exceeding the 95th percentile, excess flows will bypass wetland and discharge directly to coastal outlets

Multiple communal wetlands will be utilized to manage water quality, and to provide retention and detention for all impervious surface runoff from public roads, private COALs and private properties. The design and operational details of these wetlands are provided in the SMP and illustrated in the 4261- 4291 series drawings. The design adheres to the standards outlined in Auckland Council's Stormwater Management Devices in the Auckland Region (GD01) 2017, version 4.

OLFPs have been modelled to confirm flow depths and velocities, with the results presented in the SMP. The modelling confirms that OLFPs can be contained within the road carriageways and safely discharged into receiving streams, overtopping at road lowpoints. An illustration of these results is provided in Fig 7 below.

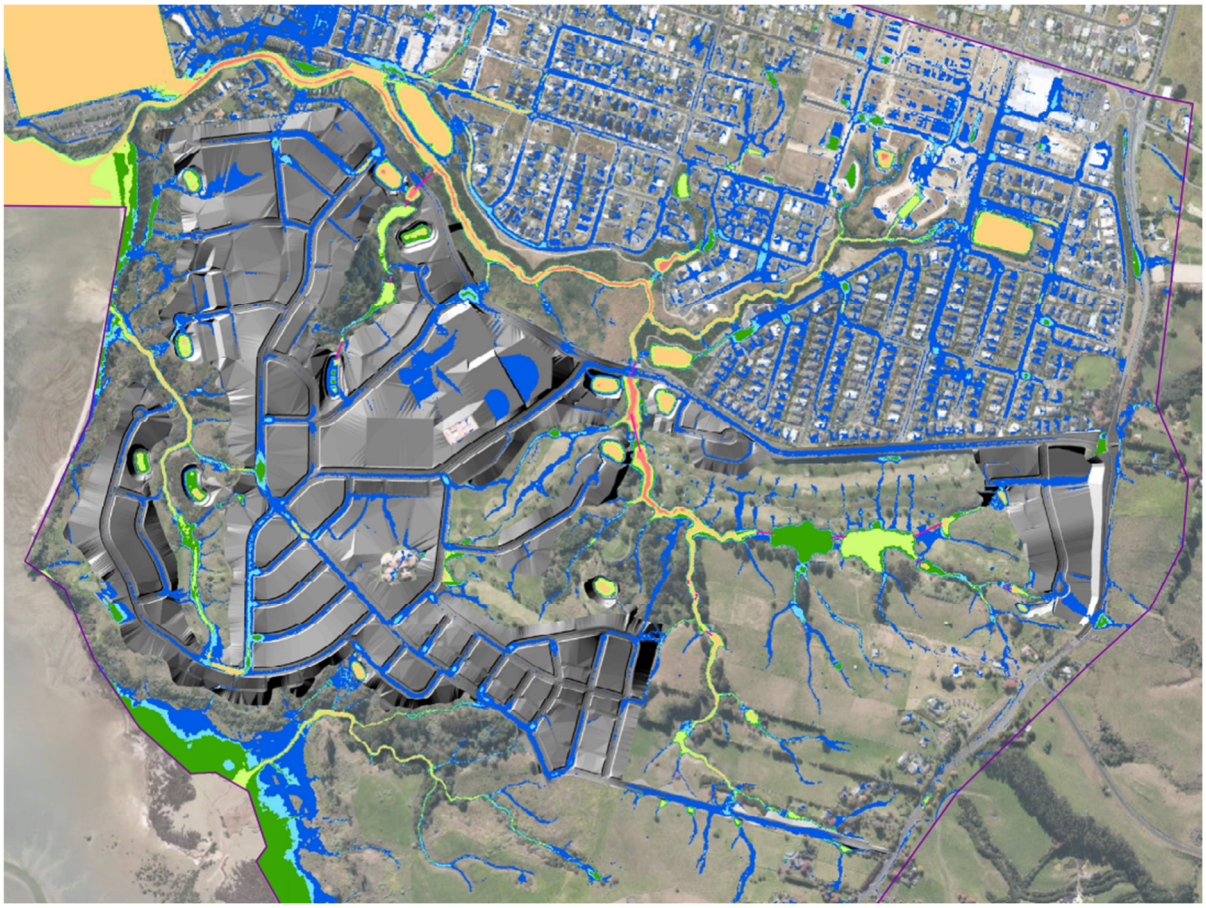

Fig 7: Extract from the SMP – Post Development ARR hazard Category 1% AEP

A requirement of the TDM is determine pedestrian safety of OLP's with carriageways. Comparing Fig 7 above the hazard mapping colours against Fig 8 below. Identifies the following:

- Under vertical low points coloured dark and light blue (H1 and H2) at intersections are within the requirements of the TDM.
- Road 2/Jack Lachlan Drive intersection being an under vertical is H3.
- Road 1 at CH 780 being an under vertical is H3
- Road 4/8 intersection being an under vertical is H3. With the OLP adjacent with Road 4 being H5.

These areas are isolated and characterised by short duration ponding and except for Road 4 flooding alternative routes are available within the development to enable residents movements.

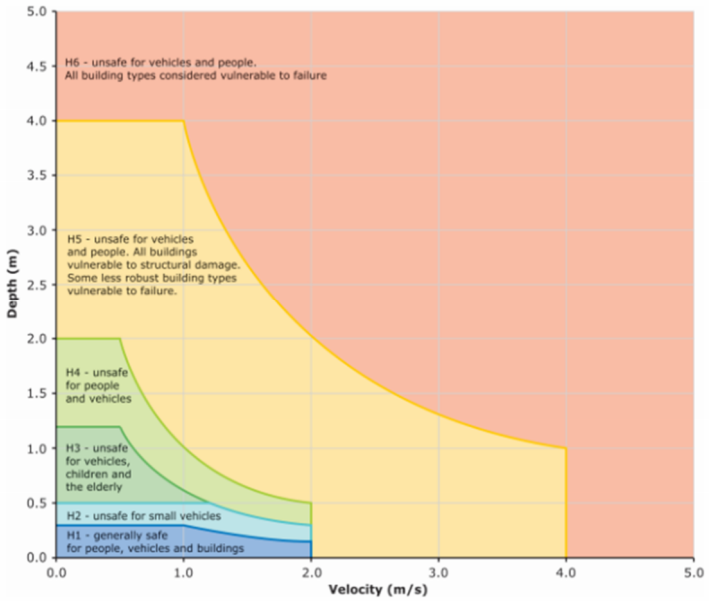

Fig 8: Combined flood hazard curves (Smith et al, 2014, Flood hazard UNSW Australia water research laboratory technical report 201/07 30 September 2014).

4.8 Traffic Calming - Road Safety Features

Traffic calming measures are being proposed to encourage slower speeds within residential areas. The main devices proposed are:

- Sinusoidal Speed humps at 60m spacings on local roads;
- Speed tables at the intersections of local roads and the main spine road (road 1); and
- Chicanes on Road 20.

All devices are designed in accordance with the TDM

4.9 Vehicle Crossings

All vehicle crossings will be designed and constructed in accordance with the TDM.

4.10 Pavement Design

A preliminary assessment of the pavement design has been undertaken using Circly modelling which will be reviewed at Engineering Plan Approval to confirm final design. The preliminary designs are based on a soil strength California Bearing Ratio (CBR) 3.5 based on Geotechnical testing undertaken. The initial design is shown on the road cross sections.

For local roads the design is proposing a granular pavement based on standard practice and collector/high use roads are a structural pavement design.

Both granular and structural pavement designs are to TDM standards to achieve final Benkleman Beam deflections of 1.00mm and 1.20mm for collector and local roads respectively.

4.11 Pedestrian and Cycle Network

4.11.1 Overview

The applicant is providing a high standard of amenity for pedestrians by providing both footpaths within carriageways and an open space path network through reserves. Similarly, the applicant is providing for an off-road cycle network ie dedicated cycle paths on high volume roads reverting to on road for local residential streets.

4.11.2 Pedestrian Network

The pedestrian network meets TDM standards ranging from a minimum of 1.8m wide footpaths through to 2.4m (minimum) within the town centre and adjacent to the school.

Within the open space network a primary footpath network will be provided, these paths will be 3.00m to act as shared paths. In addition to these paths there will be a secondary footpath network consisting of metalled paths.

4.11.3 Cycle Network

The dedicated off-road cycle paths are provided for on Jack Lachlan Drive and Roads 1 to 3. Provision has been made for the cycle network to transition from the northern side of Jack Lachlan to the southern side at Kahawairahi Drive. Due to site constraints in the vicinity of the existing houses at the northern end of Jack Lachlan Drive the dedicated cycleway merges to a shared path by the existing houses through to the existing bridge at the entrance to Pine Harbour.

4.12 Lighting

4.12.1 Street Lighting

A Street light design has been prepared by Ibex lighting in accordance with the requirements of the TDM. The preliminary design is contained in Appendix 3. Detailed design will be submitted with the Engineering approval.

4.12.2COAL Lighting

COAL lighting is proposed to be reticulated lighting in accordance with approved Plan Change 79. A design has been prepared by ECS.

4.13 Streetscape

The applicant has prepared a streetscape strategy prepared by Jasmax (Beachlands South Streetscape Strategy and an Open Space Strategy prepared by Studio Pacific (Beachlands South Open Space Strategy) which provides the framework for the streetscape and landscaping.

A detailed landscaping plan with be provided at Engineering approval stage to coordinate the hard civil infrastructure of car parks, vehicle crossings, lighting and signage.

The Open space strategy has specified the following native trees to be planted

- *Pohutukawa - Metrosideros excelsa*
- Titoki - *Alectryon excelsus*
- Puriri - *Vitex lucens*
- Kowhai - *Sophora microphylla*
- Houhere - *Hoheria populnea*
- Kauri - *Agathis australis*

- Five Finger - *Pseudopanax arboreus*
- Nikau - *Rhopalostylis sapida*
- Ti kouka - *Cordyline australis*

4.14 Waste Collection

The applicant is proposing that waste collection be provided by Auckland Council.

4.15 Departure from Standards

The following departure from TDM standards have been identified

A. Vertical alignment of Jack Lachlan Drive. The design parameters for Jack Lachlan Drive are for a design speed of 50km/hr + 10 km/hr to determine the "k" values for the sag and crests of the vertical curves. A non-compliance is required due to the existing topography and utility services which results in a suboptimal "k" value between chainages 1110 to 1340. This results in a design speed of 40km/hr.

B. Footpath provision along the northern side of Jack Lachlan Drive. AUP I458 Table 6.3.1 requires a footpath along the northern side of Jack Lachlan Drive. The footpath between chainage 930 to 1940 has been omitted from this side of the road as the topography drops off from the existing carriageway preventing construction. To construct the footpath would require the following options:

    a. Batter into the adjacent property to support the road and footpath. Approval to undertake works in adjacent properties has not been obtained.

    b. Construct a retaining wall within the existing road corridor. It is the applicants understanding that Auckland Transport doesn't allow new retaining walls within road corridors that Auckland Transport will be required to own and maintain.

    c. Shift the road alignment thereby taking additional road width from the applicants site.

    d. Constructing the footpath within the proposed front berm, reducing width for lighting and street trees.

    To ensure that an active pedestrian mode is provided a footpath will be provided on the southern side of Jack Lachlan Drive with a crossing point at Kahawairahi Drive ensuring continuity of the footpath network.

C. The proposed active mode facilities along the southern side of Jack Lachlan are required to be extended to the bridge at the Marina entrance. The existing road corridor as shown in Fig 9 below shows limited berm space on both sides of the carriageway. It is therefore proposed that the proposed cycleway and footpath merge to become an active mode path between the development boundary and the footbridge over the creek bridge at the entrance to Pine Harbour, after which where cyclists will be required to enter the slow local road environment within Pine Harbour.

Fig 9 – Jack Lachlan Drive – extract from Council GIS 2026

5.0 Stormwater

5.1 Design Standards

The following design standards have been applied to the proposal:

- Auckland Council – The Auckland Code of Practice for Land Development and Subdivision -Chapter 4 Stormwater version 4 (SWCOPv4)
- Auckland Regional Council – Technical Publication 108 Guidelines for Stormwater Runoff modelling in the Auckland Region (TP108)
- Auckland Council – Stormwater Management Devices in the Auckland Region GD2017/001 Meeting the precinct standard I458.6.7
- Auckland Council – Technical Report TR2013/18 Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices (TR018)
- Auckland Transport – Traffic Design Manual (TDM)
- Auckland Unitary Plan – E1 Water quality and integrated management
- Auckland Unitary Plan – E8 Stormwater - Discharge and diversion
- Auckland Unitary Plan – E9 Stormwater quality -High Contaminant generating car parks and high use roads.
- Auckland Unitary Plan – Stormwater management area – Flow 1 and Flow 2
- Harrison Grierson Consultants - Stormwater Management Plan.

5.2 Design Parameters

The design parameters for the stormwater network are:

Primary Network – the design storm event is the 10% AEP with 17.0% increase for 2.1° climate change

Secondary Network – the design storm event is the 1% AEP with 32.7% increase for 3.8° climate change

Stormwater Management Flow 1 – 23.5mm

5.3 Proposed Stormwater Strategy

Referring to the Stormwater Management Plan (SMP), the proposed strategy is to provide communal treatment devices for all the roading network and residentials areas. The exception to this is the light industrial and mixed-use area adjacent to Whitford Maraetai Road where all lots will be required to construct their own onsite treatment and detention devices.

5.4 Proposed Stormwater (Primary) Network

The primary stormwater network has been designed and will be constructed for the 10% AEP ARI events allowing for climate change. All flows are designed to pass through either rain gardens or wetlands prior to discharging to streams and the coast. Refer to drawing series

4000 for the layout and preliminary longitudinal sections. Refer to Appendix 3 for the calculations.

5.5 Stormwater Treatment

5.5.1 Water Quality Treatment

Water Quality Treatment is provided by rain gardens and wetlands combined with the use of GPT's.

The selection of devices has been based on the catchment characteristics and size which has resulted in both wetlands and raingardens are proposed. Refer to drawings A2515591.00-4261 to 4291 for the layout details and device locations and drawings A2515591.00-4300-4307 for structure details. Refer to Appendix 3 for calculations.

All treatment devices will be provided with the following:

- Inlet structures
- Orifice and overflow outlet
- High level overflows
- Emergency spillways
- Maintenance access tracks

Wetlands will also have:

- Forebays
- Siphon outlets
- Maintenance valves
- Safety benches

Raingardens will also have

- Storage volumes to achieve detention requirements

In addition to the communal devices, all building materials should be inert to minimise contamination generated from roofs. A consent notice will be created to ensure compliance with this requirement.

5.5.2 Operation and Maintenance Plans

Wetlands, raingardens and treatment devices are required to have maintenance manuals when vested in Council. These assets will be entered into Council's stormwater asset database and added to the maintenance programme

5.5.3 Retention and Detention

The Unitary Plan identifies the proposal area as Stormwater Management Area Flow 1 (SMAF 1) which requires a minimum of 5mm retention and 18.5mm detention being a total of 23.5mm.

Sizing of the detention tanks is generally based on the impervious area multiplied by 0.0235 to obtain the total tank volume. UAP I458 has specified the follow minimum sizing of rain tanks.

Table 8: Rain Tank Sizing - All dwellings

Dwelling Type	Minimum Tank (or Bladder)
1 Bedroom (includes Studio)	1000l
2 Bedroom	2000l

Dwelling Type	Minimum Tank (or Bladder)
3 Bedroom	3000l (all attached houses to be 3000l max)
4 Bedroom	5000l (roof area up to 110m^2) or 3000l (roof area greater than 110m^2)
5 Bedroom	5000l

Table 9: Rain Tank Sizing – Apartments

Dwelling Type	Minimum Tank (or Bladder)
1 Bedroom (includes Studio)	1000l
2 Bedroom	2000l
3 Bedroom	1500l
4 Bedroom	2000l
5 Bedroom	2500l

Detailed design of the rain tanks will be undertaken at the time of Building consent with confirmation of each lots impervious area.

A consent notice will be registered on each title to ensure compliance with both the AUP minimum requirements and SMAF requirements.

5.6 Culverts

Four culverts are proposed within the development. These culverts are all located on Road 20 within 712 Whitford Maraetai Road. Refer to drawing A2515591.00-4260 for their location and detail. The culverts are designed to all convey the 1% AEP to pass through without overtopping the road. Refer to Appendix 3 for calculations.

5.7 Overland Flowpaths (Secondary Network)

All flood plains and OLP's shown on the Councils GIS (Fig 11 below) have been considered as part of this application. The approach taken with the flowpaths where overland flowpaths enter the development area their entry points are to retained and where they exit the development area the majority have been retained except some minor ones which have been redirected as result of earthworks modelling although the redirection is still within the existing discharge catchments.

The overland flows redirected (indicated on Fig 11) are

- Ex flowpath entering 230 Jack Lachlan Drive and flowpath entering Jack Lachlan Drive east of 228 Jack Lachlan Drive, this is redirected to Road 1 and ultimately back onto Jack Lachlan Drive via Road 1 intersection.
- The two minor flowpaths between the major flowpaths have been redirected as a result of earthworks and new roading network, however the discharges from Jack Lachlan Drive will be maintained as part of the redesign of Jack Lachlan Drive

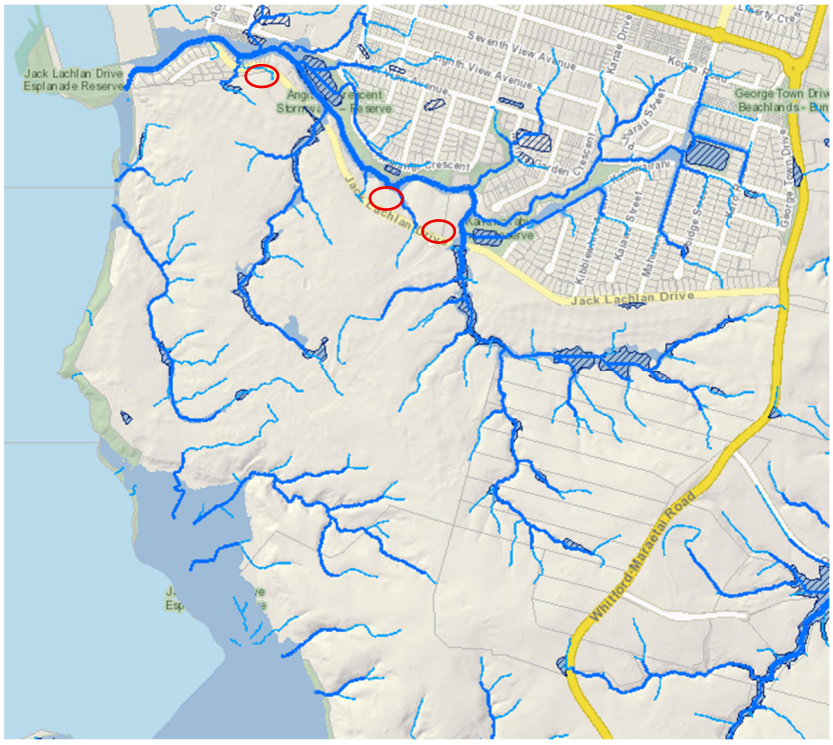

Fig 11: Overland Flowpath and Flood Plains extract from Council GIS

Within the proposal area the 1 % AEP overland flowpaths have been designed to the SWCOPv4 with climate change allowance of 3.1º. Figure 12 illustrates that with the proposed development surface the majority of the flowpaths being contained within the road reserves, public open spaces and retained watercourses. Where ponding occurs outside of these areas this is predominantly due to the creation building platform areas with limited fall.

Fig 12: Extract from the Stormwater Management Plan – 1%AEP flowpaths

Easements will be created for any flowpath with a catchment over 4,000m^2 which traverse private property to ensure unobstructed flows.

6.0
Wastewater Design

6.1 Design Standards

The following wastewater design standards have been applied to the proposal:

- Auckland Council – The Auckland Code of Practice for Land Development and Subdivision - Water and Water Code of Practice for Land Development and Subdivision Chapter 5: Wastewater Ver 2.2 (WSLCOP-WW)
- Auckland Unitary Plan – E6 Wastewater network management
- GWE - Beachlands South Fast Track Substantive Application Wastewater Concept Design and AEE ver 1
- Raath and Associates – Beachlands South Development Integrated Wastewater Servicing Strategy and Discharge Assessment Report ver
- Tonkin + Taylor – Water Quality Outfall Modelling Study ver

6.2 Existing Wastewater Reticulation

The existing wastewater network within the Beachlands area currently has no development capacity as indicated in orange on the Watercare GIS illustrated for reference on Figure 13 below. The Watercare website states that Watercare has applied for renewal of its existing discharge consent, but this process is currently suspended to review matters raised as part of the Council hearing process.

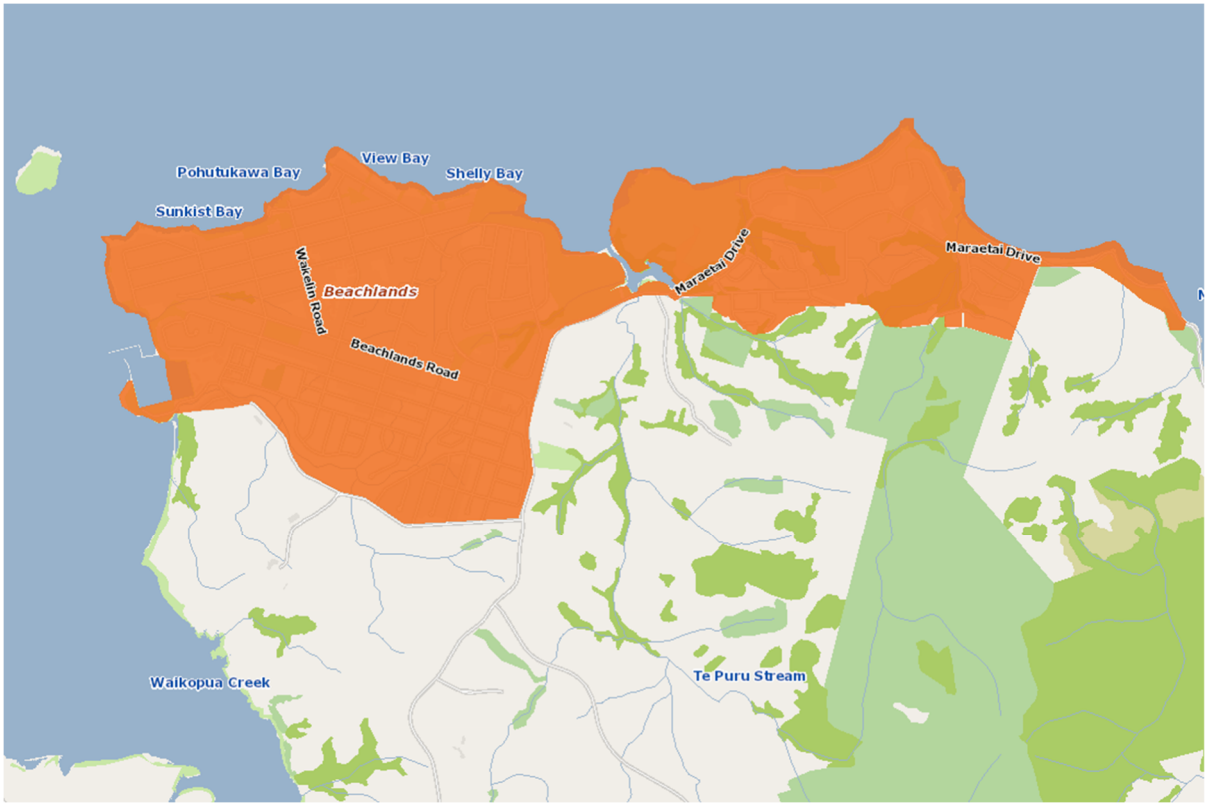

Figure 13: Extract from Watercare GIS 2025 – Service Area

6.3 Wastewater Servicing Strategy

The current wastewater strategy is to deal with wastewater internally to the site. All lots where possible will be serviced by a gravity connection and where this is unable to be achieved, private pump stations within each lot will provide a connection to the nearest gravity connection.

The gravity reticulation will be serviced by up to 9 pump stations to pump the wastewater to an onsite treatment plant located at the southern end of the Site, refer to 5000 drawing series for the location of the reticulation network and pump stations arrangements. Refer to GWE and Raath reports on the treatment and disposal options.

Discussions with Watercare are ongoing as to the eventual ownership of the network. Regardless as to whether Beachland South Limited Partnership decide to have an interim solution or alternative ownership structure, all the reticulation will be designed and constructed to the current WSLCOP-WW. This will enable future transfer of the network to Watercare at a future date (subject to agreement of terms). Refer to Appendix 4 for calculations.

6.3.1 Drainage Network

The drainage network is primarily a gravity system apart from the following lots which will require private pump stations, which will connect to the gravity network via satellite manholes.

- Lots 314-315
- Lots 520-525
- Lots 537-539
- Lots 542-543
- Lots 545-547
- Lots 561-570
- Lots 580-583

- Lots 585
- Lot 588
- Lots 594-595
- Lots 601-610

The network shown on drawings 5000 series are showing standard 150mm DN pipe. Actual pipe sizings will be determined at Engineering approval stage but are likely to consist of a network of 150 and 225mm diameter pipes. An assessment of flows has been made refer to the calculations in Appendix 4 and drawings A251991.00-5200-5208 for catchment flows

6.3.2 Pump Stations

The applicant is proposing 9 pump stations to enable the development to be serviced. The number of pump stations is primarily due to the proposal area topography and safety in design considerations of reducing the depth of drainage lines during the construction phase and for easier ongoing maintenance/replacement of the system in future.

Drawings A251991.00-5200-5208 show the catchments for each pump station and expected flows to be catered for based on Watercare standards.

Pump Station I (WWPSTN-I) can be removed at a later date and flow directed to Pump Station C to reduce the overall number of pump stations required to service the development.

Due to the requirements of the proposed treatment plant, the pump station storage has been increased from 8 hrs to 24 hrs. Refer to Drawings A2515591.00- 53000 to 5309 for concept layouts.

All pump stations have been designed to allow for on-site maintenance to ensure the final designs will be Watercare compliant.

6.3.3 Treatment Plant and Outfall

The applicant is proposing a private treatment plant which will have an interim discharge solution and final discharge system to the Hauraki Gulf. Plans showing the indicative location and longitudinal section see drawings A2515591.00-5036 outfall plan and A2515591.00-5150 longitudinal section.

For pump station details and treatment refer to reports prepared by Raath and Associates - Beachlands South Development Integrated Wastewater Servicing Strategy and Discharge Assessment Report, GWE- Beachlands South Fast Track Substantive Application Wastewater Concept Design and AEE and Tonkin and Taylor - Water Quality Outfall Modelling Study.

6.4 Departure from Standards

The departure from the WSLCOP-WW standard required is for the location of the wastewater network. Section 5.3.7.1 Pipe location specifies a priority of locations in which the network should be laid. Due to Site constraints the priority of positioning will be

a) Within private property – front yard – to allow for street planting and space for other utilities and stormwater network.

b) Common Access lots

c) Road reserves

d) Within reserves – public and or private.

7.0
Water Reticulation

7.1 Design Standards

The following design standards have been applied to the proposal

- Auckland Council – The Auckland Code of Practice for Land Development and Subdivision - Water and Water Code of Practice for Land Development and Subdivision Chapter 6: Water Ver 2.4 (WSLCOP-W)
- Auckland Unitary Plan – E1 Water quality and integrated management
- Auckland Unitary Plan - E2 Water quantity, allocation and use
- GWE – Beachlands South Fast Track Water Supply Concept Report .

7.2 Existing Water Reticulation

The existing Beachlands area is currently serviced by either roof rainwater harvesting, private bore or use of water supply provided by Pine Harbour Living Limited (PHLL). The nearest reticulated water supply is the Pine Harbour bore and treatment plant located at the end of Tui Brae and a bore located within Stage 1 of the development site.

Fig 14: Extract from Google Maps showing location of Pine Harbour Water Treatment Plant.

7.3 Water Servicing Strategy

The proposal is to provide reticulated potable water to all new allotments supplied by existing bores. This will be utilising the PHLL bore and treatment plant located at Tui Brae.

The applicant has an agreement with PHLL to provide supply to approximately 765m^3/day with the shortfall in capacity to be provided by the existing bore of approximately 480-659m^3/day.

The existing bore water supply will be treated at the existing PHLL treatment plant located at Tui Brae to ensure water quality for potable reuse. Combined with the potable water each new lot will have rainwater detention tanks which will supplement water usage with non-potable water for potential toilets/washing and garden use.

The new reticulation network will be vested in PHLL who will manage the network, similar to Watercare in the Auckland metropolitan areas.

Refer to GWE report on the water servicing.

7.4 Water Reticulation

The concept design shown on Drawings A2515591.00-6000-6035 are based on the following assumptions:

- Principal Mains ranging in size from 125mm OD to 250mm OD
- Rider Mains being 63mm OD
- Lots which are accessed off COAL will be serviced by 25mm OD lot connections from a multi meter box located within the road reserve.

PHLL have advised that any extension of its network will need to comply with WSLCOP-W.

Final modelling for the water network will be undertaken at engineering approval stage in consultation with Pine Harbour Living.

7.5 Fire Fighting

The applicant proposes to have firefighting capability provided by fire hydrants installed in the road reserve. Detailed design of the reticulation including booster pumps, additional reservoirs will be provided at Engineering approval stage with inputs provided by PHLL.

8.0 Utilities

8.1 Power Reticulation

Vector has advised that the current network has limited capacity of 40 additional units on the current network. Vector advised that new feeders will be required to be extended from the Maraetai substation.

Fig 15 below indicates the route from Maraetai to the development site. Vector will not invest in or commence actual construction of the new feeders until there is certainty of development ie until BSLP obtains the approvals sought in this application.

Refer to Vectors correspondence in Appendix 5.

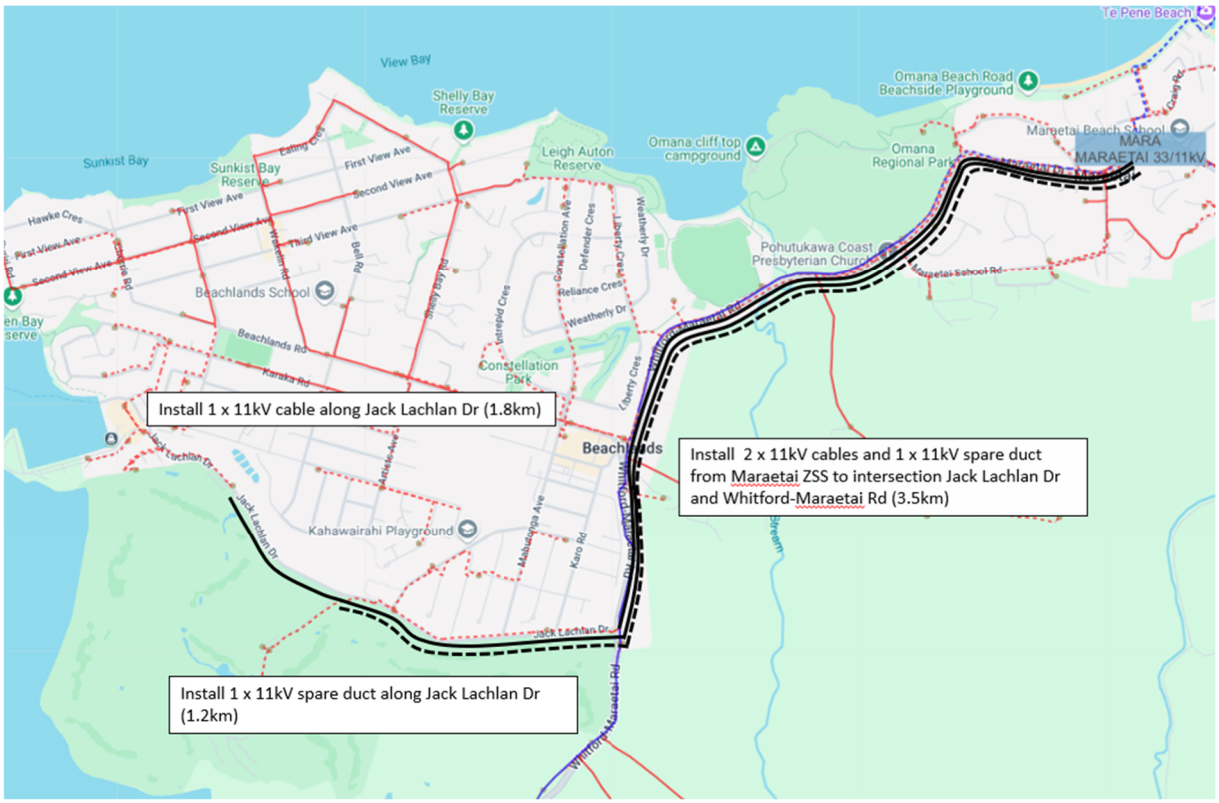

Fig 15. Vector supplied proposed extension route

8.2 Telecommunications

Both Chorus and Tuatahi Fibre have advised that they can reticulate the proposed development and there is capacity within the network. A detailed design for telecommunications infrastructure will be undertaken at Engineering Plan approval stage.

Refer to Appendix 5 for both Chorus and Tuatahi Fibre's responses.

9.0
Safety in Design

While developing the design, the philosophy was to integrate hazard identification and risk assessment methods early in the design process to eliminate or minimise the risks of injury throughout the life cycle of the development.

Safety in Design (SiD) has been considered during the consent design. The SiD commentary in this section should be used to inform further detailed design of the project. No Safety in Design workshop has been held for the project at this time.

A detailed review of SiD will also be provided as part of the future engineering plan approval (EPA) applications, which will incorporate further SiD considerations with detailed design.

9.1 Construction Considerations

9.1.1 Site Access

Within the development stabilised accesses will be provided from public roads during each stage. These site access points should be located in areas of good visibility both to and from the access point. Priority for these locations should be given to public roads with posted speed of 50km/hr and must be accompanied by suitable temporary traffic control.

As the development progresses access is proposed to be provided by a construction entrance at 712 Whitford Maraetai Road with the extension of Road 1 and Road 20 to ensure construction traffic is separated from residents as house occupation occurs.

Site access for off site works will need to be managed with traffic management plans as the works are being undertaken on live roads. Traffic management plans will be provided to Auckland Transport prior to works being undertaken after EPA is granted

9.1.2 Site Slopes

Batter slopes and interfaces are required where designed where the design model interfaces with the following features:

- Existing ground levels at the extents of earthworks where interfacing the exterior interior boundary areas.(batter slopes typically 1V:5H to a maximum of 1V:3H).
- Areas where future retaining walls are proposed, and consents yet to be granted. (batter slopes will be typically 1V:3H).
- Internal bathymetric benches within Stormwater wetlands (batter slopes will be typically 1V:1H within the future ponding area (below permanent water level) and 1V:3H outside for planted areas)
- Staging interfaces during earthwork seasonal closedown during the winter months.

Construction mitigation proposed is:

- Batter slopes are modelled to a maximum grade of 1V:3H, except for bathymetric benches slopes which are modelled to 1V;1H.
- All batter slopes to be identified with the contractor at preconstruction meetings.
- Batter slopes are to be temporarily fenced at the top of the batter with high visibility safety mesh fence or high visibility “pig tail” fence at the completion of works until permanent fencing or fall protection is installed.

9.1.3 Trenching

The proposed stormwater and wastewater reticulation networks have been designed in accordance with the SWCOPv4 and to Watercare Code of Practice- wastewater. The proposed water, power and telecommunications utilities have been designed in with the Watercare Code of Practice -water and Utility authorities design codes.

All trenching operations will be carried out in accordance with the Good Practice Guidelines-Excavation Safety (Worksafe New Zealand).

Trenching depths will be minimised based on the final finished surface design where possible noting the Watercare's required clearances which affects the depth of crossing line clearances.

9.1.4 Drainage Network

The drainage networks will be reviewed at detailed design stage. Drawings to be submitted with the EPA to ensure the following;

- Location of manholes to provide safe maintenance access.
- Minimising the number of pipes crossing future roads to reduce the quantum of future maintenance works within carriageways.
- Location of drainage lines within road reserves to ensure future maintenance can be undertaken with minimal interference with other utility services.

9.2 Operation Considerations

9.2.1 Access for Maintenance

The following has been considered for maintenance access:

- Manholes are generally located within the road reserve, or within a 3.0m set back of the lot frontage, clear of the carriageway to provide safe access
- Manholes where unable to place within the road reserve or frontage setback will be located within COAL's and or reserves to provide safe access with in areas with less traffic volumes.
- Landscape batters are no steeper than 1V:3H to provide a safe working slope for landscape operations.
- All wetlands are provided with access tracks from public roads into the wetland depression to access both the forebay and outlet. The access tracks are metalled to provide all weather access.

9.2.2 Retaining Walls

The following has been considered in the design of the retaining walls

- Heights of walls and where possible terrace walls have been proposed
- Safety barriers will be designed and installed for all walls over 1.0m in height as required by the Building Code and Auckland Councils guidance AC2231-retaining walls

9.2.3 Safe Transport Operations

SiD has been considered for vehicle, cyclist and pedestrian modes of transport. The following methods are proposed

- A hierarchy of roading network to promote low speed environments with the residential areas and local centre connecting to collector roads
- The road layout is designed in accordance with the AT TDM, AusRoads and NZS4404 where applicable.
- Ensure intersection designs provide for pedestrian and cyclist safety.

- Providing off road pedestrian and cycle networks to provide alternative access around the development and to the marina area.

9.2.4 CPTED

A safe pedestrian environment has been created by the following:

- Passive surveillance from lots, encouraging house designs to provide this.
- Off road access ways to be a minimum of 8m wide.
- Retaining wall heights reduced as much as possible along public interfaces
- Increasing lot fence permeability along public interface boundaries.
- Lots orientated towards pedestrian amenities and
- Appropriate lighting of roads, accessways and COAL's.

9.2.5 Overland Flowpaths

OLP's have been designed in accordance with SWCOPv4 and the TDM – Road Drainage to ensure where possible all flowpaths are contained within road reserve and other reserves. According to the SWCOPv4 Council requires design of flowpaths exceeding catchments greater and equal than 4000m^2 .

Where the flows for catchments exceeding 4000m2 are unable to be contained in public spaces and are required to traverse private property, Council requires these to be covenanted and easements created. By providing such easements dwellings are required to be located outside flowpaths and minimum floor levels noted.

10.0 Limitations

10.1 General

This report is for the use Beachlands South Limited Partnership Fast Track Consent application and for Expert consenting panel to consider as part of its consideration of the application only and should not be used or relied upon by any other person or entity or for any other project.

This report has been prepared for the particular project described to us and its extent is limited to the scope of work agreed between the client and Harrison Grierson Consultants Limited. No responsibility is accepted by Harrison Grierson Consultants Limited or its directors, servants, agents, staff or employees for the accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes.

2.0

Appendices

Appendix 1
Earthworks Reports and Calculations

Appendix 1a- Archaeological Management Plan

Appendix 1b- Construction Management Plan – draft

Appendix 1c- Flocculation Plan – draft

Appendix 1d– Adaptive Management Plan

Appendix 1e– USLE Calculations

Appendix 1f– Erosion and Sediment Control Calculations (Ponds)

Appendix 2
Road Design Calculations

Appendix 3
Stormwater Calculations

Appendix 3a- SMAF Volume Calculations

Appendix 3b– Drainage Network Calculations

Appendix 3c – Wetland Sizing Calculations

Appendix 3d– Wetland Spillway Calculations

Appendix 3e- Wetland Spillway Rock Riprap Calculations

Appendix 3f – Culvert Calculations

Appendix 3g – Culvert Riprap Sizing

Appendix 3h – Manhole Weir Calculations

Appendix 3i – Outlet Rock Riprap Calculations

Appendix 3j – Bubble-up Manhole Calculations

Appendix 3k – Rain Garden Calculations

Appendix 4
Wastewater Calculations

Appendix 5
Utilities

Appendix 5a – Vector Emails

Appendix 5b – Telecommunications Servicing Confirmation.

Appendix 5c – IBEX lighting design

3.0

Drawings

Bound Separately

Bound Separately

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