Project Number: 2-S8S00.35

Te Panuku Tu
Preliminary Design – 3Waters

23 June 2021

CONFIDENTIAL

wsp

150 YEARS IN AOTEAROA

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Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Gisborne District Council ('**Client**') in relation to the 3Waters Preliminary Design Review of Te Panuku Tu designed by Isthmus Architects as part of the Titirangi Summit redevelopment ('**Purpose**'). The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose, or any use or reliance on the Report by any third party.

In preparing the Report, WSP has relied upon data, site geotechnical investigation report, architect's impressions, plans and other information ('**Client Data'**) provided by or on behalf of the Client. Except as otherwise stated in the Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable in relation to incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

1 Introduction

WSP have been engaged by Isthmus Architects on behalf of the Gisborne District Council (GDC) to provide the preliminary design pertaining to water supply, wastewater, and stormwater services (collectively known as "3Waters").

2 Data collected

WSP have reviewed the following information received from the Client through Isthmus:

- Architectural design (Isthmus, June 2021)
- Landscape design (Isthmus, June 2021)
- Geotechnical Investigation Report (LDE, 2018)
- Civil Options Report (LDE, 2018)

Other information received from publicly available sources include:

- GDC 3Water asset plans (Tairawhiti Maps)
- Contours (Tairawhiti Maps)
- Design rainfall data (NIWA HIRDS v4.0)

WSP also consulted GDC's operation teams for stormwater, wastewater, and water supply – records of discussions are found in **Appendix A**.

3 Scope of Work

Scope of work for the 3Waters preliminary design are as follows:

Stormwater

- Surface assessment and measure of pervious and impervious areas
- Site hydrology and runoff estimates (pre-development and post-development)
- Confirm stormwater level of service with GDC
- Stormwater management process train and initial site layout
- Attenuation sizing and basic layout (for roofed areas)
- Treatment sizing and basic layout (for on-ground impervious areas)

Wastewater

- Confirm yield with Architect and sewage flow estimates with plumbing designer
- Confirm preferred sewage discharge locations with GDC
- Wastewater disposal process train and initial site layout

Water

- Confirm demand with Architect and pressure requirements with building services designer
- Confirm water supply services with GDC
- Initial site layout
- Water supply tank sizing

Output

- Marked up overall site plan and design brief

4 Basis of Design

Below are references for the preliminary design.

- Gisborne District Council, Engineering Code of Practice, 2000
- Te Papa Tipu Taunaki o Te Tairāwhiti (Tairawhiti Resource Management Plan), 2018
- Acceptable Solutions and Verification Methods for New Zealand Building Code Clause E1 Surface Water, 2020

5 Stormwater

The objective of the proposed stormwater management is to reduce flood risks on site arising from the development and mitigate downstream effects. The proposal is to manage stormwater quality and quantity at source. Downstream works will be focused on protecting receiving areas, such as erosion control at drainage pipe outlets.

5.1 Site location

The site of the proposed development sits at the summit of Titirangi. The James Cook Observatory used to be on site until it was demolished in 2019. The existing gun placement will be retained during and after construction.

The site is at the highest point for at least two catchment areas estimated from the contours available on Tairawhiti Maps. As shown on Figure 1, the downstream receiving areas are the Kaiti Beach Road to the west, and the open drain near the Te Poho-o-Rawiri Marae at the lowest end of Queens Drive to east.

Figure 1 Catchment drainage paths (blue lines) and receiving ends

5.2 Surface assessment

The development involves a total area of around 1,830 m^2. This includes the building, paved walkways, and new loading zone; but excludes the redevelopment of the existing car park overlooking Poverty Bay.

The site is currently 4% impervious, mainly covered by the existing gun emplacement (74 m^2) and is expected to be around 66% impervious after the development. The proposed building roof is estimated to represent more than 70% of the total impervious surface after development (at 838 m^2).

Note that these measurements only cover what is likely to be affected by the development works and need to be confirmed during detailed design.

5.3 Design rainfall

Design rainfall used was based on NIWA's records at Gisborne Aerodrome as shown in Table 1.

Table 1 Design Rainfall Depths in mm (Source: NIWA HIRDS v4.0)

ARI (yr)	AEP	10min	20min	30min	1hr	2hr	6hr	12hr	24hr
2	50%	8.03	10.7	12.9	18	25.4	43.9	60.5	2
5	20%	11.2	14.8	17.7	24.6	34.6	59.2	81.1	5
10	10%	13.7	18	21.6	29.8	41.8	71	97	10
50	2%	20.5	26.8	31.9	43.8	60.8	102	138	50
100	1%	24	31.2	37	50.6	70.1	117	158	100

For the purposes of this report, reference is made with Auckland Regional Council Technical Publication No. 10 (ARC TP10) for the target water quality storm (WQ storm), i.e., one-third of the 2-year ARI 50%AEP 24-hour design rainfall. Note that the Tairawhiti Resource Management Plan refers to ARC TP10 for stormwater management devices.

5.4 Runoff estimates

The Rational Method was used to estimate runoff. Runoff coefficient used are 0.30 for pervious surfaces, and 0.90 for impervious/paved areas in line with the New Zealand Building Code (NZBC). Given the size of the development, the site has an estimated time of concentration of 10 minutes for both before and after development.

Preliminary runoff coefficients and percentage increase between existing and post-development surfaces are as shown in Table 2. Estimated peak flows are shown in Table 3. Separate assessments shown for with and without the 838 m^2 roof to indicate how much runoff the proposed building roof contributes to the area.

Table 2 Preliminary runoff coefficients

Scenario	Overall Catchment (1,830 m^2)	Overall Catchment minus the Roof (992 m^2)
Existing	0.324	0.345
Post-development	0.697	0.526
Change	+115%	+53%

Table 3 Preliminary peak runoff estimates in l/s

ARI (yr)	AEP	Existing (1,830 m²)	Development (1,830 m²)	Existing minus Roof (992 m²)	Development minus Roof (992 m²)
2	50%	7.9	17.1	4.6	7.0
5	20%	11.0	23.7	6.4	9.7
10	10%	13.5	29.1	7.8	11.9
50	2%	20.3	43.6	11.7	17.8
100	1%	23.7	51.0	13.7	20.9

5.5 Existing stormwater infrastructure

There is no formal stormwater network in and around the project site. It is understood that the site discharges runoff by overland flows either to the kerb and channel of Queens Drive or gullies spanning to the east and west.

There is a drainage pipe located in front of the substation 180 m away from the project site. This drainage pipe currently discharges to the gullies leading to Kaiti Beach Road.

5.6 Stormwater Management Process Train

The proposed stormwater management process train is shown in Figure 2. The goal is in line with managing stormwater quantity and quality at the point source.

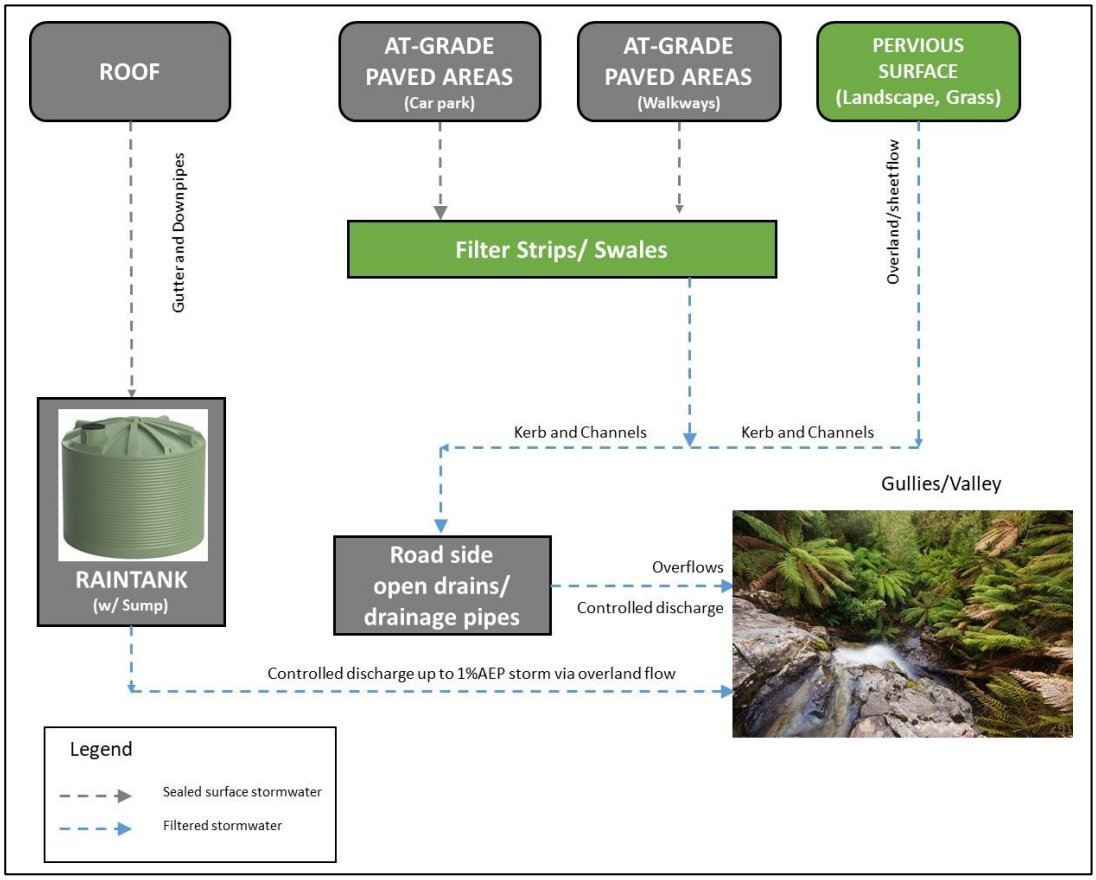

Figure 2 Stormwater Management Process

5.7 Stormwater tank sizing

The purpose of the stormwater tank is to attenuate post-development stormwater flows so as not to exceed pre-development flows, and maintaining hydraulic neutrality up to the 1%AEP storm event[1], which closely resembles the requirements under the Tairawhiti Resource Management Plan.

A routing model was used to size the stormwater tank based on the Modified Rational Method with a triangular rainfall distribution based on design rainfalls from HIRDS v4.0. No detailed temporal patterns applied considering the size of the catchment and comparatively minor influence on storage sizing.

Results of the assessment are as follows:

For the Main Building and Café only (838 m²)

- Minimum storage — 85,000 L
- Depth — 3 m
- Primary Orifice — 20 mm diameter, invert at 200 mm above the tank bottom[2]
- Secondary Orifice — 100 mm diameter, invert at 2,800 mm above tank bottom
- Dead storage — Approx. 5,600 L at 200 mm deep below primary orifice invert

For the Gun Emplacement only (87 m²)

- Minimum storage — 10,000 L
- Depth — 2 m
- Primary Orifice — 10 mm diameter, invert at 200 mm above the tank bottom[2]
- Secondary Orifice — 100 mm diameter, invert at 800 mm above tank bottom
- Dead storage — Approx. 1,000 L at 200 mm deep below primary orifice invert

For all roofed areas (925 m²)

- Minimum storage — 90,000 L
- Depth — 3 m
- Primary Orifice — 25 mm diameter, invert at 200 mm above the tank bottom[2]
- Secondary Orifice — 100 mm diameter, invert at 800 mm above tank bottom
- Dead storage — Approx. 6,000 L at 200 mm deep below primary orifice invert

Sizes above are based on a single tank arrangement. A series of tanks of equal sizes may be proposed provided that the depth remains as specified. These tanks will need to be connected with DN150 pipes at the base and near top level to better replicate a single tank arrangement. Change in storage volumes and/or depths as specified above must be validated through hydraulic assessment.

It is recommended to allow for at least 200 mm sump below the invert of the primary outlet to allow for sedimentation. Additional depth may also be required to accommodate local wind loading requirements not assessed here.

[1] Groves, M, et. al., "Does Your Detention Your Intention?", Stormwater New Zealand, 2020.
[2] Note this dead storage may need to be increased to meet local wind loading requirements

The orifice shall be formed via a drilled plate located outside of the tank in a dismantlable joint for ease of access. An external strainer should be included upstream for screening and ease of clearance. We also recommend that the spouting include a leaf screen prior to the rain tanks.

The two orifices will be connected to a common outlet pipe (DN150 mm). The outlet pipe will have a minimum 2.2 m long flow spreader its discharge end, with 20 mm holes at every 300 mm on centres for. The long side of the spreader shall be perpendicular to the outlet pipe alignment. This will help spread flows and further reduce erosion risks at the discharge point.

If the outlet pipe will be installed underground, an invert grade of 0.3-0.5% is preferred to keep the velocities low. The flow spreader shall still be installed at the downstream end of the outlet pipe and anchored against the slope especially when directly discharging to a gully.

Tanks are ideally installed on-grade in view of maintenance and repairability. Note that tanks should be positioned where there is enough conveyance capacity and fall from roofs via gutters and downpipes. The spouting will need to be sealed to force water into the tanks, with the tank vented to the atmosphere (to prevent a vacuum or an air pocket forming). The top of the tank must be at least 300 mm lower than the spouting level with an overflow point provided in the spouting.

5.8 Swale sizing

The purpose of swales is to help trap solids in stormwater runoff using vegetation (grass, plants, etc.) and increase residence time to help treatment before being discharge to downstream areas.

Preliminary swale sizing for new paved areas (e.g., paved walkways, loading zones, car parks) of 50m^2 to 200 m^2 are as follows:

- Filter strip/swale shape — Trapezoidal
- Bed width — 100 mm
- Side slopes — 1V:5H
- Bed gradient — 1:100 (1.0%)
- Minimum Length — 30 m, preferred; 20 m, absolute minimum
- Minimum depth and top width for <u>impervious areas up to 50 m^2</u>

• WQ storm	15 mm D	175 mm W
• 2%AEP storm	60 mm D	400 mm W
• 10%AEP storm	70 mm D	450 mm W
• 1%AEP storm	80 mm D	500 mm W
• Attenuation up to 1%AEP storm	180 mm D	1,000 mm W

- Minimum depth and top width for <u>impervious areas up to 200 m^2</u>

• WQ storm	25 mm D	225 mm W
• 2%AEP storm	90 mm D	550 mm W
• 10%AEP storm	100 mm D	600 mm W
• 1%AEP storm	120 mm D	700 mm W
• Attenuation up to 1%AEP storm	450 mm D	2,350 mm W

The total swale footprint recommended to cater for drainage and attenuate flows up to the 1%AEP storm event for a 200 m^2 impervious surface is at least 27 m^2 (20 m long x 1,350 mm wide). A 50 m^2 impervious surface requires a minimum of 20 m^2 for the swale (20 m long x 1,000 mm wide).

Swales will eventually discharge to an existing kerb and channel along Titirangi Drive or directly to the gullies downhill. A 450 mm high weir will be installed at the swale's downstream end and will have a 15 mm diameter orifice at the bed of the swale to attenuate flows to pre-development rates up to the 1%AEP storm event. Some form of screen will be needed to prevent orifice blockage.

Overflows from the weir will have a spreader to reduce/break the flow energies and reduce risks of downstream erosion, especially if directly discharging down to gullies.

Swales are ideally installed beside impervious surfaces. It is recommended to have the highest point of the swale (banks) lower than the lowest point of the car park to facilitate drainage.

If soil and slope stability due to saturation will be an issue, an impervious layer can be installed underneath the swale.

Swale dimensions shall be re-assessed during detailed design when site grading and levels are confirmed, and site layouts are final.

5.9 Stormwater Management Plan

The proposed stormwater management plan based on the drawings supplied by Isthmus on 11 June 2021, "IGL_4282_Te Panuku Tu _1-400 A3_.pdf" is presented in **Appendix B**. Note that the plan was prepared as a guide for Isthmus' design and resource consent application purposes only and may require cross checking with other design disciplines to ensure the stormwater management infrastructure is feasible and constructible at the indicated locations.

5.10 Next steps

Sizes, dimensions, levels and arrangements of proposed stormwater management infrastructure shall be confirmed during detailed design. Preliminary designs indicated in this report are subject to change as per the final site grading and layout plan.

It is recommended to confirm Client's preference of re-using stormwater for non-potable uses such as irrigation and toilet flushing in order to confirm storage requirements early. Note that storage required for re-use would be additional to the storage for attenuation.

6 Water supply

The objective of the proposed water supply is to safely convey potable water from GDC's reticulated system ensure the minimum flow and residual pressure to maintain level of service to the proposed development.

6.1 Existing services

There are no known existing GDC's water networks within 300 m of the proposed development site. The nearest water mains are found in Kaiti Beach Road, at both ends of Titirangi Drive: one is near the Te Poho-o-Rawiri Marae and the other is at the intersection of Endcliffe Road and Norwood Road. All the nearest water mains are sized at 100 mm nominal diameters.

6.2 Demand estimate

Estimated water within the proposed building are as follows (taken from the Building Services design):

For domestic water supply (all fixtures including commercial kitchen equipment)

- Peak flow — up to 1.5 l/s
- Peak day demand — up to 2.0 m^3

For fire-fighting purposes (for classifications FW4 to FW5)

- Water flow — 100-150 l/s
- Storage — 587–1,080 m^3

6.3 Water supply pipeline

A 25-50 mm internal diameter pipe would be capable of supplying domestic water from source to point demand. If there will be no firefighting storage available on site, using the reticulated network to maintain the required firefighting flow would require 200-250 mm diameter pipe.

The building water pipes will be connected to the new water supply pipeline through a valve (e.g., toby) for better service shall be allowed where the building connects to the wastewater main to provide ease of access during maintenance.

Pipe sizes provided are only preliminary, assuming pipe flow velocities of 2-3 m/s. Pipe sizing shall be confirmed through GDC's water supply hydraulic model in order to understand the effects of adding a new pipeline to the existing network.

6.4 Water supply options

Following discussions with GDC's water supply operations team on 11 June 2021, the development will be connected to GDC's water network. Connection will be made on either end of Titirangi Drive, with the new pipeline installed under the existing road.

Water supply options are presented in **Appendix C**. Water can be supplied through either of the following:

Option A: In-line connection with a single pump station at the offtake point

This option includes maintaining demand flow and pressure using a dedicated pump station at the foot of Titirangi Drive. This requires operating and maintaining potentially one large pump station near the existing network and a larger transmission line (200-250 mm diameter) to ensure

there is enough supply and pressure within the new reticulated line, most specifically for firefighting. This option is not Council preferred as when the situation calls for firefighting, the level of service to the other customers could be greatly reduced.

Option B: Water storage tank and booster pump at the development

A smaller pump station at the existing network offtake with a smaller transmission line (50 mm diameter) is required to bring water to the top of Titirangi, with the purposes of filling a new storage tank for firefighting at the summit of Titirangi.

The new storage tank will have an in-line booster pump to ensure that water supply pipes in the building have adequate flow and pressure. Up to of 1,080 m^3 of water storage dedicated for the development is required to ensure minimum fire-fighting requirements per FW5 classification. The storage tank can be installed underground or on-grade. Council prefers this option as firefighting requirement can be better secured at any given time while maintaining the level of services to other parts of the reticulated system. It is understood that the Client is currently scoping the requirements for firefighting and such details stated in this Report are preliminary.

Option C: Stormwater re-use for non-potable water use

This option follows either Options A or B, but with an additional tank to store stormwater for non-potable water uses such as irrigation and toilet flushing. Note that stormwater re-use storage is on top of the attenuation storage requirements per section 5.7 of this report. Furthermore, a detailed understanding of irrigation and toilet flushing requirements are required to validate the storage requirements for stormwater re-use.

6.5 Next steps

It is important to understand and confirm the building requirements for water supply in terms of operation, i.e., where is the optimum tapping point from a supply perspective.

At this stage, it is preferable to install the new water main within the same trench of the new wastewater main. Also note that GDC are currently scoping the physical works for road improvement on Titirangi Drive from the summit to Endcliffe Road – it is then recommended for the Client to engage with GDC on possibly installing the new wastewater main in line with the upcoming road works.

It is recommended that the options be assessed in view of system and power requirements, including pump operation and SCADA.

Firefighting requirements including its operation needs coordination among relevant authorities including Fire and Emergency New Zealand and Gisborne District Council. A more optimal solution may arise depending on the discussions.

As there is likely to be a new pump station be constructed within residential areas at the offtake, it is important to have the community aware of the scope of work and potential effects with respect to noise and traffic management during construction, etc.

It is paramount that the Client discuss the water supply and operation requirements in order to better understand the party responsible for operating each element of the water supply chain.

Valve specifications and locations need to be confirmed with the water supply system requirements. Understanding the effects of thrust forces and allowance for thrust blocks during detailed design along the main is vital to provide a robust and structurally sound pipeline.

It also recommended that the proposed development be tested against GDC's water supply hydraulic model to identify the effects of the new pipeline to the existing network's performance and be able to address any adverse effects, if any. This will also help optimise system requirements for supplying water to the top of Titirangi while maintaining the level of service for both existing and new reticulated areas. For example, with Option B, the pump could be run on a timer to refill the tank during periods of lower demand to mitigate an unacceptable drop in pressure.

7 Wastewater

The objective of the proposed wastewater system is to safely convey greywater and wastewater to GDC's reticulated sewer network and prevent any environmental effects in terms of surcharge and overflows to undesired locations.

The overall proposal is to directly tie-in with an existing sewer network by gravity flow.

7.1 Existing services

There are no known existing GDC sewer networks within 300 m of the proposed development site. The nearest sewer networks are found in Kaiti Beach Road, at both ends of Titirangi Drive - one is near Te Poho-o-Rawiri Marae and the other is at the intersection of Endcliffe Road and Norwood Road. All the nearest sewer networks are sized at 150 mm nominal diameters.

7.2 Demand estimate

The wastewater peak flow from the proposed building is estimated at 3.5 l/s (taken from the Building Services design). Sewer peak flows are higher than the estimate water demand based on the likelihood numerous fixture such as toilets may be used concurrently (i.e., the discharge from toilet flushing is greater than the flow rate refilling the cistern).

The estimate includes all bathroom inside and outside the building walls and commercial kitchen equipment. This number does not consider stormwater inflow and groundwater infiltration – it is assumed that the proposed wastewater system for the development will be protected from unwanted flows to the network. Allowance for inflow and infiltration shall be confirmed during detailed design.

7.3 Gravity wastewater main design

A minimum internal diameter of 100 mm at 0.50% invert grade is estimated to be capable of conveying the peak flow and permit self-cleansing flow based on the tractive force theory[3].

An inspection point (e.g., rodding eye) shall be allowed where the building connects to the wastewater main to provide ease of access during maintenance.

In view of preparing proposed main pipeline for potential future upgrades within the development, a 150 mm internal diameter pipe would be recommended.

Smooth internal pipe walls are preferred. The wastewater main would be made of un-plasticised polyvinyl chloride (PVC-U) based on the required pipe size.

7.4 Wastewater discharge options

Following discussions with GDC's stormwater and wastewater operations team on 8 June 2021, the proposed wastewater main will be connected to the existing reticulated system.

Options presented in **Appendix D** show that the development's wastewater main will connect to the GDC sewer network through either of the following:

[3] Christchurch City Council Infrastructure Design Standard, Part 6: Wastewater Drainage, 2016.

Option A: Shortest Route

The shortest route would be to connect to the existing sewer main in Kaiti Beach Road. This work involves at least 400 m of new wastewater pipes traversing along the slopes of Titirangi down to the existing sewer manhole (KAITSM025).

This option will likely involve the following works:

- Underground installation whenever possible.
- Above ground or on-grade pipe installation through steep terrain (polyethylene pipes may be used as opposed to PVC-U).
- Over 360 m of clearing existing trees, plants, etc., on the slopes of Titirangi (currently a mix of native and introduced species).
- Providing safe access for operation and maintenance
- Specialist design for steep pipe gradients (energy dissipation and ventilation).

Whilst this option is the shortest, there are significant challenges regarding construction and future repair/maintenance works. For example, there would special requirements to bring large plant on site particularly working on steep slopes without any defined vehicular access.

Option B: Same Trench with Water Supply Pipeline

Both wastewater and water supply pipes will be installed within the same trench to save time (water above sewer) and cost for installation. This option also provides room for future maintenance and repair works by utilising the existing Titirangi Drive road reserve for access.

This option, however, will require a longer wastewater pipeline to be managed and needs to be well-protected for any potential leaks to prevent any contamination to the water supply pipes. Also, future maintenance and repair would almost certainly expose the water supply pipeline if both pipelines are built within a 500 mm wide trench. Connecting to the sewer main near Te Poho-o-Rawiri Marae would need around 1,400 m of pipework while connecting to the Endcliffe Road sewer main will require 1,200 m of new pipes.

7.5 Next steps

It is important to understand and confirm the building requirements for sewerage discharge in terms of where the optimum discharge point is from a site drainage perspective. It appears that fixtures are concentrated on the south side of the building, and it could be more economical to run the new wastewater main to the Endcliffe sewer network from a hydraulic perspective.

It is recommended to engage closely with GDC's wastewater operations team to identify the best discharge point based on their understanding of the current issues with the existing network.

Wastewater pipes are typically 1.0-2.0 m below surface, and it would be ideal to understand in-situ soil characteristics and confirm trenching requirements.

At this stage, it is preferable to install the new wastewater main within the same trench of the new water main. Also note that GDC are currently scoping the physical works for road improvement on Titirangi Drive from the summit to Endcliffe Road – it is then recommended for the Client to engage with GDC on possibly installing the new wastewater main in line with the upcoming road works.

8 Exclusions

Works excluded from this report include, but not limited to the following:

- Stormwater reuse, including storage and conveyance requirements;
- Hydraulic modelling for 3Waters with the GDC reticulated networks;
- Erosion and sediment control;
- Detailed water and wastewater demand estimates (information provided by WSP MEPF);
- Systems performance of water supply and wastewater conveyance (including pump stations sizing, transmission main optimisation, and power generation estimates).
- Flood plain mapping and flood risk assessment; and
- Clashes with existing and proposed services and infrastructure.
- Geotechnical ground conditions.

Appendix A
Records of Discussions with GDC

Borja, Maurel Chito

From: Mike Greeff <Mike.Greeff@gdc.govt.nz>
Sent: Monday, 14 June 2021 11:33 AM
To: Borja, Maurel Chito; Sahil Sharma
Cc: Phillip Dodds
Subject: RE: Te Panuku Tu – Stormwater and Wastewater Requirements

Filed: -1
Filed Location: U:\ProjectsNZ\2s\2-S8S00.35 Titirangi Redevelopment subconsultancy s\Home\03 Project Execution & Completion\05 Design and calculations working documents\Preliminary Design\3Waters\Minutes\210609_-TePanukuTu–SWandWW.msg.msg
Filed Location Folder: U:\ProjectsNZ\2s\2-S8S00.35 Titirangi Redevelopment subconsultancy s\Home\03 Project Execution & Completion\05 Design and calculations working documents\Preliminary Design\3Waters\Minutes

Morning Maurel

Just want to add the following – I had a discussion with Phill.

One additional option for the wastewater would be to include it in the same trench as for the water services, and that it might be required to connect the wastewater service to the existing network in Endcliffe Road. This is of course assuming that the water connecting will also come from Endcliffe.

Mike

From: Borja, Maurel Chito <Maurel.Borja@wsp.com>
Sent: Wednesday, 9 June 2021 12:02 pm
To: Mike Greeff <Mike.Greeff@gdc.govt.nz>; Sahil Sharma <Sahil.Sharma@gdc.govt.nz>
Cc: Phillip Dodds <Phillip.Dodds@gdc.govt.nz>
Subject: Te Panuku Tu – Stormwater and Wastewater Requirements

Hi Mike and Sahil

Thanks for meeting with me to discuss stormwater and wastewater requirements for the proposed Te Panuku Tu Whare on top of Titirangi. I also CCed Phil Dodds as advised by Mike.

Below are notes from our discussions – let me know if I missed anything. Thank you

Subject **Te Panuku Tu – Stormwater and Wastewater Requirements**
Date and Time **08 June 2021, 1100H-1200H**
Venue **WSP Gisborne Office**

Attendees Maurel Borja (MB), WSP
Mike Greeff (MG), GDC
Sahil Sharma (SS), GDC

Discussion records:

Stormwater

1. Basic layout of the proposed stormwater infrastructure in shown in Figure 1 below.
2. The proposed development will be where the observatory used to sit at the summit of Titirangi, which was demolished in 2019. The existing gun emplacement will be retained.
3. The current concept shows that the development will cover at least 2,000 m^2. Impervious area will increase by more nearly 1,000 m^2.
4. There is no pronounced SW reticulation in or adjacent the project site. The site will utilise the existing terrain and grading to ensure catchments areas and flow paths are maintain between pre- and post-development scenarios.
5. The proposed roof is around 685 m^2, which will be attenuated to match pre-development flows up to the 1%AEP through rain tanks. This will discharge to Point 1.
6. The development currently lies on two catchments. Surface runoff in the development, excluding the roof, will be discharged to Points 2 and 3.
7. Flows to Point 2 will be conveyed via swales/open drains.
8. Flows to Point 3 will be directed to the existing SW pipe crossing Titirangi Drive (size and capacity to be confirmed).
9. The existing carpark on top of Titirangi will be introduced with a raingarden. Surface runoff in this area will be directed to Point 4.
10. Surface runoff on carparks will be directed to either swales or raingarden to help with treatment.
11. Surface runoff on paved walkways will be intercepted with filter strips.
12. GDC advised WSP to include assessments of the effects of the proposed stormwater layout to the discharge locations and downstream areas in the consent application.

Wastewater

1. Basic layout of the proposed wastewater infrastructure is shown in Figure 2 below.
2. There is no reticulated wastewater in or adjacent the project site. A dedicated sewer gravity line (up to DN150) is proposed to be connected to the reticulated wastewater network in Kaiti Beach Road.
3. Wastewater peak flow is estimated at 3.5 l/s excluding infiltration. This needs confirmation during detailed design.
4. GDC advised WSP to show the capacity of the proposed wastewater pipes and high-level assessment of the receiving manhole in the consent application. Pipe materials can be indicative.

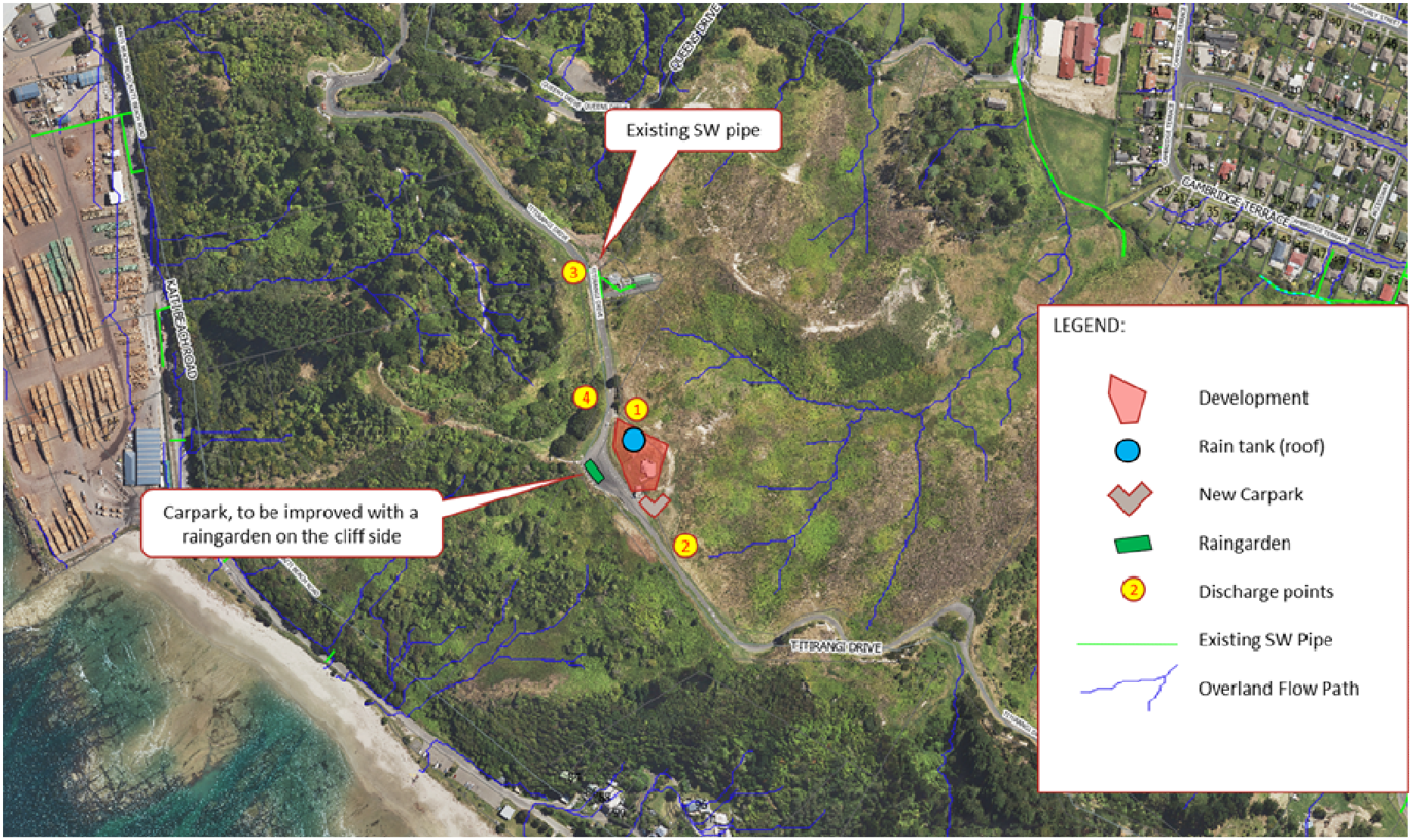

Figure 1 Proposed Stormwater Layout

Figure 2 Proposed Wastewater Layout

Maurel Chito Borja
Engineer - 3 Waters

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-LAEmHhHzdJzBlTWfa4Hgs7pbKI

Borja, Maurel Chito

From: Judith Robertson <Judith.Robertson@gdc.govt.nz>
Sent: Friday, 11 June 2021 1:07 PM
To: Borja, Maurel Chito
Subject: RE: Te Panuku Tu – Water Supply Requirements

Filed: -1
Filed Location: U:\ProjectsNZ\2s\2-S8S00.35 Titirangi Redevelopment subconsultancy s\Home\03 Project Execution & Completion\05 Design and calculations working documents\Preliminary Design\3Waters\Minutes\210611_-TePanukuTu–WaterSupply.msg.msg
Filed Location Folder: U:\ProjectsNZ\2s\2-S8S00.35 Titirangi Redevelopment subconsultancy s\Home\03 Project Execution & Completion\05 Design and calculations working documents\Preliminary Design\3Waters\Minutes

Hi Maurel,

Very good. Thank you. Any queries, I'm available.

Judith

From: Borja, Maurel Chito <Maurel.Borja@wsp.com>
Sent: Friday, 11 June 2021 11:19 AM
To: Judith Robertson <Judith.Robertson@gdc.govt.nz>
Subject: Te Panuku Tu – Water Supply Requirements

Hi Judith

Thanks for meeting with me to discuss water supply requirements for Te Panuku Tu.
My notes from our discussions below. Please let me know if I missed anything here.

Cheers!

Subject	**Te Panuku Tu – Water Supply Requirements**
Date and Time	**11 June 2021, 1100H-1200H**
Venue	**MS Teams**
Attendees	Maurel Borja (MB), WSP

Judith Robertson (JR), GDC

Discussion records:

1. As a minimum, a reticulated pipeline will be constructed on Titirangi Drive and will connect the proposed development to GDC water supply network.
2. At least three options have been identified for supplying water to the development.
    - Option 1 – In-line water services, including maintaining demand flow and pressure from a dedicated pump station at the foot of Titirangi Drive. This requires operating and maintaining potentially one large pump station near the existing network and a larger transmission line to ensure there is enough supply and pressure within the new reticulated line and inside the building.
    - Option 2 – Potable Water Storage tank and booster pump to maintain supply and pressure at the development site. A reasonably smaller pump station and transmission line at the existing network is required only to bring water to the top of the Titirangi.
    - Option 3 – Rainwater re-use for non-potable water use (e.g., toilet flushing, irrigation). Similar to Option 2, but requires an additional storage for rainwater harvesting and re-use. Note that this is treated separate from stormwater attenuation raintank.
3. JR highlighted the importance of identifying demand including fire-fighting requirements and power consumption.
4. JR emphasized that preference is usually given to the most resilient and economical design, subject to hydraulic assessment using the water supply network model (currently managed by WSP on behalf of GDC).
5. JR suggested to consider among others systems operation, power requirements through operation (pumping, SCADA requirements, etc.), aesthetic and environmental effects, and maintenance and operation requirements (making assets fixable).
6. MB explained that at present, no design is still “live” and subject to changes by the Client.

Regards

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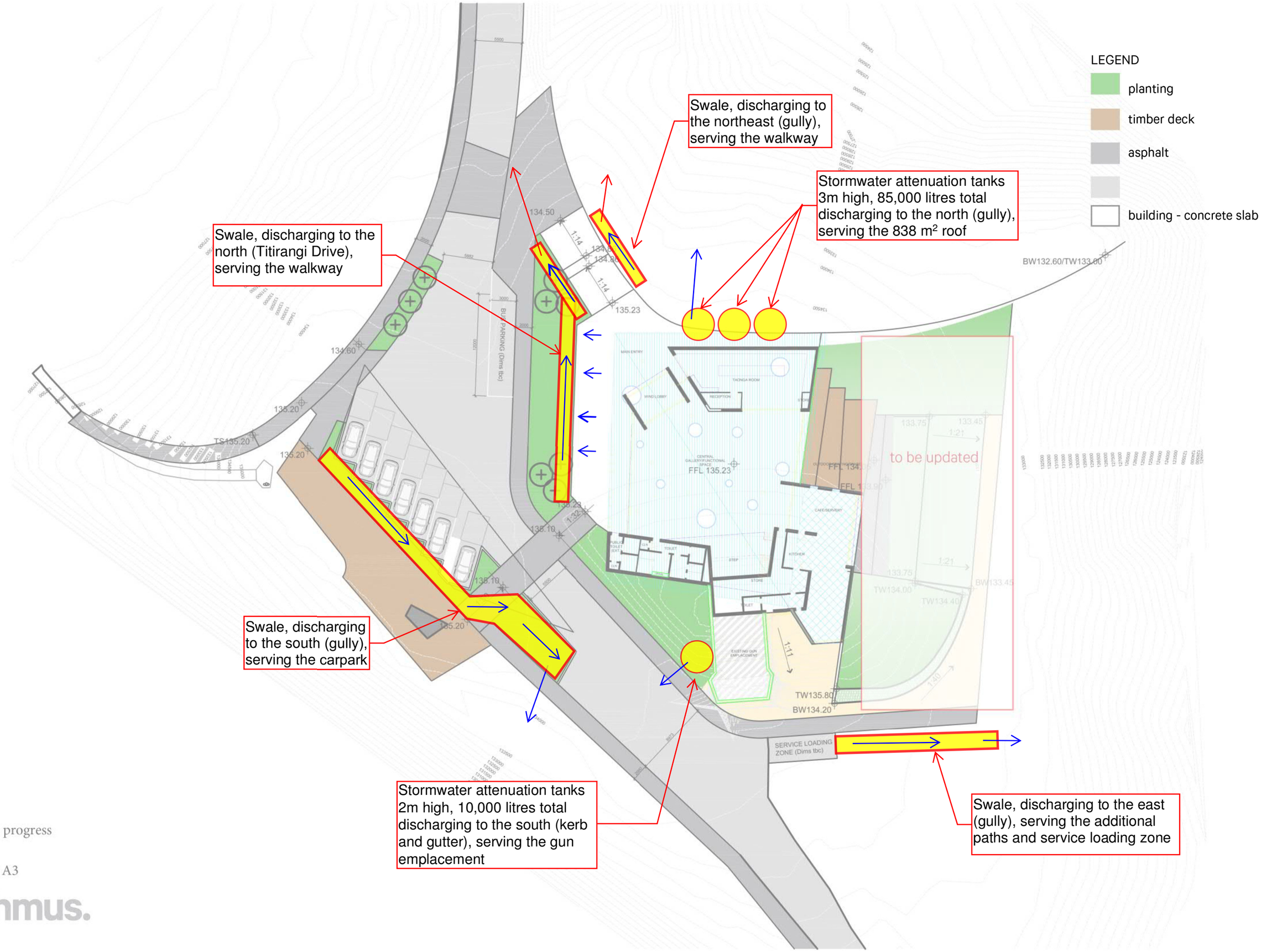
Appendix B
Stormwater Management Plan (Indicative Only)



work in progress

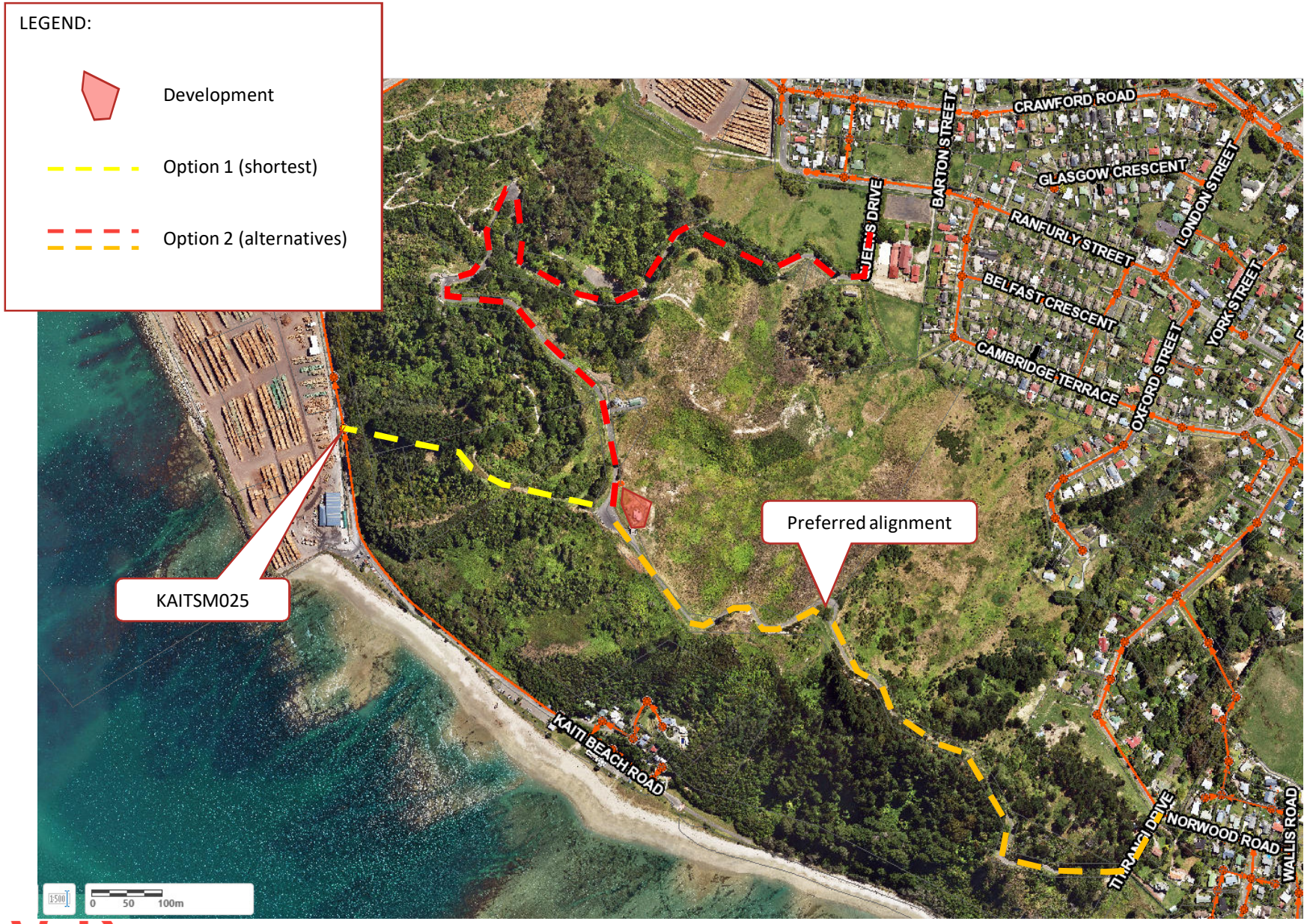
1:400 @ A3

Isthmus.

Appendix C
Water Supply Options


LEGEND:
Development
New water main options
Intake pump station options
Storage tank option
Preferred alignment
CRAWFORD ROAD
BARTON STREET
GLASGOW CRESCENT
LONDON STREET
RANFURLY STREET
BELFAST CRESCENT
YORK STREET
CAMBRIDGE TERRACE
OXFORD STREET
KAITI BEACH ROAD
NORWOOD ROAD
WALLIS ROAD
0 50 100m

Appendix D
Wastewater Discharge Options


LEGEND:
Development
Option 1 (shortest)
Option 2 (alternatives)
KAITSM025
Preferred alignment
CRAWFORD ROAD
BARTON STREET
GLASGOW CRESCENT
LONDON STREET
RANFURLY STREET
BELFAST CRESCENT
YORK STREET
CAMBRIDGE TERRACE
OXFORD STREET
KAITI BEACH ROAD
NORWOOD ROAD
WALLIS ROAD
0 50 100m