Optioneering and Concept Design Report

Project Name: Hutt CBD Sewer Bypass

Project No.: OPC101481

Date: 06/04/2023

Our water, our future.

Document Control

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Executive Summary

In 2021, Wellington Water Ltd engaged Hydraulic Analysis Ltd. to undertake hydraulic modelling of the Lower Hutt wastewater local network (including inflows from Wainuiomata east and Upper Hutt catchments). The purpose was to summarise the existing and future predicted system performance against a targeted Level of Service (LoS) The targeted Level of Service for the modelling work was:

- Uncontrolled spilling to not exceed an average of one spill per year wet weather overflow frequency (1yr event).
- Overflows at engineered overflow points to not exceed an average of two spill per year wet weather overflow frequency (6 month event).

The modelling identified several existing capacity constraints within the Hutt Central catchment that are shown to spill more frequently with predicted population growth associated with the Riverlink project.

Following the modelling study, Hutt City Council and Wellington Water Ltd put together an application to the Government's Infrastructure Acceleration Fund (IAF) to increase sewer capacity in Hutt Central, allowing the development and population growth associated with Riverlink to proceed un-hindered. The application was based on a gravity pipe intercepting the main sewers in Hutt Central, conveying flow to a pump station that pumped over Ewan Bridge to the Western Trunk Main. This was priced at $44M and $39M has now been approved in HCC's LTP to proceed with the project.

After the IAF application was lodged, Wellington Water Ltd engaged Holmes through Wellington Water's consultancy panel to undertake an optioneering assessment, including a multi criteria analysis, to identify a preferred bypass main and pump station to address the capacity constraints. This included validating the design that was put forward in the IAF application. During this process the target LoS for the project area and new engineered overflow point was updated to not exceed an average of one spill per two years wet weather overflow frequency (2yr event).

This report describes the optioneering that was undertaken as part of the MCA process, including longlist development, shortlisting, MCA criteria and weighting, MCA scoring with specialist input, sensitivity testing, and post-workshop activities including identification of project risks. The result of this process is a highest scoring option, identification of project risks that affect this option and recommendation for further work to understand these risks and enable a preferred option to be adopted.

An initial longlist of improvement options was identified based on variables such as bypass cut in location and potential locations for a proposed pump station. The longlist also included the option to 'do nothing'. Options were modelled for a 1yr design event to assess performance, and ultimately how well each option met the LoS. Options that did not achieve the LoS or showed critical constraints were not carried forward to the shortlist.

Five options were shortlisted as possible solutions:

1. Bypass in High St. to pump station at Ewan Bridge
2. Bypass in Pretoria St. to pump station on Pretoria St.

3. Bypass in Pretoria St. to pump station at north Hutt Rec.
4. Bypass in Pretoria St. to pump station at south Hutt Rec.
5. Bypass in Potomaru St. to pump station at Ariki St. 2nd pump station at Ewan Bridge.

All options have been shown through hydraulic modelling to reduce uncontrolled overflows in a 2yr event throughout the northern and southern Riverlink catchments for the 2070 maximum predicted development (MPD) scenario.

A Multi-Criteria Analysis (MCA) process was used to assess the options against a set of criteria developed for this project. The main criteria were cost, ability to meet growth (MPD), Mana Whenua values, impacts on social and economy, and seismic and operational resilience. The scoring for Mana Whenua values was conducted by Taranaki Whānui, impacts on social and economy by Stantec's planner, and the remaining criteria by Holmes.

Following the MCA workshop, scores were reviewed and, in some cases, amended considering additional input from experts that were unable to be consulted prior. Sensitivity testing of the MCA scores was also conducted by altering the weighting of criteria. This was to understand the sensitivity of the results to different criteria weighting. This identified Option 2 as the highest scoring option. The Level 1, 95% cost estimate for this option is [redacted]

Following the workshop, operational risks were highlighted associated with options that connect to the Western Trunk Main. This resulted in updating the project risk register and a risk workshop, with representatives from the consultant team and Wellington Water, to understand these risks and others associated with the project. This workshop highlighted that Wellington Water continued to be uncomfortable with the operational risk associated with connecting to the Western Trunk Main, and additional upgrades may be required to mitigate these risks. This affected all options except Option 4, and it was concluded that these upgrades need to be understood to be able to compare the highest scoring option, Option 2, with Option 4 and recommend a preferred option.

Following risk workshop, additional work was carried out to identify and quantify the associated risks with connecting to the Western Trunk Main. Firstly, the modelling results from HAL were reviewed to identify the risks which were used to identify and confirm solutions to mitigate them. The solutions assessment identified three required updates to Option 2 to mitigate the operational risks associated with discharging to the Western Trunk Sewer. These were to upsize the Western Trunk Main, include real time controls (RTC) on the pump station, and increase the storage to 2ML. This updated Option 2, was renamed Western Trunk Main Option.

Following the identification of the proposed solutions, a cost and risk vs benefit comparison was completed between the Western Trunk Main Option, Option 4 and the do nothing option to identify a preferred option. From this the Western Trunk Main Option was identified as the preferred option due to being the most cost effective, with a 95th percentile cost of [redacted]

Endorsement of the preferred option was gained from COG and 3WDMC and it was recommended that this option should be taken forward to concept design. However, 3WDMC raised concerns that the cost of operating and maintaining the new infrastructure was unknown. Therefore, they also made a recommendation that an OPEX cost estimate be completed at concept design.

Following the endorsement of the preferred option, concept design was progressed. Additional modelling was complete by HAL to determine the design flows for preferred option, and these were used to develop the design. The alignment of the preferred option was developed and the locations fo the cut-ins, rising main, and EOP were refined. From this is was determined that to reduce the length of pipe required that the EOP was overflow from the High Street manhole instead of the pump station directly. Using this updated alignment and pipe levels, hydraulic modelling was completed to size the cut-in pipes and the EOP pipe, as well as determine the overflow level. The overflow level was designed so that the hydraulic grade did not exceed the expected max level in the Kings Crescent manhole to prevent spilling in the upstream network.

From the hydraulic modelling the overflow level was used to determine the depth required for the storage tank and pump station. The design of the schematic pump station and storage layout was also progressed. Due to the lack of space, a concrete storage tank was determined at the preferred storage option to reduce the required tank footprint and construction area.

The developed concept option was then presented in a SiD workshop held between representatives from COG, NET, Chief Advisor Wastewater, Growth Team, peer reviewer and consultant project team to review the proposed design and provide comments, particularly in relation to operation and maintenance considerations. A constructability workshop was also held between Holmes and Alta with an additional second meeting concentrating on the storage tank only, to discuss constructability considerations and identify risks. The comments from both reviews and workshops were incorporated into the concept design.

The concept drawings were then passed to Alta for a level 2 capex cost estimate, which gave a 95th percentile estimate of [redacted] including an allowance for property purchase. An opex cost estimate was also completed which estimated to be an average annual cost of [redacted].

This report recommends that a survey is carried out to confirm the levels of the existing services where the design ties-in. The hydraulic design should then be updated to reflect the confirmed levels. Further work is also recommended to develop the pump station layout from concept design and determine long term site plans. Including the option for a wetwell only pump station, tank construction methodology, and identify preferred properties for purchase.

Table of Contents

List of Tables

List of Appendices

1 Introduction

1.2 Project Location

This project is looking at the wastewater catchments located around Hutt Central, Wellington. These are identified as northern Riverlink and southern Riverlink in Figure 1, below. These catchments are part of the Hutt Valley wastewater network and ultimately drain to Seaview Wastewater Treatment Plant (WWTP).

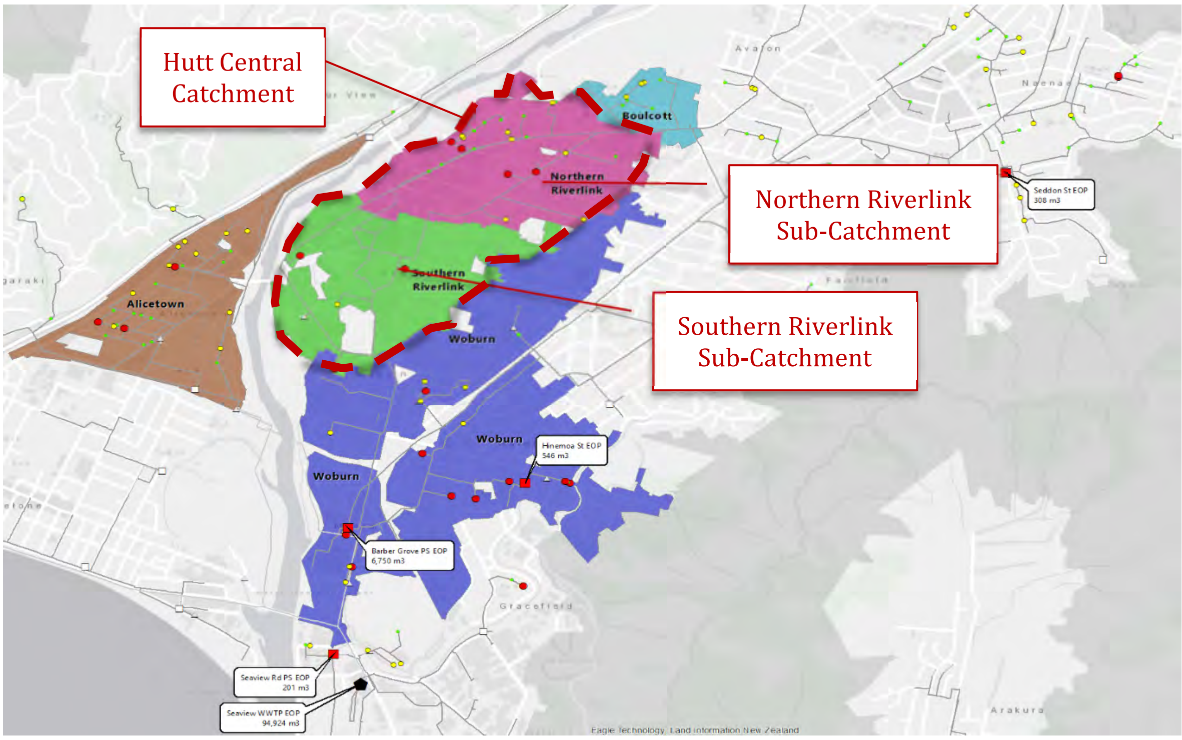


Figure 1 – Catchments around Hutt Central

1.3 Project Background

The existing and future predicted system performance and capacity within the Lower Hutt wastewater network has been investigated and summarised in reports produced by Hydraulic Analysis Limited (HAL) for Wellington Water Ltd (WWL): Lower Hutt Wastewater Network Option Assessment[1] (Sept. 2021) and Seaview Strategic Wastewater Model System Performance Assessment[2] (Mar. 2022). Potential upgrade options to address capacity issues were identified to enable growth and to mitigate existing network constraints to meet the targeted level of service.

HAL (2021) identifies Hutt Central as a priority area of Lower Hutt where there are currently capacity constraints. Modelling undertaking by HAL has shown that there are currently no dry weather flow (DWF) spills within the Riverlink area (based on model assumptions). However, network capacity is predicted to become severely constrained under DWF conditions by 2040, meaning that dry weather overflows may occur in the future because of growth if constraints are not mitigated. This is due to a predicted maximum probable increase in population of 12,841 across Hutt Central by 2070 (from

4,439 to 17,280), including 4,550 in Riverlink brownfield development in the northern and southern Riverlink catchments (HAL, 2021).

Table 1 summarises the predicted increase in wet weather uncontrolled spill frequencies, locations and volumes across the Seaview WWTP catchment.

Annual Spill Frequency Category	No. Spill Locations			Total Spill Volume (m^3)		
	Current	MPD	Change	Current	MPD	Change
≤ 0.5	239	239	0	570	380	-190
0.5 - 1	93	87	-6	1410	830	-580
1 - 2	82	107	25	3250	6680	3430
2 - 6	100	106	6	15660	19660	4000
6 - 12	21	28	7	9990	14690	4700
> 12	6	16	10	1820	39530	37710
Total > 0.5	302	344	42	32130	81390	49260

Table 1 – Predicted Increase in Uncontrolled Spill Frequencies, Locations and Volume

HAL (2021) identifies the following key wastewater mains (listed below) in Hutt Central are close to, or over capacity and are predicted to spill in an uncontrolled manner at various locations as demand increases associated with continued development and population. Figure 2 highlights the locations of these mains.

- Ludlam Crescent (600mm dia).
- Bellevue Road (450mm dia).
- Cornwall Street (300mm dia).
- Woburn Road (300mm dia).

The uncontrolled spilling is predicted to be at a frequency that would exceed the acceptable containment standard and thus the target level of service.

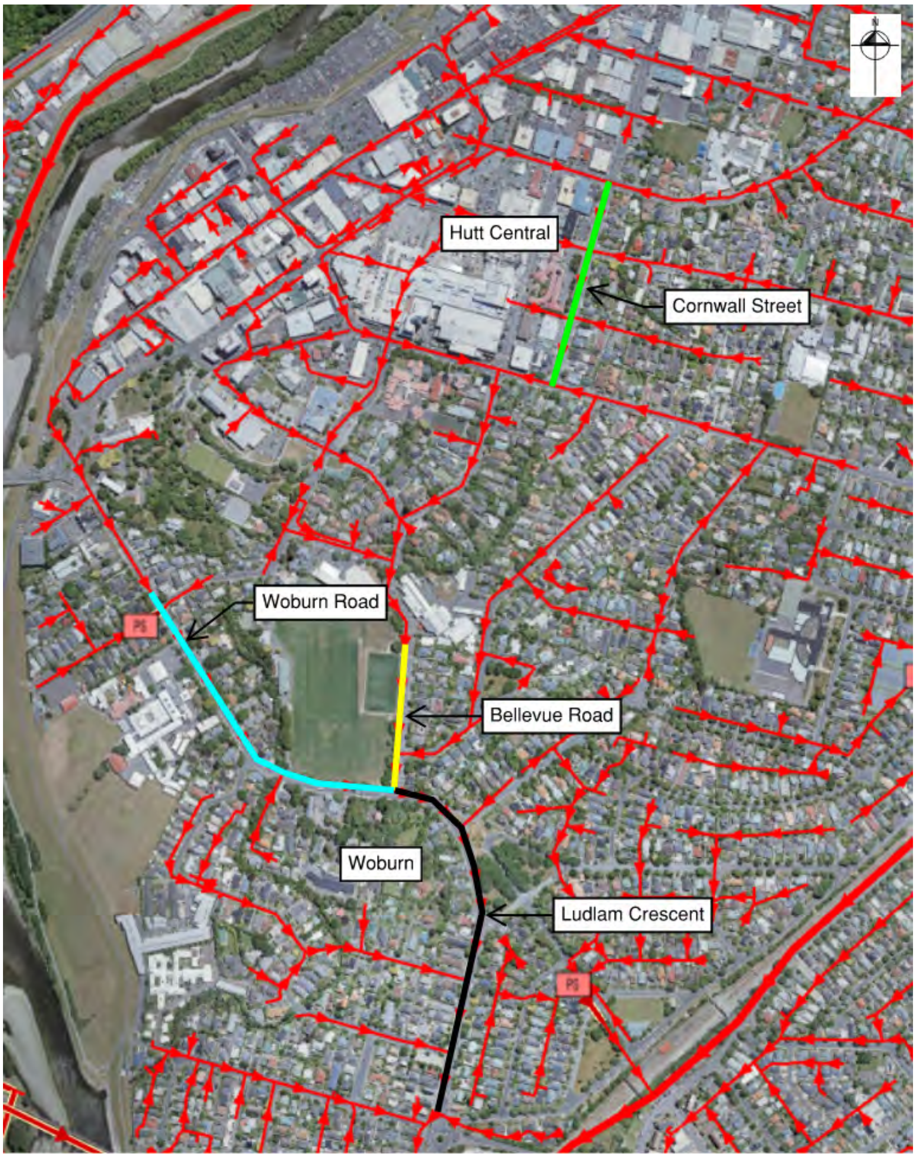


Figure 2 – Hydraulic Constraints in Hutt Central

To reduce the predicted increase in frequency and volume of overflows, and to address the current capacity issues, the wastewater network requires additional capacity and infrastructure that also increases the overall network resilience.

The Lower Hutt Network Options Assessment (HAL, 2021) commissioned by WWL outlined two possible network improvement options that could mitigate the effects of the expected growth. One of these options was selected and priced as part of HCC's August 2021 application for the Infrastructure Acceleration Fund (IAF). The requested funding was [redacted], with [redacted] being approved HCC's LTP for the project.

Due to the complexity of the network in the area, and large number of possible ways to relieve capacity in the network, WWL identified that an optioneering and multi criteria analysis (MCA) process should be completed to identify a preferred option to address the capacity constraints within the Northern Riverlink and Southern Riverlink area.

This report describes the optioneering that was undertaken as part of the MCA process, including longlist development, shortlisting, MCA criteria and weighting, MCA scoring with specialist input, sensitivity testing, and post-workshop activities including identification of project risks. The result of this process is a highest scoring option, identification of project risks that affect this option and recommendation for further work to understand these risks and enable a preferred option to be recommended.

1.4 Target Level of Service (LoS)

As advised by WWL during the Lower Hutt Network Options assessment (HAL, 2021), the primary and secondary customer outcomes and service goals associated with the project are:

Primary customer outcome		Outcome 3: Resilient networks support our economy
Primary goal		3.3 We plan to meet future growth and manage demand
Secondary customer outcome		Outcome 1: Safe and healthy water
Secondary goal		1.4 We minimise public health risks associated with wastewater and stormwater

Primary and secondary service goal objectives and performance measures associated with the project are:

Service objective: Water supply and wastewater services are planned to accommodate changes in demand and future growth

> **Performance measure:** Length of wastewater reticulation pipes in the Lower Hutt area predicted to be at less than 100% capacity during 1-year average return interval (ARI) overflow event.

Service Objective: The public is protected from direct exposure to untreated wastewater onto land.

> **Performance measure:** Reduction in volume of uncontrolled overflows in the Riverlink project area.

Considering the service objectives/performance measures, the target levels of service for the project were originally defined as:

- Uncontrolled overflows to not exceed an average of one spill per year wet weather overflow frequency (for the area serviced by Seaview Wastewater Treatment Plant).

- Overflows at constructed locations to not exceed an average of two spills per year wet weather overflow frequency (for the area serviced by Seaview Wastewater Treatment Plant).

Combining these led to a more succinct definition for the LoS as 'ability to reduce 2070 MPD network overflows across northern and southern Riverlink catchments, based on a 1yr containment standard'. The longlist options were modelled and assessed based on this LoS.

Following conversations with WWL on consenting, it was agreed that the LoS for the project should be for a 2yr containment standard (2yr ARI overflow frequency), i.e. overflows to not exceed an average of one spill per two years wet weather overflow frequency. The shortlist options were re-modelled to account for this change.

1.5 Overflow ARI and 'Design Event'

Wet weather overflows are a function of entire network performance, not just rainfall events. Wastewater systems can respond differently to a rainfall event depending on the antecedent conditions of the network. For example, a 6-month ARI rainfall event occurring at the end of an extended dry period may not affect the network as the ground is dry and absorbs the rainfall. However, if a similar event occurs when the ground is already saturated and the system/s capacity is exceeded, a wastewater overflow can occur.

In general, an overflow ARI is assessed using long-time series (LTS) simulations. This typically involves a simulation using a time series of measured rainfall data over a time period at least 6 times the target overflow frequency, e.g., at least a 6-year time period for a 1yr ARI target overflow frequency.

Due to the lengthy computation time associated with LTS simulations, 'design events' are typically accepted as a proxy of the network performance at a target containment standard. By adopting the appropriate initial conditions from the LTS, such an event (typically only a few days long) can be simulated with much less computation time required. This is particularly useful when testing and comparing the effects of many different improvement options, though results from a 'design event' are likely to be different to the performance predicted by a full LTS simulation.

To select a design event that corresponds to an overflow ARI, events are identified that produce a spill volume or spill peak flow that approximately correlate to the target overflow ARI at most predicted spill locations. This is based on ranking and calculating an associated ARI for each location predicted to spill in a LTS simulation.

The rainfall events occurring on the 12 March 2017 and 15 November 2016 were adopted as events that have the strongest correlation with the simulated 1yr ARI and 2yr ARI overflow (respectively) within the area of interest for this project (for both volume and peak flow).

For more information on the development of the model use in this project including assumptions and limitations refer to HAL (2021).

2 Scope of Design

This report covers the optioneering (Sections, 7, 8 and 9) and concept design (Section 10) of the project.

The scope of the design to support the optioneering process is as follows:

- Development of outline options for addressing capacity constraints.
- Hydraulic modelling to determine ability of options to meet level of service requirements.
- Geotechnical desktop assessment to support analysis of options.
- Archaeological desktop assessment to support analysis of options.
- Assessment of potential construction methodology to support cost estimates.

The scope of design to support the concept design of the preferred option is as follows:

- Development of preferred option alignment and drawings
- Design of schematic pump station and storage layout for preferred option.
- Hydraulic modelling of preferred option to size pipelines and EOP levels.
- Development of SiD and risk register for preferred option
- Updated cost estimate for preferred option.

3 Basis of Design

This project is based on the following documentation:

- The Project Activity Brief issued by WWL dated 20 January 2022
- Lower Hutt Wastewater Network Options Assessment, HAL 2021
- The Project Management Plan issued by Holmes dated March 2022
- Regional Standards for Water Services, 2021
- Regional Specification for Water Services, 2021
- Wellington Water and Hutt City Council (HCC) H&S Standards, Policies and Procedures.

4 Scope of Works

The optioneering scope covers the following work:

- Review of existing information

- Development of a longlist of options.
- Refining longlist to create a shortlist of options.
- Prepare outline design sketches for designs and high-level cost estimates for shortlisted options.
- Confirm feasibility and practicality of shortlisted options.
- Complete an MCA process to systematically score the shortlist options.
- Complete an MCA workshop to moderate scoring and identify a highest scoring option
- Update project risk register and complete a risk workshop to identify project risks
- Prepare and submit an Options Assessment Report summarising the outcome of the MCA process and investigations.

The development and endorsement of preferred option scope covers the following work:

- Detailed review of modelling results for highest scoring option to understand effect on operation of Western Trunk Main and Ava Pump Station
- Identifying options to mitigate increase in operational risk caused by discharging additional flow to Western Trunk Main from Hutt CBD
- Model options to understand effectiveness and identify the preferred
- Update cost estimate of highest scoring option to account for additional upgrades required to mitigate operational risk
- Compare updated highest scoring option to option that doesn’t discharge to Western Trunk Main
- Confirm with COG that operational risks raised have been mitigated and gain endorsement of preferred option
- Present preferred option to 3WDMC to gain endorsement to progress to concept design

The concept design scope covers the following work:

- Review of modelling results for preferred option to understand design flows for pump station and EOP.
- Concept design of offline storage tank and pump station design and proposed construction methodology.
- Model indicative pipeline location and levels for rising main, gravity cut-ins, and EOP.
- Hydraulic modelling to confirm pipe sizes and EOP levels.
- Update cost estimate for concept design based on produced drawings to reflect changes from previous design stage and updated information.

- Update of SiD risk register and subsequent SiD and constructability workshops to discuss proposed design and provide comments
- Review and update risk register for concept design

5 Existing Network Configuration

Figure 3 - Lower Hutt Wastewater Network (WWL GIS, 2022)

There are two wastewater trunk mains in the Hutt Valley that provide drainage for the majority of the suburbs of Upper Hutt and Lower Hutt. The Western Trunk Main takes flows from Upper Hutt and Stokes Valley and crosses Te Awa Kairangi Hutt River at Silverstream, where there is a 10ML storage tank for high flows, and an engineered overflow point. The Western Trunk Main then runs adjacent to the Hutt River on the west side of the valley and collects flow from the Western Hills suburbs, Melling and Alicetown before connecting to Ava pump station. Ava pump station pumps flows directly to Seaview wastewater treatment plant via Wainone Street bridge, with a high-flow pump pumping flows to Barber Grove pump station.

The Hutt Valley Main Sewer is located on the east side of the valley, approximately adjacent to the railway line, with the downstream end connecting to Barber Grover pump station. The Hutt Valley Main Sewer picks up flows from suburbs in the valley floor south of Stokes Valley and to the east of the Hutt River. A bifurcation chamber at the downstream end of Stokes Valley sends high-flows from the Western Trunk Main into the Hutt Valley Main Sewer when flows to Silverstream are restricted.

Barber Grove pump station pumps directly to Seaview wastewater treatment plant and has an engineered overflow point that discharges to the Hutt River. Due to no engineered overflow point at Ava pump station, high flows in the Western Trunk Main from the catchment above Silverstream are controlled by a valve on the Western Trunk Main. This is to protect Ava pump station from being overwhelmed by high flows, and allows the storage tank and engineered overflow point at Silverstream to be utilised as a preference to uncontrolled spilling around Ava pump station.

Hutt Central, which comprises the Northern Riverlink and Southern Riverlink catchments, drains to a wastewater main that runs along High Street from the north end of Epuni to Barber Grove pump station. This main drains parts of Epuni and Boulcott before running through Hutt CBD, picking up flows from the reticulation network within the CBD. South of the CBD it picks up flows from Woburn before connecting to the trunk main from Wainuiomata about 100 m upstream of Barber Grove pump station.

6 Site Investigations

6.1 Geotechnical Desktop Investigation

A geotechnical desktop study was undertaken by Holmes to understand ground conditions for each option. This was used to inform the construction costing exercise and to help assess, score effects on performance sub-criteria for each shortlisted option and identify project risks associated with ground conditions. The study found that the area encompassing the shortlisted options to be underlain by Holocene River Deposits comprising highly variable interbedded silt, sand, and gravel. General groundwater observations were that groundwater would be primarily associated with the unconfined Taitā Alluvium unit.

See full report attached in Appendix A.

6.2 Archaeological Assessment

An archaeological desktop assessment was completed to understand archaeological risk on the project. This included a review of desktop plans and literature, which indicated a high-density use of the project area in the latter half of the 19th century, with significant use of the wider Lower Hutt area in the preceding decades. Thus, there is likely extensive archaeological material in the area.

While the area has been heavily modified with the intense urban expansion of the Hutt valley in the early to mid-20th century, the likelihood of inground archaeology being present in all areas of the project is high.

It is recommended that the preferred option undertakes an Assessment of Archaeological Effects report, with the likely requirement of obtaining an Archaeological Authority from Heritage New Zealand.

As several the recorded archaeological sites are of Māori origin it is recommended that consultation with relevant mana whenua is undertaken for the project in an early and meaningful way. The full report is attached in Appendix G.

7 Longlist Assessment

7.1 Methodology

The Activity Brief provided by WWL for this project outlined the opportunity to provide a new wastewater bypass in the form of a new trunk main and/or new pump station to provide additional capacity to Hutt Central. The Brief excluded looking at upgrading the existing trunk mains as this was deemed unlikely to be effective in providing necessary capacity for a reasonable cost.

Given the flat topography of Hutt Central, a new trunk main without a pump station would appear to be unfeasible given its depth and length. The option put forward in the Brief was a cut-in to the existing network, a diversion to a new pump station and a discharge rising main to a downstream connection point.

In parallel with this scope of work, WWL are running an inflow and infiltration reduction programme across Hutt Central. The effectiveness of this programme was not considered in either the network modelling work undertaken to support optioneering or as a separate option.

Options were compared against the ‘do nothing’ option for uncontrolled spill reduction in a 1-year return period event.

7.1.1 ‘Do Nothing’ Scenario

All the longlisted options were assessed against the ‘do nothing’ scenario, which details simulated controlled and uncontrolled spilling for the ‘Maximum Probable Development’ (MPD) future development scenario modelled by HAL. This scenario is based on HCC population projection for 2051 and then extrapolated to 2070 for Hutt Valley and Wainuiomata; the catchment area serviced by Seaview WWTP. The simulated spilling is the output of running the Seaview Strategic Model with inputs based on water consumption and return to sewer flows, developed by HAL for each flow gauge catchment. The model was run for both dry and wet weather flows, first for a 1yr event and then for a 2yr event. These scenarios were based on assumptions that accounted for the existing network as of 2022 plus upgrade works currently underway. When run for the MPD future development scenario the output is comparative to ‘doing nothing’. The results for simulated uncontrolled spilling for the Riverlink North and South catchments (summarised in Table 2 below) in the ‘do nothing’ scenario form the basis for comparison of all longlist options.

Event	1yr ARI		2yr ARI	
Catchment	North	South	North	South
Simulated Uncontrolled Spilling (m^3)	880	910	1660	1640

Table 2 – 'Do Nothing' Simulated Uncontrolled Spilling Results (HAL, 2022)

Given the service objectives and performance measures set out in the activity brief by WWL and that 'do nothing' clearly does not align with these, the option was ruled out in the longlist to shortlist assessment as being viable.

7.2 Identification of Longlist Options

The key variables that went into longlist identification included:

- Cut-in location of where the bypass will divert flows from the existing network mains. Location of cut-in is significant as it will determine whether enough flow is diverted to prevent downstream unplanned overflows;
- Location of any potential new pump station(s);
- Downstream re-connection location; and
- Pipe alignment between cut-in, pump station and re-connection point, including river crossing.

7.2.1 Cut-in Location

Various locations for initial cut-in locations were considered and assessed on their effectiveness on how well they met the performance measures. Secondary cut-ins were modelled for options along pipe alignments to ensure maximum spill reduction were achieved for catchments.

Several initial cut-in options were considered including:

- No cut-ins upstream of proposed pump station;
- Cut-in to the High Street and/or Kings Crescent mains in the south of Riverlink area;
- Cut-in to the High Street and/or Kings Crescent mains in the north of Riverlink area; or
- Cut-in to the High Street and Kings Crescent main junction north of the Riverlink area

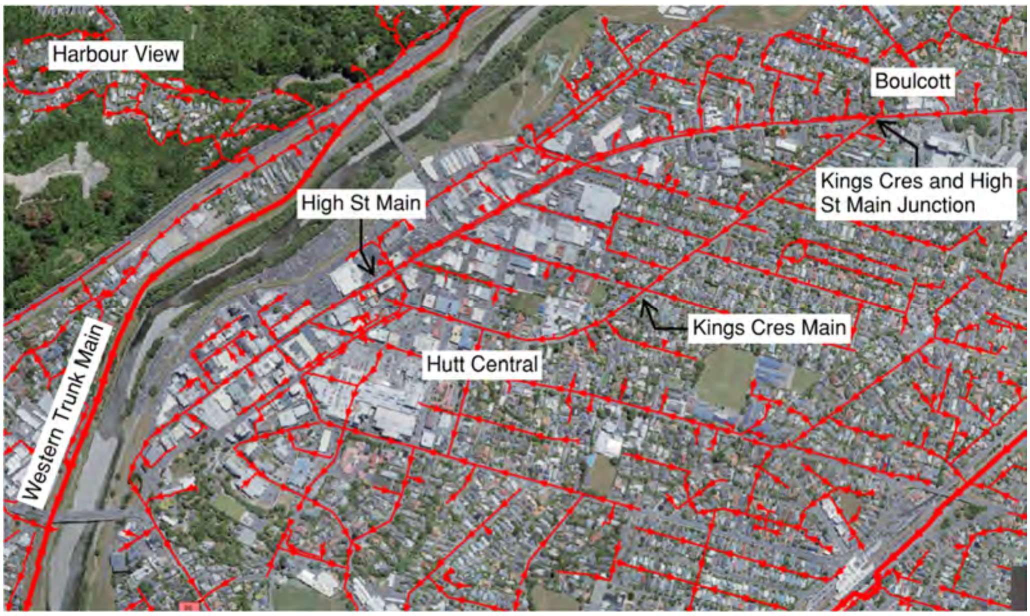


Figure 4 - Identification on Mains Proposed to Cut Into

7.2.2 Pump Station Site Identification

It was identified that storage would be needed as part of a viable solution, thus requiring a pumping station, and rising main to convey wastewater once stored. A suitable area for a pump station and storage would be approximately 690m^2 (30m x 23m) and be located within the Hutt Central area to keep the amount of gravity main required, and thus pump station depth, to a minimum. Proximity to the Riverlink development area was also considered based on the opportunity to tie works in with the Riverlink project.

Multiple pump station location options were identified in the Riverlink area based on the existing and future land available of sufficient size. An approximate size for the pump station of 30.0 m by 23.0 m was used to accommodate the pump station, 600m^3 storage and maintenance access. The following general areas were considered when identifying locations:

- Existing council owned greenfield land – parks/reserves etc.
- Council owned land being repurposed as part of the Riverlink project.
- Identified locations where land could be purchased.

Potential locations for new pump stations were then narrowed down by their proximity to the wastewater mains to be cut into, space available to accommodate the pump station infrastructure and storage tanks and overall pump station depth so not to breach the Waiwhetu aquifer.

7.2.3 Re-Connection Location

Ultimately, any solution would need to connect into the existing network, ideally at a point where there is capacity to convey predicted additional flows from Hutt Central area and is in relatively close proximity to the development area. The Western Trunk Main was identified as the closest large diameter main to the development area so potential routes to cross Te Awa Kairangi to connect into the main were identified.

Further to this, existing pump stations were considered for locations to connect to the network as an opportunity to potentially utilise existing storage. Despite not being close to the development site, Barber Grove was identified as a potential pump station for connection considering upgrade works that are currently underway to improve storage at the station and conveyancing capacity to Seaview WWTP.

7.2.4 Pipe Alignment

From the identified new pump station locations, discharge points, and upstream cut-in points numerous different options were compiled, and pipe layouts determined. Different pipe alignments were considered including running the pipes along the main roads in Lower Hutt CBD, running pipes in the suburbs outside of the main CBD area, and running the pressure main along the Hutt River stopbank.

7.3 Longlist Options

The longlist options can be grouped into five categories based on their pump station locations:

1. Pump station located at the southern end of High Street which is to be closed off as part of the Riverlink works.
2. Pump station located on Hutt Recreation Reserve.
3. Pump station located on a property on Pretoria Street.
4. Pump station located in the Melling Link stub which is to be closed off as part of the Riverlink project works – this location is to be a carpark for [redacted].
5. Pump station located in the [redacted] near Ariki Street to the north of Hutt Central.

For these pump station locations, different cut-in locations and discharge points, and thus, different sub-options, were identified, as set out below.

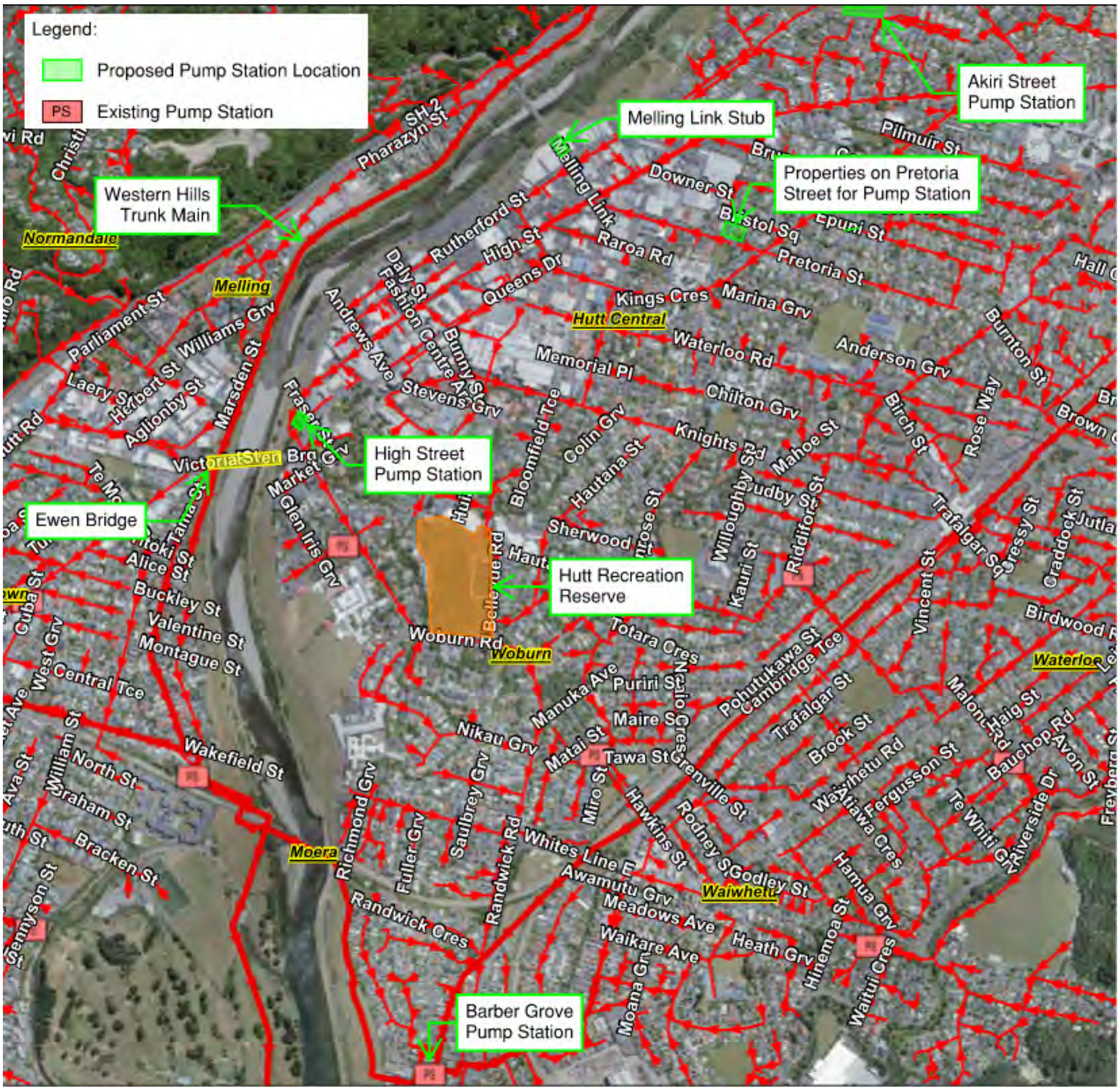


Figure 5 - Potential Pump Station Locations

1. High Street Pump Station

a. Cut-in to main at Melling Road and include side connections to service the Riverlink Development. Rising main crosses Ewen Bridge connecting to Western Trunk Main in Railway Avenue.

b. Cut-in to King Crescent sewer main at Cornwall Street and Queens Drive and rising main across Ewen Bridge connecting to Western Trunk Main in Railway Ave.

c. Cut-in to King Crescent sewer main at Cornwall Street and Queens Drive. Rising main connects directly to Barber Grove pump station along the Hutt River stock bank.

d. Existing main connects directly to new pump station. Rising main runs from pump station across Ewen bridge connecting to Western Trunk Main in Railway Avenue.

e. Cut into High Street main and King Crescent main at Brunswick Street and connect rising main across Ewen Bridge to Western Trunk Main in Railway Avenue. (Original IAF application option).

f. Cut into High Street main and King Crescent main at Pretoria Street and run the rising main across Ewen Bridge to Western Trunk Main in Railway Avenue.

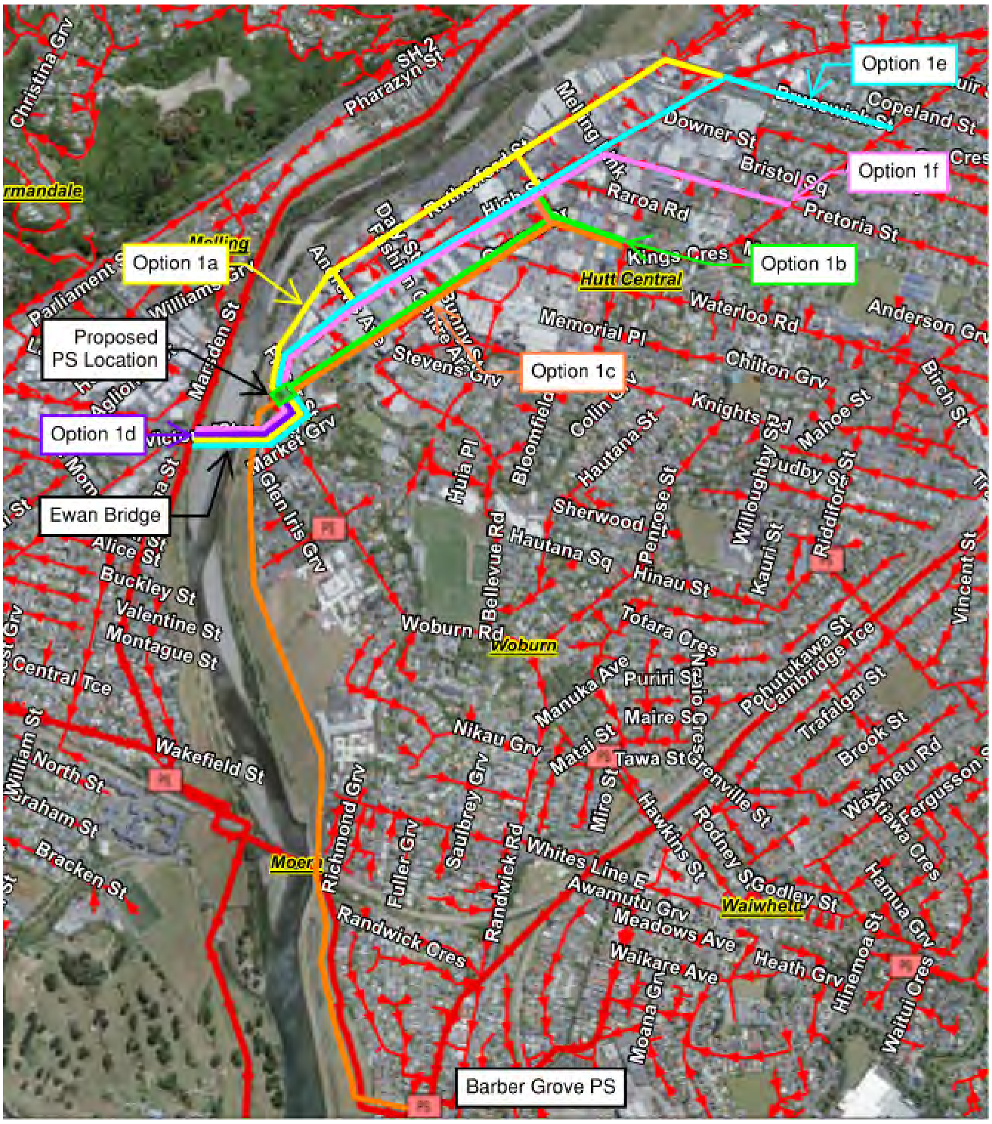


Figure 6 – Longlist Options Group 1

2. Hutt Recreation Reserve Pump Station

a. Cut into High Street main at Daly Street and King Crescent main at Bloomfield Terrace and rising main directly to Barber Grove pump station.

b. Cut into High Street and Kings Crescent main at Pretoria Street and rising main across Ewen Bridge to Western Trunk Main in Railway Avenue.

c. Cut into Hight Street and Kings Crescent main at Pretoria Street and rising main directly to Barber Grove pump station.

d. No cut into existing main upstream of the Hutt Reserve pump station. Rising main directly to Barber Grove pump station.

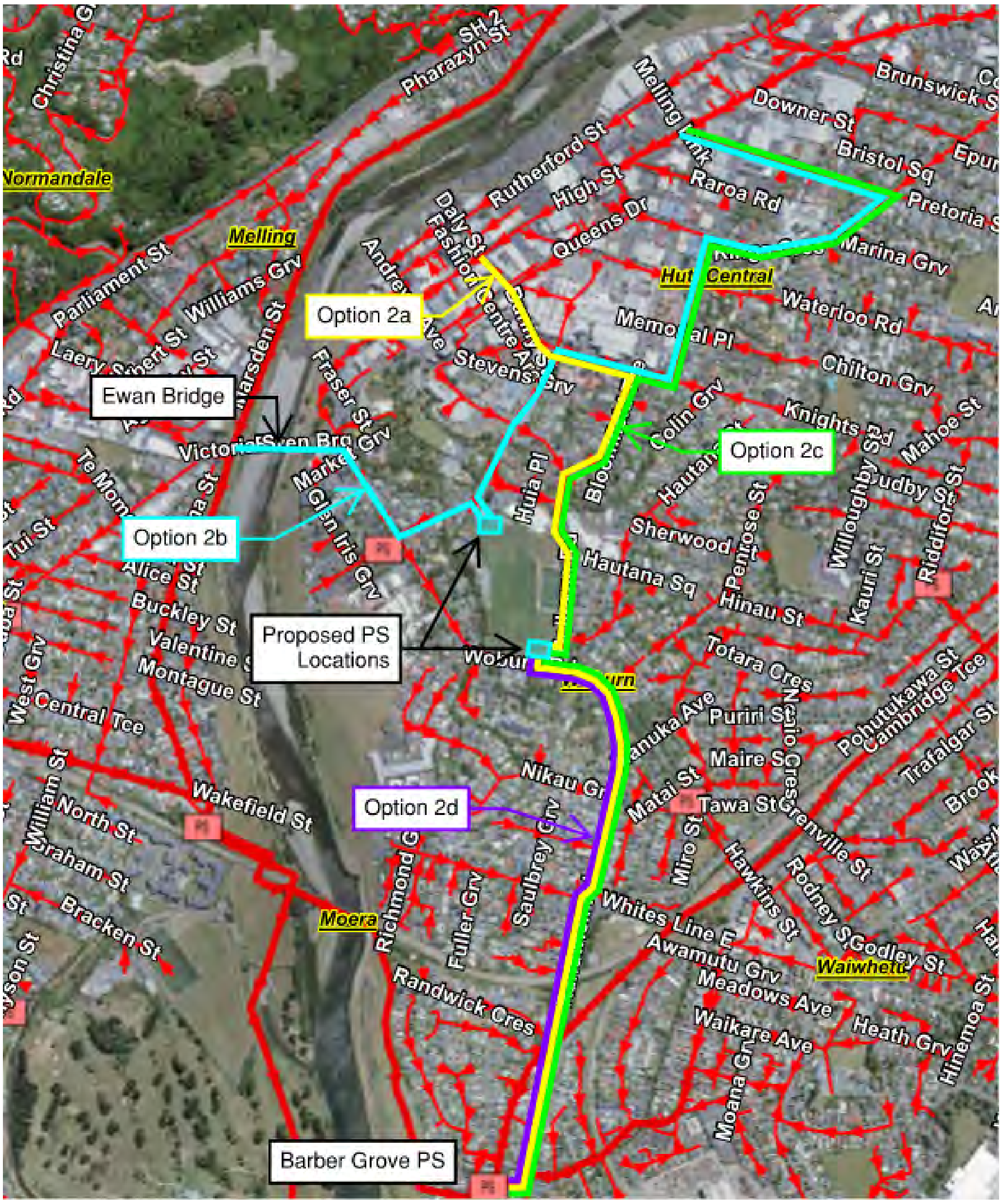


Figure 7 - Longlist Options Group 2

3. Pretoria Street Pump Station

a. Cut into High Street and Kings Crescent main at Pretoria Street and rising main across either the new Melling road or pedestrian bridge to connect into the Western Trunk Main.

Figure 8 - Longlist Options Group 3

4. Melling Link Stub Pump Station

a. Cut into High Street and Kings Crescent main at Pretoria Street and rising main across either the new Melling Road or pedestrian bridge to connect into the Western Trunk Main.

b. Cut into Hight Street and Kings Crescent main at Pretoria Street and rising main across Ewen Bridge to Western Trunk Main in Railway Avenue.

Figure 9 - Longlist Options Group 4

5. **Ariki Street Pump Station**

    a. Cut into main at High Street and Kings Crescent junction and rising main across either the new Melling road or pedestrian bridge to connect into the Western Trunk Main. Pump station at High Street stub with rising main connecting to Western Trunk Main across Ewen Bridge.

    b. Cut into main at High Street and Kings Crescent junction and drill rising main under river and connect to the Western Trunk Main.

Figure 10 - Longlist Options Group 5

7.4 Longlist to Shortlist Assessment

The initial longlist of options was sent to HAL for hydraulic performance analysis. The results of the analysis were assessed to confirm the feasibility of the different options and eliminate any that did not achieve the targeted level of service, or those with critical constraints.

Using the process outlined above, the longlist of options was reduced to a shortlist. The shortlist is comprised of Long List Options 1e, 3a, 2b, 2c, and 5a & b – which have been renumbered as Options 1, 2, 3, 4, and 5a & b, respectively. Refer to Appendix C for longlist options modelling results and Table 3 for summary of long list modelling results.

Following a discussion around Riverlink construction completion dates, Option 4a was replaced by 3a and subsequently referred to as Option 2 in the shortlist. The decision to do so was made to ensure the shortlisted option would better align the deliverables of the wider Riverlink project. This was deemed appropriate as both options performed equally in terms of reduction in uncontrolled spilling. The only parameter separating the two options was the location of the pump station.

		Change in Total Uncontrolled Spilling (m^3)[1]		
Upgrade Option	**HAL Reference**	**Northern Riverlink**	**Southern Riverlink**	**Shortlisted**
MPD (do nothing)	MPD	*880*	*910*	
1a	AAA	-590	-910	
1b	AAB	-120	-910	
1c	AAC	-120	-910	
1d	AAD	-100	-880	
1e	AAG	-870	-910	✓
1f[2]	AAH	-770	-910	
2a	AAI	-60	1,470	
2b	AAN	-770	-910	✓
2c	AAO	-770	-870	✓
2d	AAE	190	5,130	
3a	AAJ	-770	-910	✓
4a[3]	AAJ	-770	-910	
4b	-	-	-	
5a	AAM	-730	-890	✓
5b	AAM	-730	-890	✓

Table 3 - Summary of Longlist Modelling Results

[1] Change in spilling relative to the do nothing option.

[2] Option 1f is similar in nature to Option 1e, but performs slightly worse, so Option 1e was adopted as the shortlisted option.

[3] Option 4a was originally considered on the shortlist but was replaced due to programme constraints with Riverlink.

Reviewing the reduction in spill volume (compared to do nothing) served to quickly rule out options that did not perform sufficiently as ‘fatally flawed’ as they clearly would not meet the LoS. This definitively ruled out options that increased spilling (2a and 2d) as well as those providing only a small amount of reduction (1b, c and d). Though not fatally flawed, 1a was deemed not to make the cut as the reduction in spilling fell outside the range of the shortlisted options, all of which provide a reduction greater than 90% of the predicted ‘do nothing’.

8 Shortlist Assessment

Shortlisted options derived from the longlist are described in detail below. The modelling for these options was re-run using a 2yr event and thus based on a 2yr containment standard.

8.1 Shortlist Options

The shortlisted options are outlined in more detail below. Pricing information was supplied by Alta Consulting (refer cost estimate in Appendix B).

Option	Description
1 (Longlist Option 1e)	Bypass in High Street to P.S. at Ewan Bridge (Option used in IAF application), connect to Western Trunk Main
2 (Longlist Option 3a)	Bypass in Pretoria Street to P.S. on Pretoria Street, connect to Western Trunk Main
3 (Longlist Option 2b)	Bypass in Pretoria Street to P.S. at north end of Hutt Recreation Ground, connect to Western Trunk Main
4 (Longlist Option 2c)	Bypass in Pretoria Street to P.S. at south end of Hutt Recreation Ground, connect to Barber Grove Pump Station
5a (Longlist Option 5a)	Bypass in Potomaru Street to P.S. at Ariki Street. 2nd P.S. at Ewan Bridge, connect to Western Trunk Main
5b (Longlist Option 5b)	Bypass in Potomaru Street to P.S. at Ariki Street. Rising main drilled under Te Awa Kairangi. 2nd P.S. at Ewan Bridge, connect to Western Trunk Main

Table 4 – Summary of Shortlist Options

After receiving a second round of feedback from Taranaki Whānui dated 25/08/2022, Option 5b to drill under Te Awa Kairangi was disregarded as a viable option. Refer Appendix E for feedback letters.

8.2 Shortlist Options

8.2.1 Option 1

Description

Cut into the existing WW mains at High Street and Kings Crescent junctions with Brunswick Street and install 1.9 km of 450 mm dia. sewer along High Street to a new 100 L/s pump station with 600 m^3 of storage at the southern end of High Street. Install 290m new rising main from the pump station across Ewan Bridge to connect into the exiting Western Trunk Main in Railway Ave. 60m of 375mm dia. overflow pipework to Te Awa Kairangi.

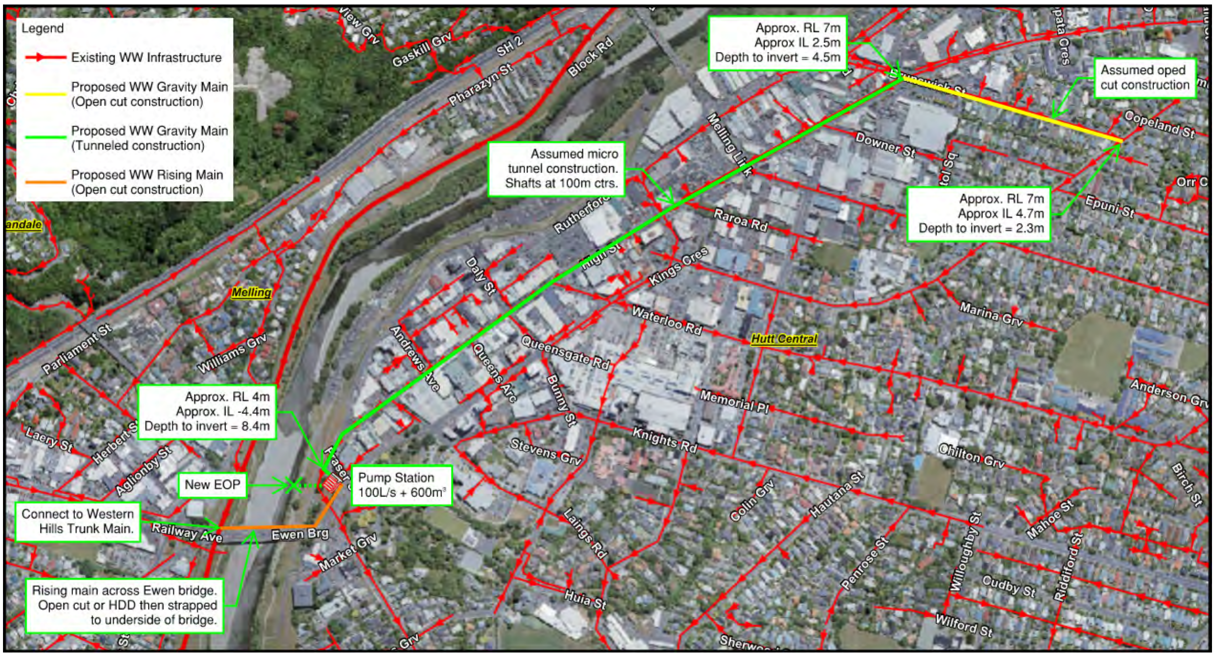


Figure 11 – Option 1

Capital Cost Estimate

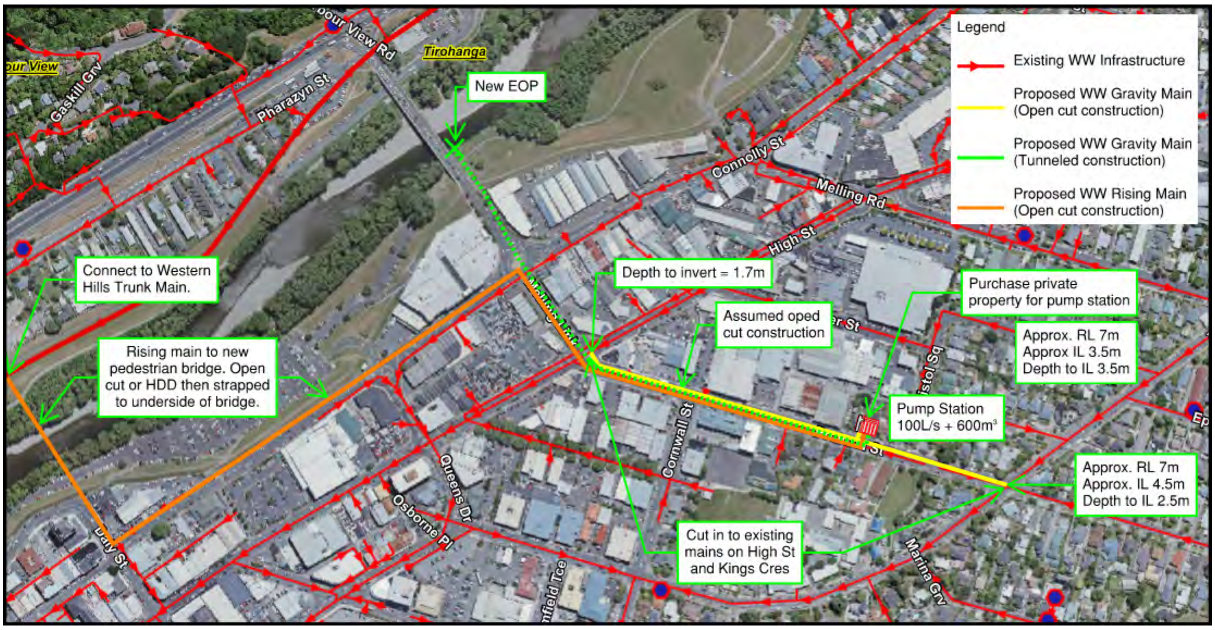
95% Level 1 estimate: [redacted]

Uncontrolled Spill Reduction (2yr event): 2,930m^3 (relative to do nothing)

8.2.2 Option 2

Description

Cut into the existing mains at High Street and Kings Crescent junctions with Pretoria Street and install 650 m of 375 mm dia. sewer along Pretoria St and Melling Link to a new 100 L/s pump station with 600 m³ storage on Pretoria Street, requiring the purchase of private property(s). Install 440 m of rising main from the pump station along Rutherford Street and across either the new Melling road or pedestrian bridge to connect into the Western Trunk Main. 560m of 375mm dia. overflow pipework along Pretoria Street and Melling Link to an engineered overflow point (EOP) at Te Awa Kairangi.



New EOP

Connect to Western Hills Trunk Main.

Rising main to new pedestrian bridge. Open cut or HDD then strapped to underside of bridge.

Depth to invert = 1.7m

Assumed oped cut construction

Purchase private property for pump station

Approx. RL 7m
Approx IL 3.5m
Depth to IL 3.5m

Pump Station
100L/s + 600m³

Approx. RL 7m
Approx. IL 4.5m
Depth to IL 2.5m

Cut in to existing mains on High St and Kings Cres

Figure 12 - Option 2

Capital Cost Estimate

95% Level 1 estimate: [redacted]

Uncontrolled Spill Reduction (2yr event): 2,520m³ (relative to do nothing)

8.2.3 Option 3

Description

Cut into existing mains at High Street and Kings Crescent junctions with Pretoria Street and install 1.7km of 450 mm dia. sewer main from Pretoria Street along Cornwall Street, Knights Road, and Myrtle Street to a new 200 L/s pump station with 600 m³ of storage at the northern end of the Hutt Recreation Ground. Install 685 m of rising main along Myrtle Street and Woburn Road, and across Ewen Bridge to connect into the exiting Western Trunk Main in Railway Ave. 530m of 450mm dia. overflow pipework along Myrtle Street and St. Albans Grove to an engineered overflow point (EOP) at Te Awa Kairangi.

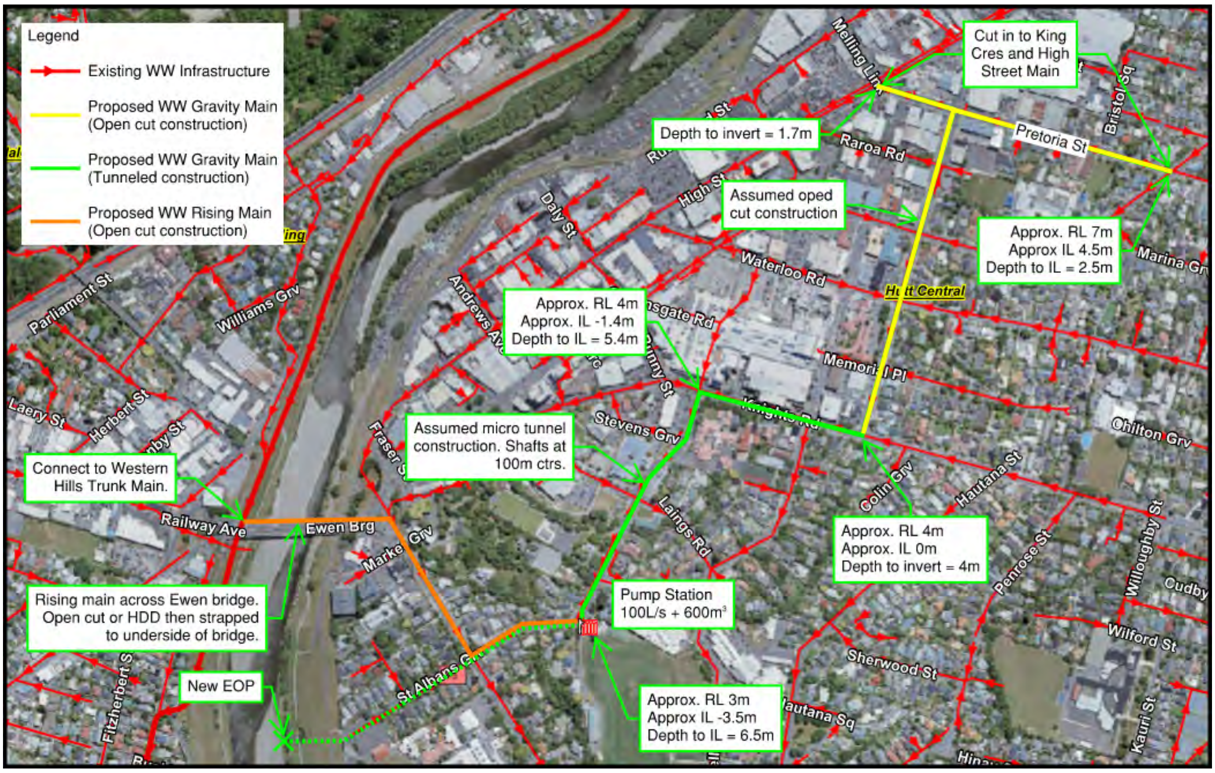


Figure 13 - Option 3

Capital Cost Estimate

95% Level 1 estimate: [redacted]

Uncontrolled Spill Reduction (2yr event): 2,520m³ (relative to do nothing)

8.2.4 Option 4

Description

Cut into existing mains at High Street and Kings Crescent junctions with Pretoria Street and install 1.8 km of 450 mm dia. sewer main from Pretoria Street, along Cornwall Street and Bloomfield Terrace to a new 200 L/s pump station with 600 m³ storage at the southern end of Hutt Recreation Ground. Install 1.35 km of rising main along Ludlam Crescent and Randwick Road to connect to the existing Barber Grove pump station. 765m of 450mm dia. overflow pipework along Woburn Road and St. Albans Grove to an engineered overflow point (EOP) at Te Awa Kairangi.

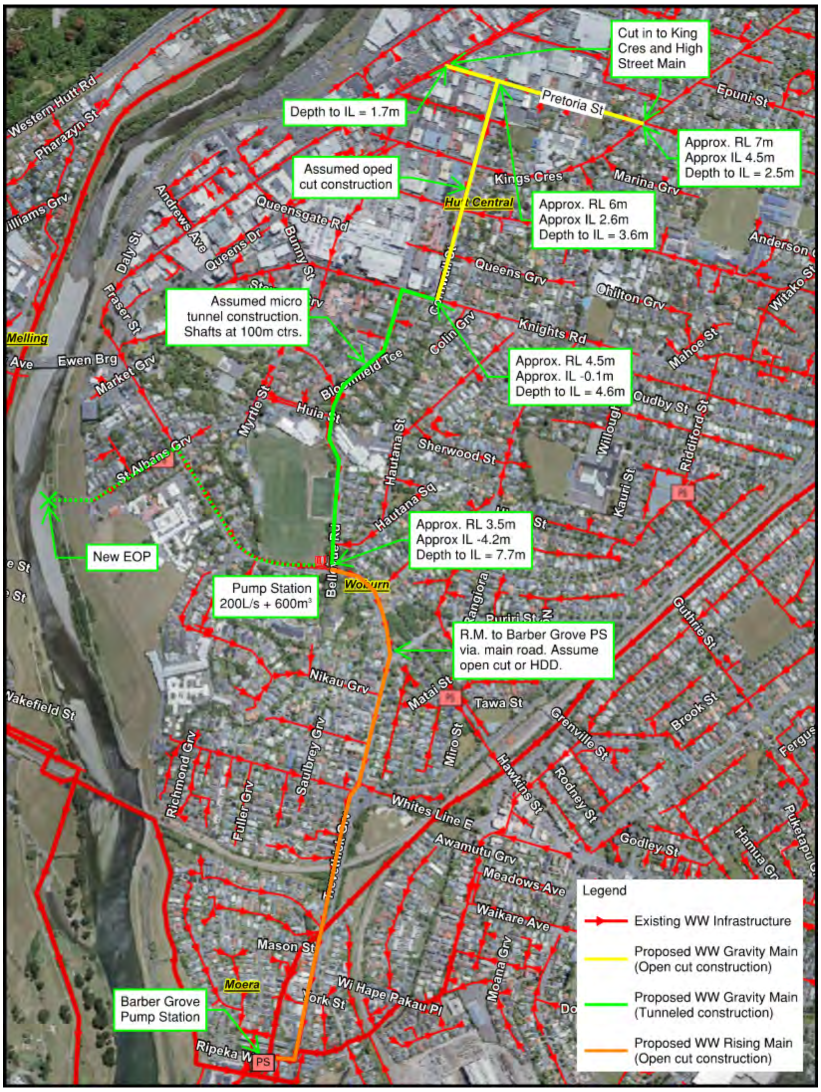


Figure 14 - Option 4

Capital Cost Estimate

95% Level 1 estimate: [redacted]

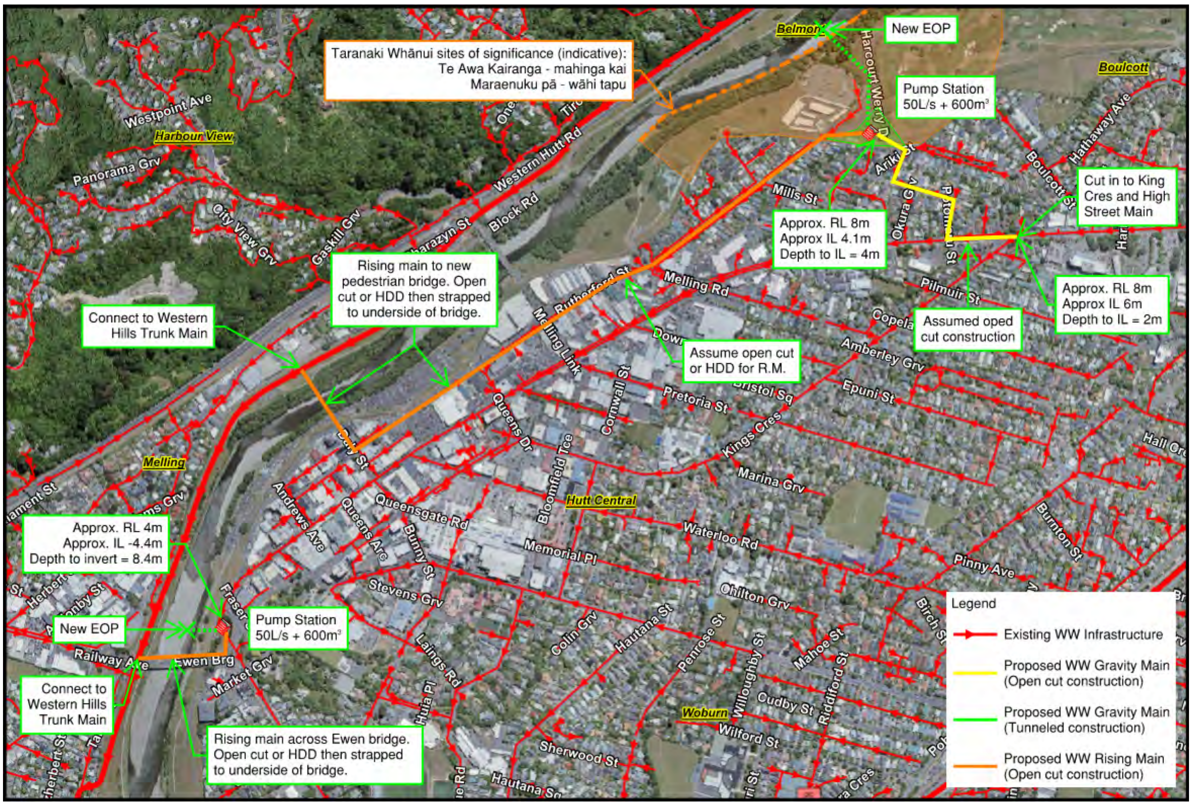
Uncontrolled Spill Reduction (2yr event): 2,000m^3 (relative to do nothing)

8.2.5 Option 5

Description

Cut into existing main at High Street and Kings Crescent junction and install 450 m of 450 mm dia. sewer main from Kings Crescent along Potomaru Street and Ariki Street to a new 50 L/s pump station at Ariki Street Install 1.3 km of rising main from the pump station along Connolly Street and Rutherford Street and across either the new Melling road or pedestrian bridge to connect into the Western Trunk Main. 285m of overflow pipeline adjacent to Harcourt Werry Drive to an engineered overflow point (EOP) at Te Awa Kairangi. An alternative option to drill rising main under river and discharge to Western Trunk Main was originally considered and priced though after receiving feedback from Taranaki Whānui this was disregarded as a viable option. Refer Appendix E for feedback letters.

New 50 L/s pump station with approximately 600m^3 storage at the southern end of High Street. Install 290 m new rising main from the pump station across Ewan Bridge to connect into the exiting Western Trunk Main in Railway Ave. 60m of 375mm dia. overflow pipework to an engineered overflow point (EOP) at Te Awa Kairangi.



Taranaki Whānui sites of significance (indicative): Te Awa Kairanga - mahinga kai Maraenuku pā - wāhi tapu

New EOP

Pump Station 50L/s + 600m^3

Cut in to King Cres and High Street Main

Approx. RL 8m Approx IL 4.1m Depth to IL = 4m

Approx. RL 8m Approx IL 6m Depth to IL = 2m

Assumed oped cut construction

Rising main to new pedestrian bridge. Open cut or HDD then strapped to underside of bridge.

Connect to Western Hills Trunk Main

Assume open cut or HDD for R.M.

Approx. RL 4m Approx. IL -4.4m Depth to invert = 8.4m

New EOP

Pump Station 50L/s + 600m^3

Connect to Western Hills Trunk Main

Rising main across Ewen bridge. Open cut or HDD then strapped to underside of bridge.

Figure 15 - Option 5

Capital Cost Estimate

95% Level 1 estimate: [redacted]

Uncontrolled Spill Reduction (2yr event): 2,290m^3 (relative to do nothing)

8.3 Optimisation

Optimisation of Option 1 was undertaken by HAL to investigate the effect on performance that providing additional storage would have. This was run based on a 2yr event and thus providing a 2yr containment standard. 600m^3 of storage addressed uncontrolled spilling across Riverlink North and South whilst providing a 2yr containment standard at the pump station though increased uncontrolled spills in Alicetown. It was found that increasing the storage to 2400m^3 the same containment standard was provided and did not increase uncontrolled spilling in Alicetown. This did however increase overflow at Barber Grove PS. 3600m^3 of storage would be required to also not increase overflows at Barber Grove PS. Providing a similar amount of storage to each of the shortlist options would provide similar benefits, opening the potential to investigate optimal spill reduction vs. investment for whichever option is taken forward as the preferred.

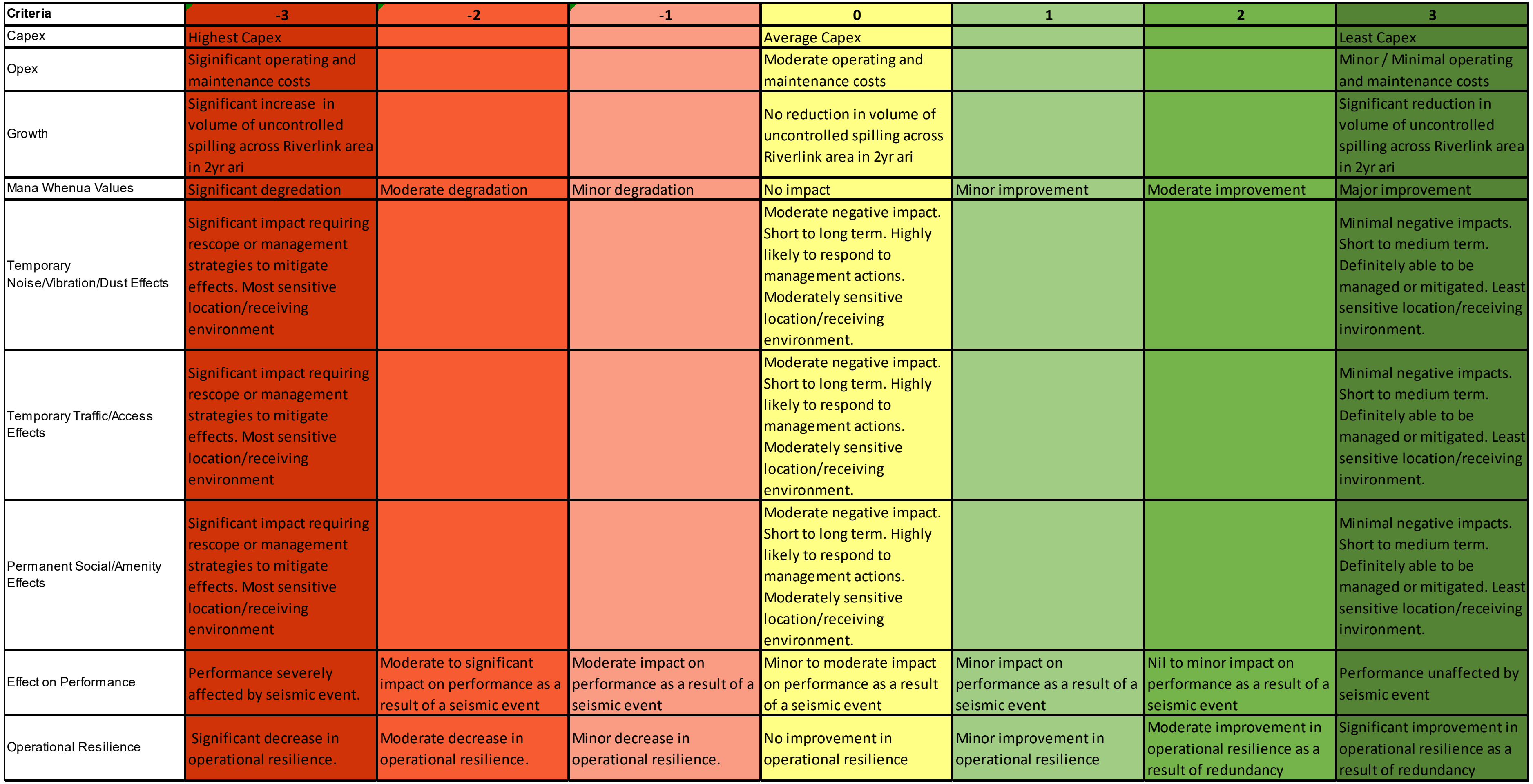
8.4 Multi-Criteria Assessment of Shortlisted Options

An MCA was completed on the shortlisted options to identify a highest scoring option.

The criteria and the base weightings that were developed for the MCA are shown in Table 5. The weightings were subsequently discussed and agreed in the MCA Workshop dated 15 August 2022. Table 6 details the scoring scale applied to each criterion.

Criteria	**Sub-Criteria**	**Description**	**Weighting (%)**
Cost	Capex	Capital cost	15
	Opex	Operation & maintenance over 50 years	5
Growth	N/A	Ability to meet 2070 MPD	20
Mana Whenua Values	N/A	Effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa	15
Social & Economic Effects	Temporary construction effects (Noise / Vibration / Dust)	Impact on everyday life of public and business owners	10
	Temporary construction effects (Traffic / Access)		10
	Permanent social/amenity effects	Effects on social/amenity that will be permanent rather than temporary	10
Resilience	Effect on performance	Resilience to ground shaking from siesmic event	7.5
	Operational resilience	Operational resilience as a result of redundancy	7.5
			100

Table 5 – MCA Criteria and Weightings



Criteria	-3	-2	-1	0	1	2	3
Capex	Highest Capex			Average Capex			Least Capex
Opex	Siginificant operating and maintenance costs			Moderate operating and maintenance costs			Minor / Minimal operating and maintenance costs
Growth	Significant increase in volume of uncontrolled spilling across Riverlink area in 2yr ari			No reduction in volume of uncontrolled spilling across Riverlink area in 2yr ari			Significant reduction in volume of uncontrolled spilling across Riverlink area in 2yr ari
Mana Whenua Values	Significant degredation	Moderate degradation	Minor degradation	No impact	Minor improvement	Moderate improvement	Major improvement
Temporary Noise/Vibration/Dust Effects	Significant impact requiring rescope or management strategies to mitigate effects. Most sensitive location/receiving environment			Moderate negative impact. Short to long term. Highly likely to respond to management actions. Moderately sensitive location/receiving environment.			Minimal negative impacts. Short to medium term. Definitely able to be managed or mitigated. Least sensitive location/receiving invironment.
Temporary Traffic/Access Effects	Significant impact requiring rescope or management strategies to mitigate effects. Most sensitive location/receiving environment			Moderate negative impact. Short to long term. Highly likely to respond to management actions. Moderately sensitive location/receiving environment.			Minimal negative impacts. Short to medium term. Definitely able to be managed or mitigated. Least sensitive location/receiving invironment.
Permanent Social/Amenity Effects	Significant impact requiring rescope or management strategies to mitigate effects. Most sensitive location/receiving environment			Moderate negative impact. Short to long term. Highly likely to respond to management actions. Moderately sensitive location/receiving environment.			Minimal negative impacts. Short to medium term. Definitely able to be managed or mitigated. Least sensitive location/receiving invironment.
Effect on Performance	Performance severely affected by seismic event.	Moderate to significant impact on performance as a result of a seismic event	Moderate impact on performance as a result of a seismic event	Minor to moderate impact on performance as a result of a seismic event	Minor impact on performance as a result of a seismic event	Nil to minor impact on performance as a result of a seismic event	Performance unaffected by seismic event
Operational Resilience	Significant decrease in operational resilience.	Moderate decrease in operational resilience.	Minor decrease in operational resilience.	No improvement in operational resilience	Minor improvement in operational resilience	Moderate improvement in operational resilience as a result of redundancy	Significant improvement in operational resilience as a result of redundancy

Table 6 – MCA Scoring Scale

8.4.1 Cost

Capital Cost (CAPEX)

For scoring the capital cost of each of the short-listed options, first the maps detailing the proposed alignments for gravity and rising mains and locations of pump station(s) were sent to Alta Consulting. The approximate depths at proposed cut in points to existing mains was taken from WWL GIS and included on the mapping. Assuming a constant grade of 0.5% for gravity mains and utilising the contour information also on GIS, information on approximate depth to base of pump station(s) and incoming gravity main(s) was also provided.

Alta have completed a bottom-up estimate for the works using bench marking of rates used on similar projects in the Wellington region and indexing rates and prices from previous years to a 2022 base date. Alta have not allowed for cost escalation in the future.

From the level one costing provided by Alta, the 95th percentile estimate was used to determine the scoring for each option. Due to the large difference between the lowest and highest cost, the approach used to score each option was that the most expensive would score lowest and the least expensive score highest. A linear interpolation was applied to score the remaining options.

Several assumptions were made by Alta in providing costing, such as open cut construction for pipework less than 4.5 m deep and trenchless construction for pipework deeper than 4.5 m.

Refer to Alta’s memo in Appendix B for a more detailed explanation and analysis of assumptions and costings.

Operational Cost (OPEX)

Scoring for operational costs is based on giving a higher score for lesser operational costs and a lower score for higher operational costs. The assumption pre workshop was that these costs would be associated with the running and maintenance of pumps.

New information received provided clarity to the assumption that operational costs are associated with the operation and maintenance of pumps but also will be dictated by the ease of access to pumps, storage and mains. These factors were considered and qualitative scoring completed for each option.

8.4.2 Growth

Initially, modelling was conducted for a 1yr design event to determine the total volume of uncontrolled spilling across the Riverlink north and south catchment areas.

As previously stated, it was decided that modelling should account for a 2yr design event. The modelling for the shortlisted options was rerun on this basis.

To score the criteria for the MCA workshop, the output volumes from the hydraulic modelling produced by HAL for each of the 5 options was compared (refer Appendix C for detailed hydraulic modelling results). A higher score was given for the options providing the most reduction in uncontrolled spilling within the northern Riverlink and southern Riverlink catchments whereas the lowest score would be given for an increase in spilling.

8.4.3 Mana Whenua Values

WWL sought input from Taranaki Whānui as iwi with mana whenua status in the area.

The initial response from Taranaki Whānui was that it is recognised that reducing wastewater overflows into Te Awa Kairangi (Hutt River) and Te Whanganui a Tara (Wellington Harbour) is of importance. Further to this, Taranaki Whānui stated that there is no inherent opposition to the provision of additional wastewater infrastructure at the early scoping phase.

Attention was drawn to the accidental find of a partially completed waka buried 4.5 m deep into the bank of Te Awa Kairangi. It is of significant importance to Taranaki Whānui that the project team is cognisant of disturbance of land along the true left side of the river around this location.

Taranaki Whānui have requested that they are kept up to date on any findings through further investigation (e.g. archaeological assessment) and will be appropriately engaged with should an archaeological authority application be prepared. As also requested, further updates will be provided to Taranaki Whānui at significant project milestone stages.

A pre-workshop information pack was sent to Taranaki Whānui via TW Engagement at WWL dated 27 July 2022 including an updated shortlist options maps with pipe alignments and pump station locations.

Taranaki Whānui were asked to review the five shortlist options and provide commentary and scoring for the Mana Whenua criteria. As part of the information pack details were given on how the options could be scored based on an objective scale of -3 for significant degradation/negative impact to +3 for major improvement/positive impact, a 0 translating to no change/impact.

Feedback provided remains in line with the original stance that Taranaki Whānui do not oppose in principle the provision of additional wastewater infrastructure, though it was added that this stance is based on an outcome of improving the quality of discharges to Te Awa Kairangi (Hutt River) and Te Whanganui a Tara (Wellington Harbour), both sites of significance to Taranaki Whānui.

Scoring for the five options was also provided and is detailed in section 8.3.3 Mana Whenua Values Final Score. Refer Appendix E for Taranaki Whānui response letter dated 25 August 2022.

8.4.4 Social and Economy

Mapping of alignments for the shortlist options was used by the Stantec Planner to assess the temporary and permanent social and economic impacts on everyday life of the public and business owners within the project vicinity. The assessment criterion was broken down into three sub-criteria:

1. Noise, Vibration and Dust (temporary);
2. Traffic and Access (temporary); and
3. Social and Amenity (permanent).

The assessment of the options and thus scoring undertaken by Stantec was based on a review of the areas encompassing the option alignments using Google Maps. The proposed alignments assessed covered the gravity sewer mains, pump station and storage locations, rising mains and overflow pipelines.

For scoring the sub-criteria, a scale of lowest score (-3) for significant impact requiring rescope or management strategies to mitigate effects / most sensitive receiving environment' and highest score (+3) for 'minimal negative Impacts, able to be managed or mitigated / Least sensitive environment' was used.

Some key evaluation assumptions have been made, such as that all constructed overflows will be to Te Awa Kairangi and that there is no discernible difference between the impact of open cut construction compared to tunnelled construction. Refer to the memo in Appendix D for a more detailed explanation of assumptions, methodology and scoring.

8.4.5 Resilience

To assess the resilience of each option, a comparison of total length of asset, depth of asset and asset located in seismic risk zones was made. This was done using information taken from WWL GIS, as well as overlaying the alignments for each option onto the seismic risk mapping from GWRC GIS. A geotechnical desktop investigation was conducted by Holmes to help inform the scoring for this criterion. It was found that ground conditions across the different option alignments were consistent enough not to affect the scoring.

The pre workshop provisional scoring was based on giving the option with longest amount of asset, the most amount of asset at depth greater than 4.5 m and most amount of asset in high-risk seismic zone the lowest score, and the highest score for shortest amount of asset, least amount of asset at depth greater than 4.5 m and least amount of asset in high-risk seismic zone. The remaining options were scored based on the lengths in each category.

8.5 MCA Workshop Scoring

An MCA workshop was held at WWL's office on 15 August 2022. This was attended by members of WWL, their legal counsel (Dentons), Hutt City Council, the peer reviewer (Mott MacDonald), Stantec Planning Team, Alta Consulting and Holmes.

Scoring each criterion was led by a specialist, with the provisional results brought to the workshop for discussion. April Peckham from Stantec completed scoring for Social and Economic Effects. [redacted] from Holmes completed the scoring for Resilience. Alta Consulting provided inputs to the cost estimate. HAL provided hydraulic modelling results to inform Growth. Scoring for Cost and Growth was then done by Holmes ([redacted]) with these inputs.

The agreed scores for each criterion from the MCA workshop are shown in Table 7. The overall score is a product of the agreed weighting and the score for each criterion. The detail of the scoring for each criterion is discussed in the following sections of this report.

	Cost		Growth	Mana Whenua Values	Social & Economic Effects			Resilience	Overall
	Capex	Opex			Noise / Vibration / Dust	Traffic & Access	Permanent Social / Ameity	Ground Shaking	
Weight	15%	5%	20%	15%	10%	10%	10%	15%	100%
Option 1	-3	0	2		-2	-1	2	-1	-0.30
Option 2	3	0	0		1	1	3	2	1.25
Option 3	-1	0	-1		-1	-1	-3	-1	-1.00
Option 4	-2	0	-3		-2	1	-1	-3	-1.55
Option 5	2	-1	-2		0	2	-2	3	0.30

Table 7 – MCA Workshop Scores

8.6 Post MCA Workshop

8.6.1 Meeting with Customer Operation Group (COG)

Meetings were held with [redacted] (Customer Planning Engineer – Utilities (Regional) at WWL) on 18/08/22 and [redacted] (Customer Planning Engineer - East at WWL) and [redacted] (Customer Services Engineer at WWL) on 30/08/22 to gain a better understanding of the operations and maintenance requirements associated with Hutt Valley wastewater network at present and into the future. Further to this, input from WWL Customer Operations Group also highlighted that there are current capacity issues with the Western Trunk Main.

At present, flow control is in place at Silverstream to prevent overflows at Ava pump station. Ava pump station has a high-flow emergency pump to Barber Grove. However, if incoming flow exceeds the current pumping capacity, the pump station does not have a constructed overflow point so overflows in an uncontrolled manner, flooding neighboring properties. It was also noted that the condition of the Western Trunk Main is poor with some valves not having been operated in 20 years.

The current HCC Long Term Plan[3] has the Western Hills Main Sewer Renewal project budgeted at $61.4M, programmed to begin in 2038/39 and run for six years.

In contrast, Barber Grove pump station and rising main is currently undergoing an upgrade to provide additional capacity and resilience. The pump station also has an engineered overflow point allowing controlled discharge. These current characteristics of the network are the reason for the preference from COG to avoid the Western Trunk Main (and thus Ava pump station).

8.6.2 Cost Scoring Details

Option	Cost Estimate (95th Percentile)
1 - P.S. at Ewan Bridge	[redacted]
2 - P.S on Pretoria Street	[redacted]
3 - P.S. at North Hutt Rec.	[redacted]
4 - P.S. at South Hutt Rec.	[redacted]
5 - P.S. at Ariki St. & at Ewan Bridge	[redacted]

Table 8 – Post Workshop Cost Estimates

Capex Scoring

MCA Workshop Score						
-3	-2	-1	0	1	2	3
Option 1	Option 4	Option 3			Option 5	Option 2

Following the MCA workshop the options were updated to show a route for the engineered overflow point from each pump station to the Hutt River and re-costed.

Due to constraints around delivery for construction of the new Melling road bridge meaning that the bridge cannot be relied on for connecting a rising main to, alternative routing to use the proposed pedestrian bridge for crossing the river has been adopted, along with the purchase of private property to locate the pump station originally proposed at what would be the redundant stub of the existing Melling Bridge. Taking these factors into consideration, the costing for options affected were updated (Options 2 & 5). This led to an increase to the 95th percentile estimate for Options 2 & 5 of approx.[redacted]and[redacted]respectively. Alta's cost estimates were used to support the costing exercise.

The updated costs were used to revaluate the scoring.

Post Workshop Score						
-3	-2	-1	0	1	2	3
Option 1	Option 4	Option 3			Option 5	Option 2

Refer Appendix B for details supporting the cost estimates.

Opex Scoring

Following the workshop, conversations with WWL made it clear that although an original assumption that the majority of maintenance and operational costs are associated with the pumps in general was partially correct, ease of access to pump station(s) and mains will also affect the cost of maintenance. For example, if no off-road parking is provided to access the pump station then traffic management would be required for regular operational access adding to cost.

In general, pump stations require at least one inspection a week and in some cases two. Further to this, it is common practice that pump stations are cleaned once or twice a year requiring access for a vacuum-truck. Gravity mains also require access for flushing to maintain full capacity. This tends to be required more frequently in areas with high fats, oils and grease associated with eateries and dining, such as Hutt CBD, and is more difficult, and therefore expensive, to do when access is hindered by parking, for example. Rising mains also require flushing though tend to be lower maintenance than gravity mains.

Scoring for the Opex sub-criterion was reviewed and revised considering the new information received from WWL.

	-3	-2	-1	0	1	2	3
Workshop:			Option 5	Options 1 - 4			
Post Workshop:	Option 1	Option 4	Options 3 & 5	Option 2			

Option 1 scored -3 as access to maintain any new main in High Street would be very restricted and disruption to businesses would be significant. Access to the pump station would also likely be limited at times.

Option 2 scored 0 as the location of pump station would be good in terms of gaining 24/7 access. Access to any new main for maintenance could be problematic, though would be less restricted.

Option 3 scored -1 as pump station access would be hindered due to numerous clubs etc in the vicinity. There would also be moderate disruption to these clubs. Access for maintenance of mains would also be hindered due to parking.

Option 4 scored -2 as there are significant lengths of both gravity and rising main, which access to could be restricted at times. However, access to the pump station would not be too much of an issue.

Option 5 scored -1 as access to the High Street pump station would likely be limited at times, however access to the pump station at Ariki St is not likely to be an issue. There is a short length gravity main away from CBD so access is likely to be unhindered. This option does propose two pump stations so would incur additional operational and maintenance costs compared to other options.

8.6.3 Growth Scoring Detail

	MCA Workshop Score						
	-3	-2	-1	0	1	2	3
	Option 4	Option 5		Options 2 & 3			Option 1
Reduction:	2000m^3	2290m^3		2520m^3			2930m^3

After the MCA workshop it was agreed that the Growth scoring did not entirely reflect the objective definitions, i.e., lowest score for ‘strong, negative impact for the criteria or measure’ to highest score for ‘strong, positive impact for the criteria or measure’ as all options provide a positive impact to some degree. Therefore, the scoring has been altered to better reflect this by not applying a negative score or a score of zero to any of the options.

	Post Workshop Score						
	-3	-2	-1	0	1	2	3
					Options 4 & 5	Options 2 & 3	Option 1
Reduction:					2000m^3 & 2290m^3	2520m^3	2930m^3

Refer Appendix C for details on hydraulic modelling results.

8.6.4 Mana Whenua Values Scoring Details

Scoring of the options against this criterion was carried out by Taranaki Whānui as set out in Appendix E (letter dated 25 August 2022). Options 1, 2, 3 & 5 were given a score of -1 and in general the feedback was that it is preferable (to Taranaki Whānui) that wastewater is kept away from, and does not traverse, the awa and mahinga kai. A score of -3 was given to the alternative rising main location for Option 5 (5b) as drilling under Te Awa Kairangi is considered to have a more negative impact. This alternative option was subsequently disregarded as a viable solution and thus excluded from the overall scoring. Option 4 scored +3 as this option was considered to have a strong positive impact as there is no proposal for wastewater to cross Te Awa Kairangi.

-3	-2	-1	0	1	2	3
Option 5b (drill under Te Awa Kairangi)		Options 1, 2, 3 & Option 5a				Option 4

Refer Appendix E for details of Taranaki Whānui feedback.

8.6.5 Social and Economy Scoring Details

Scores were reviewed following the MCA workshop as it was discussed that the effects of vibration between open trench construction and tunnel construction would be similar for both. The effects for the alignment of the overflow pipeline and odour associated with a pump station were also considered for the social / amenity sub criterion post MCA workshop. Alignments of the rising main for Options 2 & 5 were also amended due to the timing conflict associated with construction of the New Melling road bridge. These new alignments were considered post MCA workshop in re-evaluating scoring.

Noise, Vibration and Dust

	-3	-2	-1	0	1	2	3
Workshop:		Option 4	Options 1 & 3	Option 5	Option 2		
Post Workshop:		Option 4	Options 1, 3 & 5	Option 2			

Traffic and Access

	-3	-2	-1	0	1	2	3
Workshop:			Options 1 & 3	Option 5	Option 2	Option 4	
Post Workshop:		Option 4	Options 1, 3 & 5	Option 2			

Social / Amenity

	-3	-2	-1	0	1	2	3
Workshop:		Option 3	Option 4 & Option 5 (Ariki St. PS)			Option 1 & Option 5 (Ewan Br. PS)	Option 2
Post Workshop:		Options 2 & 3	Option 4 & Option 5 (Ariki St. PS)			Option 1 & Option 5 (Ewan Br. PS)	

It is concluded that, overall, option 2 has the associated least impacts, both temporary and permanent, and option 4 the most. Refer Appendix D for full report and more detailed explanations of assumptions, methodology and effects scoring.

8.6.6 Resilience Scoring Details

MCA Workshop Score						
-3	-2	-1	0	1	2	3
Option 4		Options 1 & 3		Option 2	Option 2	Option 5

Following the MCA workshop, the criterion was split into two sub-criteria, one to score the effect on performance because of a seismic event and one to score the effect on operational resilience as a result of redundancy (weighed evenly). See respective scales for these sub-criteria:

Effect on Performance

-3	-2	-1	0	1	2	3
Significant impact on performance as a result of a seismic event	Moderate to significant impact on performance as a result of a seismic event	Moderate impact on performance as a result of a seismic event	Minor to moderate impact on performance as a result of a seismic event	Minor impact on performance as a result of a seismic event	Nil to minor impact on performance as a result of a seismic event	Performance unaffected by seismic event.

Operational Resilience

-3	-2	-1	0	1	2	3
Significant decrease in operational resilience.	Moderate decrease in operational resilience.	Minor decrease in operational resilience.	No improvement in operational resilience	Minor improvement in operational resilience as a result of redundancy	Moderate improvement in operational resilience as a result of redundancy	Significant improvement in operational resilience as a result of redundancy

To assess the ‘effect on performance’ sub criterion the same information was used as previous (length of asset etc.) though in addition to this, whether an option proposed to cross a river attached to a structure was also considered as this would increase the impact because of a seismic event. In assessing the effect on performance consideration was also given to the fact that the Western Trunk Main runs across the Wellington Fault Line (refer Figure 16) and would likely be heavily damaged in a seismic event.

Figure 16 – Wellington Fault Line

Seismic event effect on Performance Score:

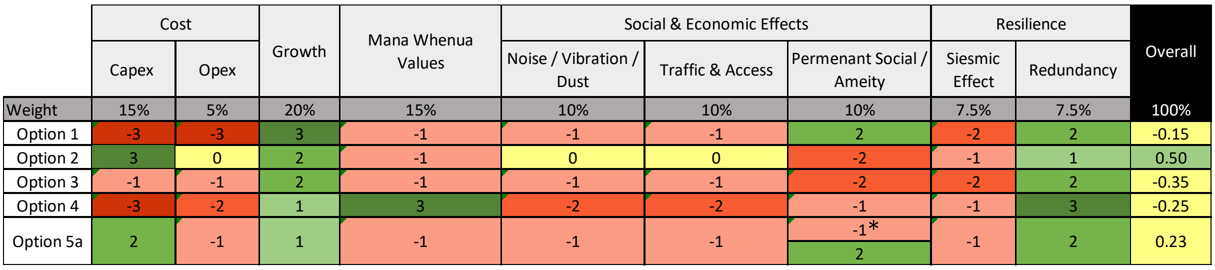
-3	-2	-1	0	1	2	3
	Options 1 & 3	Options 2, 4 & 5				

Operational Resilience Score:

-3	-2	-1	0	1	2	3
				Option 2	Options 1, 3 & 5	Option 4

Refer Appendix E for seismic risk mapping.

8.7 Post MCA Workshop Score Summary



	Cost		Growth	Mana Whenua Values	Social & Economic Effects			Resilience		Overall
	Capex	Opex			Noise / Vibration / Dust	Traffic & Access	Permenant Social / Ameity	Siesmic Effect	Redundancy	
Weight	15%	5%	20%	15%	10%	10%	10%	7.5%	7.5%	100%
Option 1	-3	-3	3	-1	-1	-1	2	-2	2	-0.15
Option 2	3	0	2	-1	0	0	-2	-1	1	0.50
Option 3	-1	-1	2	-1	-1	-1	-2	-2	2	-0.35
Option 4	-3	-2	1	3	-2	-2	-1	-1	3	-0.25
Option 5a	2	-1	1	-1	-1	-1	-1* 2	-1	2	0.23

* Option 5 proposes two pump stations; a score is given for each pump station site. The weighting is split between the sites for this criterion.

Table 9 – Post Workshop Scores

8.8 Sensitivity Analysis

A sensitivity analysis was undertaken following the MCA workshop to test how sensitive the results were to different weighting of criteria. Six sensitivity scenarios were undertaken. These were:

1. Assuming a preference towards capex cost by increasing the capex cost weighting to an upper limit of 60%;

2. Assuming a preference to exclude capex cost by setting capex weighting to 0%;

3. Assuming a preference towards growth by increasing the growth weighting to an upper limit of 60%,

4. Assuming a preference towards Social and Economic effects by increasing the combined effects weighting to an upper limit of 60%, evenly distributed between the three sub-criteria.

5. Assuming a preference towards permanent effects by increasing the weighting for permanent effects to 20% and decreasing the weighting for both temporary effects criteria to 5%; and

6. Assuming a preference towards Mana Whenua values by increasing the Mana Whenua values weighting to an upper limit of 60%.

Table 10 shows the weighting used for each of the sensitivity scenarios

Criteria	Sub-Criteria	Base Weighting (%)	Cost Preference (%)	Exclude Cost (%)	Growth Preference (%)	Effects Preference (%)	Perm. Effects Preference (%)	Mana Whenua Preference (%)
Cost	Capex	15.0%	45.0%	0.0%	7.5%	7.5%	15.0%	6.5%
	Opex	5.0%	15.0%	6.9%	2.5%	2.5%	5.0%	2.5%
Growth	N/A	20.0%	14.3%	21.9%	60.0%	15.0%	20.0%	14.4%
Mana Whenua Values	N/A	15.0%	9.3%	16.9%	10.0%	10.0%	15.0%	60.0%
Social & Economic Effects	Noise / Vibration / Dust (Temporary)	10.0%	4.3%	11.9%	5.0%	20.0%	5.0%	4.4%
	Traffic / Access (Temporary)	10.0%	4.3%	11.9%	5.0%	20.0%	5.0%	4.4%
	Social / Amenity (Permanent)	10.0%	4.3%	11.9%	5.0%	20.0%	20.0%	4.4%
Resilience	Effect on performance	7.5%	1.8%	9.4%	2.5%	2.5%	7.5%	1.9%
	Operational resilience	7.5%	1.8%	9.4%	2.5%	2.5%	7.5%	1.9%
		100%	100%	100%	100%	100%	100%	100%

Table 10 – Sensitivity Scenario Weighting

Summary	Base	Cost Preference	Exclude Cost	Growth Preference	Effects Preference	Perm. Effects Preference	Mana Whenua Preference
Option 1	-0.15	-1.46	✓ 0.28	✓ 1.40	✓ 0.05	0.15	-0.44
Option 2	✓ 0.50	✓ 1.46	0.03	1.23	0.03	0.30	-0.21
Option 3	-0.35	-0.58	-0.28	0.80	-0.70	-0.45	-0.58
Option 4	-0.25	-1.41	0.18	0.43	-0.78	-0.15	✓ 1.52
Option 5	0.23	0.75	-0.10	0.58	-0.10	✓ 0.38	-0.40

Table 11 – Sensitivity Analysis Results

Table 11 shows the results from the sensitivity analysis. This demonstrates that Option 2 is highest scoring on a cost preference basis. However, when considering an exclusion of capex or preference towards growth, Option 1 is the highest scoring. Option 4 scores highest based on a preference towards Mana Whenua values, and though Option 1 also scores highest on an effects preference basis, the difference in score between Options 1 and 2 is too small to differentiate Option 1 as a true highest scoring option. Option 5 scores highest when there is a preference towards permanent effects.

8.8.2 Commentary on Cost Preference

The current approved budget in the HCC LTP for this project is [redacted]. Therefore, there is a strong driver for HCC and WWL to have an option that within or as close to this target cost as possible. Should the cost increase, then additional funding would need to be requested through HCC's LTP process and this would be at the detriment of other projects. This may cause a delay in the project timeline while waiting for additional funds.

This scenario was considered by increasing the cost weighting to 60%.

The preference towards cost and in turn a lower cost option is clearly demonstrated with the significant reduction in overall score for Options 1 and 4, which both scored a -3 for the cost criterion, and an increase for Options 2 and 5.

	Option 1	Option 2	Option 3	Option 4	Option 5
Base	-0.15	0.50	-0.35	-0.25	0.23
Cost +	-1.46	1.46	-0.58	-1.41	0.75

Option 2 remains the highest scoring in this scenario, thus should remain the highest scoring option overall.

8.8.3 Commentary on Excluding Cost

Excluding capital cost from the assessment assumes that budget will be made available at whatever level required for the highest scoring option. The preference is towards non-financial outcomes as the main project drivers.

Under this scenario, Option 1 becomes the highest scoring option, primarily because it scores relatively well in the Growth criteria and in the Permanent Effects criteria.

	Option 1	Option 2	Option 3	Option 4	Option 5
Base	-0.15	0.50	-0.35	-0.25	0.23
Cost -	0.28	0.03	-0.28	0.18	-0.10

For an MCA to exclude cost, there needs to be a strong project driver for non-financial outcomes, and options that are significantly different that drive the project towards non-financial outcomes. In this instance, the main elements across all options – gravity diversion pipe, pump station and rising main – are the same, so there is no strong separation between options that drive non-financial outcomes. Also, the spread in cost between options is high, almost double in some cases, so excluding cost in an MCA assessment that does not have a strong non-financial outcome does not appear to be valid in this case.

It can be concluded that excluding cost should be discounted, hence Option 2 remains the highest scoring option.

8.8.4 Commentary on Growth Preference

A preference towards the Growth criteria means a preference towards maximising the reduction in amount of uncontrolled spilling in the Northern and Southern Riverlink catchments. Option 1 performs the best, reducing spilling by 2,930m^3. Option 2 & 3 are second equal with a reduction of 2,520m^3. The result for this sensitivity scenario is shown below.

	Option 1	Option 2	Option 3	Option 4	Option 5
Base	-0.15	0.50	-0.35	-0.25	0.23
Growth +	1.40	1.23	0.80	0.43	0.58

The difference in spill reduction between Option 1 and Options 2&3 is around 16% or around 400m^3. This difference is relatively small and does not significantly separate Option 1 from Options 2&3. It should also be considered that this project is being undertaken alongside other spill reduction projects across the Hutt network, such as the pipe renewals programme to reduce inflow and infiltration. Therefore, given the relatively small difference in outcome between options, and given that overall network spilling is not solely reliant on this project, increasing the weighting of the Growth criteria does not appear to be valid in this case.

It can therefore be concluded that Option 2 should remain as the highest scoring option.

8.8.5 Commentary on Effects Preference

A preference towards the Effects criteria means a preference towards options that have the least amount of temporary and permanent effects. Increasing the overall weighting of this criteria to 60%, split across the three Effect sub-categories gives the following result – with Option 1 becoming the highest scoring option, with Option 2 a close second.

	Option 1	Option 2	Option 3	Option 4	Option 5
Base	-0.15	0.50	-0.35	-0.25	0.23
Effects +	0.05	0.03	-0.70	-0.78	-0.10

The Hutt Sewer Bypass project is required to enable growth associated with the Riverlink project. The scope of the Riverlink project includes significant upgrade works to the flood banks running past Hutt CBD, a new Melling train station, a new Melling bridge and significant upgrades and changes to CBD roads and pedestrian accesses. The temporary and permanent effects of the Riverlink project are going to be significantly greater than the Hutt Sewer Bypass project on its own. Therefore, given the relatively small effects of the Hutt Sewer Bypass project relative to Riverlink, it would appear unreasonable to put a high weighting on the Effects criteria for the Hutt Sewer Bypass project alone.

Therefore, it can be concluded that Option 2 should remain as the highest scoring option.

8.8.6 Commentary on Permanent Effects Preference

There is a viewpoint that permanent effects should be weighted higher than temporary effects, precisely due to the fact that they are permanent, i.e. at least the design life of a pump station (given that the permanent effects are scored on factors associated with a pump station) as opposed to a short-term disruption caused by construction in localised areas.

This scenario was considered by increasing the permanent effect weighting to 20% and reducing the weighting for temporary effects to 5% for both.

A preference towards permanent effects favours options where a pump station is located in a less sensitive receiving area, i.e., away from residential property, sport centres or schools.

	Option 1	Option 2	Option 3	Option 4	Option 5
Base	-0.15	0.50	-0.35	-0.25	0.23
Perm. +	0.15	0.30	-0.45	-0.15	0.38

Option 5 becomes the highest scoring in this scenario, though only marginally compared to Option 2.

As with the above preference towards overall effects, weighting the permanent effects of the Hutt Sewer Bypass projects higher appears unreasonable given the relatively small impact the effects have compared to the wider Riverlink project.

It should therefore be concluded that Option 2 remain as the highest scoring option.

8.8.7 Commentary on Preference to Mana Whenua Values

Based on feedback received from Taranaki Whānui during the project, giving preference towards the Mana Whenua Values criterion essentially gives preference towards options that have the greatest spill reduction and options that do not cross Te Awa Kairangi or mahinga kai.

This scenario was considered by increasing the Mana Whenua Values weighting to 60%, and the remaining weighting distributed pro rata across the other criteria.

Option 4 scores highly in this scenario because it strongly aligns with Taranaki Whānui's values in that the option provides a good amount of spill reduction and avoids crossing Te Awa Kairangi or mahinga kai.

	Option 1	Option 2	Option 3	Option 4	Option 5
Base	-0.15	0.50	-0.35	-0.25	0.23
Values +	-0.44	-0.21	-0.58	1.52	-0.40

Feedback received from Taranaki Whānui also states that Taranaki Whānui do not oppose, in principle, the provision of additional wastewater infrastructure "if the outcome is an improvement to the quality of discharges to these two receiving environments [Te Awa Kairangi & Te Whanganui-a-Tara], which are sites of significance to Taranaki Whanui". Given what appears to be an over-arching principle of reducing wastewater entering Te Awa Kairangi and Te whanganui-a-Tara, increasing the criteria weighting to 60% for Mana Whenua Values seems unreasonable when all options perform well at reducing uncontrolled spilling compared to doing nothing.

Option 4 becomes the highest scoring option with the weighting for Mana Whenua Values goes above 30% - or double the base case weighting.

Given that Mana Whenua Values are a subset of Mana Whenua's kaitaiaki over their lands, and other concerns including things like cost to iwi ratepayers, social effects, providing for growth in population, it would appear unreasonable to double the weighting of Mana Whenua Values as this would not align with an interpreted stance that a solution should balance the other criteria also.

It should therefore be concluded that Option 2 remain as the highest scoring option.

8.9 Risk Assessment

Following the sensitivity testing, a project risk assessment was completed to highlight the main risks to the project and to help facilitate the decision-making process. A risk workshop was conducted with the project team on 27/10/2022, with attendance from WWL, HCC, Dentons and the consultant project team. The main risk items are outlined below with full optioneering phase risk register assessment included in Appendix H:

Risk ID (from risk register)	**Description**	**Consequence**	**Control**
R01	Funding for project approved based on a turn cost of [redacted]. Currently, Option 2 and Option 5 are closest to this at [redacted] and [redacted] respectively. All other options are significantly over the secured funding.	Budget for amounts above funding amount will need to be found from other LTP or IAF projects, though developer contributions or from the rate payer. Failure to do so may lead to the sewer bypass project being delayed until funding becomes available.	Confirm funding availability with HCC and consequence of going over approved funding amount. Consider increase to MCA price weighting if there is a significant risk to HCC's programme of works. Potential to update value in LTP though more info. would be required ASAP.
R03	All options in this study fall partially outside the bounds of the Riverlink designation. The definition of sewer works within the designation cover re-alignment required because of the Riverlink works. This may not cover new pump stations and storage tanks.	The project may have to be consented separately, and this will need to be done by WWL before passing to Riverlink Alliance. This could delay delivery of the project and ability to tie into main Riverlink works	Undertake a consent assessment on the preferred option to establish consent triggers, if any, and possible consent pathway.
R04	The project is an IAF-linked project with an agreed construction completion date of end of 2026. Not achieving this date could affect HCC's reputation with Kāinga Ora and put risk to other HCC IAF funded projects.	If funding is decreased then HCC will have to finance the difference, leading to possible wider programme delays. If sufficient funding cannot be secured across the programme of works then the project may be cancelled.	Ultimate timing of project will likely be reliant on the Riverlink Alliance programme. There is an opportunity to amend the agreed date once delivery plan is known. Risk can potentially be reduced by selecting options with a smaller footprint and shorter construction timeframe.

Risk ID (from risk register)	Description	Consequence	Control
			Options reliant on new Melling road bridge and/or existing Melling bridge stub updated to remove dependencies.
R05	The Western Trunk Main and its terminal pump station – Ava – both have some existing capacity limitations. There are sections of the Western Trunk Main that are currently under capacity, and the Ava pump station has no EOP. As a result, flows are currently actively managed by operations by throttling at the Silverstream diversion during high-flow events and either sent to the Main Collecting Sewer or to the Silverstream storage tank.	Any additional flow added to the Western Trunk Main as part of the Hutt Sewer Bypass project will likely result in additional flows during high-flow events being diverted away from Western Trunk Main and Ava PS. In a worst-case scenario, this may lead to additional spilling at the Silverstream EOP	The lack of EOP at Ava pump station was partly mitigated by installing an emergency pump and rising main direct to Barber Grove pump station. However, this still requires careful management as any failure could result in sewage spilling to neighbouring properties. A capacity upgrade is scheduled on Western Trunk Main beginning in the 2038/39 financial year. Current budget for this project is set at [redacted]. Some of this work may be brought forward and completed by the Riverlink Alliance. If an option is selected that pushes flow from Hutt CBD to Western Trunk Main then the timing of the Western Trunk Main upgrade should be reviewed and any additional requirements identified due to this project. A parallel study should also be undertaken on the Hutt Valley storage requirements and how best to service the network
R06	WWL are currently seeking a global network discharge consent. It is being sought on a frequency basis, however, the consent proceedings will likely take another 6-9 months, and the outcome may not be as currently sought	The new EOP proposed at each pump station as part of this project is being included on the basis that it will not need to operate within a two-year containment standard. The EOP itself will have a manually controlled valve that will require an operator decision to open it and	In the short-term, any option selected under the Hutt Sewer Bypass project will have the ability to spill from the pump station back to the existing network, without uncontrolled spilling.

Risk ID (from risk register)	Description	Consequence	Control
		spill to the Hutt River. It is currently thought that this will be covered under the emergency works provision of the Resource Management Act. Should the current consent proceedings alter the assumption about the EOP associated with this project, then it may need to be removed or consented via a different pathway. This could result in project delays or additional operation risk.	A study should be undertaken on the possible solutions to mitigating operational risk if it is deemed that the EOP at the pump station proposed in this project is not able to function.
R07	Opposing views of stakeholders may mean that decisions on the project stall and cause delays.	Delays to the project could put some or all of the funding at risk. Preference of an option that is not the highest scoring from MCA could lead to uncertainty around the robustness of the process in selecting a solution.	The MCA process was inclusive of all stakeholders. A risk workshop was held to highlight risks associated with project and possible mitigation measures. Further work has been identified to support selection of the preferred option and this will be fed back into the MCA process. A paper will be submitted to the Three Waters Decision Making Committee to make a call on solution.
R09	Te Awa Kairangi south of Ewan Bridge is known to experience aggradation though movement of gravels.	The aggradation of gravels south of Ewan Bridge already causes issues with stormwater outlets in that additional maintenance is required to keep them operational. This could pose a similar risk for EOP's proposed in this portion of the river	Conduct a review location of EOP locations in relation to known operational issues / gravel aggradation sites / proposed riverbed levels
R10	The basis of the Growth criteria in the MCA is a reduction in uncontrolled spilling. This	By changing the project criteria to reducing overall spilling has significant implications for	It is important to paint a wider picture of the network and the aim of reducing overall

Risk ID (from risk register)	Description	Consequence	Control
	comes from a public health driver to take potential spilling away from where it is closest to people and put it in to a waterbody and away from undiluted and direct human contact. The result of this however is that uncontrolled network spilling is effectively moved to a controlled spilling point which, in some instances, results in an increase in spilling out of an EOP. Modelling has also shown that for options connecting to the Western Trunk Main, whilst uncontrolled spilling across Riverlink North and South was addressed there was a knock-on effect of increasing uncontrolled spills downstream (based on a 2yr event for 2070 MPD). These factors have potential negative implications when considering the network discharge consent currently being sought by WWL.	the required storage volume, and also does not necessarily guarantee that uncontrolled spilling will reduce. High level modelling has indicated that approximately 2,400 m^3 and 3,600m^3 of storage would be required in the Hutt Sewer Bypass project to have no uncontrolled spilling in Alicetown and no net increase in overall spilling in the network respectively. It would be very difficult to find funding and a location in Hutt Central for storage volumes of this size.	spilling. There are other projects planned that will lead to an overall spill reduction – such as the Western Trunk Main upgrade. Basing this project on an assessment of reduction in uncontrolled spilling meets the secondary service objective and does not drive unrealistic levels of spill containment.
R11	If the project isn't delivered through the Riverlink Alliance, it may be difficult to sequence the works with the Alliance programme.	Any delays to the project could put some or all of the funding at risk. There is also a risk of additional cost and disruption to the public from having to double up on work areas.	Ongoing engagement with HCC Riverlink project management to ensure project timeframes align with those of the wider Riverlink project.

8.10 Highest Scoring Option

Based on the MCA scoring, Option 2 came out as the highest scoring option.

Post-MCA testing indicates that Option 2 as the highest scoring option is sensitive to changes in the base weightings. However, post-MCA discussion has highlighted that there are significant operational risks associated with Option 2 that would currently prevent WWL from agreeing it to be the preferred option.

The existing operational risks in the Western Trunk Main and Ava pump station will be increased with Option 2, which may result in additional diversion and spilling at Silverstream or uncontrolled spilling on the Western Trunk Main and/or within Alicetown. Upgrades are scheduled on Western Trunk Main prior to the ultimate design capacity of Option 2 being reached, so these operational risks may be manageable in the short-term until these upgrades are in place. However, there is the potential that the additional flows in the Western Trunk Main will mean proposed upgrades need to be brought forward to manage the risk, and these upgrades will need to be more significant than those currently identified in the LTP. Therefore, further work has been identified to enable a comparison of any additional upgrades required on Western Trunk Main such that it can be compared to the additional cost of [redacted] required to provide a solution that does not connect to the Western Trunk Main.

9 Development and Endorsement of Preferred Option

A meeting was held between representatives from WWL, Holmes and HAL on 14 November 2022 to discuss how to progress the project to enable a preferred option to be confirmed. From this meeting, it was agreed the following additional work was required:

1. Review modelling results to identify and quantify risks associated with connecting to the Western Trunk Main
2. Identify and confirm solution(s) to mitigate these risks, including modelling of solutions
3. Develop highest scoring option from MCA (Option 2) to include the above mitigation solution(s)
4. Complete options assessment to identify preferred option. Options assessment completed between:
    - Highest scoring option from MCA (Option 2) developed as part of Step 3, above – renamed Western Trunk Main Option
    - Shortlisted Option 4 – Renamed Barber Grove Option
    - Do nothing
5. Present to, and gain endorsement of preferred option from, Wellington Water Customer Operations Group (COG) and Three Waters Decision Making Committee (3WDMC)

9.1 Modelling Review

The modelling results from the 2070 MPD 2yr scenario and the shortlisted Option 2 2yr scenario were reviewed to identify the impact on the Western Trunk Main and Ava PS of discharging additional flow to the Western Trunk Main. In the 2070 MPD 2yr scenario this showed uncontrolled spilling along the Western Trunk Main, 7 below. This supported the message from COG that the Western Trunk Main is currently at capacity but also showed these capacity issues were providing protection to Ava PS. This demonstrated that these capacity issues would have to be addressed to enable growth in the wider Hutt Valley, which was fed back into WWL to inform future projects.

The addition of extra flow from Option 2 further increased uncontrolled spilling on the Western Trunk Main and also slightly increased uncontrolled spilling in Alicetown, highlighting the capacity issues raised by COG with Ava PS, Figure 17. These results provided evidence to support the information received from COG and a modelling base case to enable solutions to this spilling to be tested.

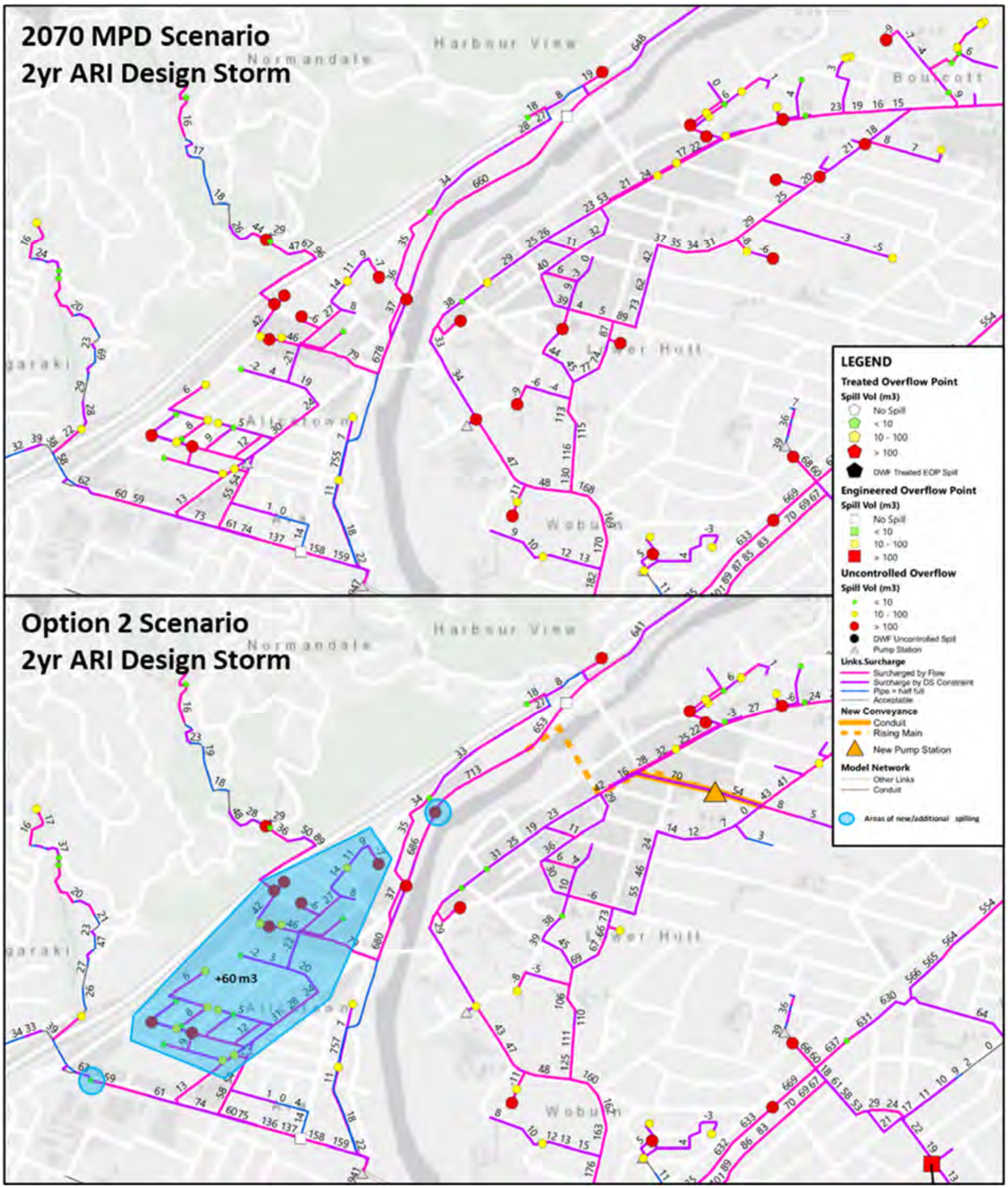


Figure 17 - Comparison of Modelling Results for 2070 MPD and Option 2 (2yr ARI Design Storm)

9.2 Solution Identification and Assessment

A list of potential solutions to mitigate this increase in uncontrolled spilling was developed through conversations between Holmes and WWL Network Engineering Team (NET), Chief Advisor Wastewater, WWL project manager, peer reviewer and HAL. From this, the following solutions were identified:

- Upsize the Western Trunk Main to increase capacity
- Provide Real Time Control at New Pump Station
- Increase Storage at New Pump Station
- Increase Throttle at Silverstream Storage Tank
- Provide EOP at Ava Pump Station

9.2.1 RiverLink Project Upgrades to Western Trunk Main

The modelling results highlighted capacity issues within the Western Trunk Main and a review of the pipe sizes along the length showed there is an approx. 400m section upstream of Ewen Bridge where the diameter decreases from DN900 to DN675. Due to the Western Trunk Main operating in a surcharged condition during rainfall events, this section acts as a throttle. Therefore, the option to upsize this section to increase capacity was looked at.

Information received from RiverLink showed the project is proposing to relocate this section of the Western Trunk Main. To meet Wellington Water requirements, this undersized section would also need to be upsized as part of that relocation. Information was received from RiverLink that showed the extent of the proposed relocation and upgrade (Technical Memo: Western Hills Main Sewer – Design Statement, GHD, March 2022).

The Option 2 Scenario was updated to include the upgrades to the Western Trunk Main proposed as part of RiverLink and the model rerun. This showed the proposed upgrades removed the uncontrolled spilling on the Western Trunk Main but, due to capacity issues with Ava PS, there was an increase in uncontrolled spilling in Alicetown including one new spill location, Figure 18. Due to the benefit to uncontrolled spilling, this was considered a viable option to help mitigate the adverse effects of Option 2 on the Western Trunk Main. However, as this increased spilling in Alicetown further work was required to mitigate this.

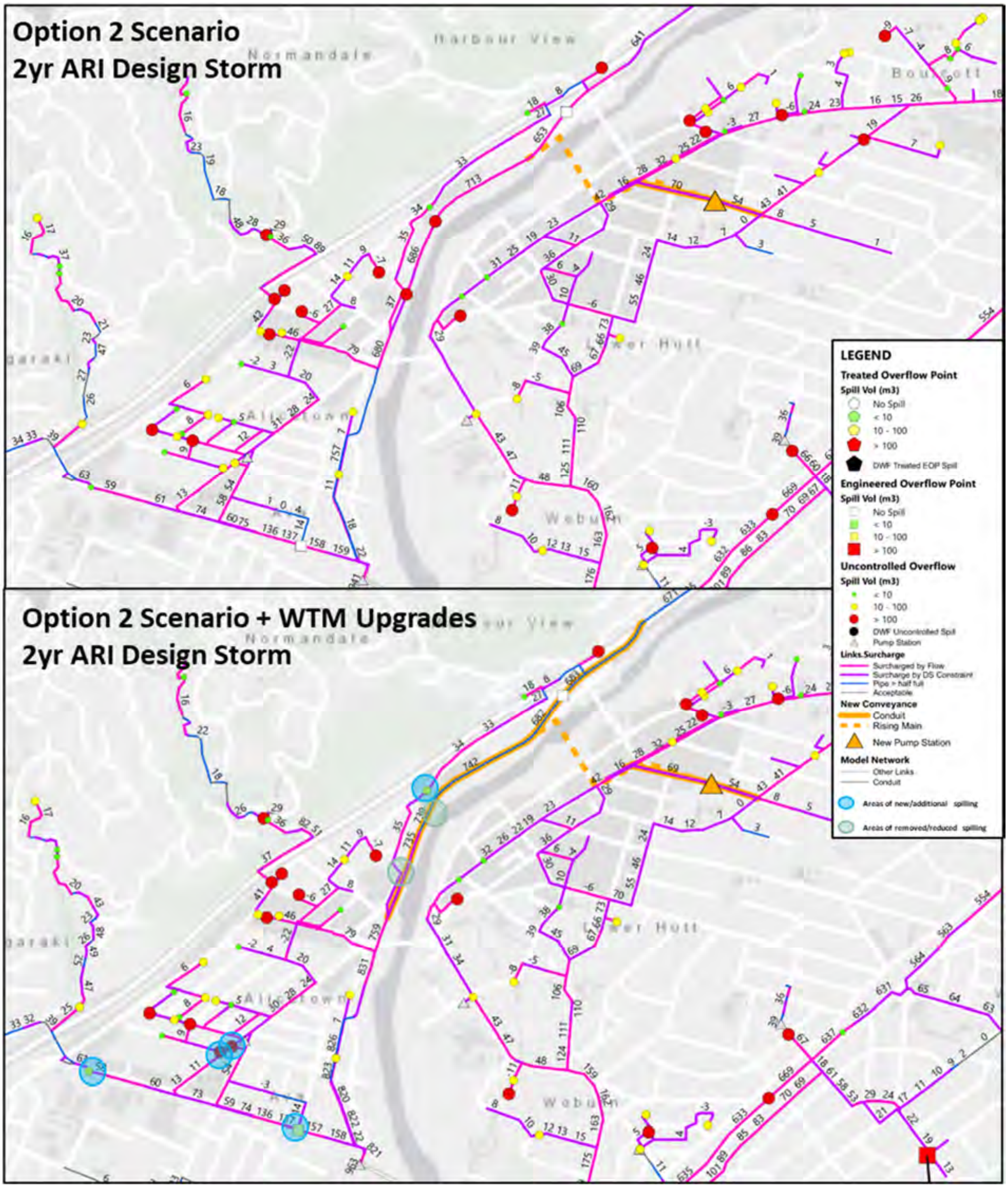


Figure 18 - Comparison of Option 2 with and without WTM Upgrades (2yr ARI Design Storm)

As the upgrades proposed as part of RiverLink would occur regardless of the solution to this project, the 2070 MPD model scenario was run including these upgrades. This was to understand if the proposed upgrades impacted downstream. These upgrades removed the location of uncontrolled spilling on the Western Trunk Main but increased spilling in Alicetown, Figure 19. These effects would need to be mitigated so this information was fed back into WWL to inform future projects.

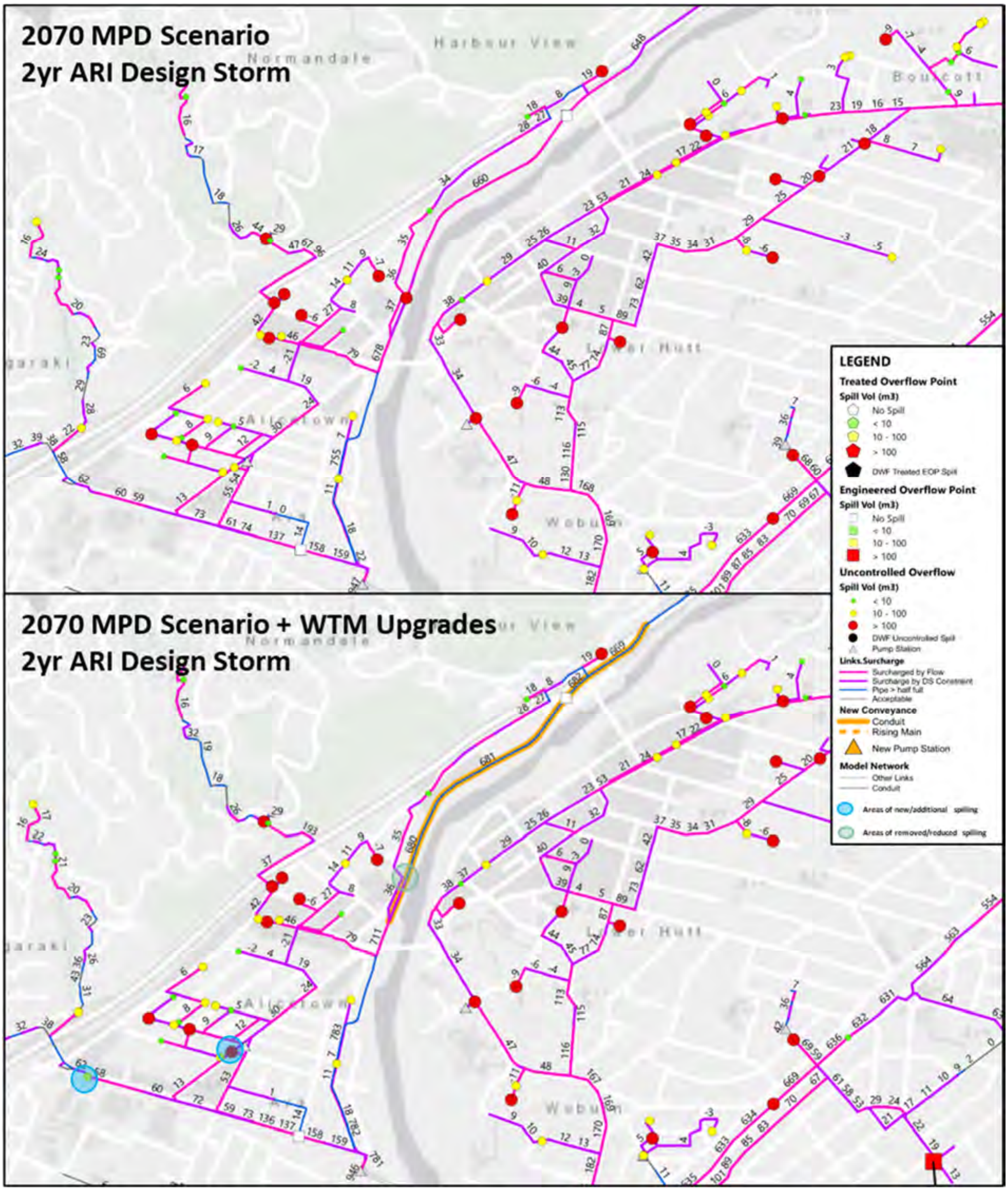


Figure 19 - Comparison of 2070 MPD with and without WTM Upgrades (2yr ARI Design Storm)

9.2.2 Real Time Control and Additional Storage at New Pump Station

Capacity issues in the Western Trunk Main are caused by inflow and infiltration from storm events. This means flow in the Western Trunk Main varies during the event, with the pipe running at capacity for approx. 8 hours during the peak of the storm. This means there is capacity outside of this period for the additional flow from Hutt CBD.

To make use of this, Option 2 was updated to include a real time control (RTC) on the pump station so this would only pump when there is capacity in the Western Trunk Main, with an override to pump when the storage was full. This showed that the proposed 600m³ of storage was only sufficient to store inflows for approx. 2 hours. To enable inflows to be stored for the full duration of the peak of the storm, the volume of storage was increased to 2000m³ (2ML), Figure 20.

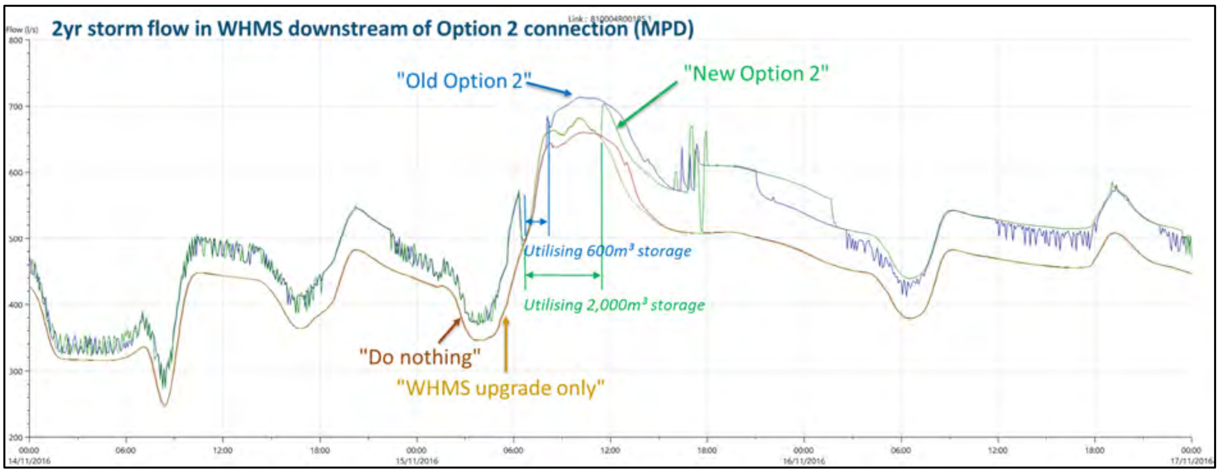


Figure 20 - WTM Flow vs Time Graph for Various Options (2yr ARI Design Storm)

The model was updated to include the RTC and additional storage, including the RiverLink upgrades, and re-run. Comparing this to Option 2 showed the uncontrolled spilling on the Western Trunk Main has been mitigated and there is no increase in spilling in Alicetown. This means this solution was seen as viable to mitigate the operational risks associated with the Western Trunk Main and Ava PS.

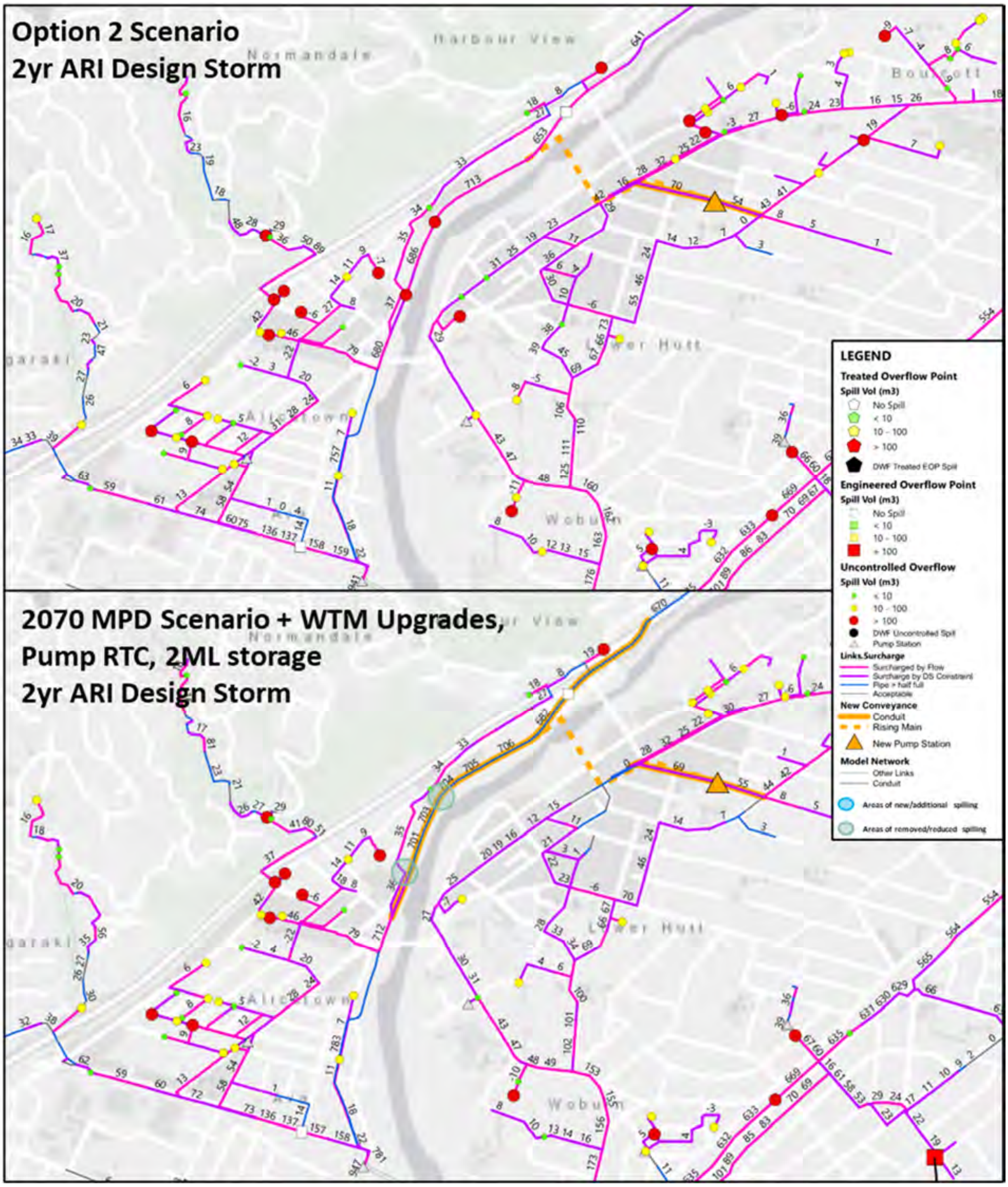


Figure 21 - Comparison of Option 2 with Western Trunk Main Option (2yr ARI Design Storm)

9.2.3 Increase Throttle at Silverstream Storage Tank

The current operation of the Hutt Valley wastewater system includes throttling flows at Silverstream storage tank to provide capacity on the Western Trunk Main for discharges from the Western Hills suburbs and utilise the storage and EOP provided at Silverstream. An option to increase this throttling, and therefore provide additional capacity for the discharge from Hutt CBD, was discussed.

This also had the benefit of potentially providing a more feasible location for additional storage in the network, compared to next to the new pump station in Hutt CBD.

A model scenario was run that increased the throttle at Silverstream storage tank by 100L/s and thus decrease the pass forward flow rate 400L/s to 300L/s. The results from this scenario showed the spilling at Silverstream increased by 21,000m³, from 44,100m³ to 65,100m³. Therefore, any additional storage provided at Silverstream instead of the new pump station would need to be 10x the volume, resulting in this option being dismissed.

Further interrogation of the modelling results showed that the peak dry weather flow (DWF) arriving at Silverstream in the 2070 MPD scenario is 520L/s, which is greater than the current throttled flow rate. This means in this scenario the storage at Silverstream is being used to store dry weather flow. This is not the intended operation of this tank and has implications in terms of septicity with the tank and downstream network. This information was fed back into WWL to support further investigations and projects to mitigate growth in the catchments upstream of Silverstream.

9.2.4 Provide EOP at Ava Pump Station

Currently there is no EOP at Ava PS, which means if the pumps fail or the PS is overwhelmed this results in uncontrolled spilling in Alicetown, resulting in a potential risk to human health. To mitigate this, an option to provide an EOP at Ava PS, that would discharge to the Hutt River, was discussed. However, this was dismissed as unfeasible as the level of Ava PS is below the level of the Hutt River under normal flow conditions. Therefore, any EOP would need to be pumped and this is already provided by a secondary pump set and rising main that discharges to Barber Grove PS.

9.3 Western Trunk Main Option Development

The solutions assessment identified three required updates to Option 2 to mitigate the operational risks associated with discharging to the Western Trunk Sewer. These are:

- Upsizing the Western Trunk Main as proposed by the RiverLink project
- Include an RTC on the new pump station to only pump when there is capacity in the Western Trunk Main
- Increase storage at the new pump station to 2ML to be utilised during the peak of the storm

This updated Option 2, Figure 22, was renamed Western Trunk Main Option. To enable a comparison to the Barber Grove Option the cost estimate was also updated.

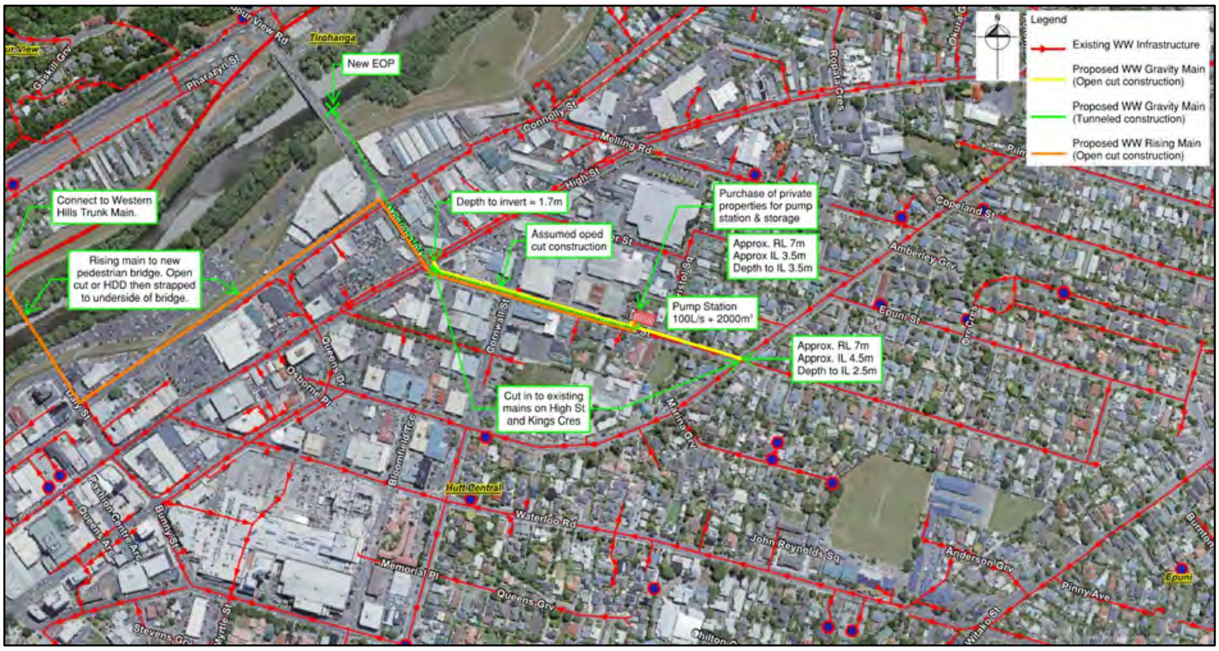


Figure 22 – Western Trunk Main Option Overview

9.3.1 Cost Estimate Updates

The Option 2 cost estimate was updated to account for the additional elements associated with the Western Trunk Main Option. Updates completed were as follows:

- Western Trunk Main upgrades – this was not included in the cost estimate as these upgrades are independent of this project and fall under the RiverLink budget. However, an item was included on the Project Risk Register that if these upgrades don't occur, they will be needed to enable the Western Trunk Main Option.
- Pump RTC – this was not included in the cost estimate due to the stage of the project and level of the cost estimate meaning this level of detail is not represented.
- 2ML storage – Two options for including the additional storage were costed. One as inline storage provided by large diameter pipes in Pretoria Street and one as a concrete storage tank. The storage tank was found to be the most cost-effective option so this was included in the proposed solution.

The 95th percentile cost estimate for the Western Trunk Main Option is [redacted].

9.4 Options Assessment

Comparison of the Western Trunk Main Option was made to the Barber Grove Option to confirm the preferred option to be recommended for concept design. A comparison was also made to Do Nothing, to justify the investment. As part of this, the MCA scoring was reviewed but it was decided this would not be revisited. This is because the changes to Option 2 would not cause a material change to any of the scoring and the difference in overall score between Option 2 and Option 4 was quite significant. Instead, a comparison of cost and risk vs benefit was made of the three options, as summarised in Table 12.

Table 12 – Options Assessment Presented at 3WDMC

Option	Western Trunk Main Option	Barber Grove Option	Do Nothing
Capex Cost	[redacted]	[redacted]	[redacted]
Risks	• Is dependent on the Western Trunk Main being upgraded as part of Riverlink works. • Requires the purchase of private properties.	• Project capital cost [redacted] more than IAF application budget of [redacted] – would leave less for storm water projects. • Additional disruption to public due to large project area mostly outside of RiverLink designation.	• WWL service goals not met, i.e. uncontrolled dry weather spills predicted to occur by 2040. • Reputational risk to WWL and HCC.
Total Spill Reduction (2070 MPD, 2yr ARI)	2520m^3	2000m^3	0m^3
Benefits	• Project area closer to extent of RiverLink designation i.e. less disruption. • Significant reduction in uncontrolled spill volumes across the RiverLink area in the 2yr ARI. • Level 1 95% estimate is closest to budget put forward in the IAF application.	• Direct to Barber Grove PS so is not dependent on Western Trunk Main upgrades. • Moderate to significant reduction in uncontrolled spill volumes across the RiverLink area in the 2yr ARI.	• No capital cost meaning more funding is available for other IAF projects. • Does not meet funding intent of IAF application. • Future escalation of costs if works are not carried out alongside RiverLink.

From this, the Western Trunk Main Option was identified preferred option due to being the most cost effective, with none of the residual risks identified as showstoppers.

9.5 Endorsement of Preferred

The preferred option needed to be endorsed prior to commencing with concept design. Endorsement was sought from the following:

- Customer Operations Group (COG)

- Three Waters Decision Making Committee (3WDMC)

9.5.1 Endorsement by COG

As the operational risks associated with discharging to the Western Trunk Main were first raised by COG, it was considered prudent to present the updated Western Trunk Main Option to them to confirm if the updates had mitigated their concerns. A meeting was held with [redacted] on the 16 January 2023 to present the updates to the Western Trunk Main Option and gain feedback. To support this, this option was run with the current level of development to demonstrate there would be no detriment to the operation of the Western Trunk Main or Ava PS at the point the option was constructed.

In this meeting, [redacted] verbally confirmed that the updated Western Trunk Main Option did not pose any significant additional risk to the operation of the Western Trunk Main or Ava Pump Station. In the meeting, he also raised additional operational considerations for the updated options, although none of these were considered insurmountable through design development. Therefore, these have been included in the SID Risk Register.

A copy of the presentation from the meeting is provided in Appendix I.

9.5.2 Endorsement by 3WDMC

The project and options assessment was presented to 3WDMC on 19 January 2023 to gain WWL governance endorsement of the preferred option and project team recommendation that this should be taken forward to concept design.

In the meeting the committee was supportive of the options assessment completed, endorsed the preferred option and agreed this could be taken into concept design. However, they raised concerns that the cost of operating and maintaining the new infrastructure was unknown. Therefore, they also made a recommendation that an OPEX cost estimate be completed at concept design and used to inform future OPEX budgets.

A copy of the 3WDMC paper is provided in Appendix J.

9.6 Actions and Next Steps

Following endorsement of the Western Trunk Main Option as the preferred option by COG and 3WDMC the following next steps were identified

- Progress concept design of the preferred
- Develop an OPEX Cost Estimate as part of the concept design deliverables

10 Concept Design

The concept design for the Western Trunk Main option was progressed as discussed in the previous section. The following concept design was progressed for the preferred option:

- Identify and develop preferred 2000m^3 storage option and location.
- Rising main sizing and pump station design for ADWF and PWWF.
- Gravity cut-in sizing and indicative layout.
- Development of EOP design and levels.

A simplified sketch of the concept design is shown in Figure 23 below to indicate the layout of the design.

Figure 23. Overview of concept design layout

10.1 Design Inputs

Design Flows

Hydraulic modelling of the concept design was completed by HAL to determine the design flows for the concept design. The modelling results for the 2070 MPD 2 yr Option 2 scenario was reviewed to identify the required design flows for the cut-ins and pump station design. The key results identified from the modelling are shown in Table 13 below, full results are shown in Appendix M.

Table 13. Design Flows for 2070 2yr Option 2 Scenario

Location	New Pump Station	Kings Crescent (MH01)	High Street (MH06 and MH11)
Model Data			
ADWF (L/s)	32	-	-

PDWF (L/s)	50	-	-
PWWF (L/s)	121	52	69

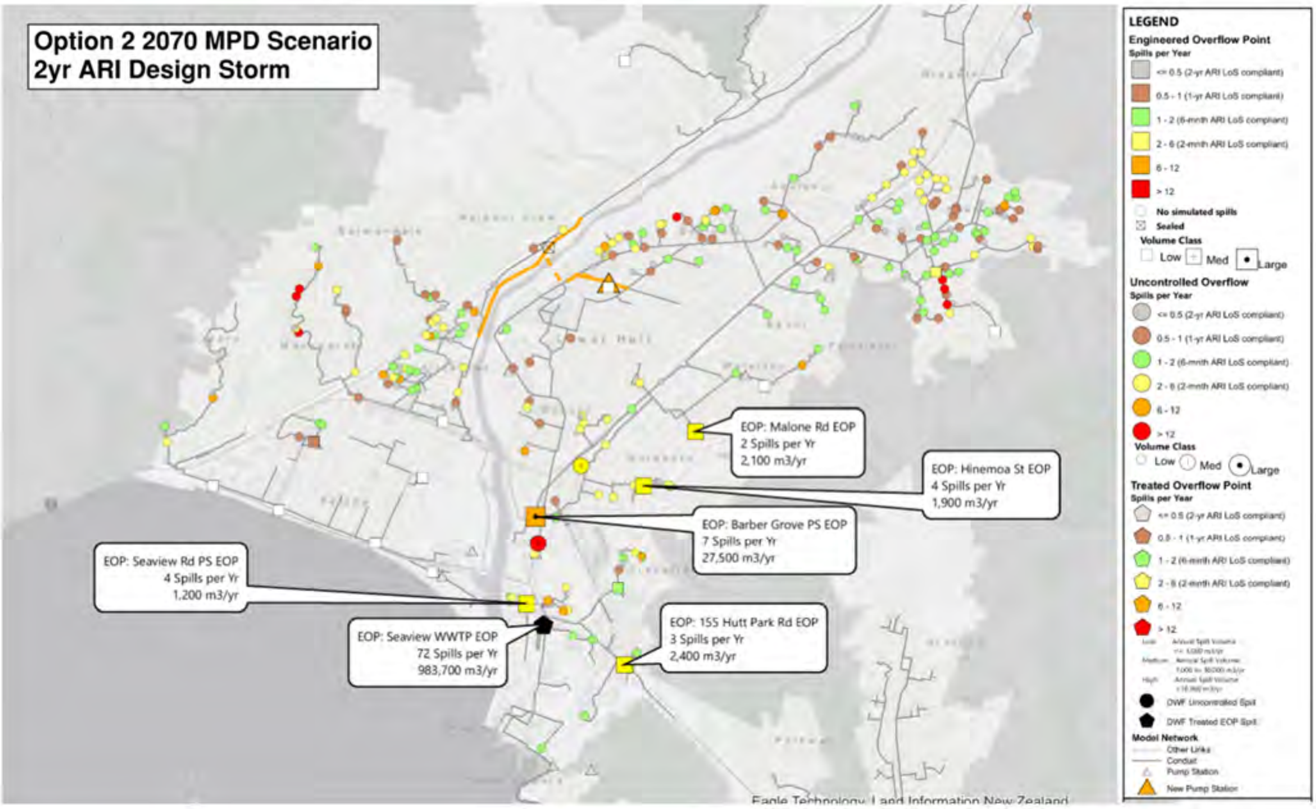


Figure 24. HAL Modelling Results for Concept Design Option

These results were used to size the cut-in pipes, EOP pipe, and rising main.

Existing services

Existing ground levels have been sourced from LINZ Lidar data, captured 23/03/21 to 27/03/21.

The location of the existing 3 water services were collected from Wellington Water GIS. However, the GIS does not provide invert levels or lid levels, only depth to inverts. Therefore, the invert levels of the existing services were determined using the ground levels from the LIDAR information and then determining the inverts from the depth to inverts supplied.

Existing Network Hydraulic Levels

Additionally, HAL provided the model setup and results for the current and MPD scenarios for Option 2 to provide the maximum water levels in the cut-in manholes. The maximum water levels in the network were used to set the EOP level to ensure that the proposed storage and overflow will not cause spilling upstream in the network.

It is noted that there are some discrepancies between the HAL input data and the information sourced from LINZ and Wellington Water. Therefore, hydraulic levels and inputs should be confirmed during the next stages of the design.

10.2 Gravity Cut-ins

For the concept option there are two cut-ins to the existing network proposed – one at the High St main at the junction with Pretoria St, and the other at the Kings Crescent main also at the junction with Pretoria St.

Due to capacity restraints, and to reduce demand on the downstream network, these cut-ins will divert all the upstream flow to the new pump station. Cut-ins will be achieved via a new manhole into the mains.

For the High Street mains, a manhole will be installed onto each main, and the flow combined into a single gravity pipe and conveyed to the new pump station. There is a single cut-in for the Kings Crescent main. The flows from the gravity cut-ins are directed to a combined manhole on Pretoria Street before being diverted to the new pump station. Information on the cut-in manhole levels was gathered from both the HAL model, WWL GIS, and Lidar. However, there are some discrepancies between the different information sources. Table 14 below shows the summary of the levels from each source and the adopted information for concept design. Further survey is required in the next design stage to confirm the correct levels.

Table 14. Summary of cut-in manhole levels

MH ID	710096R00173	HCC_WW009623	MH06 (proposed MH)
	HAL	**WWL GIS**	**Adopted for Concept**
Lid Level	5.889m converted from WGL1953 to NZVD2016	7.0m – estimated from LIDAR	7.318m
Invert Level	3.412m converted from WGL1953 to NZVD2016	5.3m – estimated from Lid Level and GIS Invert	3.666m
Depth to Invert	2.477m	1.70m	3.652m
MH ID	**710017R00433**	**HCC_WW009849**	**MH01 (proposed MH)**
	HAL	**WWL GIS**	**Adopted for Concept**
Lid Level	7.233m converted from WGL1953 to NZVD2016	7.5m – estimated from LIDAR	7.579m
Invert Level	4.412m converted from WGL1953 to NZVD2016	4.9m – estimated from Lid Level and GIS Invert	3.053m
Depth to Invert	2.821m	2.6m	4.526m

Sizing of the gravity pipes was completed using EPA SWMM and the design flows from the HAL's modelling. The pipe from the High St cut-in was calculated to be 375mm internal diameter and the cut-in from Kings Cres was calculated to be 300mm internal diameter.

Manholes will be installed at a maximum of every 90m along the gravity pipes. Due to the depth of the pipe, it is proposed to install the gravity mains in the carriageway to ensure the neighbouring properties are not affected by the excavation and construction of the pipes. An indicative pipeline location is shown on the drawings.

10.3 Pump Station and Storage

Inlet structure

The flow from the cut-ins is first directed to the inlet manhole, which is 1.5m minimum diameter. From the inlet manhole there is a gravity connection to both the pump station and the storage tank. During normal demands, the flows will be prevented from entering the storage tank by an overflow weir in the manhole. If the pumps malfunction or are not able to handle the peak flows, then the flow with back up in the inlet manhole and overtop the weir that spills to the storage tank. A penstock valve will be included at the base of the weir which can be opened after a peak event to drain and flush the tank. The level of the overflow weir is required to be approximately 4.36mRL.

Storage Tank

As described in Section 9, the proposed storage tank shall contain 2000m^3 of working volume. Several options to provide the required storage were considered, this included inline storage options GRP tanks, and a concrete tank.

As determined previously, offline storage was considered the favourable option. The [redacted] properties were chosen as indicative location for the pump station and storage. Final location of the pump station and storage is dependent on landowner negotiation but could be located anywhere on Pretoria Street between Kings Crescent and High Street. Site size required is approximately 1700m^3.

When considering the GRP tank option, the tank size was limited to 3.5m diameter to allow ease of transport of tanks to site as well as installation on site. To provide 2000m^3 of storage, eight x 3.5m diameter x 30.5m long tanks are required. When accounting for the required construction space, the required site space for the tanks alone was approximately 36m by 32m or 1150m^2. This option requires the purchase of a minimum of three properties to allow for the storage and pump station and requires additional properties to allow for earthworks and construction of the storage, which would be a considerable cost to the project due to the proposed location near the Lower Hutt CBD.

Therefore, a concrete tank was also considered to reduce the required footprint of the storage and pump station. The benefit considered for the concrete storage is to incorporate the temporary works into the permanent works to reduce the cost of temporary works. The size considered for the concrete tank is approximately 34m L x 23m W x 3.2m D, which gives a footprint of 780m^2. There is the possibility that the tank and pump station could be constructed on only 2 properties on Pretoria St. Constructability input for the proposed storage tank was provided by Alta. Due to the proximity of the neighbouring buildings and potential risks during construction it was determined that three properties will be required for the pump station and storage to minimise construction risks.

The level 2 cost estimate provided by Alta is based on construction of the storage tank using temporary propping for the structure. This is a conservative approach to the cost estimate and there is the opportunity to use the temporary retaining as part of the permanent structure to reduce costs. This can be determined in a later stage of design.

The storage tank will also include tipping buckets to flush the tank after use It is proposed to fill the tipping buckets via a water supply connection from the main in Pretoria Street. Access hatches are required on either end of the tank for maintenance access and ventilation.

Venting and odour control is also required, especially due to the pump station's proximity to residential houses. It is proposed to provide this via an odour bed, which is indicatively shown on the drawings. Details of the odour control and venting to be determined during later stages of design.

As discussed in Section 9, sufficient storage is provided to contain the peak wet weather flows for the design storm. Therefore, a permanent emergency generator is not required. Connections for emergency generator should be provided.

Pump Station

As per Wellington Water requirements, pumps in CBD areas shall be dry well installed due to access and noise limitations. Therefore, a dry well arrangement is proposed for the pump station. Three pumps are proposed for the pump station in a duty, assist, standby arrangement. All pumps are to be the same model so are interchangeable.

Concept sizing for the dry well and wet well area was determined based on Flygt's design manual for small to medium pump stations. To reduce the footprint of the pump station, a round chamber was chosen. A chamber diameter of approximately 4.25m is required. Specific pump station components and access have not been considered during concept design and there is the potential that as the pump station is refined in later design stages that the diameter will increase. There is also the opportunity for a wet well only pump station to be used which would reduce the size of the pump station.

WWL has a reference pump station design for Malone Road, which has not been provided for concept design, but lessons learnt from this project should be incorporated in the next stages of design.

The required operating volume for the pump station was calculated using the peak wet weather flow of 121 L/s and assuming a maximum of 8 starts per hour, which gives an operating volume of 11.25m^3. For the 4.25m diameter pump station, this gives an operating depth of around 2.6m. Refer to the drawings showing the pump station layout and operating depth.

A valve set including non-return valve, isolation valve, and meter will be included after the wastewater is pumped from the pump station and into the rising main.

The proposed location of the pump station and storage is not located in a flood plain. The proposed depth of the pump station and storage is a maximum depth of 8.15m. The Waiwhetu Aquifer is located at a approximate depth of 20m bgl, therefore, it is not expected that the proposed developed with penetrate the aquifer. Further work is required to ensure that the depth of the proposed development does not impact the aquitard layer (Petone Marine Bed) of the aquifer and to confirm no contamination will occur.

Other Requirements

It is proposed to provide vehicle access through the whole site. This allows maintenance vehicles to enter through either Pretoria Street or Bristol Square and exit on the opposite street. This prevents vehicles from having to reverse onto the street and provides access along the whole length of the tank.

There are other additional details that have been noted for future design but have yet to be determined or detailed during concept design. These include:

- Long term use of site – there is potential for to use part of the site as publicly accessible green space due to the proximity of the proposed site to the Hutt CBD. Long term use of the site to be determined by HCC.
- Operation of storage – currently storage drains via gravity to the pump station. To reduce the depth of the pump station the option to pump from storage back to the wet well can be explored in the next design stage.
- Security of the site – fencing will be required around the operational areas at a minimum, and potentially around the whole site. The extent of fencing required will be determined based on the long term use of the site.
- MCC building sizing and location – an indicative location is shown on the drawings. Location and sizing are to be confirmed during later stages in design.
- Security and maintenance lighting requirements – to be confirmed with HCC
- Wash down facility required – to be confirmed in later design stages.
- Access hatches for maintenance – indicative location currently shown, details around method of access and locations to be confirmed.
- The seismic critically of the storage and pump station structure.
- Design will need to consider whether the existing power network has sufficient capacity
- Require confirmation the depth of the pump station and storage will not impact the integrity of the Waiwhetu Aquifer aquitard layer (Petone Marine Bed).

10.4 Engineered Overflow Point (EOP)

An engineered overflow point will be provided for the pump station to the Hutt River in case of pump malfunction or excessive flows to prevent surcharging of upstream manholes. To reduce the amount of pipework required, it is proposed to start the overflow pipe from the cut-in manhole in High Street. When the storage is full and pumps unable to handle the flows the sewage will back up into the cut-in pipe and, once it reaches the EOP overflow weir level, spill into a new overflow pipe from the High Street manhole to the Hutt River. As the overflow will not be consented as advised by WWL, it is required that the EOP must be manually operated as to ensure a conscious decision is made to allow overflows. This will be achieved via a valve in EOP pipe with an actuator.

The EOP weir level was set so that the hydraulic level does not exceed the maximum water level of 5.5mRL in the Kings Crescent cut-in manhole.

Designing the levels and sizing of the overflow, and modelling of the scenario was completed using EPA SWMM. The EOP pipe sizing was designed so that the capacity exceeded the PWWF to ensure that the EOP does not form a throttle and contribute to spilling in the upstream network during high flows. Therefore, a design flow of 121 L/s was used, and the pipe was sizes to be a 475mm uPVC pipe.

Figure 25 below shows the hydraulic grade line from the EPA SWWM model under the 2yr PWWF flows during the time that the storage tank is full, and all flow is spilling to the overflow as a free discharge.

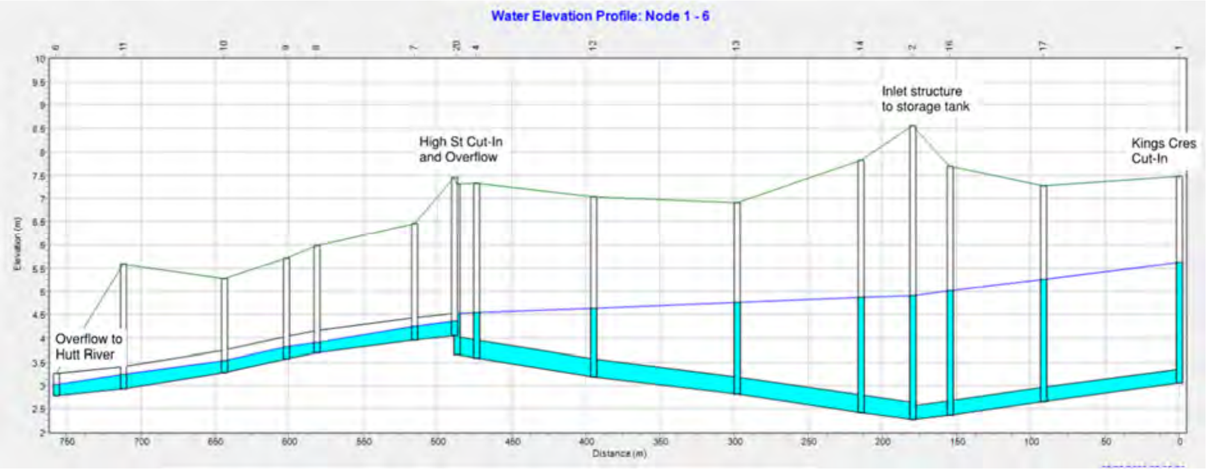


Figure 25. EPA SWMM model of EOP during PWWF when tank is full

The model demonstrates that at peak MPD flows are not throttled by the overflow and that the proposed hydraulic level at the Kings Crescent does not exceed the maximum level of 5.532mRL.

The EOP outlet will include an outlet structure, scour protection, and backflow prevention, with the details to be confirmed during later design stages. The level of the EOP outlet was set to allow a free discharge during normal river conditions. However during flood conditions the outfall may be surcharged, which could impact the operation of the EOP.

Monitoring will also be required at the EOP to measure the flow, volume, and number of overflows that occur. Additionally, there may be requirements to screen the EOP overflow in the High Street manhole. This will result in additional maintenance requirements for the screens to clean them. A non-return valve will also be required at the overflow outlet to the Hutt River to ensure that river flows do not back up into the pipe during high flow events.

10.5 Pressure main

The proposed rising main runs from the proposed pump station on Pretoria Street, along Rutherford Street, and across the proposed pedestrian/cycle bridge before discharging to the existing Western Hills Trunk main across the Hutt River. The flow range for sizing the rising main is based on the average dry weather flow and 120% of the peak wet weather flow, as per Wellington Water standards.

Wellington Water standards specify that a rising main velocity should be between 0.6m/s – 3m/s. Based on Table 15, a 315mm OD PE pipe was chosen for the rising main as it best meets the flow requirements.

Table 15. Rising Main Sizing

Scenario	Flow (L/s)	280 PE pipe - velocity (m/s)	315 PE pipe - velocity (m/s)	355 PE pipe - velocity (m/s)
Duty	60	1.50	1.17	0.93
Duty/Assist	121	2.96	2.35	1.84
120% of PWWF	145	3.55	2.81	2.21

Air and scour valves are included on the rising main at the high and low points and are shown in likely locations on the drawings. Odour control may be required for the valves. This shall be determined at a later stage of design.

A satellite manhole with drop structure will be provided prior to the discharge into the WHTM to dissipate the rising main energy. A gravity connection will then be provided into the WHTM manhole. Details for the connection to the existing main to be determined during later stages of design.

11 Additional Considerations

The following sections have been updated following the completion of concept design.

11.1 Operations and Maintenance

There has been ongoing engagement with COG through the optioneering and concept design phase to understand operations and maintenance requirements associated with the new infrastructure. This has included their attendance at the MCA workshop, SID and risk workshops and additional meetings. The expected operational requirements associated with the new upgrades are outlined below:

Infrastructure	Operation and maintenance activities
Pump Station	• Exercising pumps • Regular cleaning / maintenance of pumps • Washdown of drywell • Washdown of wetwell
Storage Tank	• Exercise flushing equipment • Cleaning / maintenance of flushing equipment • Washdown of storage tank
Rising Main	• Cleaning and maintenance of air valves • Exercising and clearing scour valves
Gravity Connection Mains	• Regular flushing of mains • Clearing blockages

Gravity EOP	• Inspection and clearing blockages • Removing river gravels from outlet

11.2 Cost Estimate

11.2.1 Capital Cost

A Level 2 capex cost estimate of the concept design has been completed by Alta, Appendix L and summarised in the table, below.

	Level 2 Estimate
Base Estimate	[redacted]
Contingency	[redacted]
Expected Estimate	[redacted]
Funding Risk	[redacted]
95th % Estimate	[redacted]

This has been developed to the WWL Cost Estimation Manual (Version 1, September 2022) and used the General Method to apply contingency and funding risk, summarised below with details provided in the memo in Appendix L.

	Project Contingency	Funding Risk
Traffic Management	20%	30%
Pipework – Open Cut	20%	30%
Pipework – Tunnel	30%	40%
Shafts	30%	40%
Pipework – Rising Main	20%	30%
Pipework – Bridge Crossing	10%	15%
Pump Station	30%	40%
Pump Station Storage	30%	40%
Service Location Works	30%	40%
Service Relocation Works	30%	40%

The cost estimate provided by Alta excludes property purchase costs. The 95Th percentile estimate has been updated to include an allowance for property purchase as follows:

	Level 2 Estimate	Comment
95th % Estimate (excluding property)	[redacted]	**From Appendix L**
Allowance for property purchase	[redacted]	**Average cost of** [redacted] **per house, allowance for 3 houses**
Contingency and funding risk on property purchase allowance	[redacted]	**Assumed 20%**
95th % Estimate (including property)	[redacted]	

11.2.2 Operational Cost

An opex cost estimate developed based on the Wellington Optimisation Unit Cost Database (GHD, Rev 12 December 2021) and discussions with COG to determine operational requirements for the pump station and storage tank. Due to the lack of data, the opex cost estimate contains a number of assumptions, detailed in Appendix N, and should be used as a guide only. It covers annual operational costs for power, inspections and maintenance and doesn't include for replacement of assets with a design life of less than 100 years or the depreciation value of assets.

A copy of the opex cost estimate is provided in Appendix N and summarised below:

Infrastructure	Average Annual Cost
Pump Station	[redacted]
Storage Tank	[redacted]
Rising Main	[redacted]
Gravity Connection Mains and EOP	[redacted]
Total	[redacted]

11.2.3 Carbon Cost

A carbon assessment has not been completed as part of the concept design. However, it is expected that the following elements of the project account for most of the capital carbon, with potential options for reduction:

- Excavation, earthmoving and disposal of material – This is expected to be the highest contributor and options to reduce excavation volumes, double handling of material and increase reuse of material should be investigated. This could include using trenchless techniques and reducing depth of assets.

- Volume of concrete in structures – Options to reduce the volume of concrete used should be explored and can include considering construction methodology for the new pump station and storage tank and incorporation of temporary works into permanent works.

- Material choices for new infrastructure – Material choices for new pipelines should consider their embodied carbon and disposal options at end of life.

11.3 Safety in Design

The following Safety in Design (SID) activities have been completed as part of the concept design:

- Completion of initial safety in design review and update to the SID risk register by Holmes design team

- Sharing of SID risk register and draft concept design drawings with WWL, RiverLink Project Manager and wider design team for comment

- Safety in Design workshop held on 7 March 2023 with representatives from COG, NET, Chief Advisor Wastewater, Growth Team, peer reviewer and consultant project team to review the proposed design and provide comments, particularly in relation to operation and maintenance considerations

- Constructability workshop held between Holmes and Alta on 1 March 2023, with subsequent workshop held on 9 March 2023 concentrating on the storage tank only, to discuss constructability considerations and identify risks
- Update to the SID risk register to incorporate comments from the reviews and workshops

The updated SID risk register is provided in Appendix K. High priority risks identified are:

Specific Asset Reference (if applicable)	Risk Source (Hazard)	Risk Description	Raw Risk Rating	Control Description	Control Owner
Trenches, launch/reception pits, new pump station, new storage tank	Excavation	Injury/death from falling into excavation, excavation collapse during construction or flooding of excavation from high groundwater	Extreme 350	- Use of trenchless construction to reduce excavation - Construction methodology/sequencing to reduce open excavations - Use of trench shoring and edge protection	Contractor
N/A	Traffic Or Pedestrian Movement	Injury/death by road traffic accident due to construction site within road reserve	Extreme 350	- Consider location of pipelines and locate within footpaths, berms where possible	Designer
New pump station	Confined Spaces	Health risks/death associated with accessing new pump station as a confined space to operate and maintain	High 280	- Locate instrumentation and controls in above ground building and provide actuators on valves etc. to reduce requirement to enter below ground structure	Designer
N/A	Services – Working With Or Near	Injury/death associated with services strike	High 280	- Complete services search / BeforeUdig, survey, potholing to identify services - Locate new infrastructure aware from critical services and with clearances identified in Regional Spec - Include location of services on drawings	Designer
New pipelines	Traffic Or Pedestrian Movement	Injury/death from traffic collision while accessing new pipeline for flushing and maintance	High 280	- Locate manholes / access points in footpaths, berms and out of live traffic lanes	

Specific Asset Reference (if applicable)	Risk Source (Hazard)	Risk Description	Raw Risk Rating	Control Description	Control Owner
New pump station, storage tank or below ground structures	Working At Height or Raised and Falling Objects	Injury/death from falling from height or objects falling into new below ground structures during construction	High 280	- Consider construction methodology that reduces need to work at height - Use of barriers etc. to protect workers from falling from height or falling objects	Contractor
New storage tank	Confined Spaces	Health risks/death associated with accessing new storage tank to clean and maintain	High 280	- Include automated flushing devices - Consider proposed equipment to reduce need to access for maintenance - Locate access hatches at opposite ends to enable forced ventilation of tank while accessing for maintenance	Designer
New rising main (bridge section)	Working At Height or Raised and Falling Objects	Injusry / death associated with falling from height while retrofitting the rising main to the bridge	High 280	Install rising main on bridge while bridge deck is being constructed	
New storage tank	Excavation	Injury / death caused by collapse or groundwater inundation of storage tank due to deep excavation below ground water table	High 280	- Complete geotechnical site investigation including groundwater monitoring at the site to confirm groundwater level and enable appropriate design and construction method to be chosen	Designer

11.4 Risk Assessment

The following project risk activities have been completed as part of this project:

- Review and update to risk register upon project commencement
- Regular review of risk register through the delivery of optioneering and concept design
- Update to risk register following receipt of comments on optioneering report
- Sharing risk register with WWL, RiverLink Project Manager, Dentons and wider design team for comment
- Risk workshop held on 27 October 2022 with representatives from COG, NET, Chief Advisor Wastewater, Growth Team, peer reviewer, legal, planning and consultant project team to review the risk register and provide comments
- Update to risk register following risk workshop to incorporate comments
- Update to risk register following identification of the preferred option to reflect residual risks associated with that option
- Review and update to risk register prior to issue of concept design deliverables

The updated project risk register is provided in Appendix H. High priority risks identified are:

Risk Title	Description/ Cause/ Consequence	Risk Owner	Phase	Established Controls	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)
Groundwater Management	Description: There is a threat that the groundwater table needs to be drawn down to enable construction of the storage tank Cause: The cause of the threat is a high groundwater table and deep, buried storage tank. Consequence: The consequence of the threat is increase costs, potential programme delays and impacts on adjacent properties caused by settlement	Lead Designer	Construction		23	- Complete geotechnical site investigation including groundwater monitoring to confirm groundwater levels
Funding Envelope	Description: There is a threat that the project cost is above the current approved funding amount of [redacted] (rates and developer contributions) Cause: The cause of the threat is an underestimate of cost at budget setting stage and additional requirements and costs being identified during concept design Consequence: The consequence of the threat is insufficient funding to complete project resulting in project being cancelled and loss of funding or inability to meet project outcomes due to funding constraints	Project Manager	Construction	- Level 1 cost estimates undertaken by Alta as part of optioneering - MCA including capital cost + sensitivity testing on cost weighting - Cost estimate being updated to Level 2 for concept design	22	- Input updated expected cost into HCC annual plan review (October 2023) to increase project budget - Investigate and progress value for money ideas identified - Consider undertaking targetted value for money activities (workshop etc.)

Risk Title	Description/ Cause/ Consequence	Risk Owner	Phase	Established Controls	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)
Extent of Riverlink Designation	"Description: There is a threat that the Hutt CBD Sewer project falls outside of the Riverlink consent designation. In particular the location and volume of the storage tank requires a separate consent. Cause: The cause of the threat is the Riverlink designation was obtained without the Hutt CBD Sewer project in frame Consequence: The consequence of the threat is Hutt CBD Sewer project will have to be consented separately, and that this will need to be done by WWL before passing to Riverlink Alliance. This could delay delivery of the project and ability to tie into main RiverLink works"	Project Manager	Design Development	- Review possible consent triggers and highlight as part of optioneering - Complete planning assessment and include as part of concept design deliverables	22	'- Engage HCC and GWRC consenting teams with the project to understand requirements - Commence discussions with RiverLink on preferred approach - separate consenting vs changes to RiverLink consent designation

Risk Title	Description/ Cause/ Consequence	Risk Owner	Phase	Established Controls	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)
Availability of Resources	Description: There is a threat that HCC RiverLink Partner Lead has insufficient capacity to adequately support this project. Cause: The cause of the threat is this project is outside the original scope of the RiverLink project and is funded by IAF. Therefore, it hasn't been allowed for in the original resourcing plan. Consequence: The consequence of the threat is this project isn't adequately championed to the RiverLink board, and therefore doesn't become part of realising threat R11 and missing opportunity R02.	Project Manager	Procurement	- Continued engagement and pushing project with HCC RiverLink Partner Lead	22	- Continue to push agenda of this project with HCC RiverLink Partner Lead - Escalate within Wellington Water to enable escalation within HCC

11.5 Consultation and Approvals

A Planning Assessment has been completed to understand the planning and consenting requirements associated with this project, Appendix O. Overall, consenting for construction of the proposed solution is straightforward, although consents will need to be obtained from HCC and GWRC or the existing RiverLink consent designation extended to cover consentable activities associated with this project. Therefore, it is recommended meetings are held with the GWRC and HCC planning departments to confirm requirements and RiverLink to agree a consenting approach. In addition, this highlighted the following items that will need to be addressed as the project progresses:

- It will be difficult to obtain a consent for a new wastewater discharge from the proposed EOP and this will likely be publicly notified. Previous discussions with WWL RMA team have indicated they are not planning to consent the discharge and use the emergency works provision under the RMA for any discharges. They are currently seeking legal advice on this approach.

- The proposed rising main and gravity pipelines are being constructed adjacent to identified Selected Land Use Register (SLUR) sites. Due to contamination creep, the project may require the excavation and disposal of contaminated material. It is recommended a contaminated land expert is engaged during the next stage of design to understand the risk, and whether a preliminary site investigation (PSI) and detailed site investigation (DSI) need to be completed.

- Construction of the proposed EOP structure may require works within the river channel or diversion of the river, which would fall outside a permitted activity and therefore require consent. Due to the location of the EOP structure, it is likely this activity would fall under the existing RiverLink consent designation. However, discussions with RiverLink are needed to confirm this.

- Installation of the proposed rising main on the pedestrian and cycle bridge is expected to be a permitted activity and therefore no specific consent is required for this activity.

- Construction of the new storage tank exceeds permitted activity earthworks volumes and therefore would require a consent. Due to the location of the proposed storage tank, it is unlikely this activity would fall under the existing RiverLink consent designation. Discussions should be progressed between WWL and RiverLink on whether this is consented separately or the RiverLink designation is extended to cover the construction of the storage tank.

- Part of the proposed project falls outside the existing RiverLink consent designation and therefore construction and demolition works would either have to comply with the permitted activity standards for noise, a separate consent would need to be obtained or the RiverLink designation extended to cover these activities. Discussions should progress between WWL and RiverLink to confirm the approach.

- The discharge of odour from the pump station and storage tank has the potential to create objectional odour. It is recommended an air quality expert is engaged to understand compliance requirements.

- The proposed works may impact the integrity of the Waiwhetu Aquifer or its aquiclude. Therefore, it is recommended geotechnical site investigation is completed to determine the depth of the aquiclude and aquifer in the location of the project, particularly where large or deep structures are being proposed. Also, discussions should be progressed with GWRC to understand restrictions associated with the aquifer.

11.6 Customer and Community

A high-level Communications and Engagement Plan has been developed for this project, Appendix P. This provides an outline for key audiences and communication objectives and strategies relating specifically to the scope of this project and WWL/HCC.

Due to the proposal for this project to be delivered by the RiverLink alliance, it is expected that communications and engagement relating to this project will become the responsibility of the alliance. Therefore, this plan has been developed to provide input into their communication activities and it is expected to be adopted by the alliance.

11.7 Smart Investment and Value for Money

The number of smart investment and value for money ideas have been proposed and incorporated into the concept design of the project, as outline below.

Value for money ideas included in the design are outlined in the Table 16, below, with estimated capex cost savings:

Table 16. Summary of value for money ideas included in the design

Idea	Description	Benefit	Estimated capex cost savings
Move upstream end of EOP closer to the river	Connect the upstream end of the EOP to the manhole on the corner of High Street and Pretoria Street instead of the new pump station and utilise the new connection main as an EOP	Reduce length of EOP by approx. 310m	[redacted]
Trench sharing between gravity main and rising main along Pretoria Street	Align gravity main and rising main adjacent to each other along Pretoria Street to enable a common trench during construction	Reduce total excavation volume and reinstatement requirements	[redacted]

Potential value for money ideas are outlined in Table 17, below, with estimated capex cost savings. It is recommended these are investigated further at the next stage of design.

Table 17. Potential value for money ideas

Idea	Description	Benefit	Estimated capex cost savings
Wet well only pump station	Change the layout of the proposed pump station from wet well/drywell to wet well only	Reduce diameter of pump station resulting in material savings and reduced excavation to construct	[redacted]
Construct EOP with minimum cover level	Change vertical alignment of EOP so it is constructed with minimum cover level	Reduce excavation depth	[redacted]
Install rising main concurrently to bridge construction	Install rising main on bridge during bridge construction.	Remove requirement for scaffolding to install rising main on bridge. Some efficiencies in connection brackets	[redacted]
Construction method for storage tank	Use construction method and incorporate temporary works into permanent works (e.g. secant piling)	Reduces temporary works costs. Potentially reduces risk associated with ground conditions and groundwater	[redacted]
Pump empty storage tank	Pump from storage tank into pump station	Reduce depth of pump station reducing costs	[redacted]
Delivery by RiverLink alliance	Works constructed concurrently to RiverLink project by same contractor	Efficiencies in delivery including reduction in onsite overheads and reinstatement costs	[redacted]

11.8 Procurement and Programme

Due to the significant geographic overlap with the RiverLink project, and the use of structures being constructed by RiverLink as part of this project, it is proposed this project is delivered by the RiverLink alliance. This would entail handing the project over to the alliance at the end of concept design to allow them to develop the design and deliver this project alongside the main RiverLink works. This also has benefits in terms of delivery efficiency and reduced impact on the community. Through this procurement method, delivery programme will be confirmed later by the RiverLink alliance. WWL are currently in discussions with the HCC RiverLink Partner Lead to progress this.

Delivery milestones have been agreed with Kāianga Ora as part of the IAF application. The current proposed completion date for the project is 2026. However, it is understood this date can be renegotiated once a delivery partner is on board.

12 Conclusion

This report concludes a robust optioneering, shortlisting and MCA process was completed to identify a highest scoring option for relieving uncontrolled spilling in Hutt CBD caused by population growth because of the Riverlink project. However, there were limitations in this process due to the scope not including review of the Western Trunk Main and Ava spill mitigation measures currently in place. This has resulted in significant operational risks associated with the highest scoring option that prevent it from being recommended as the preferred option. Therefore, further work is required to understand these risks, the requirements to mitigate them and to be able to identify a preferred option for taking forward to concept design.

A meeting was held between WWL, Holmes, and HAL to identify the additional work to identify a preferred option. From the meeting the following work was undertaken, review of the modelling to identify risks with connecting Western Trunk Main, confirmed the solutions to mitigate the risks, and update the highest MCA scoring options (Option 2) to include the mitigation solutions. Using the updated Option 2 an additional options assessment was used to identify the preferred solution to progress to concept design. The revised option 2 was identified as the preferred option and was endorsed by 3WDMC, however, concerns were raised the the cost of operating and maintaining the new infrastructure was unknown. Therefore, they recommended that an OPEX Cost estimate be completed at concept design.

Following the endorsement by 3WDMC the preferred option (revised Option 2) was progressed to concept design. This report concludes the concept design process that was used to develop the preferred option, the SiD and risk register, and updated cost estimate. The alignment of the pipelines and schematic of the pump station and storage layout was completed. Additionally, hydraulic modelling was completed to size the pipelines and set the EOP and storage tank levels. However, there were limitations in the modelling completed due to the accuracy of the information used to build the model. Therefore, surveys of the existing pipes is required to understand the design tie-in points and to confirm the hydraulic design.

13 Recommendations

This report makes the following recommendations:

- That this report be accepted as an accurate representation of the process that has been undertaken to complete an MCA and determine the highest scoring option for the Hutt CBD Sewer Bypass.
- That further work is carried out to understand the requirements to mitigate the operational risks associated with options connecting to the Western Trunk Main.
- That the cost estimate for Option 2 is updated with any additional requirements to make it a feasible solution, as identified above.

- That the revised Option 2, including upgrades to mitigate operational risks, is rescored using the MCA criteria to enable a like for like comparison with Option 4.
- That this revised scoring is used to support the recommendation for a preferred option to be taken forward to concept design.
- To survey all existing services the concept option connect and to confirm the hydraulic design.
- That further work is carried out to develop the pump station layout from concept and determine long term site plans. Including the option for a wetwell only pump station, tank construction methodology, and identify preferred properties for purchase.
- That further work is undertaken to understand the consenting requirements and options for the EOP.

14 References

[1] HAL. (2021). Lower Hutt Wastewater Network Option Assessment

[2] HAL. (2022). Seaview Strategic Wastewater Model System Performance Assessment Report

[3] HCC. (2021). Tō tātou mahere ā-ngahurutanga 2021-2031 | Our 10-year plan 2021-2031

Appendix A – Geotechnical Desktop Assessment

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Memorandum

From: [redacted]
Date 06 July 2022 Project No: 144418.50
Subject: Riverlink Wastewater Trunk CBD Bypass - Geotechnical Desktop Assessment

1 INTRODUCTION

This memorandum outlines factual geological information along five proposed wastewater alignment options for the Hutt Central Business District (CBD) sewer bypass project in Lower Hutt, Wellington. The purpose of this memorandum is to provide a high-level overview of the anticipated soil types and groundwater conditions for informing construction methodology.

The five proposed alignment options are appended to this memorandum.

2 GEOLOGICAL OVERVIEW

The GNS Geological map[1] of the area shows the entire study area to be underlain by Holocene River Deposits comprising highly variable interbedded silt, sand and gravel.

We also reviewed the New Zealand Geotechnical Database (NZGD) for nearby investigation information and performed a literature review of publicly available sources of the Lower Hutt Aquifer[2]. We include relevant logs from our NZGD review in Appendix A.

We summarise the general stratigraphic sequence at the site in Table 1 below.

Table 1: Hutt Valley Geological Overview

Unit	General Description
Fill/Reclaimed Land	Variable but generally reworked Taita Alluvium or engineered fill
Taita Alluvium	Highly variable interbedded silt, sand and gravel
Melling Peat / Petone Marine Beds	Organic silts, sands and local gravels. Shell beds.
Upper Waiwhetu Gravels	Coarse gravels

Generally the Taita Alluvium is sufficiently thick in the study area, that the majority of the proposed alignment options will be governed by variability within this unit, rather than the boundaries between other units identified in Table 1.

3 GENERAL GROUNDWATER OBSERVATIONS

Groundwater at the site is primarily associated with the unconfined Taita Alluvium unit. Below the Taita Alluvium and Petone Marine Beds is the Waiwhetu Aquifer is artesian. It is assumed that excavations will not breach into the Waiwhetu aquifer, therefore we focus of groundwater observations in the Taita Alluvium.

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[1] Begg, J.G.; Johnston, M.R. (compilers) 2000: Geology of the Wellington area: scale 1:250,000. Lower Hutt: Institute of Geological & Nuclear Sciences. Institute of Geological & Nuclear Sciences 1:250,000 geological map 10. 64 p

[2] Gyopari, M. (2014), Lower Hutt Aquifer Model Revision (HAM3): Sustainable Management of the Waiwhetu Aquifer

Figure 1 from Gyopari, M. (2014)[2] summarises groundwater contours based on available monitoring data during July 2012. This study indicated that the groundwater level in the Taita alluvium is generally between 1 m and 4 m above mean sea level.

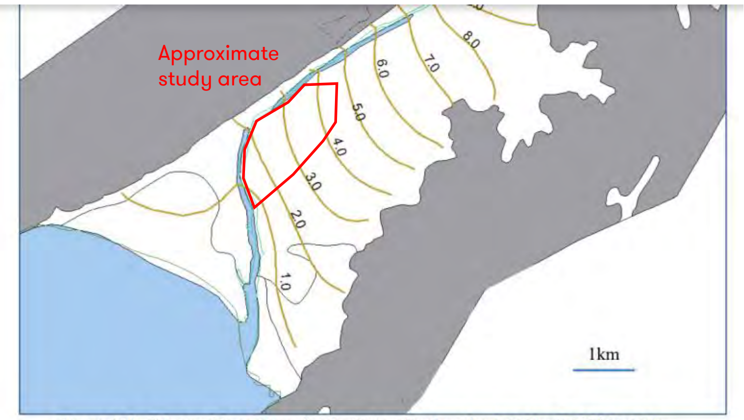

Figure 4.10: Water table contours for the Taita Alluvium simulated by HAM3 for July 2012 and based on available monitoring data. Contours in metres above mean sea level.

Figure 1 : Extract of Fig 4.1, Gyopari 2014

Groundwater level variations in the Taita Alluvium are strongly influenced by the level in the Hutt River, riverbed degradation and aggradation, continuity of cohesionless layers, localised rainfall, and tidal influences in areas closer to the foreshore. To highlight some of this variability, we present Figure 2 from Gyopari, M. (2014)[2]. Although the data presented here is not within the study area (approximately 5.5km north-east) it indicates potentially variability that may be encountered within the study area.

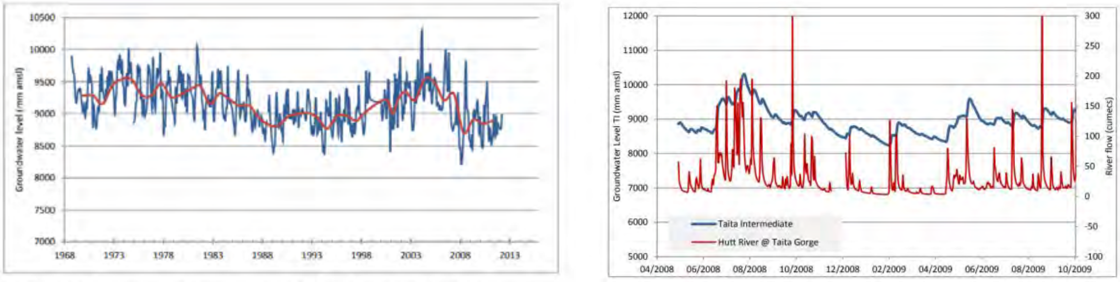

Figure 4.2: Long-term groundwater level record for Taita Intermediate site (30d and annual means plotted)

Figure 4.3: Seasonal groundwater level variation in the Taita Alluvium and correlation with flow in the Hutt River

Figure 2: Extracts of Fig. 4.2 and 4.3 Gyopari 2014

We observed a large amount of variability in the groundwater levels from the borehole readings. This may be due to drilling fluid not having equalised or compounding variations discussed above. As such it is suggested for planning purposes that the median groundwater level should be consistent with Figure 4.10[2] at approximately 2.0m – 4.0m AMSL[3]. Using the information presented from the Taita Intermediate site, variation in groundwater levels may be as much a +/- 0.75m depending on location, season, and proximity to the Hutt River.

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[3] Above Mean Sea Level

3.1 Hydraulic properties

We understand the pipeline installation will consider both open trench and trenchless construction techniques. One of the main considerations between these two options is the impact of groundwater flows during construction. The current makeup of the Taita Alluvium suggest seepage through cohesionless layers may be possible depending on the amount of fines in the gravel matrix, continuity of the cohesionless layers, depth of excavation and proximity from the river. We present anticipated hydraulic properties based on our literature research for the Taita Alluvium and Petone marine beds/melling peat below.

Taita Alluvium

Gyopari, M. (2014)[2] summarise the hydraulic properties of the Taita Alluvium from a large scale pump test at Avalon Studios is approximately 4km north east from Lower Hutt CBD, and 350m from the Hutt River. The following is an extract from this reference:

"A large-scale pumping test was carried out in a shallow bore at Avalon Studios (R27/7320) in 1992 and provided a range of transmissivity values of between 2,700 and 52,700 m2 /day, with an average of 4,500 m2 /day. This equates to a hydraulic conductivity of around 1,000m/day in the Avalon Studios area, which is probably representative of the more recent Taita Alluvium adjacent to the river where there is a strong connectivity with the river. Further from the river, on older terraces and where the Taita Alluvium merges with the Melling Peat and Petone Marine Beds, the hydraulic conductivity maybe substantially less."

As discussed above, the hydraulic properties of the Taita Alluvium are likely to be highly variable, but the observations from the Avalon Studios pump test are likely to be broadly applicable within the study area. Hydraulic conductivity is expected to reduce with distance from the Hutt River, or the presence of cohesive material.

Petone marine beds/melling peat

The melling peat and Petone marine beds generally have low hydraulic conductivity. They create an aquitard and confine the artesian conditions encountered in Upper Waiwhetu Aquifer. Gyopari, M. (2014)[2] state the following;

"Measurements from various construction site investigations provide a horizontal hydraulic conductivity range of $1x10^{-3}$ *to* $1x10^{-4}$ *m/day. Vertical hydraulic conductivity is expected to be at least an order of magnitude lower due to the stratified nature of the marine beds and the presence of laterally persistent silt layer"*

4 OPTIONS ASSESSMENT

4.1 Option 1

Based on the geological information between Kings Crescent and the pumpstation location at Fraser Street, the invert levels are all anticipated to be within gravel of the Taita Alluvium. It should be noted that information between Kings Crescent and High Street is very limited. Due to the cohesionless nature of the material, open trenched installation methods are not thought to be suitable for the length of this option. As the logs along this alignment are primarily water bore logs, detailed information on the gravels is not provided. BH161817 is the only engineering log, and indicates the gravel to be fine to medium with a high sand content, and medium to very dense.

Table 2: Option 1 Borehole Data Summary

BH ID	Anticipated Soil Type at IL	Anticipated Soil Type Above IL	Groundwater depth (mBGL)
Other_83097	Gravel	Gravel and silt	3.0
BH_137214	Gravel	Gravel, sand, silt	1.2

BH ID	Anticipated Soil Type at IL	Anticipated Soil Type Above IL	Groundwater depth (mBGL)
BH_154568	Silt/clay	Silt and sand	N/A
BH_161817	Gravel	Silt and sand	3.5
BH_114761	Gravel	Gravel, sand silt	N/A

Where groundwater data is available, groundwater depths along the alignment are recorded at 1.5m – 3.5m BGL. Standing groundwater levels appear to be above the proposed invert levels.

Pump Station

The nearest Borehole to the pumpstation is BH_114761 which indicates sand and gravel from 1.8m BGL to the base of the borehole at 20.1m BGL. We expect the pump station and associated well excavation are not anticipated to be at risk of breaching the Waiwhetu Aquifer. Additional studies may be needed to confirm impacts on the Waiwhetu Aquifer due specific dewatering or specific construction requirements.

4.2 Option 2

Geotechnical information between Kings Crescent and the proposed pump station location is very limited. Boreholes drilled on Downer Street and High Street, both approximately 100m away from the pipe alignment, indicate cohesive material at the invert levels which suggests open trench excavation may be viable from Pretoria Street to the pump station. Groundwater information is only available for BH_137214 within this section, and indicates groundwater at a depth of 1.2m BGL. The gravel at the IL in BH_137189 is indicated to be fine to coarse, and medium to very dense.

Table 3: Option 2 Borehole Data Summary

BH ID	Anticipated Soil Type (IL)	Anticipated Soil Type (Above IL)	Groundwater depth (mBGL)
Other_84102	Silt	Silt	N/A
BH_137214	Silt	Silt	1.2
BH_137189	Gravel	Sand and silt	4.8

Pump Station

The Taita Alluvium is shown to be variable at the approximate location of the pump station, with interbedded silt sand and gravel down to at least 9.7m BGL. The invert level is within gravel, however the nearest borehole depth does not extend to the anticipated pump station base elevation, so comment cannot be made on the risk of breaching the Waiwhetu Aquifer. Additional studies are needed to confirm the impacts of the pump station on the Waiwhetu Aquifer.

4.3 Option 3

As with option 2, information along Pretoria Street is very limited but the nearest available data indicates cohesive material which may permit open trench installation. Groundwater levels are not provided on the data utilised. Grading and density information for the gravel is also not provided.

Table 4: Option 3 Borehole Data Summary

BH ID	Anticipated Soil Type (IL)	Anticipated Soil Type (Above IL)	Groundwater depth (mBGL)
BH_114670	Silt	Silt	N/A
BH_114750	Silt	Silt	N/A
Other_83879	Gravel	Gravel and silt	N/A

Pump Station

The proposed pump station shows gravel to a depth of 7.6m BGL, which is below the IL. Below this is a sand which appears to be of the Petone Marine Beds. As such, the pump station is not considered to be at risk of breaching the Waiwhetu Aquifer. Additional studies may be needed to confirm impacts on the Waiwhetu Aquifer due specific dewatering or specific construction requirements.

4.4 Option 4

The borehole information suggests ILs will sit within cohesive material from Pretoria Street to near the proposed pump station. Open trenched excavation may be viable for this section. Groundwater information is limited, but Other_84459 indicates a standing groundwater level of 1.0m BGL. The log for Other_84459 does not provide an engineering description of the gravel. The gravel fill in BH_136050 is indicated to be fine to coarse and medium dense.

Table 5: Option 4 Borehole Data Summary

BH ID	Anticipated Soil Type (IL)	Anticipated Soil Type (Above IL)	Groundwater depth (mBGL)
BH_114670	Silt	Silt	N/A
BH_114750	Silt	Silt	N/A
Other_84459	Gravel	Gravel and silt	1.8
Other_84449	Silt	Fill (Gravel and silt)	N/A
Other_114885	Sand	Sand and silt	N/A
BH_136050	Fill (Gravel)	Fill (gravel)	4.5

Pump Station

There is very limited information at the proposed pump station location. The nearest log terminates approximately 0.5m above pump station IL in gravel. Additional studies are needed to confirm the impacts of the pump station on the Waiwhetu Aquifer.

4.5 Option 5

Cohesionless material shown to be present from 1.8m BGL to 20.1m BGL at location of Fraser Street pump station.

Boreholes along Rutherford Street indicate primarily cohesive material in upper 2m so trenchless or open trench construction methods should be viable from the pump station to the river. Groundwater is not anticipated to be present at this depth. The gravel is described as fine to coarse in BH_137757.

Table 6: Option 5 Borehole Data Summary

BH ID	Anticipated Soil Type (IL)	Anticipated Soil Type (Above IL)	Groundwater depth (mBGL)
BH_137557	Gravel	Gravel and silt	N/A
Other_84358	Silt	Silt	2.3
BH_137189	Sand	Sand and fill (gravel)	4.8
BH_114761	Gravel	Sand and silt	N/A

The nearest borehole to the Harcourt Werry Drive pump station is BH_137557 shows interbedded alluvium to 9.25m BGL, with gravel at invert level and locally interbedded silt/sand/gravel at 5m below IL. This material appears to consist of Taita Alluvium suggesting there is unlikely to be a risk of breaching the Waiwhetu Aquifer, however the descriptions are limited.

Pump Station

The nearest borehole to the Fraser Street pumpstation is BH_114761 which indicates sand and gravel from 1.8m BGL to the base of the borehole at 20.1m BGL. The pump station and associated well excavation are not anticipated to be at risk of breaching the Waiwhetu aquifer. Additional studies may be needed to confirm impacts on the Waiwhetu Aquifer due specific dewatering or specific construction requirements.

Drilling under the Hutt River

Boreholes drilled either side of the Hutt river show highly variable alluvial deposits consisting of interbedded silt, gravel, and sand. It is expected that a relatively shallow horizontal bore under the Hutt river would be through saturated river gravel. Sizable boulders and cobbles should be expected within the alluvial deposits and a drilling specialist should review the ground conditions and make comment on suitability of their specific equipment for any trenchless construction under the Hutt River. A hydrology assessment should be performed to determine any long-term scour and erosion effects that may occur to confirm the pipe depth requirements under the river.

[redacted]

[redacted]
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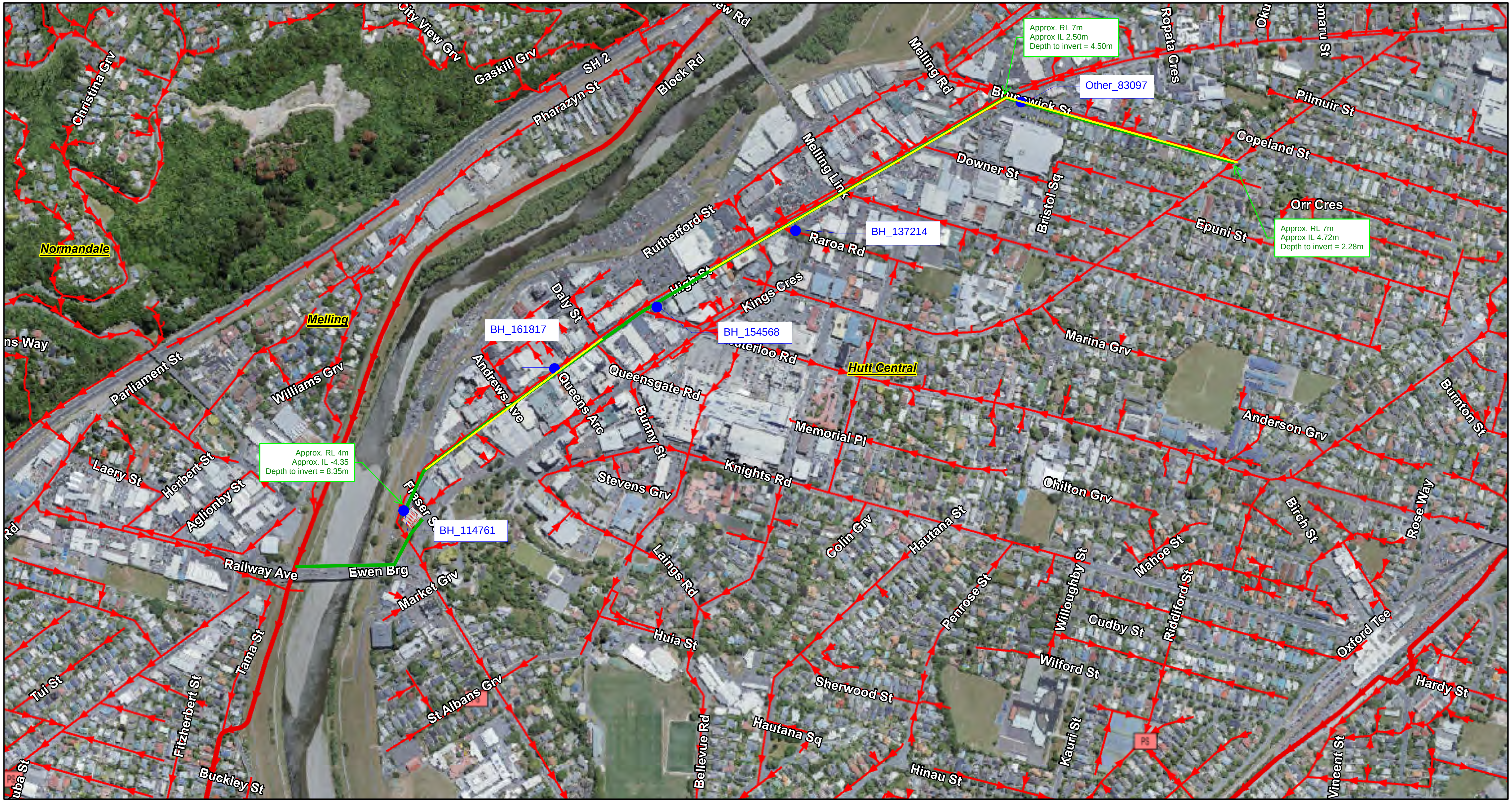
Holmes NZ LP

Copies to:

Wellington Water Ltd Map



5/11/2022, 12:06:34 PM

HAL Reference: AAG

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- PS Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 29/06/2022

CSK: Option 1 REV: 01

Wellington Water Ltd

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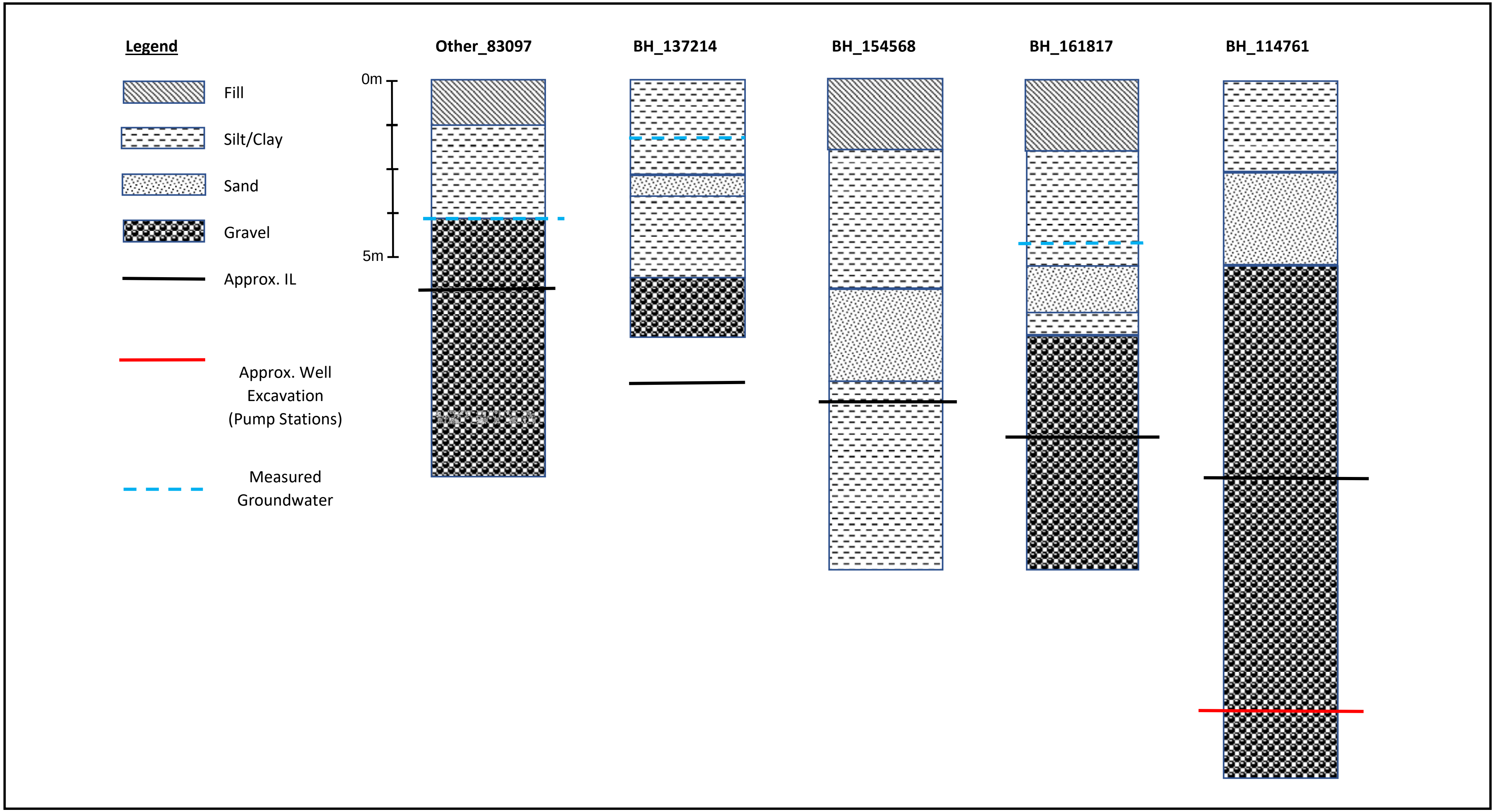
Option 1 Borehole Summary



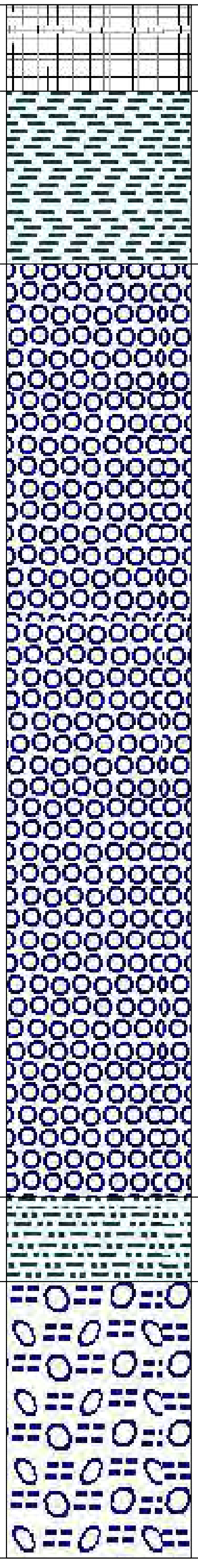
PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 29/06/2022

CSK: Option 1 REV: 01

Borelog for well BQ32/0004

Gridref: 1760432.5436759
Ground Level Altitude +MSD
Driller : GRIFFITHS DRILLING COMPANY LTD
Drill Method : Rotary/Percussion
Drill Depth : 9.00m Drill Date : 28/03/2011 12:00:00 a.m.



Scale	Depth	Drillers Description	Formation
	-0.50m	**Brown. FILL. GRAVELS**	
	-1.50m	**Brown. SILT, semi cohesive**	
-5	-6.90m	**Blue Grey. GRAVELS, medium/ (W/L -3.0m below ground level)**	
	-7.40m	**BLUE GREY. SILT. SAND, fine.**	
	-9.00m	**Blue grey. GRAVELS, medium. Brown SILT.**	

GEOTECHNICS

BOREHOLE LOG

BOREHOLE No.: **WS2**

Hole Location: Please refer to test location plan.

SHEET: 1 OF 1

PROJECT: GWN 340 HIGH STREET ENGEO
LOCATION: 340 High Street, Lower Hutt
JOB No.: 1008253.0000

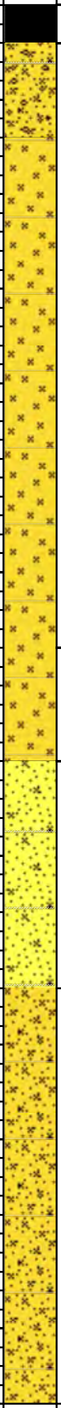
CO-ORDINATES: (NZTM)
R.L.:
DATUM
DRILL TYPE: Window Sampler
DRILL METHOD: PR
DRILL FLUID: N/A
HOLE STARTED: 05/09/2018
HOLE FINISHED: 05/09/2018
DRILLED BY: GEOTECHNICS
LOGGED BY: HAMU
CHECKED: MTN

GEOLOGICAL

GEOLOGICAL UNIT,
GENERIC NAME,
ORIGIN,
MATERIAL COMPOSITION.

ENGINEERING DESCRIPTION

Column headings: FLUID LOSS (%) 25 50 75 | WATER | CORE RECOVERY (%) | METHOD | CASING | TESTS | SAMPLES | RL (m) | DEPTH (m) | GRAPHIC LOG | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) 10 25 50 100 200 | COMPRESSIVE STRENGTH (MPa) 1 5 20 50 100 250 | DEFECT SPACING (cm) 20 60 200 600 2000 | Description and Additional Observations



Depth scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5

Water: 05/09/2018 (at approx. 1.2 m)

Core recovery / Method / Casing:
- 100 / WS / 60mm (to 1.0 m)
- 100 / WS / 60mm (1.0 – 2.0 m)
- 100 / WS / 35mm (2.0 – 3.0 m)
- 100 / WS / 35mm (3.0 – 3.7 m)

Tests and samples:
- ● 140/68 kPa
- WS2-1 @ 1.5m
- WS2-2 @ 2.5m
- ● 125/36 kPa
- WS2-3 @ 3.5m
- WS2-4 @ 3.7m

Moisture	Strength/Density	Description and Additional Observations
		ASPHALT.
M	St	Sandy gravelly SILT (ML); orange brown. Stiff, moist, low plasticity; sand, fine to coarse; gravel, fine, angular to subrounded.
		SILT (ML), minor sand; orange brown mottled orange. Stiff, moist, low plasticity; sand, fine.
W-S	S	*1.70m:* Soft, wet to saturated.
M-W	L	Silty SAND (SM); grey mottled orange and brown. Loose, moist to wet, well graded; sand, fine to coarse.
	MD	*2.15m:* Medium dense.
	L	*2.40m:* Loose.
W-S	S	Sandy SILT (ML); grey. Soft, wet to saturated, low plasticity; sand, fine to coarse. *2.80m:* Wood fragments. *3.65 - 3.70m:* Gravel, 20mm in diameter. *3.70m:* Wood, 35mm in diameter in end of core barrel.

3.7m: Refusal

COMMENTS

Hole Depth
3.7m

Scale 1:20

Rev.: A

BoreLog - 10/09/2018 11:52:22 a.m. - Produced with Core-GS by GeRoc

NZGD ID: BH_154568

IAN R BROWN ASSOCIATES LTD
Geological Engineering Consultants

GEOTECHNICAL DRILLHOLE LOG

PROJECT: 1272 252-256 High Street
GRID REF: 2669734E_5998078N
R.L. GROUND: 5.50
HOLE DIP (angle from horiz):
HOLE AZIMUTH:
HOLE NO. WGDH368

Drilling Information						Core Material							Rock Mass Defects / SPT data		
METHOD	Core Loss/ Lift % 5 10 50	Water Level Date	Drill Water Loss % 0-100	Casing/ Samples	R.L.	Depth	Graphic Log	Material Description rock type, lithological features structure, colour, texture	Stratigr. Unit	Weathering SW MW HW	Point Load Strength MPa	Relative Strength S MS MW W	Fracture Log (cm spacing of natural fractures) 50 10 5 1	Defect Description type, inclination, width coating, roughness SPT Description	RQD

METHOD
Jet Vac
SPT
Sonic
SPT
Sonic
SPT
Sonic
SPT
Sonic
SPT
Sonic
SPT
Sonic
SPT
Sonic
SPT
SPT

Depth: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

TOTAL DEPTH 12.90 m

Material Description

- TARSEAL
- CONCRETE
- FILL, bricks, silt, gravel, HC contamination
- grey SILT, soft, minor FILL, HC contamination
- light brown silty, fine, angular GRAVEL, loose, moist-wet, HC contamination
- grey CLAY very soft, moist with minor gravel, minor sand, HC contamination
- grey/brown silty CLAY, soft, moist, HC contamination
- Coreloss
- grey silty CLAY, soft, moist, minor sand, trace gravel, HC contamination
- grey silty CLAY, soft, moist, minor fine sand
- grey clayey SILT, firm, moist
- grey silty fine SAND, medium dense, minor clay, minor shell
- grey soft SILT, soft, moist
- grey silty medium SAND, loose, moist
- WOOD
- dark grey-grey fine-medium silty SAND, moist, loose, with trace wood
- grey medium sub-rounded SAND, loose, moist minor fine rounded gravel
- grey fine-medium well rounded gravelly, medium-coarse SAND, moist, loose-medium dense, well graded
- grey/brown silty CLAY, soft, moist, organic
- dark brown/black armorphous-fibrous PEAT, soft-firm, moist
- grey fine sandy SILT, firm grading soft, moist
- grey fine clayey SILT, soft, moist
- grey/brown clayey SILT, soft, moist, organic
- grey fine sandy SILT, soft-firm, moist, minor clay
- grey silty medium SAND, loose, moist
- grey clayey SILT, soft-firm, moist, occasional <1cm shell beds, minor organics, minor fine sand
- grey silty CLAY, soft-firm, moist, occasional <1cm shell beds, minor fine sand

SPT Description

SPT @ 1.5m
0/0//0/0/0/0 N=0

SPT @ 3.0m
0/1//0/0/1/1 N=2

SPT @ 4.5m
0/03//1/1/1 N=3

SPT @ 6.0m
5/7//1/1/1/1 N=4

SPT @ 7.5m
1/1//1/2/2/1 N=6

SPT @ 9.0m
1/1//2/3/4/2 N=11

SPT @ 10.5m
1/1//1/2/3/1 N=7

SPT @ 12.0m
0/0//1/2/2/3 N=8

SPT @ 12.45m
2/3//2/2/2/2 N=8

ROCK WEATHERING
UW - Unweathered
SW - Slightly weathered
MW - Moderately weathered
HW - Highly weathered
CW - Completely weathered

RELATIVE STRENGTH
VS - Very strong
S - Strong
MS - Moderately strong
W - Weak
VW - Very weak
EW - Extremely weak

FRACTURE LOG (cms)

LOGGED MKB
DATE
CHECKED
APPROVED
PHOTOGRAPH NUMBERS
LENGTH 12.90
CORE BOXES 4
ORIGINAL SCALE 1: 60
(A3)

DRILLER Niko Matthews
STARTED 2019/03/17
FINISHED 2019/03/17
DRILL Sonic

Explanation

NZGD ID: BH_154568

SHEET 1 OF 1.00 DRG NO.

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	**BH03**
sheet:	1 of 2
project no.	***773-WLGGE222080***

client:	***The Wellington Company Limited***	date started:	***31 Oct 2018***
principal:	***-***	date completed:	***31 Oct 2018***
project:	***177 High Street***	logged by:	***CD***
location:	***Lower Hutt***	checked by:	***SM***

position: Not Specified
surface elevation: Not Specified
angle from horizontal: 90°
drill model: Fraste XL1 Red (Sonic) & SLG.1 (Rotary)
drilling fluid:
hole diameter : 123 mm

drilling information | **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
NDD					1.0		GP	**Sandy GRAVEL**: fine to coarse grained, angular, grey. 0.4 m: trace glass fragments				**FILL** Vacuum excavated to 1.5m, logged from jet vac hole. HP are reading times 100 compressive strength
SD			SPT 0, 0, 0, 0, 1, 1 N*=2 SPT 0, 1, 1, 0, 1, 1 N*=3 SPT 2, 3, 2, 3, 2, 3 N*=10		2.0 3.0		ML	**SILT**: low plasticity, grey, minor clay, minor fibrous organics.	M	S F to St		**UPPER ALLUVIUM** Core Run (1.5-1.95 m): 100% recovery Core Run (2.0-2.45 m): 100% recovery Core Run (2.45-3.0 m): 91% recovery Core Run (3.0-3.45 m): 100% recovery Core Run (3.45-4.0 m): 100% recovery
		31/10/18	SPT 3, 3, 3, 2, 3, 3 N*=11		4.0		SP	**SAND**: fine grained, dark grey, trace silt. 4.65 m: silt becoming minor		MD		Core Run (4.0-4.45 m): 100% recovery Core Run (4.45-5.0 m): 91% recovery
			SPT 3, 4, 3, 4, 5, 6 N*=18		5.0		ML	**SILT**: non plastic, dark grey, with some fine to medium grained subrounded gravels.	D to M M	VSt		Core Run (5.0-5.45 m): 100% recovery
HQ			SPT 5, 6, 5, 6, 7, 7 N*=25 SPT 7, 7, 11, 11, 11 N*=44		6.0 7.0		GP	**Sandy GRAVEL**: fine to medium grained, sub-rounded to angular, dark grey, sand is fine to coarse grained.		MD VD		**TAITA ALLUVIUM** Core Run (5.45-6.0 m): 76% recovery Core Run (6.0-6.45 m): 100% recovery Core Run (6.45-7.0 m): 82% recovery Core Run (7.0-7.45 m): 100% recovery Core Run (7.45-8.0 m): 82% recovery

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: NON CORED 177 HIGH ST_GINT.GPJ <<DrawingFile>> 26/11/2018 15:32

method

AD	auger drilling*
AS	auger screwing*
HA	hand auger
W	washbore
NDD	non destructive drilling
SD	sonic drilling
*	bit shown by suffix
e.g.	AD/T
B	blank bit
T	TC bit
V	V bit

support

M	mud	N	nil
C	casing		

penetration

1 2 3
no resistance ranging to refusal

water

10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests

B	bulk disturbed sample
D	disturbed sample
E	environmental sample
SS	split spoon sample
U##	undisturbed sample ##mm diameter
HP	hand penetrometer (kPa)
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
VS	vane shear; peak/remouded (kPa)
R	refusal
HB	hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture

D	dry
M	moist
W	wet
S	saturated
Wp	plastic limit
Wl	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

coffey
A TETRA TECH COMPANY

Engineering Log - Borehole

Borehole ID.	**BH03**
sheet:	2 of 2
project no.	**773-WLGGE222080**
client:	**The Wellington Company Limited**
principal:	**-**
project:	**177 High Street**
location:	**Lower Hutt**
date started:	**31 Oct 2018**
date completed:	**31 Oct 2018**
logged by:	**CD**
checked by:	**SM**

position: Not Specified
surface elevation: Not Specified
angle from horizontal: 90°
drill model: Fraste XL1 Red (Sonic) & SLG.1 (Rotary)
drilling fluid:
hole diameter : 123 mm

drilling information / **material substance**

method & support	penetration 1 2 3	water	samples & field tests	RL (m)	depth (m)	classification symbol	material description: SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetrometer (kPa) 100 200 300 400	structure and additional observations
HQ			SPT 12, 18, 22, 28/45mm N*=R SPT 10, 13, 13, 15, 22/70mm N*=R		9.0	GP	7.9 m: with 90mm cobble **Sandy GRAVEL**: fine to medium grained, sub-rounded to angular, dark grey, sand is fine to coarse grained. *(continued)*	M	VD		**TAITA ALLUVIUM** Core Run (8.0-8.45 m): 100% recovery Core Run (8.45-9.0 m): 73% recovery Core Run (9.0-9.45 m): 100% recovery Core Run (9.45-10.0 m): 82% recovery
			SPT 4, 6, 6, 10, 14, 14 N*=44		10.0	SP	**SAND**: fine grained, dark grey, trace fine gravels.		D		Core Run (10.0-10.45 m): 100% recovery
			SPT 1, 2, 3, 4, 2, 2 N*=11 SPT 3, 2, 3, 3, 2, 3 N*=11		11.0 12.0	SM	**SILTY SAND**: fine grained, dark grey, trace shells.		MD		**PETONE MARINE BEDS** Core Run (10.45-11.0 m): 82% recovery Core Run (11.0-11.45 m): 100% recovery Core Run (11.45-12.0 m): 82% recovery Core Run (12.0-12.45 m): 100% recovery
					13.0 14.0 15.0		Borehole BH03 terminated at 12.45 m Target depth				

CDF_0_9_06_LIBRARY.GLB rev:AR Log COF BOREHOLE: NON CORED 177 HIGH ST_GINT.GPJ <<DrawingFile>> 26/11/2018 15:32

method

AD	auger drilling*
AS	auger screwing*
HA	hand auger
W	washbore
NDD	non destructive drilling
SD	sonic drilling
*	bit shown by suffix
e.g.	AD/T
B	blank bit
T	TC bit
V	V bit

support

M	mud	N	nil
C	casing		

penetration

1 2 3
no resistance ranging to refusal

water

10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests

B	bulk disturbed sample
D	disturbed sample
E	environmental sample
SS	split spoon sample
U##	undisturbed sample ##mm diameter
HP	hand penetrometer (kPa)
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
VS	vane shear; peak/remouded (kPa)
R	refusal
HB	hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture

D	dry
M	moist
W	wet
S	saturated
Wp	plastic limit
Wl	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Borelog for well R27/1202

Gridref: 1759239.5435976
Ground Level Altitude 4.20 +MSD
Driller : SUB-STRUCTURAL DRILLING
Drill Method :
Drill Depth : m Drill Date : 1/01/1948 12:00:00 a.m.

Page
1 / 2

Scale	Depth	Drillers Description	Formation
	-1.83m	**Silt**	1
	-3.96m	**Sand**	1
-5	-5.18m	**Metal**	1
	-5.49m	**Sand**	1
	-7.32m	**Metal and sand**	1
-10		**Sand and metal**	p

⇓-11.3m

Borelog for well R27/1202

Gridref: 1759239.5435976
Ground Level Altitude 4.20 +MSD
Driller : SUB-STRUCTURAL DRILLING
Drill Method :
Drill Depth : m Drill Date : 1/01/1948 12:00:00 a.m.

Scale	Depth	Drillers Description	Formation
	-11.3m	**Sand and metal**	p
	-14.0m	**Metal**	2
	-14.3m	**Sand**	p
-15	-17.1m	**Metal**	2
	-18.3m	**Metal and sand**	2
-20	-20.1m	**Metal and wood**	2

Wellington Water Ltd Map

[redacted]

5/5/2022, 9:49:59 AM

HAL Reference: AAJ

1:4,514

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

⬢ Water Shut Valve

Wastewater Pipe

➔ Trunk Main

→ Main

— Discharge Pipe

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 23/06/2022

CSK: Option 2 REV: 02

Wellington Water Ltd
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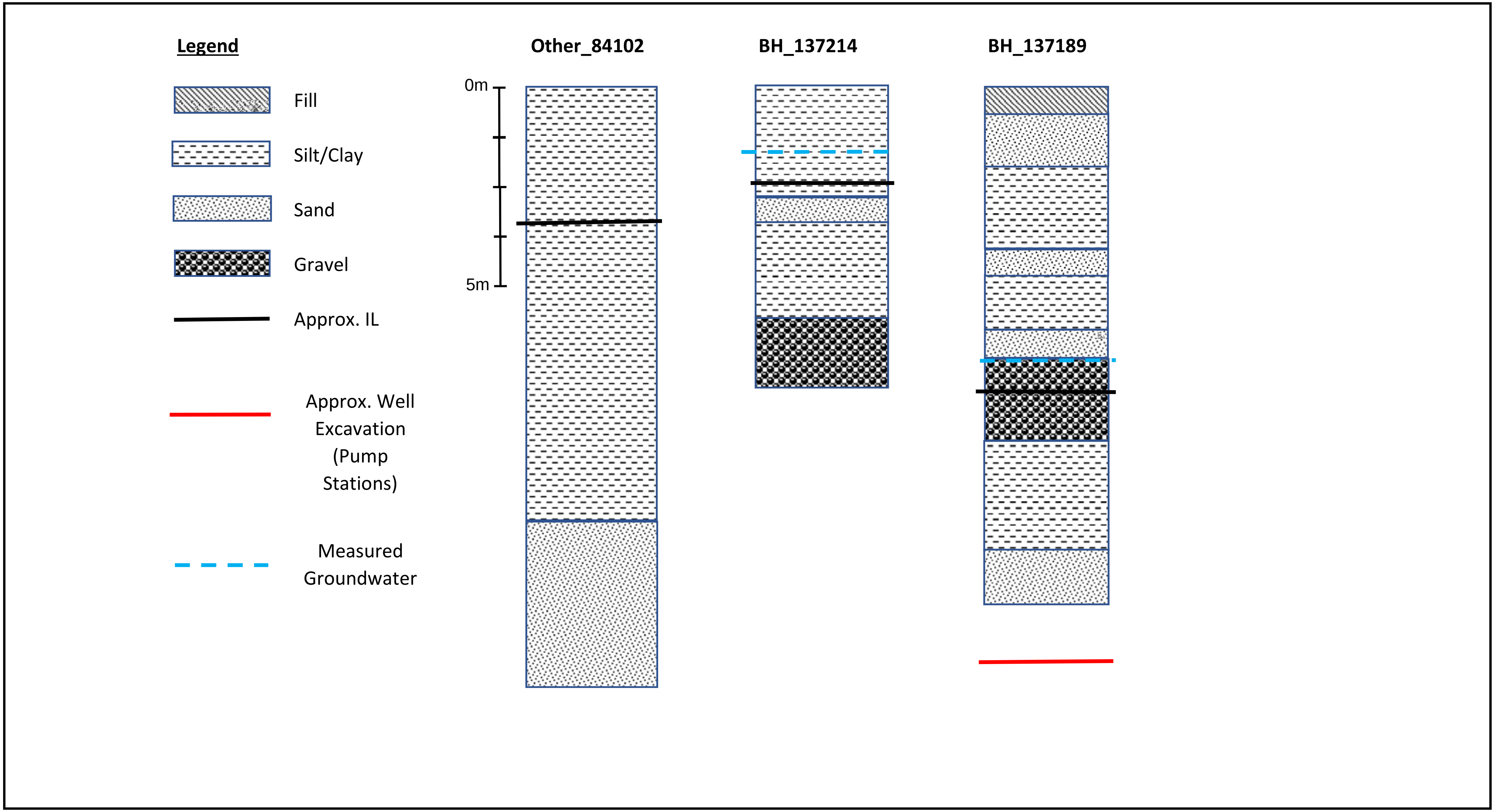
Option 2 Borehole Summary



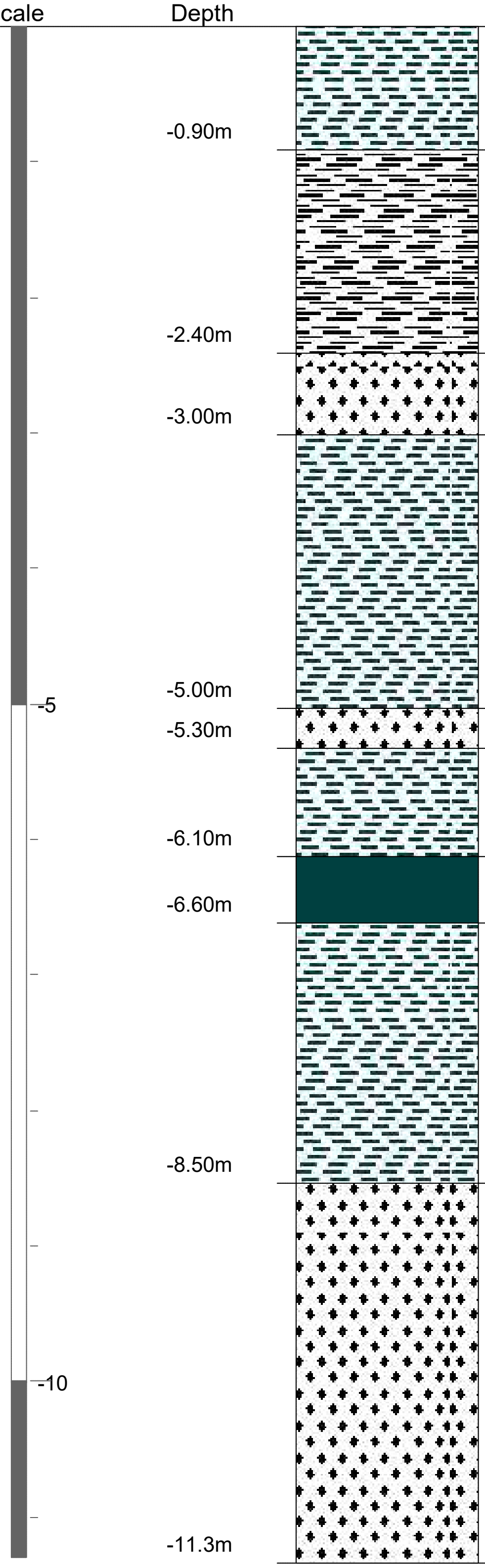
PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 29/06/2022

CSK: Option 2 REV: 01

Borelog for well R27/6055

Gridref: 1760359.5436606
Ground Level Altitude 6.80 +MSD
Driller :
Drill Method :
Drill Depth : m Drill Date :



Depth	Drillers Description	Formation
-0.90m	**Silt**	1
-2.40m	**Silty clay**	1
-3.00m	**Sand**	1
-5.00m	**Organic silt**	1
-5.30m	**Sand**	1
-6.10m	**Organic silt**	1
-6.60m	**Peat**	m
-8.50m	**Organic silt**	2
-11.3m	**Silty sand**	p

GEOTECHNICS

BOREHOLE LOG

BOREHOLE No.: **WS2**

Hole Location: Please refer to test location plan.

SHEET: 1 OF 1

PROJECT: GWN 340 HIGH STREET ENGEO
LOCATION: 340 High Street, Lower Hutt
JOB No.: 1008253.0000

CO-ORDINATES: (NZTM)
R.L.:
DATUM
DRILL TYPE: Window Sampler
DRILL METHOD: PR
DRILL FLUID: N/A
HOLE STARTED: 05/09/2018
HOLE FINISHED: 05/09/2018
DRILLED BY: GEOTECHNICS
LOGGED BY: HAMU
CHECKED: MTN

GEOLOGICAL

ENGINEERING DESCRIPTION

DEPTH (m)	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	Description and Additional Observations
0.0 – 0.2		100	WS	60mm					ASPHALT.
0.2 – 0.7							M	St	Sandy gravelly SILT (ML); orange brown. Stiff, moist, low plasticity; sand, fine to coarse; gravel, fine, angular to subrounded.
0.7 – 2.0	05/09/2018 ▼	100	WS	60mm	● 140/68 kPa	WS2-1 @ 1.5m			SILT (ML), minor sand; orange brown mottled orange. Stiff, moist, low plasticity; sand, fine.
1.70							W-S	S	*1.70m:* Soft, wet to saturated.
2.0 – 2.6		100	WS	35mm		WS2-2 @ 2.5m	M-W	L	Silty SAND (SM); grey mottled orange and brown. Loose, moist to wet, well graded; sand, fine to coarse.
2.15								MD	*2.15m:* Medium dense.
2.40								L	*2.40m:* Loose.
2.6 – 3.7		100	WS	35mm	● 125/36 kPa	WS2-3 @ 3.5m WS2-4 @ 3.7m	W-S	S	Sandy SILT (ML); grey. Soft, wet to saturated, low plasticity; sand, fine to coarse.
2.80									*2.80m:* Wood fragments.
3.65 – 3.70									*3.65 - 3.70m:* Gravel, 20mm in diameter.
3.70									*3.70m:* Wood, 35mm in diameter in end of core barrel.
3.7									3.7m: Refusal

COMMENTS

Hole Depth
3.7m

Scale 1:20

TONKIN & TAYLOR LTD.

BOREHOLE LOG

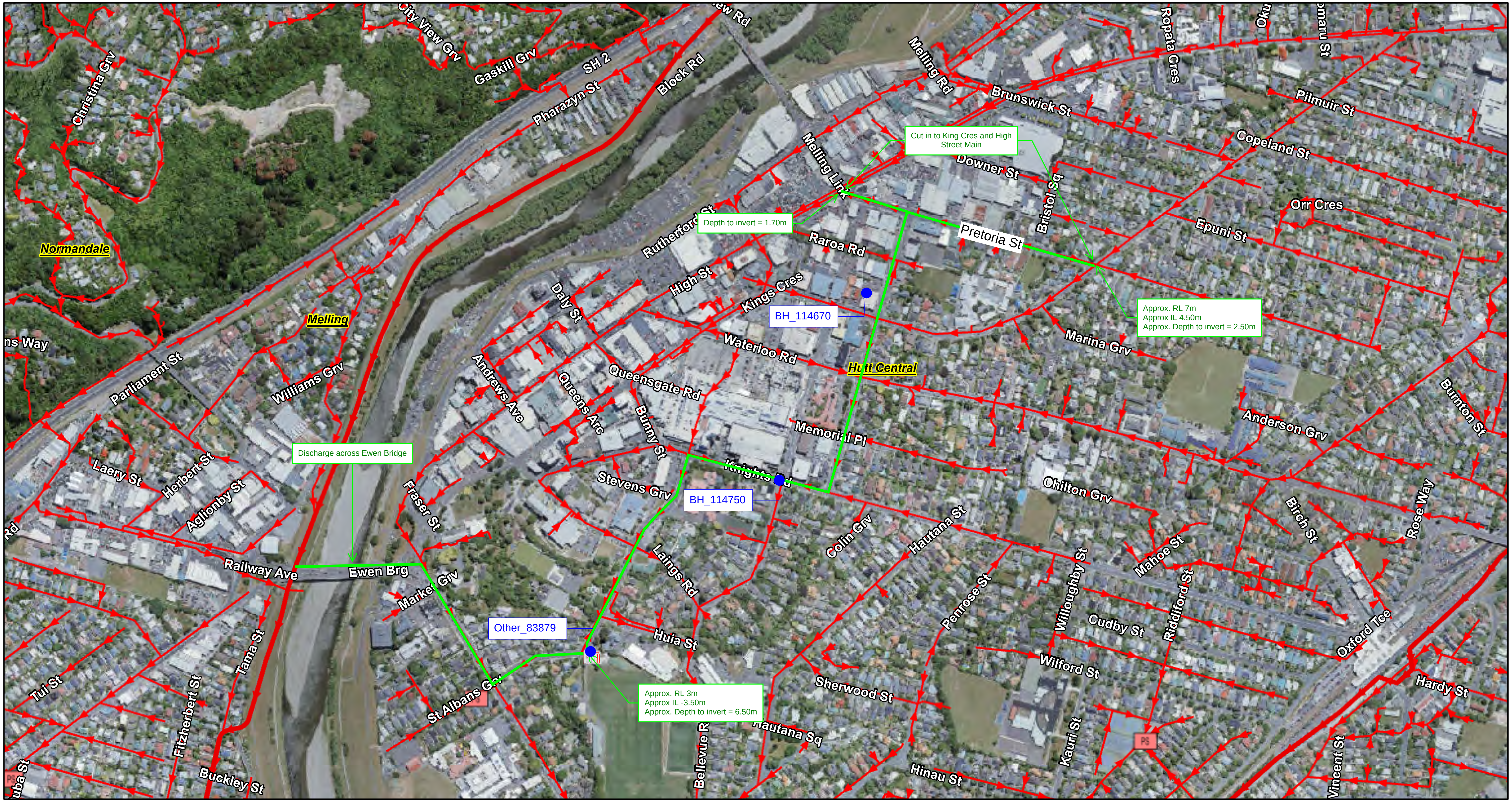
BOREHOLE NO: BH3
SHEET 1 OF 1

PROJECT: HARVEY NORMAN
LOCATION: CNR MELLING LINK & RUTHERFORD ST
JOB NO: 83083
CO-ORDINATES: Refer site plan
RL: 6.7m
DATUM:
DRILL TYPE: Rotary
DRILL METHOD: Auger
DRILL FLUID: Nil
HOLE STARTED: 3/10/02
HOLE FINISHED: 3/10/02
DRILLED BY: Geotech Drilling
LOGGED BY: HWW
CHECKED BY: PP

DRILLING AND TESTS:
FLUID LOSS: N/A
WATER: WL measured @ 4.75m depth (10/10/02)
METHOD/CASING: Nil

SAMPLES, TESTS	CORE RECOVERY	DEPTH (m)	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ORIGIN TYPE, MINERAL COMPOSITION, DETECTS, STRUCTURE
				ASPHALT			
			GM	SILTY GRAVEL, rounded, fine to coarse, brown, gravels grey.	D	'MD'	FILL
2/1/3 N=4	49%	1.0	SP	SAND, fine to medium, brown, minor silt.	D-M	VL-L	Concreted @ surface & lockable toby.
0/2/2 N=4	36%	2.0	ML	SANDY SILT, non plastic, brown	M	S-F	INTERBEDDED ALLUVIAL SILTS & SANDS
2/2/3 N=5	62%		ML	SILT, slight to moderate plasticity brownish grey, slight orangey brown mottling.	M	F	
4/5/7 N=12	80%	3.0	SM	SILTY SAND, fine, grey with orangey brown mottling	M	L-MD	
2/2/2 N=4	80%	4.0	ML	SANDY SILT, non plastic, grey, sand fine.	M	S-F	Hand slotted PVC pipe wrapped in filter cloth.
8/12/20 N=32	100%	5.0	GP	SAND, medium to coarse, grey.	W	MD-D	
20/29/21 for 100mm N>50	78%	6.0	GW	GRAVEL, subrounded, fine to coarse, grey, some sand.	M-W	VD	ALLUVIAL GRAVELS
2/3/4 N=7	89%	7.0	ML	SILT, non plastic, blackish brown, some organics,	M-W	F	ALLUVIAL SILTS
		8.0		@ 8.5m grey with trace organics.			End cap.
3/6/12 N=18	89%		GP	SAND, fine to medium, grey	W	MD	ALLUVIAL SANDS.
4/8/13 N=21		9.0		@ 9.2m as above but blackish grey.			
				Borehole completed @ 9.7m			

Wellington Water Ltd Map



Cut in to King Cres and High Street Main

Depth to invert = 1.70m

Approx. RL 7m
Approx IL 4.50m
Approx. Depth to invert = 2.50m

Discharge across Ewen Bridge

Approx. RL 3m
Approx IL -3.50m
Approx. Depth to invert = 6.50m

5/11/2022, 12:06:34 PM

HAL Reference: ___

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- PS Wastewater Pumpstation

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 3 REV: DRAFT

Wellington Water Ltd
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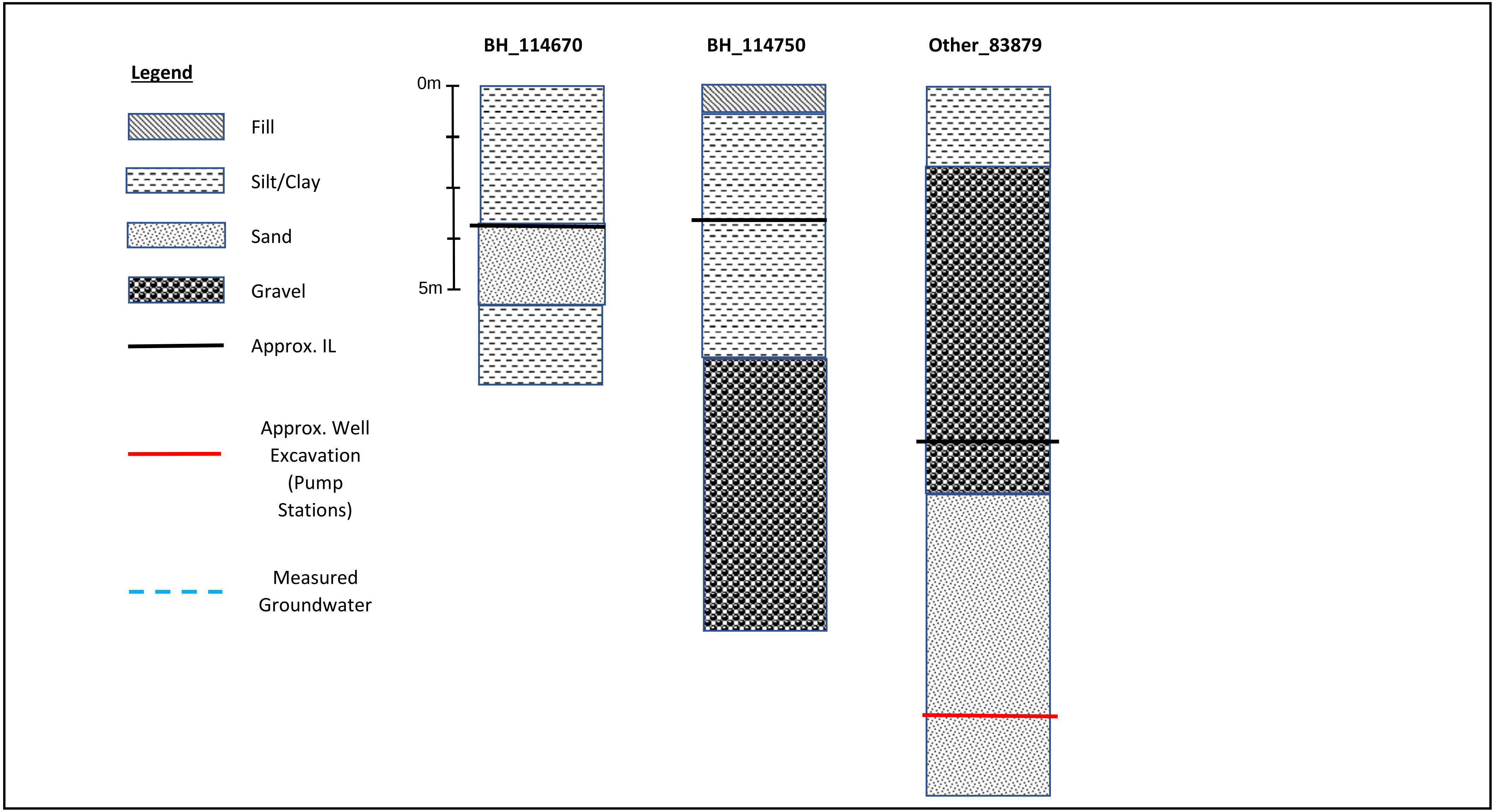
Option 3 Borehole Summary



PROJECT: Riverlink Wastewater Bypass

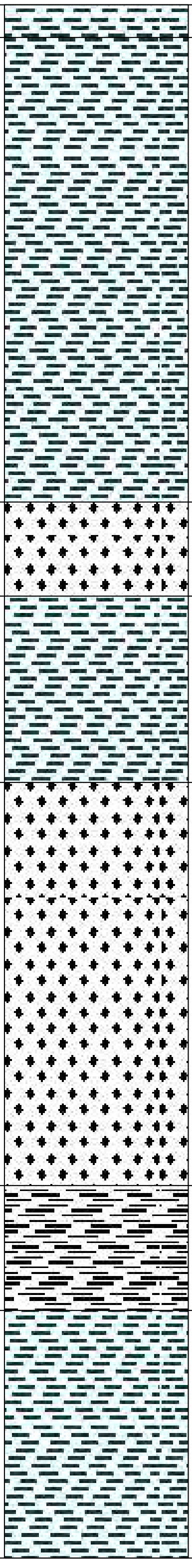
JOB NO: 144418.53 DATE: 29/06/2022

CSK: Option 3 REV: 01

Borelog for well R27/1045

Gridref: 1760099.5436386
Ground Level Altitude 6.00 +MSD
Driller :
Drill Method :
Drill Depth : m Drill Date : 1/01/1978 12:00:00 a.m.

Page
1 / 2



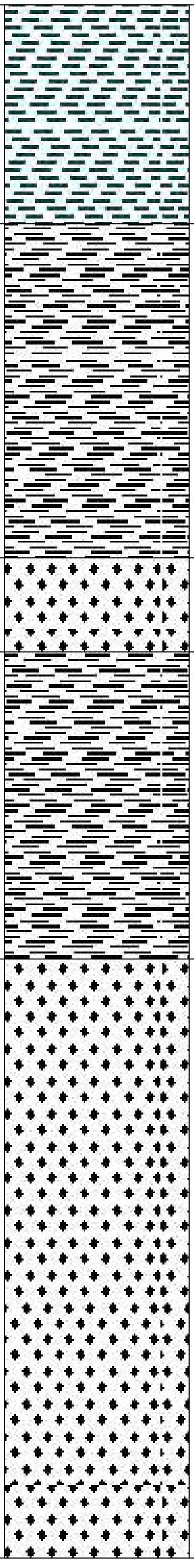
Scale	Depth	Drillers Description	Formation
	-0.10m	**Topsoil**	1
	-1.60m	**Soft brown silt**	1
	-1.90m	**Brown sand**	1
	-2.50m	**Firm grey silt**	1
	-3.80m	**Grey silty sand**	1
	-4.20m	**Firm brown organic clay**	1
	⇓-5.70m	**Grey sandy silt**	1

Borelog for well R27/1045

Gridref: 1760099.5436386
Ground Level Altitude 6.00 +MSD
Driller :
Drill Method :
Drill Depth : m Drill Date : 1/01/1978 12:00:00 a.m.

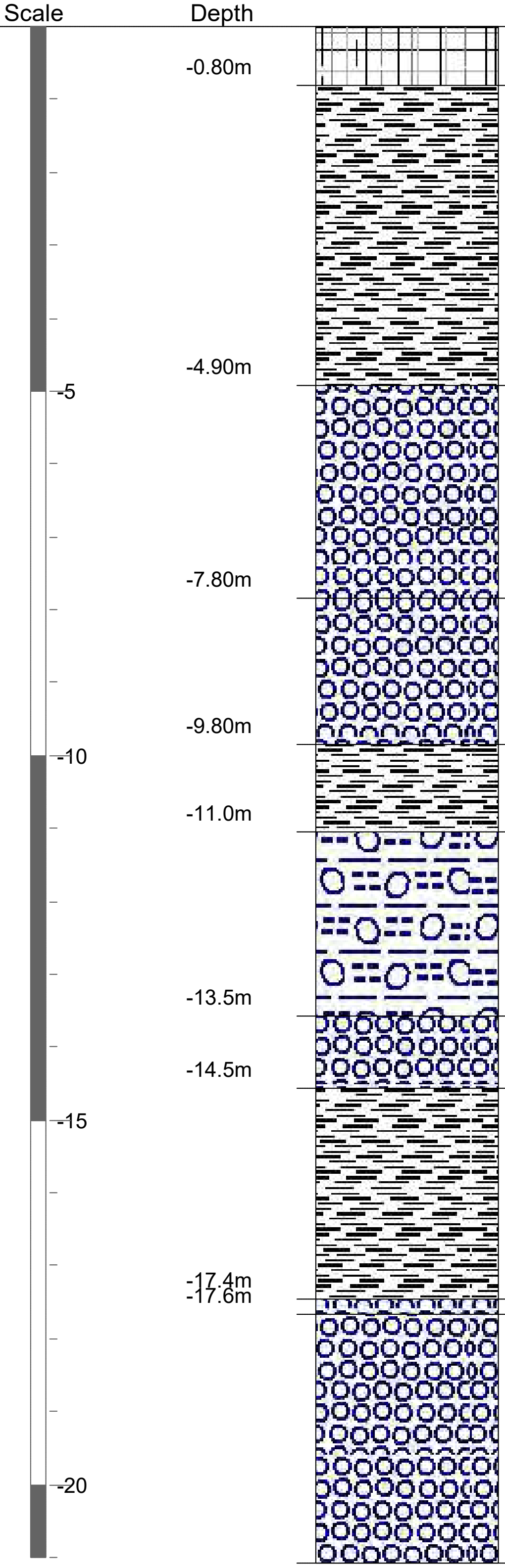
Page
2 / 2

Scale	Depth	Drillers Description	Formation
	-5.70m	**Grey sandy silt**	1
	-6.78m	**Grey clay**	2
	-7.08m	**Grey silty clay**	2
	-8.07m	**Firm brown organic clay**	2
	-10.00m	**Fine grey sand**	p



Borelog for well R27/1177

Gridref: 1759939.5436036
Ground Level Altitude 4.50 +MSD
Driller : RICHARDSON DRILLING COMPANY LTD
Drill Method :
Drill Depth : m Drill Date : 1/01/1976 12:00:00 a.m.

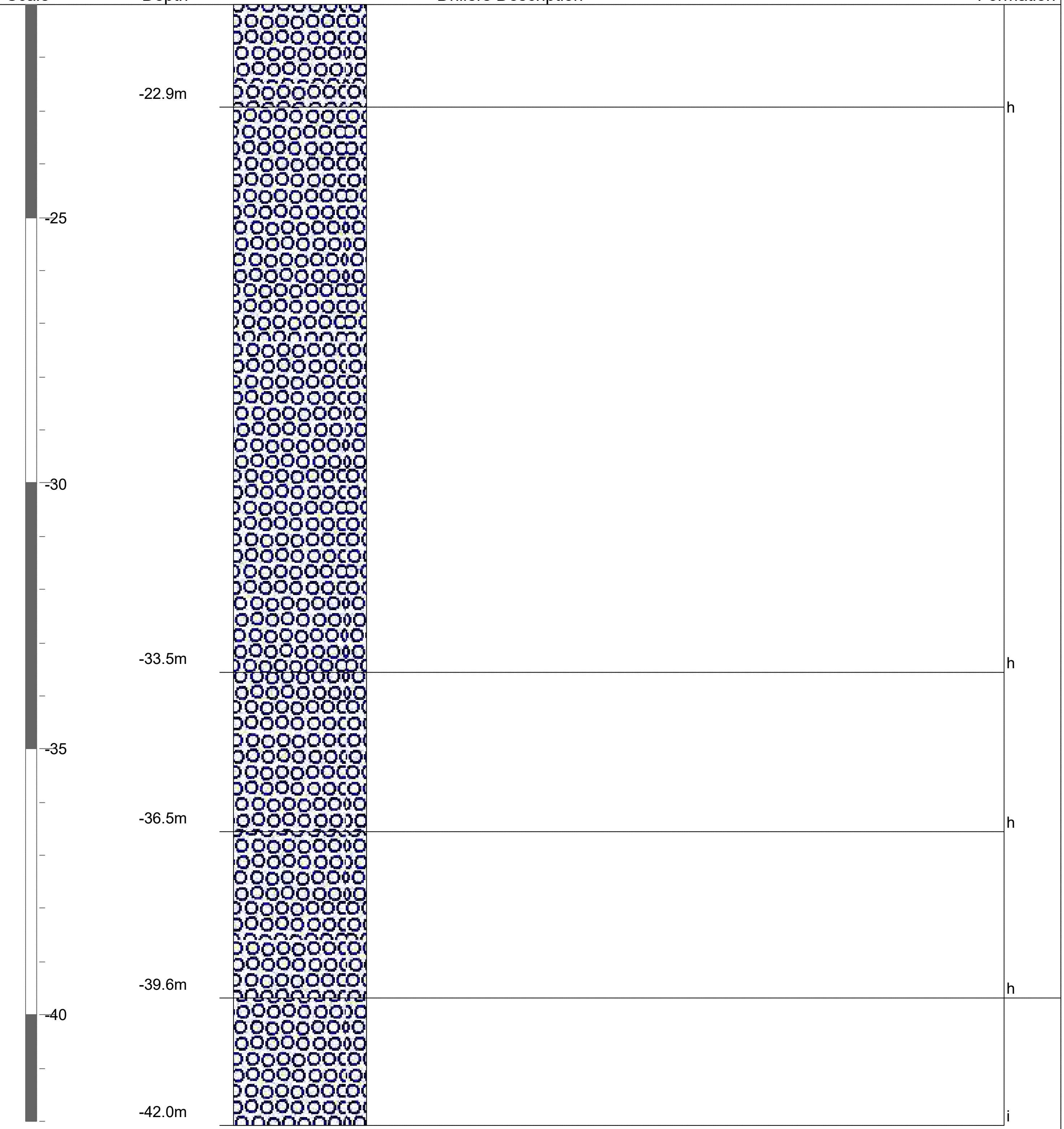


Depth	Drillers Description	Formation
-0.80m	**Fill**	1
-4.90m	**Grey and brown clay**	1
-7.80m	**Blue gravel,blue clay and wood**	1
-9.80m	**Blue gravel**	p
-11.0m	**Blue silty clay and wood**	p
-13.5m	**Blue rounded gravel and silt**	2
-14.5m	**Blue grey clay**	2
-17.4m	**Brown gravel with clay**	p
-17.6m	**Blue rounded gravel with blue clay**	3
-22.9m		h

Borelog for well R27/1177

Gridref: 1759939.5436036
Ground Level Altitude 4.50 +MSD
Driller : RICHARDSON DRILLING COMPANY LTD
Drill Method :
Drill Depth : m Drill Date : 1/01/1976 12:00:00 a.m.

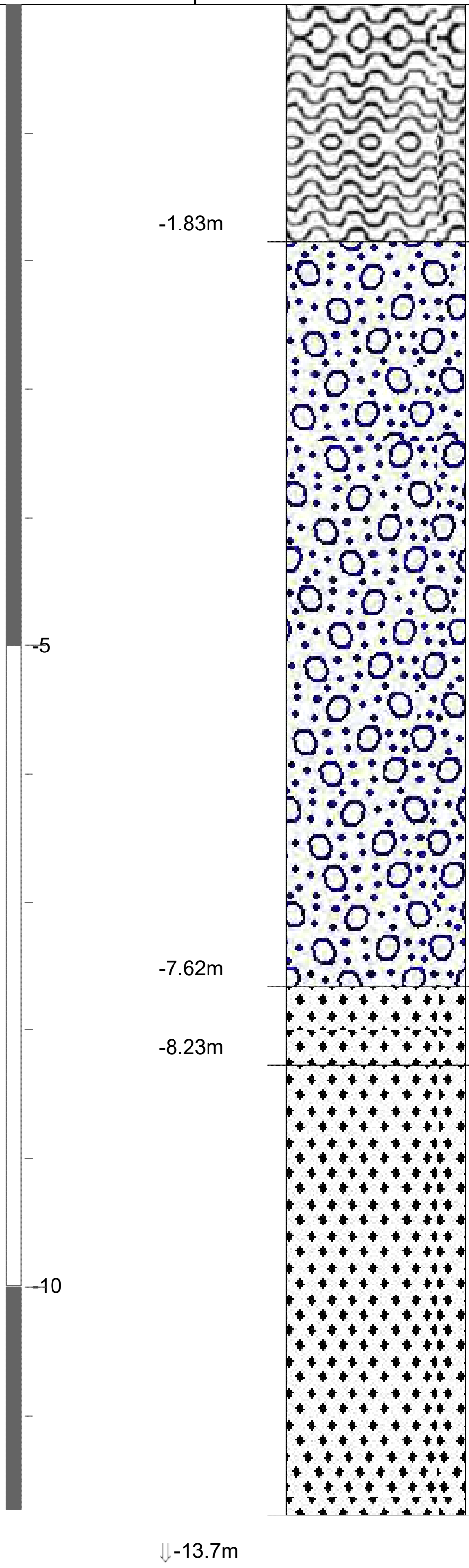
Scale Depth Drillers Description Formation



Borelog for well R27/1115

Gridref: 1759589.5435716
Ground Level Altitude 3.603.54 +MSD
Driller : RICHARDSON DRILLING COMPANY LTD
Drill Method :
Drill Depth : m Drill Date : 1/01/1968 12:00:00 a.m.

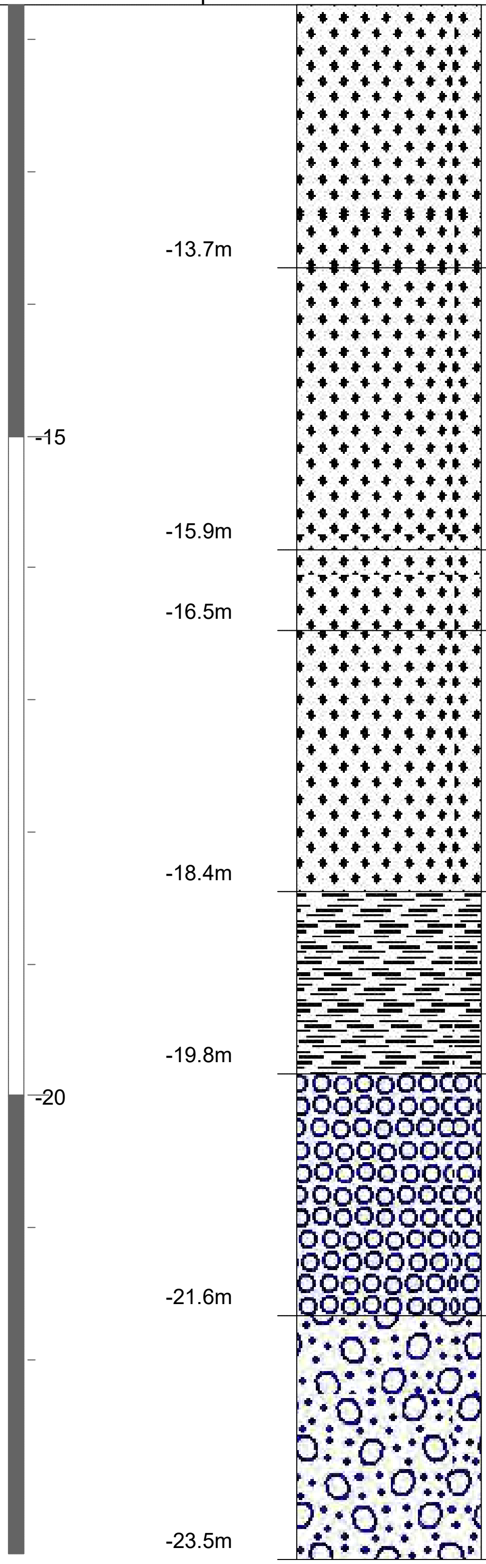
Page
1 / 2



Scale	Depth	Drillers Description	Formation
	-1.83m	Topsoil	1
	-7.62m	Blue and brown gravel and sand	1
	-8.23m	Fine blue sand,shell and blue and brown gravel	p
		Fine blue sand,shell and silt	p

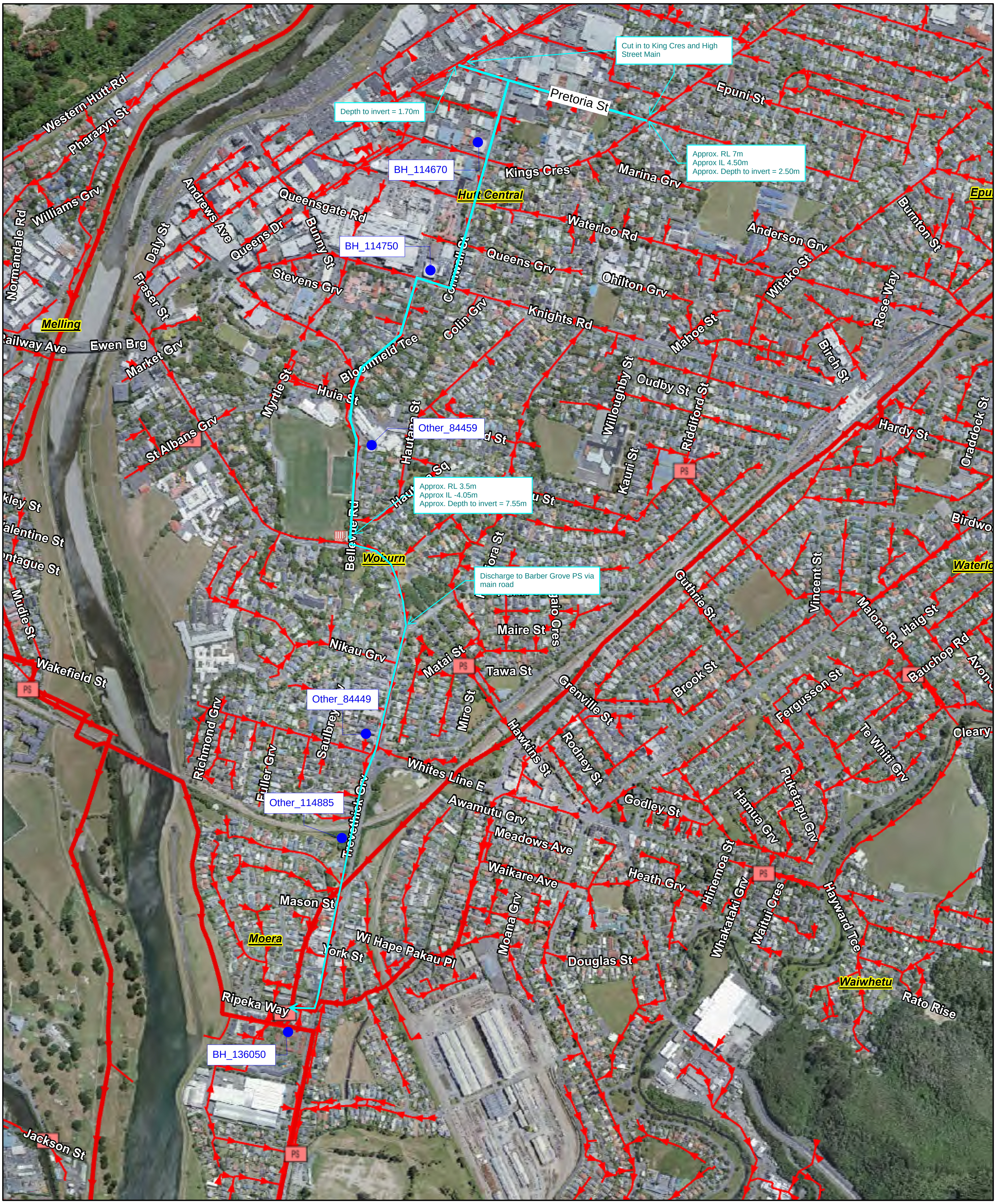
Borelog for well R27/1115

Gridref: 1759589.5435716
Ground Level Altitude 3.603.54 +MSD
Driller : RICHARDSON DRILLING COMPANY LTD
Drill Method :
Drill Depth : m Drill Date : 1/01/1968 12:00:00 a.m.



Scale	Depth	Drillers Description	Formation
	-13.7m	Fine blue sand,shell and silt	p
-15	-15.9m	Fine blue sand and shell	p
	-16.5m	Fine blue sand,shell and silt	p
	-18.4m	Fine blue sand and shell	p
	-19.8m	Grey silty clay,sand and blue gravel	p
-20	-21.6m	Blue and brown gravel with blue sand	p
	-23.5m	Brown gravel and fine blue sand	3

Wellington Water Ltd Map



5/9/2022, 10:26:32 AM

Wastewater Pipe

Trunk Main

Main

Discharge Pipe

Other

Wastewater Pipe

PS Wastewater Pumpstation

HAL Reference: ___

1:9,028

0 0.1 0.2 0.4 mi

0 0.15 0.3 0.6 km

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 4 REV: DRAFT

Wellington Water Ltd
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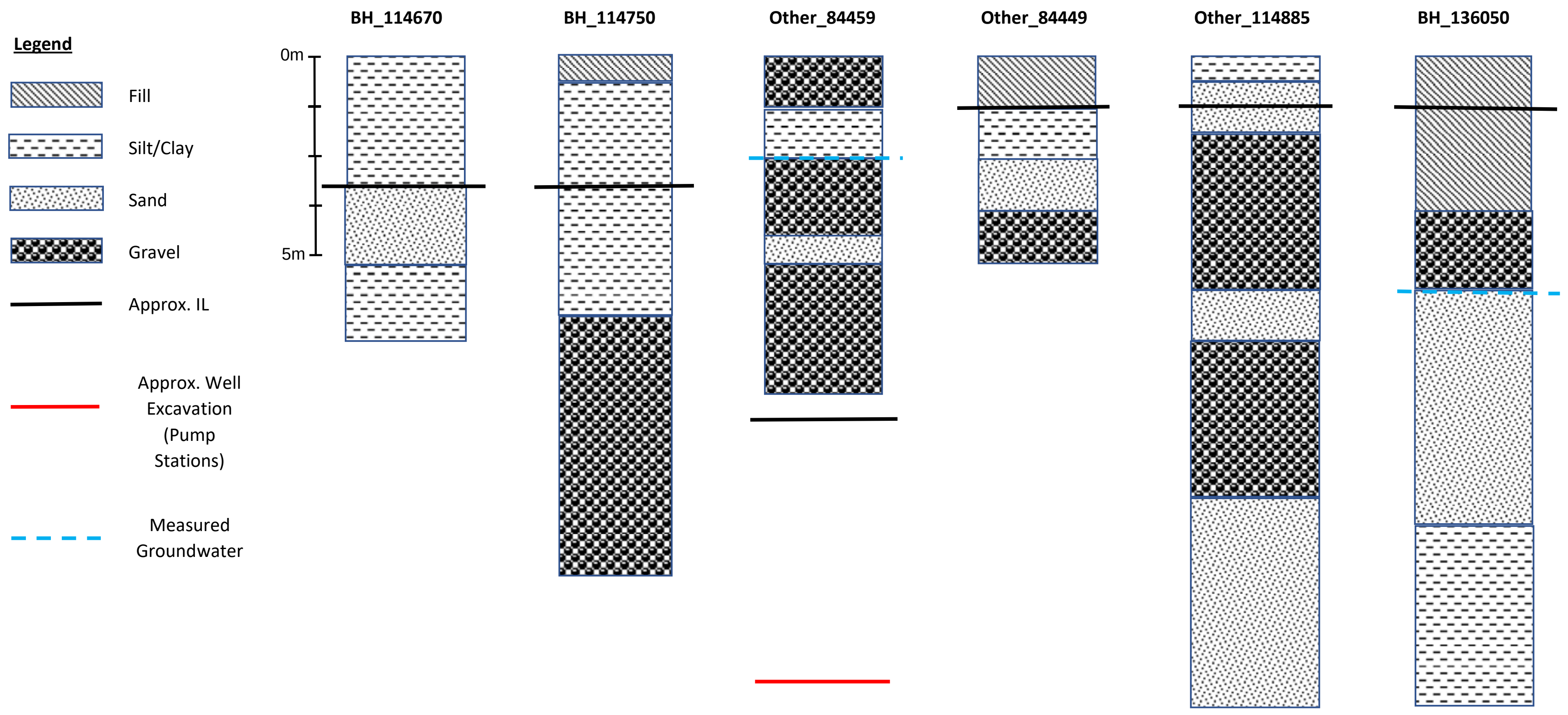
Option 4 Borehole Summary



PROJECT: Riverlink Wastewater Bypass

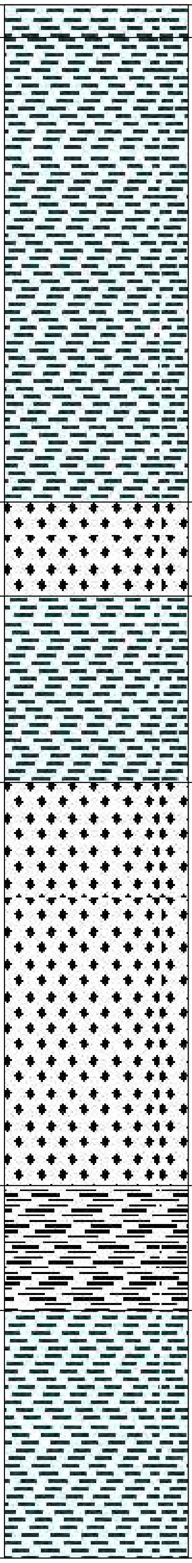
JOB NO: 144418.53 DATE: 29/06/2022

CSK: Option 4 REV: 01

Borelog for well R27/1045

Gridref: 1760099.5436386
Ground Level Altitude 6.00 +MSD
Driller :
Drill Method :
Drill Depth : m Drill Date : 1/01/1978 12:00:00 a.m.

Page
1 / 2

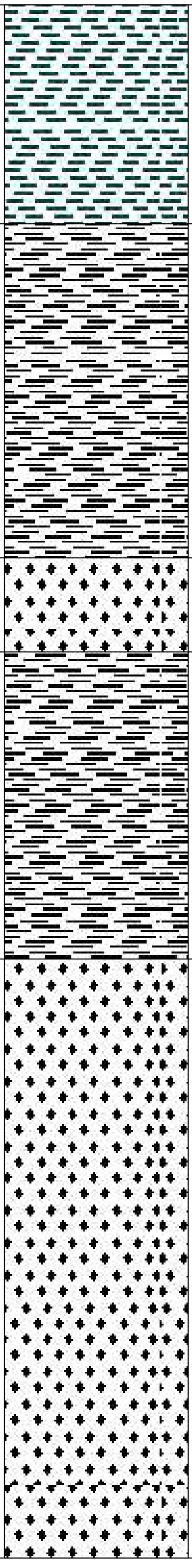


Scale	Depth	Drillers Description	Formation
	-0.10m	**Topsoil**	1
	-1.60m	**Soft brown silt**	1
	-1.90m	**Brown sand**	1
	-2.50m	**Firm grey silt**	1
	-3.80m	**Grey silty sand**	1
	-4.20m	**Firm brown organic clay**	1
		Grey sandy silt	1

⇓-5.70m

Borelog for well R27/1045

Gridref: 1760099.5436386
Ground Level Altitude 6.00 +MSD
Driller :
Drill Method :
Drill Depth : m Drill Date : 1/01/1978 12:00:00 a.m.



Scale	Depth	Drillers Description	Formation
	-5.70m	**Grey sandy silt**	1
	-6.78m	**Grey clay**	2
	-7.08m	**Grey silty clay**	2
	-8.07m	**Firm brown organic clay**	2
	-10.00m	**Fine grey sand**	p

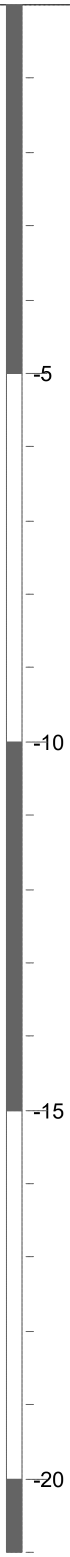
Borelog for well R27/1177

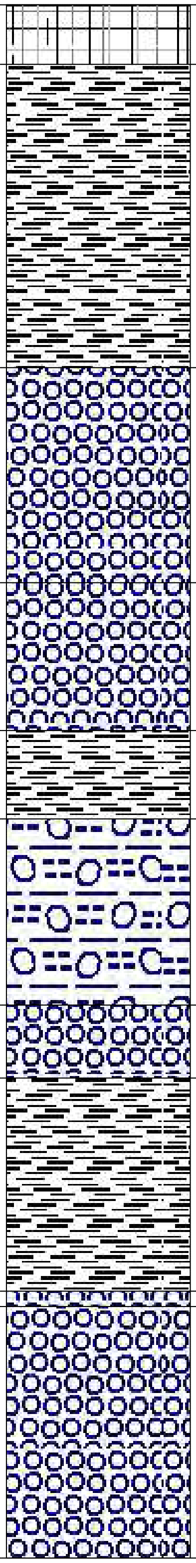
Gridref: 1759939.5436036
Ground Level Altitude 4.50 +MSD
Driller : RICHARDSON DRILLING COMPANY LTD
Drill Method :
Drill Depth : m Drill Date : 1/01/1976 12:00:00 a.m.

Page
1 / 2

greater WELLINGTON
REGIONAL COUNCIL

Scale Depth Drillers Description Formation





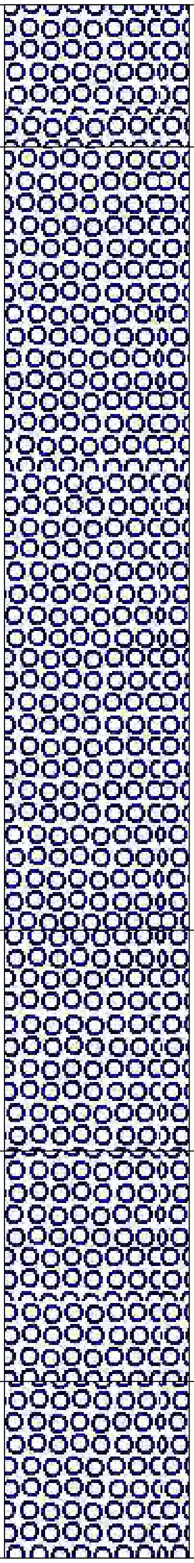
Depth	Drillers Description	Formation
-0.80m	**Fill**	1
-4.90m	**Grey and brown clay**	1
-7.80m	**Blue gravel,blue clay and wood**	1
-9.80m	**Blue gravel**	p
-11.0m	**Blue silty clay and wood**	p
-13.5m	**Blue rounded gravel and silt**	2
-14.5m	**Blue grey clay**	2
-17.4m	**Brown gravel with clay**	p
-17.6m	**Blue rounded gravel with blue clay**	3
		h

⇓-22.9m

Borelog for well R27/1177

Gridref: 1759939.5436036
Ground Level Altitude 4.50 +MSD
Driller : RICHARDSON DRILLING COMPANY LTD
Drill Method :
Drill Depth : m Drill Date : 1/01/1976 12:00:00 a.m.

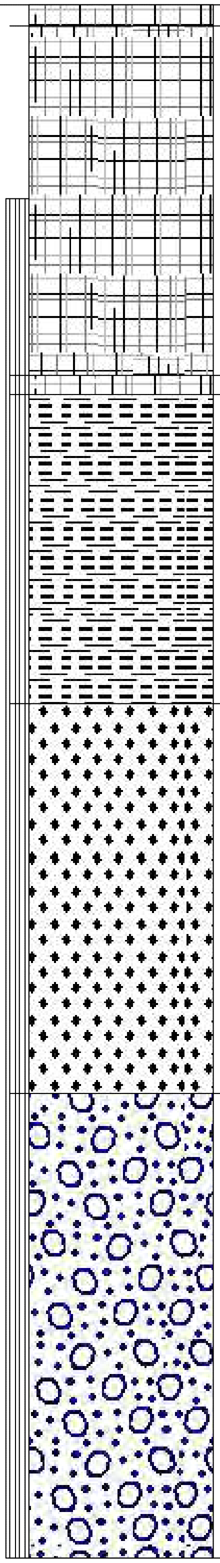
Page
2 / 2



Scale	Depth	Drillers Description	Formation
	-22.9m		h
-25			
-30			
	-33.5m		h
-35			
	-36.5m		h
	-39.6m		h
-40			
	-42.0m		i

Borelog for well R27/7367

Gridref: 1759822.5434898
Ground Level Altitude +MSD
Driller :
Drill Method :
Drill Depth : 4.00m Drill Date : 3/08/2009 12:00:00 a.m.

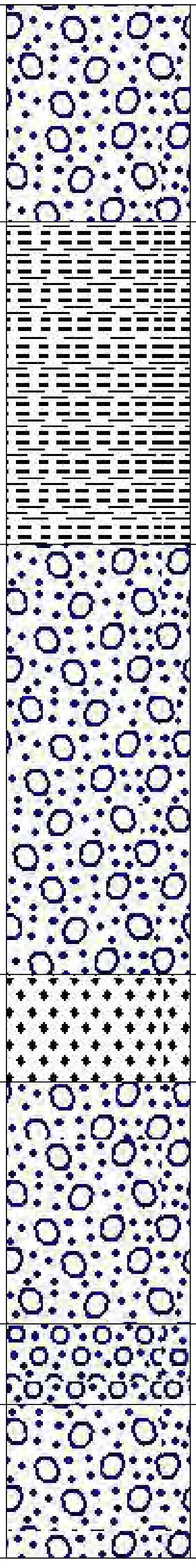


Scale	Depth	Drillers Description	Formation
	-0.05m	**Asphalt**	
		SILTY GRAVEI - FILL	
	-0.95m -1.00m	**Geotextile material**	
		SILTY CLAY, firm. Light brown	
	-1.80m	**SAND, fine to medium grained. Light grey**	
	-2.80m	**SANDY GRAVEL, fine. Rounded to sub-rounded. Bluish grey. Poorly graded**	
	-4.00m		

Borelog for well R27/7395

Gridref: 1759817.5435645
Ground Level Altitude +MSD
Driller : GEOTECH DRILL
Drill Method :
Drill Depth : 11.55m Drill Date : 13/10/2011 12:00:00 a.m.

Page
1 / 2



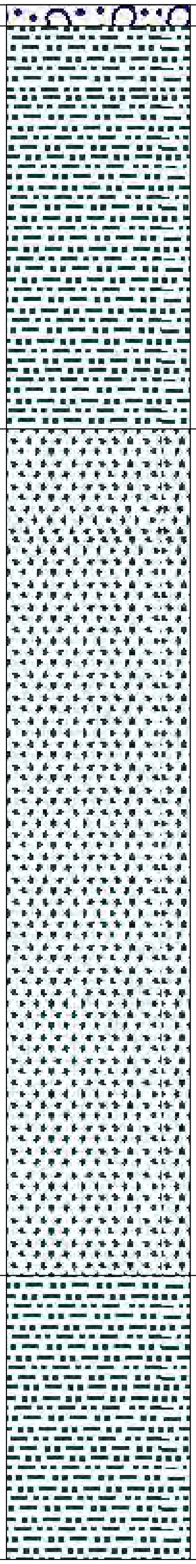
Scale	Depth	Drillers Description	Formation
	-0.80m	**Brown SANDY GRAVEL, tightly packed, dry [FILL]**	
	-2.00m	**Brown-grey SILTY CLAY, minor GRAVEl. Soft; moist; highly plastic. (W/L -1.8m below ground level)**	
	-3.60m	**Grey SANDY GRAVEL. Dense; moist; well graded**	
	-4.00m	**Grey fine to medium SAND. Dense; moist; uniformly graded**	
	-4.90m	**SANDY GRAVEL. Dense; mosit; well graded**	
-5	-5.20m	**Grey coarse SAND, minor fine GRAVEL. Dense; wet; well graded**	
		Grey SANDY GRAVEL. Dense; moist; well graded	

⇓-5.85m

Borelog for well R27/7395

Gridref: 1759817.5435645
Ground Level Altitude +MSD
Driller : GEOTECH DRILL
Drill Method :
Drill Depth : 11.55m Drill Date : 13/10/2011 12:00:00 a.m.

Page
2 / 2

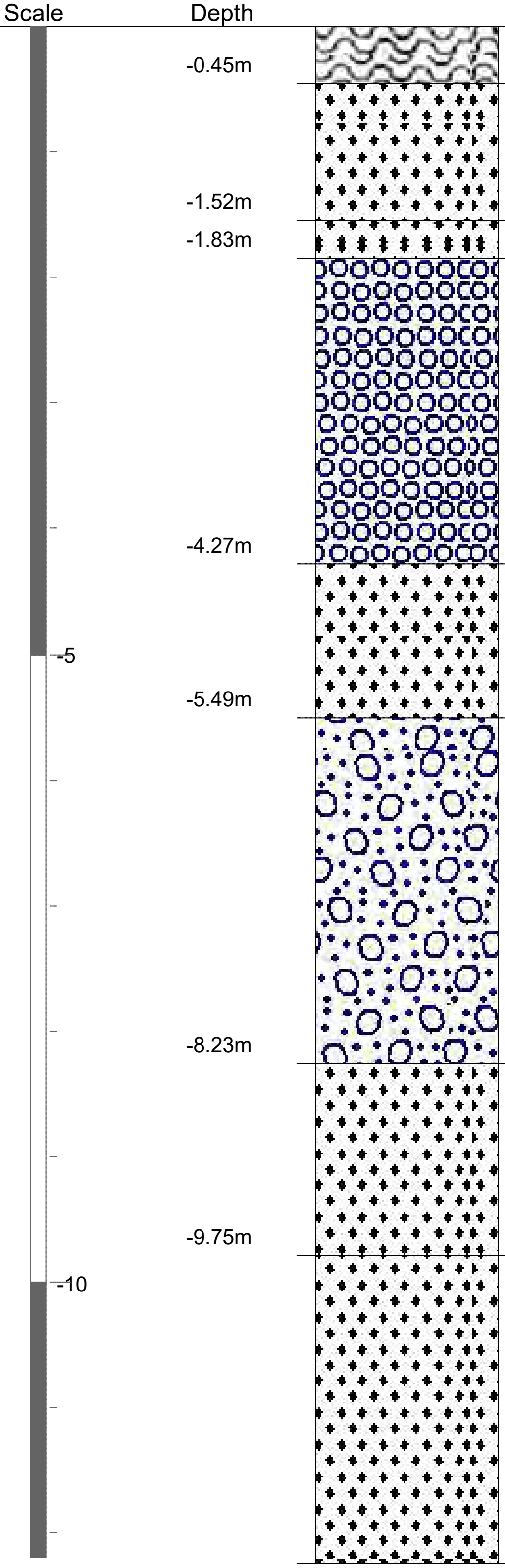


Scale	Depth	Drillers Description	Formation
	-5.85m	**Grey SANDY GRAVEL. Dense; moist; well graded**	
		Grey SILTY SAND. Medium dense; moist; well graded	
	-7.35m	**Dark grey fine SAND. Dense; moist; uniformly graded**	
-10			
	-10.5m	**Dark grey slightly SANDY SILT; very stiff; moist; non plastic**	
	-11.6m		

Borelog for well R27/1122

Gridref: 1759757.5434602
Ground Level Altitude 2.803.41 +MSD
Driller :
Drill Method :
Drill Depth : m Drill Date : 1/01/1974 12:00:00 a.m.

Page
1 / 2

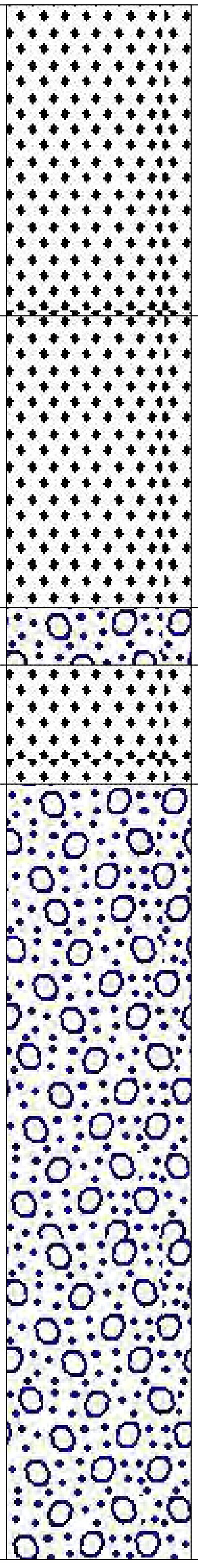


Depth	Drillers Description	Formation
-0.45m	**Topsoil**	1
-1.52m	**Brown silty sand**	1
-1.83m	**Blue sand**	1
-4.27m	**Blue metal**	1
-5.49m	**Grey silty sand**	1
-8.23m	**Metal and coarse blue sand**	2
-9.75m	**Fine blue sand**	p
	Blue and brown silty sand with shell	p

⇓-14.6m

Borelog for well R27/1122

Gridref: 1759757.5434602
Ground Level Altitude 2.803.41 +MSD
Driller :
Drill Method :
Drill Depth : m Drill Date : 1/01/1974 12:00:00 a.m.



Scale	Depth	Drillers Description	Formation
	-14.6m	**Blue and brown silty sand with shell**	p
-15	-16.9m	**Blue sand and metal. Water bearing**	p
	-17.4m	**Brown metal and sand**	2
	-18.3m	**Blue sand**	p
-20	-24.4m	**Brown metal**	3

Stantec

STANTEC NEW ZEALAND
Level 13, 80 The Terrace
Wellington
Tel: 04 381 6700
Fax: 04 473 1982

BOREHOLE LOG

Job No: 310101237
Hole No: BH01
Sheet: 1 of 3

Client: Wellington Water
Started: 13/09/19
Project: MCS Sewer Duplication
Location: Seaview, Petone
Finished: 16/09/19
Logged: LA
Description: Sonic Drilled Hole
GWRC Well Number: BQ31/0417
Checked: AN
Easting: 808072.876m
Northing: 410737.626m
Inclination: Vertical
RL Surface : 1.702m
Diameter (Int/Ext): 85mm/123mm
Casing (Diam/Dpth): 127mm/15m
Datum: NZVD2016

Depth (m)	Elevation (m)	Samples Type	Shear Vane (kPa) Peak Strength/ Residual Strength	Standard Penetration Tests Blows (Seating // 75mm/150mm, 225mm/300mm)	N Value/ Refusal Data	Material Description (Logging carried out in accordance with Guidelines for the Field Classification of Soil and Rock for Engineering Purposes. New Zealand Geotechnical Society, 2005)	Graphic Log	Moisture Condition	Groundwater	Other Observations	Installation
1.0						MADE GROUND. Jet vacuum excavated to 1.500m. Gravel, coarse brown, sub- angular to sub-rounded and topsoil. [FILL] (1.5)	▨	moist	▽ 16/9 ATD Static water level taken in the morning		
2.0		SPT sample Disturbed sample W sample		3/3//4/5/6/7	N = 22	Fine to coarse, light brownish grey silty sandy gravel MADE GROUND. Well graded, medium dense, sub-angular to sub-rounded siltstone/sandstone, moist. Some soil and plant material present from cave in from top of hole becoming less sandy at base of run. Some silt. [FILL] (3)	▨	moist			
3.0 4.0		SPT sample Disturbed sample W sample		2/3//7/8/7/7	N = 29	Fine to cobble, dark brownish grey GRAVEL with some coarse sand. Well graded, sub-angular to sub-rounded siltstone/sandstone, medium dense, moist. [ALLUVIUM] (4.5)	o	moist			
		SPT sample Disturbed sample		4/4//5/5/6/6	N = 22	Fine to medium, dark grey SAND with some brown plastic peat. Poorly graded (uniform), medium dense, moist. Peat has low plasticity. Some calcium carbonate bivalve fossil shell fragments at base of run. [ALLUVIUM]	⁘	moist	▽ 17/9 ATD Static Water Level		

Drilling Method:
Sonic Rig
Casing:
PQ
Contractor:
Stantec
Flush:
Water
Equipment Type:
Sonic Rig

Remarks: Datum: NZVD 2016

STANTEC NEW ZEALAND
Level 13, 80 The Terrace
Wellington
Tel: 04 381 6700
Fax: 04 473 1982

BOREHOLE LOG

Job No: 310101237
Hole No: BH01
Sheet: 2 of 3

Client: Wellington Water
Started: 13/09/19
Project: MCS Sewer Duplication
Location: Seaview, Petone
Finished: 16/09/19
Logged: LA
Description: Sonic Drilled Hole
GWRC Well Number: BQ31/0417
Checked: AN
Easting: 808072.876m
Northing: 410737.626m
Inclination: Vertical
RL Surface : 1.702m
Diameter (Int/Ext): 85mm/123mm
Casing (Diam/Dpth): 127mm/15m
Datum: NZVD2016

Depth (m)	Elevation (m)	Samples Type	Shear Vane (kPa) Peak Strength/ Residual Strength	Standard Penetration Tests Blows (Seating // 75mm/150mm, 225mm/300mm)	N Value/ Refusal Data	Material Description (Logging carried out in accordance with Guidelines for the Field Classification of Soil and Rock for Engineering Purposes. New Zealand Geotechnical Society, 2005)	Graphic Log	Moisture Condition	Groundwater	Other Observations	Installation
		Disturbed sample				Fine to medium, dark grey SAND with some brown plastic peat. Poorly graded (uniform), medium dense, moist. Peat has low plasticity. Some calcium carbonate bivalve fossil shell fragments at base of run. [ALLUVIUM]*[continued]* (6)		moist			
6.0		W sample SPT sample Disturbed sample		2/2//3/3/4/4	N = 14	Fine to coarse, dark grey SAND with brown plastic peat occasionally. Poorly graded (uniform), loose, moist. Peat is low plasticity with fibrous plant remains present occasionally. Calcium carbonate bivalve fossils (whole and fragments) throughout run, sulphurous odour on opening core. [ALLUVIUM] (7.5)		moist			
7.0		W sample									
		SPT sample Disturbed sample		1/2//3/2/3/3	N = 9	Fine to coarse, dark grey silty SAND with brown plastic peat occasionally. Poorly graded (uniform), medium dense, moist. Peat is low plasticity with fibrous plant remains present occasionally. Becoming siltier at base with a high concentration of bivalve fossil fragments and plastic peat from 8.830 - 9.000m. Sulphurous odour on opening core. [ALLUVIUM] (9)		moist			
8.0											
9.0		SPT sample Disturbed sample		1/2//3/4/3/4	N = 14	Grey, sandy SILT. Soft, moist, low plasticity (cracks when rolled). Plastic brown peat occasionally, low plasticity, soft. Calcium carbonate bivalve fossils (whole and fragments) throughout. Bivalves are ribbed assymetric shells, some gastropods present (small). Sulphurous odour on opening core. [ALLUVIUM]		moist			

Drilling Method:
Sonic Rig

Casing:
PQ

Contractor:
Stantec

Flush:
Water

Equipment Type:
Sonic Rig

Remarks: Datum: NZVD 2016

Stantec

STANTEC NEW ZEALAND
Level 13, 80 The Terrace
Wellington
Tel: 04 381 6700
Fax: 04 473 1982

BOREHOLE LOG

Job No: 310101237
Hole No: BH01
Sheet: 3 of 3

Client: Wellington Water
Started: 13/09/19

Project: MCS Sewer Duplication
Location: Seaview, Petone
Finished: 16/09/19
Logged: LA

Description: Sonic Drilled Hole
GWRC Well Number: BQ31/0417
Checked: AN

Easting: 808072.876m Northing: 410737.626m Inclination: Vertical
RL Surface : 1.702m

Diameter (Int/Ext): 85mm/123mm Casing (Diam/Dpth): 127mm/15m
Datum: NZVD2016

Depth (m)	Elevation (m)	Samples Type	Shear Vane (kPa) Peak Strength/ Residual Strength	Standard Penetration Tests Blows (Seating // 75mm/150mm, 225mm/300mm)	N Value/ Refusal Data	Material Description (Logging carried out in accordance with Guidelines for the Field Classification of Soil and Rock for Engineering Purposes. New Zealand Geotechnical Society, 2005)	Graphic Log	Moisture Condition	Groundwater	Other Observations	Installation
		W sample				Grey, sandy SILT. Soft, moist, low plasticity (cracks when rolled). Plastic brown peat occasionally, low plasticity, soft. Calcium carbonate bivalve fossils (whole and fragments) throughout. Bivalves are ribbed assymetric shells, some gastropods present (small). Sulphurous odour on opening core. [ALLUVIUM]*[continued]* *(10.5)*		moist			
		SPT sample Disturbed sample		1/0//1/2/1/2	N = 6	Brownish grey SILT with trace fine sand. Soft, moist, low to medium plasticity. Calcium carbonate bivalve fossil fragments throughout, occasional fibrous plant remains (peat). [ALLUVIUM]		moist			
11.0											
		W sample				*(12)*					
12.0		SPT sample Disturbed sample		0/1//0/1/2/2	N = 5	Light grey SILT, soft, moist, low to medium plasticity (can be moulded but cracks when rolled). Calcium carbonate bivalve fossil shell fragments throughout. [ALLUVIUM]		moist			
13.0											
		SPT sample Disturbed sample		0/0//1/1/1/1	N = 4						
14.0											
						Borehole terminated due to Target Depth *(15)*					

Drilling Method:
Sonic Rig

Casing:
PQ

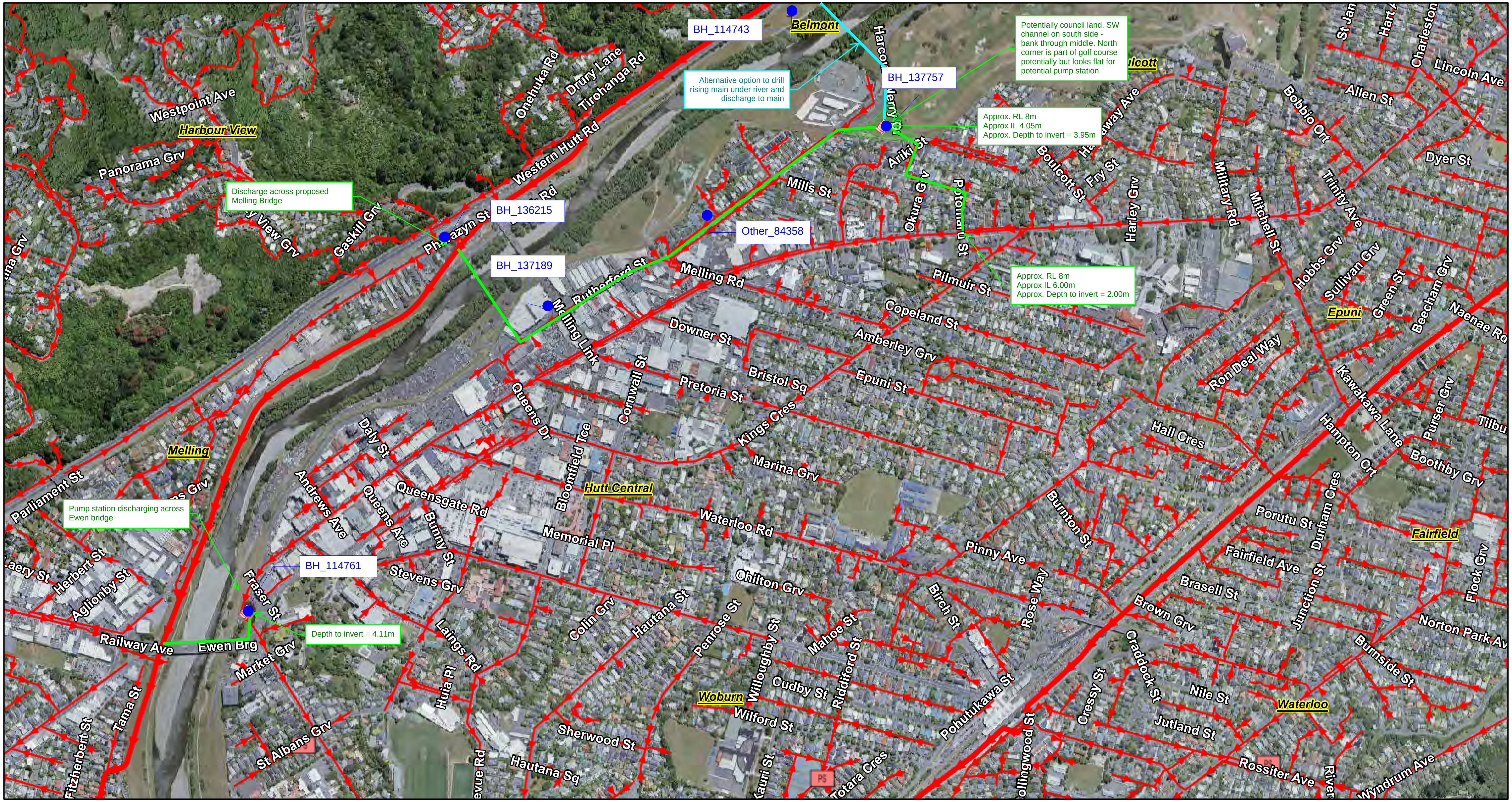
Contractor:
Stantec

Flush:
Water

Equipment Type:
Sonic Rig

Remarks: Datum: NZVD 2016

Wellington Water Ltd Map



Alternative option to drill rising main under river and discharge to main

Potentially council land. SW channel on south side - bank through middle. North corner is part of golf course potentially but looks flat for potential pump station

Approx. RL 8m
Approx IL 4.05m
Approx. Depth to invert = 3.95m

Discharge across proposed Melling Bridge

Approx. RL 8m
Approx IL 6.00m
Approx. Depth to invert = 2.00m

Pump station discharging across Ewen bridge

Depth to invert = 4.11m

5/23/2022, 11:24:52 AM

HAL Reference: AAL/AAM

1:9,028

0 0.1 0.2 0.4 mi
0 0.17 0.35 0.7 km

Wastewater Pipe

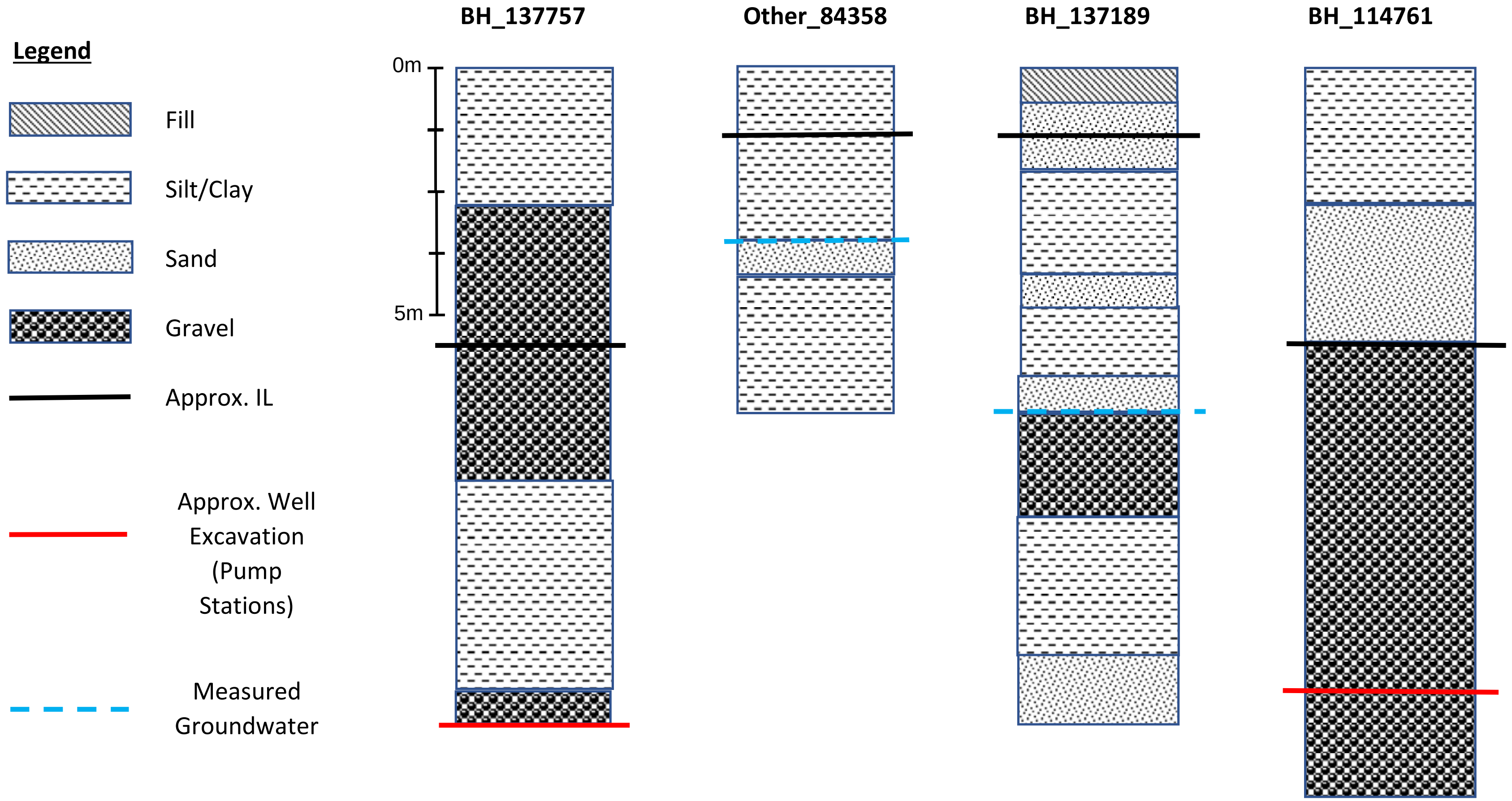
🟥	Wastewater Trunk Main
🟥	Wastewater Pipe
	Wastewater Service Connection
PS	Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass
JOB NO: 144418.53 DATE: 22/06/2022
CSK: Option 5 REV: 01

Wellington Water Ltd
Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors | LINZ | Wellington Water Ltd | WWL | Wellington Water Ltd, HCC, PCC, SWDC, GWRC, UHCC, WCC | Wellington Water Ltd, Wellington City Council | Wellington Water Ltd, Greater Wellington Regional Council | Wellington

Option 5 Borehole Summary



PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 29/06/2022

CSK: Option 5 REV: 01

TONKIN & TAYLOR LTD.

BOREHOLE LOG

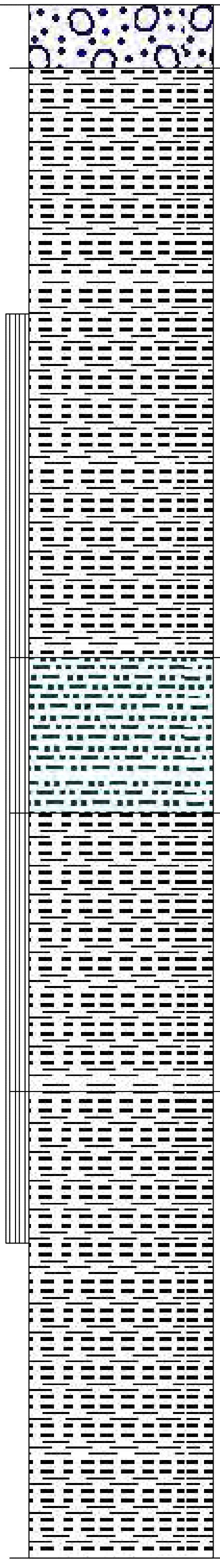
BOREHOLE NO: 18
SHEET 1 OF 1

PROJECT: H.R.F.C.S.R.
LOCATION: HUTT RIVER (TLB)
JOB NO: 10476
CO-ORDINATES: SECTION 520L + 30m
DRILL TYPE TRUCK MOUNTED RIG
DRILL METHOD: ODEX DRILLING
HOLE STARTED: 28.7.90
HOLE FINISHED: 28.7.90
RL: 8.46
DRILLED BY: LEMMON PILING
DATUM: NCD
DRILL FLUID: –
LOGGED BY RS
CHECKED BY: RJD

DRILLING AND TESTS							ENGINEERING DESCRIPTION						GEOLOGICAL	
FLUID LOSS	WATER	CORE RECOVERY	METHOD/CASING	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	ESTIMATED SHEAR STRENGTH, kPa 10 25 50 100 200	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
								ML	TOPSOIL SILT, stiff, dark brown - occ. rootlets					
				6										
						1			- grades clayey & orange brown					
				12				ML	SILT, sandy, stiff, grey					
						2								
				54				GW / GP	GRAVEL (fine to coarse) sandy, grey - grades silty				ALLUVIUM	
						3								
				50										
									- coarse gravels					
						4								
				54					- occ. wood debris					
						5								
				35				ML	SILT, clayey, stiff, grey - wood debris					
						6								
				12										
						7								
				24					- wood debris					
						8			SAND (fine) mod. dense, grey					
				29				ML	SILT, sandy, stiff, grey					
									SAND (med). mod.dense, grey					
						9			GRAVEL, (fine to coarse), sandy, dense, grey					
				49										
									BOREHOLE TERMINATED AT 9.25 m					
						10								

Borelog for well R27/7126

Gridref: 1760331.5436914
Ground Level Altitude 7.02 +MSD
Driller : UNKNOWN or MISCELLANEOUS
Drill Method :
Drill Depth : 5.00m Drill Date : 13/03/2003 12:00:00 a.m.



Scale	Depth	Drillers Description	Formation
	-0.20m	**Sandy Gravel, brown trace glass and coal.**	
	-2.10m	**Clayey silt, brown, trace of orange-brown mottles, rootlets and coal. Becoming grey with orange mottles @ 0.7m. Dark brown mottles @ 0.75m. Becoming grey @ 1.1m.**	
	-2.60m	**Silty sand, grey, fine-medium grained. Static water level at 2.3m below ground level**	
	-3.50m	**Silty clay, grey, trace of fine sand. With laminated beds of silty sand up to 1cm thick, trace wood fragments.**	
	-5.00m	**Silty clay, trace sand and shell fragments.**	

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE NO: BH3
SHEET 1 OF 1

PROJECT: HARVEY NORMAN
LOCATION: CNR MELLING LINK & RUTHERFORD ST
JOB NO: 83083
CO-ORDINATES: Refer site plan
RL: 6.7m
DATUM:
DRILL TYPE: Rotary
DRILL METHOD: Auger
DRILL FLUID: Nil
HOLE STARTED: 3/10/02
HOLE FINISHED: 3/10/02
DRILLED BY: Geotech Drilling
LOGGED BY: HWW
CHECKED BY: PP

DRILLING AND TESTS

FLUID LOSS: N/A

WATER: WL measured @ 4.75m depth (10/10/02)

METHOD/CASING: Nil

SAMPLES, TESTS	CORE RECOVERY
2/1/3 N=4	49%
0/2/2 N=4	36%
2/2/3 N=5	62%
4/5/7 N=12	80%
2/2/2 N=4	80%
8/12/20 N=32	100%
20/29/21 for 100mm N>50	78%
2/3/4 N=7	89%
3/6/12 N=18	89%
4/8/13 N=21	

DEPTH (m): 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0

ENGINEERING DESCRIPTION

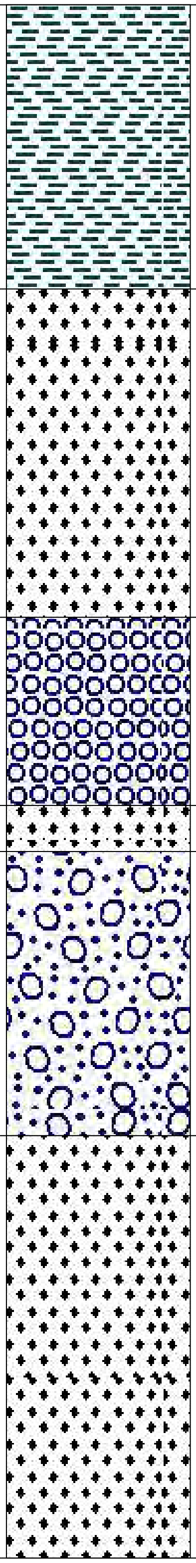
CLASSIFICATION SYMBOL	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	SHEAR STRENGTH OR RELATIVE DENSITY	GEOLOGICAL: ORIGIN TYPE, MINERAL COMPOSITION, DETECTS, STRUCTURE
	ASPHALT			
GM	SILTY GRAVEL, rounded, fine to coarse, brown, gravels grey.	D	'MD'	FILL
SP	SAND, fine to medium, brown, minor silt.	D-M	VL-L	Concreted @ surface & lockable toby.
ML	SANDY SILT, non plastic, brown	M	S-F	INTERBEDDED ALLUVIAL SILTS & SANDS
ML	SILT, slight to moderate plasticity, brownish grey, slight orangey brown mottling.	M	F	
SM	SILTY SAND, fine, grey with orangey brown mottling	M	L-MD	
ML	SANDY SILT, non plastic, grey, sand fine.	M	S-F	Hand slotted PVC pipe wrapped in filter cloth.
GP	SAND, medium to coarse, grey.	W	MD-D	
GW	GRAVEL, subrounded, fine to coarse, grey, some sand.	M-W	VD	ALLUVIAL GRAVELS
ML	SILT, non plastic, blackish brown, some organics, @ 8.5m grey with trace organics.	M-W	F	ALLUVIAL SILTS End cap.
GP	SAND, fine to medium, grey @ 9.2m as above but blackish grey.	W	MD	ALLUVIAL SANDS.

Borehole completed @ 9.7m

Borelog for well R27/1202

Gridref: 1759239.5435976
Ground Level Altitude 4.20 +MSD
Driller : SUB-STRUCTURAL DRILLING
Drill Method :
Drill Depth : m Drill Date : 1/01/1948 12:00:00 a.m.

Page
1 / 2



Scale	Depth	Drillers Description	Formation
	-1.83m	**Silt**	1
	-3.96m	**Sand**	1
-5	-5.18m	**Metal**	1
	-5.49m	**Sand**	1
	-7.32m	**Metal and sand**	1
-10		**Sand and metal**	p

⇓-11.3m

Borelog for well R27/1202

Gridref: 1759239.5435976
Ground Level Altitude 4.20 +MSD
Driller : SUB-STRUCTURAL DRILLING
Drill Method :
Drill Depth : m Drill Date : 1/01/1948 12:00:00 a.m.

Scale	Depth	Drillers Description	Formation
	-11.3m	**Sand and metal**	p
	-14.0m	**Metal**	2
	-14.3m	**Sand**	p
-15	-17.1m	**Metal**	2
	-18.3m	**Metal and sand**	2
-20	-20.1m	**Metal and wood**	2

Appendix B – Level 1 Cost Estimate (for Shortlist Assessment)

[redacted]

Pricing Method

Due to the limited design information and early design stage, there are several key assumptions used in developing the cost estimate. These assumptions have been listed in this memorandum.

Alta have estimated the works from first principles with some bench marking of rates used on other similar projects in the Wellington region. Where rates and prices have been used from previous years, these have been indexed to a 2022 base date. No allowance has been made for any cost escalation to future periods.

No site visits have been undertaken to inform the construction restraints, however, google maps and New Zealand Geotechnical Database have been used to gain site information.

Physical Works

Alta have provided sketches of the key construction assumptions which have been reviewed with Holmes and used as the basis for the cost estimates. These are attached in the appendix for reference.

The works has been broken down into the following elements

- Traffic Management
- Pipework - Open Cut
- Pipework - Pilot Bore
- Trenchless Manholes and Shafts
- Pipework - Rising Main
- Pipework - Bridge Crossing
- Pipework - HDD River Crossing
- Pump Station
- Pump Station Storage
- Service Location Works
- Service Relocation Works

A summary of the key assumptions for each of the above sections are detailed below.

Traffic Management

Traffic Management has been priced based on a crew rate per day. The estimate also includes an allowance for barrier installation, temporary traffic lights and VMS boards.

The durations are calculated on open cut and trenchless pipe lay productivities. The traffic allowance for open cut crews is a 4 person crew and associated vehicles for the duration of the open cut works. The allowance for the trenchless pipe work is a 4 person crew and associated vehicles for 30 working days per launch pit and retrieval pit.

Pipework - Open Cut

Open cut pricing has been built up from first principles including crew pricing, material costs and assumed productivities. We have assumed high-density polyethylene pipes will be used. The costs also include for road reinstatement, tip fees and trench backfill.

Alta have calculated a range of rates for various pipe sizes and depths. These have been applied to the pipe alignments based on a desktop review of the initial invert depth of the pipe and the depth at the pump station.

Open trench construction methods have been assumed for all pipe installation up to a depth of 4.5m. Where pipes are deeper that 4.5m, trenchless methods have been assumed.

The geotechnical information available indicates that the ground conditions are likely to be Taita Alluvium consisting of silts, sands and gravels, which the pricing has been based on. At this stage, no additional allowance has been made for dewatering, however contingency has been applied to the base estimate to make allowance for additional costs and design development such as this.

No manholes or connections have been included in the price other than the connections shown on the drawings and for changes in pipe direction.

Pipework - Pilot Bore

Where the gravity pipe is indicated to be greater than 4.5m deep, trenchless pipe installation methods have been priced. The rate used is based on half the work being installed using pilot bore methods, and half the work being installed using Micro Tunnel Boring Machine methods. The split is due to the geotechnical information indicating the likely presence of cobbles. These present a risk to pilot bore methods.

The pricing is benchmarked on projects with similar size trenchless pipe. It is recommended that further geotechnical investigation is undertaken to confirm the preferred trenchless method and to refine the costings.

Trenchless Manholes and Shafts

Trenchless shafts have been allowed for at 100m centres. This matches the maximum distance for the pilot bore method.

The pricing allows for a temporary shaft, excavation, permanent manhole structure and backfill. There are various ways of constructing temporary shafts, including solder piled and timber lagging, sheet piling and caisson shafts. For this pricing, we have assumed caisson construction methods.

Depth is based on the pipe invert level assuming a constantly falling gravity main.

Pipework - Rising Main

Open cut pricing has been built up from first principles including crew pricing, material costs and assumed productivities. We have assumed high-density polyethylene pipes will be used. The costs include for road reinstatement, tip fees and backfill.

The pipe size has been assumed to be 300mm nominal diameter.

An air valve or scour valve has been included at 250m intervals.

Pipework - Bridge Crossing

Pipe bridge costs are based on a ductile Iron pipe being connected to an existing bridge. The pricing allows for access scaffold for the installation, brackets, pipe materials and connection to the bridge.

Pipework - HDD River Crossing

Horizontal directional drilling pricing has been benchmarked off similar projects where long drill shots under waterways are required. There is a significant amount of investigation works required to confirm that the construction method would be achievable, especially considering the proximity to the Waiwhetu aquifer, which provides drinking water to the Wellington region.

Pump Station

Pump station pricing has been benchmarked off similar projects, and flow rates. Previous projects have been adjusted for inflation to reflect current costs. The flow rates for the pump stations vary from 100l/s for options 1 to 4, and 50l/s for options 5 and 6.

The pricing includes for all typical pump station equipment including wet well, pumps, flow meters, odour management, electrical equipment, and controls.

Pump Station Storage

Storage pricing is based on 600m³ of glass reinforced plastic (GRP) tanks buried next to the pump station. The pricing includes for temporary works and removal of excavated material, and backfill with aggregate.

We have assumed a depth range of 3-5m for the storage tanks.

Service Location Works

Service location work is based on the length of pipe to be installed. The rate includes for traffic management, hydro excavation, and temporary reinstatement.

Service Relocation Works

An allowance has been included for service relocation. The costs are focused on the pump station, with options 5 and 6 having a higher allowance due to these options having two pump station sites.

Outfall

Emergency overflow pipework and outfall structures have been included within the estimates. The pipe rate is similar to the open cut pipe rate, with depths assumed to be 2-3 meters cover.

Contractors Risk

Alta have included an allowance of 3% for contractor’s construction risk.

Onsite Overheads

Alta have built up a site management cost. The project delivery team is assumed to consist of two project managers for the pump station and the pipework, associated project engineers and site engineers, and other support staff including Health and Safety, Communications and Quality staff, surveyors, and contract and commercial management support.

Site facilities have been included, along with a site compound and site consumables, insurances and bonds and IT costs. Project durations vary between 12 to 18 months depending on the quantity of work required.

The onsite overheads for each project are considered reasonable, when comparing these on a percentage basis against the direct costs of each project.

Offsite Overheads and Profit

An allowance of [redacted] has been applied to the direct costs and onsite overheads for contractor's offsite overheads and profit.

Consultancy Fees (MSQA)

An allowance of [redacted] of the physical works cost has been made for management, surveillance and quality assurance costs during the project delivery phase.

Investigations

Consultancy fees of [redacted] of the physical works cost have been included for investigation design costs, along with a nominal allowance for initial site investigation and other costs.

Preliminary Design/Consenting

Consultancy fees of [redacted] of the physical works cost have been included for preliminary design costs, along with a nominal allowance for preliminary site investigation and other costs.

Detailed Design

Consultancy fees of [redacted] of the physical works cost have been included for detailed design costs, along with a nominal allowance for preliminary site investigation and other costs.

Procurement

Consultancy fees of [redacted] of the physical works cost have been included for the procurement costs.

Contingency & Funding Risk

The project contingency and Funding risks has been set in line with the Wellington Water Cost Estimation Manual, level one estimate at [redacted] and [redacted] respectively.

The projects have then been risk adjusted, based on the level of cost risk associated with each project.

For each project, the Pipework, Pump Station and Rising Main elements have been reviewed and a specific risk for each element has been applied. This has been scored as either Low Medium or High. The base assumption of 40% project contingency and 60% funding risk has been adjusted by 5% up or down as shown in the table below for high or low scores. This has then been weighted based on the percentage each element is of the total cost.

Table 2: Risk Adjustments

	Project contingency	Funding Risk
Low	[redacted]	[redacted]
Medium	[redacted]	[redacted]
High	[redacted]	[redacted]

The risk has been scored for each element of each project as shown in the table below.

Table 3: Risk Assessment

	Option 01	Option 02	Option 03	Option 04	Option 05	Option 06
PIPEWORK	HIGH	LOW	MEDIUM	MEDIUM	LOW	LOW
PUMP STATION	MEDIUM	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH
RISING MAIN	LOW	LOW	MEDIUM	HIGH	MEDIUM	HIGH

This results in the weighted adjusted risk for each option is shown in the table below

Table 4: Risk Summary

	Option 01	Option 02	Option 03	Option 04	Option 05	Option 06
Project Contingency	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Funding Riks	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Further details on the risk allocation are included in the appendix.

Escalation

The pricing is based on current cost, with no allowance for future cost escalation. Nationally the construction market is currently experiencing higher than normal cost escalation. The market is seeing a range of increases across materials, labour and plant that varies between 5% and 40% over the past 12 months.

The impact on project cost varies depending on the type of project and the input components. These projects are subject to escalation risk on the following key items

- Commodity prices for raw materials such as steel, copper, and aluminium.
- Increases in shipping costs.
- Increase in specialist equipment costs.
- Increased transport costs in New Zealand.
- Increased labour costs.

Conclusion

The project expected costs are shown in Table 1: Summary of Estimates. These costs are provided to allow an assessment of the difference in outturn cost in comparison to the various options reviewed. Several key assumptions have been made to provide budget estimates, and these have been kept constant across the options where possible to allow a like for like comparison of the costs.

It is recommended that once a preferred option is selected, further assessment of the assumptions and costs for that option are reviewed and the budget estimate is updated.

Yours sincerely,

[redacted]

[redacted]

Alta Consulting Ltd
022 685 8441

Reviewed by: Tim Lancaster

	Option 01	Option 02	Option 03	Option 04	Option 05	Option 06
	HAL AAG	HAL AAJ	-	-	HAL AAL	HAL AAM
Investigations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Consultancy Fees	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Site Investigations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Project Development	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Consultancy Fees	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Site Investigations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Consenting Fees, Community Engager	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Consenting	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Detailed Design	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Consultancy Fees	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Site Investigations	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Detailed Design	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Procurement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Consultancy Fees	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Procurement	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Construction	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Physical Works	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Traffic Management	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - Open Cut	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Trenchless Manholes and Shafts	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - Rising Main	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Station	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Station Storage	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Service Location works	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Service Relocation Works	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Outfall Works	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Contractors Risk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
SubTotal	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
On Site Overheads	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Off Site O/H & Profit	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Physical Works	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Construction	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Base Estimate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Expected Estimate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
95th Percentile Estimate	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

	Weighted Percentage of Cost					
	Option 01	Option 02	Option 03	Option 04	Option 05	Option 06
	Estimate 01	Estimate 02	Estimate 03	Estimate 04	Estimate 05	Estimate 06
	HAL AAG	HAL AAJ	-	-	HAL AAL	HAL AAM
Pipework - Open Cut	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Trenchless Manholes and Shafts	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - Rising Main	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Station	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Station Storage	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Station	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rising Main	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

	Risk					
	Option 01	Option 02	Option 03	Option 04	Option 05	Option 06
Pipework	3	1	2	2	1	1
Pump Station	2	2	2	2	3	3
Rising Main	1	1	2	3	2	3

	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Station	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rising Main	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pipework	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Pump Station	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rising Main	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
P50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
P95	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

PROJECT ESTIMATE

Project Name:	Option 01
Current Phase:	Level 1 Estimate
Base Date:	Aug-22

Phase	Description	Base Estimate	Contingency	Total
Investigations				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Project Development	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Consenting Fees, Community Engagement	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Consenting	[redacted]	[redacted]	[redacted]
Detailed Design		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Detailed Design	[redacted]	[redacted]	[redacted]
Procurement		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Procurement	[redacted]	[redacted]	[redacted]
Construction		[redacted]	[redacted]	[redacted]
	Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Physical Works	[redacted]	[redacted]	[redacted]
	Traffic Management	[redacted]	[redacted]	[redacted]
	Pipework - Open Cut	[redacted]	[redacted]	[redacted]
	Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]
	Manholes and Shafts	[redacted]	[redacted]	[redacted]
	Pipework - Rising Main	[redacted]	[redacted]	[redacted]
	Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]
	Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]
	Pump Station	[redacted]	[redacted]	[redacted]
	Pump Station Storage	[redacted]	[redacted]	[redacted]
	Service Location works	[redacted]	[redacted]	[redacted]
	Service Relocation Works	[redacted]	[redacted]	[redacted]
	Outfall Works	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]
	Contractors Risk	[redacted]	[redacted]	[redacted]
	SubTotal	[redacted]	[redacted]	[redacted]
	On Site Overheads	[redacted]	[redacted]	[redacted]
	Off Site O/H & Profit	[redacted]	[redacted]	[redacted]
	Total Physical Works	[redacted]	[redacted]	[redacted]
	Total Construction	[redacted]	[redacted]	[redacted]
Base Estimate		[redacted]	[redacted]	[redacted]
	Base Estimate	[redacted]	[redacted]	[redacted]
	Contingency	[redacted]	[redacted]	[redacted]
	Expected Estimate	[redacted]	[redacted]	[redacted]
95th Percentile Estimate		[redacted]	[redacted]	[redacted]
	Funding Risk	[redacted]	[redacted]	[redacted]
	95th Percentile Estimate	[redacted]	[redacted]	[redacted]

Notes: This estimate is exclusive of escalation and GST.

Approvals	Name	Signature	Date
Prepared by:	[redacted]		
Reviewed by:	[redacted]		
Approved by:			

PROJECT ESTIMATE

Project Name:	Option 02
Current Phase:	Level 1 Estimate
Base Date:	Aug-22

Phase	Description	Base Estimate	Contingency	Total
Investigations				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Project Development	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Consenting Fees, Community Engagement	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Consenting	[redacted]	[redacted]	[redacted]
Detailed Design		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Detailed Design	[redacted]	[redacted]	[redacted]
Procurement		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Procurement	[redacted]	[redacted]	[redacted]
Construction		[redacted]	[redacted]	[redacted]
	Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Physical Works	[redacted]	[redacted]	[redacted]
	Traffic Management	[redacted]	[redacted]	[redacted]
	Pipework - Open Cut	[redacted]	[redacted]	[redacted]
	Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]
	Manholes and Shafts	[redacted]	[redacted]	[redacted]
	Pipework - Rising Main	[redacted]	[redacted]	[redacted]
	Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]
	Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]
	Pump Station	[redacted]	[redacted]	[redacted]
	Pump Station Storage	[redacted]	[redacted]	[redacted]
	Service Location works	[redacted]	[redacted]	[redacted]
	Service Relocation Works	[redacted]	[redacted]	[redacted]
	Outfall Works	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]
	Contractors Risk	[redacted]	[redacted]	[redacted]
	SubTotal	[redacted]	[redacted]	[redacted]
	On Site Overheads	[redacted]	[redacted]	[redacted]
	Off Site O/H & Profit	[redacted]	[redacted]	[redacted]
	Total Physical Works	[redacted]	[redacted]	[redacted]
	Total Construction	[redacted]	[redacted]	[redacted]
Base Estimate		[redacted]	[redacted]	[redacted]
	Base Estimate	[redacted]	[redacted]	[redacted]
	Contingency	[redacted]	[redacted]	[redacted]
	Expected Estimate	[redacted]	[redacted]	[redacted]
95th Percentile Estimate		[redacted]	[redacted]	[redacted]
	Funding Risk	[redacted]	[redacted]	[redacted]
	95th Percentile Estimate	[redacted]	[redacted]	[redacted]

Notes: This estimate is exclusive of escalation and GST.

Approvals

	Name	Signature	Date
Prepared by:	[redacted]		
Reviewed by:	[redacted]		
Approved by:			

PROJECT ESTIMATE

Project Name:	Option 03
Current Phase:	Level 1 Estimate
Base Date:	Jun-22

Phase	Description	Base Estimate	Contingency	Total
Investigations				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Project Development	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Consenting Fees, Community Engagement	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Consenting	[redacted]	[redacted]	[redacted]
Detailed Design		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Detailed Design	[redacted]	[redacted]	[redacted]
Procurement		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Procurement	[redacted]	[redacted]	[redacted]
Construction		[redacted]	[redacted]	[redacted]
	Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Physical Works	[redacted]	[redacted]	[redacted]
	Traffic Management	[redacted]	[redacted]	[redacted]
	Pipework - Open Cut	[redacted]	[redacted]	[redacted]
	Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]
	Manholes and Shafts	[redacted]	[redacted]	[redacted]
	Pipework - Rising Main	[redacted]	[redacted]	[redacted]
	Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]
	Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]
	Pump Station	[redacted]	[redacted]	[redacted]
	Pump Station Storage	[redacted]	[redacted]	[redacted]
	Service Location works	[redacted]	[redacted]	[redacted]
	Service Relocation Works	[redacted]	[redacted]	[redacted]
	Outfall Works	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]
	Contractors Risk	[redacted]	[redacted]	[redacted]
	SubTota	[redacted]	[redacted]	[redacted]
	On Site Overheads	[redacted]	[redacted]	[redacted]
	Off Site O/H & Profit	[redacted]	[redacted]	[redacted]
	Total Physical Works	[redacted]	[redacted]	[redacted]
	Total Construction	[redacted]	[redacted]	[redacted]
Base Estimate		[redacted]	[redacted]	[redacted]
	Base Estimate	[redacted]	[redacted]	[redacted]
	Contingency	[redacted]	[redacted]	[redacted]
	Expected Estimate	[redacted]	[redacted]	[redacted]
95th Percentile Estimate		[redacted]	[redacted]	[redacted]
	Funding Risk	[redacted]	[redacted]	[redacted]
	95th Percentile Estimate	[redacted]	[redacted]	[redacted]

Notes: This estimate is exclusive of escalation and GST.

Approvals			
	Name	Signature	Date
Prepared by:	[redacted]		
Reviewed by:	[redacted]		
Approved by:			

PROJECT ESTIMATE

Project Name: Option 04
Current Phase: Level 1 Estimate
Base Date: Jun-22

Phase	Description	Base Estimate	Contingency	Total
Investigations		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Project Development	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Consenting Fees, Community Engagement	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Consenting	[redacted]	[redacted]	[redacted]
Detailed Design		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Detailed Design	[redacted]	[redacted]	[redacted]
Procurement		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Procurement	[redacted]	[redacted]	[redacted]
Construction		[redacted]	[redacted]	[redacted]
	Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Physical Works	[redacted]	[redacted]	[redacted]
	Traffic Management	[redacted]	[redacted]	[redacted]
	Pipework - Open Cut	[redacted]	[redacted]	[redacted]
	Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]
	Manholes and Shafts	[redacted]	[redacted]	[redacted]
	Pipework - Rising Main	[redacted]	[redacted]	[redacted]
	Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]
	Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]
	Pump Station	[redacted]	[redacted]	[redacted]
	Pump Station Storage	[redacted]	[redacted]	[redacted]
	Service Location works	[redacted]	[redacted]	[redacted]
	Service Relocation Works	[redacted]	[redacted]	[redacted]
	Outfall Works	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]
	Contractors Risk	[redacted]	[redacted]	[redacted]
	SubTotal	[redacted]	[redacted]	[redacted]
	On Site Overheads	[redacted]	[redacted]	[redacted]
	Off Site O/H & Profit	[redacted]	[redacted]	[redacted]
	Total Physical Works	[redacted]	[redacted]	[redacted]
	Total Construction	[redacted]	[redacted]	[redacted]
Base Estimate		[redacted]	[redacted]	[redacted]
	Base Estimate	[redacted]	[redacted]	[redacted]
	Contingency	[redacted]	[redacted]	[redacted]
	Expected Estimate	[redacted]	[redacted]	[redacted]
95th Percentile Estimate		[redacted]	[redacted]	[redacted]
	Funding Risk	[redacted]	[redacted]	[redacted]
	95th Percentile Estimate	[redacted]	[redacted]	[redacted]

Notes: This estimate is exclusive of escalation and GST.

Approvals

	Name	Signature	Date
Prepared by:	[redacted]		
Reviewed by:	[redacted]		
Approved by:			

PROJECT ESTIMATE

Project Name:	Option 05
Current Phase:	Level 1 Estimate
Base Date:	Jun-22

Phase	Description	Base Estimate	Contingency	Total
Investigations				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Project Development	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Consenting Fees, Community Engagement	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Consenting	[redacted]	[redacted]	[redacted]
Detailed Design		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Detailed Design	[redacted]	[redacted]	[redacted]
Procurement		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Procurement	[redacted]	[redacted]	[redacted]
Construction		[redacted]	[redacted]	[redacted]
	Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Physical Works	[redacted]	[redacted]	[redacted]
	Traffic Management	[redacted]	[redacted]	[redacted]
	Pipework - Open Cut	[redacted]	[redacted]	[redacted]
	Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]
	Manholes and Shafts	[redacted]	[redacted]	[redacted]
	Pipework - Rising Main	[redacted]	[redacted]	[redacted]
	Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]
	Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]
	Pump Station	[redacted]	[redacted]	[redacted]
	Pump Station Storage	[redacted]	[redacted]	[redacted]
	Service Location works	[redacted]	[redacted]	[redacted]
	Service Relocation Works	[redacted]	[redacted]	[redacted]
	Outfall Works	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]
	Contractors Risk	[redacted]	[redacted]	[redacted]
	SubTotal	[redacted]	[redacted]	[redacted]
	On Site Overheads	[redacted]	[redacted]	[redacted]
	Off Site O/H & Profit	[redacted]	[redacted]	[redacted]
	Total Physical Works	[redacted]	[redacted]	[redacted]
	Total Construction	[redacted]	[redacted]	[redacted]
Base Estimate		[redacted]	[redacted]	[redacted]
	Base Estimate	[redacted]	[redacted]	[redacted]
	Contingency	[redacted]	[redacted]	[redacted]
	Expected Estimate	[redacted]	[redacted]	[redacted]
95th Percentile Estimate		[redacted]	[redacted]	[redacted]
	Funding Risk	[redacted]	[redacted]	[redacted]
	95th Percentile Estimate	[redacted]	[redacted]	[redacted]

Notes: This estimate is exclusive of escalation and GST.

Approvals	Name	Signature	Date
Prepared by:	[redacted]		
Reviewed by:	[redacted]		
Approved by:			

PROJECT ESTIMATE

Project Name:	Option 06
Current Phase:	Level 1 Estimate
Base Date:	Jun-22

Phase	Description	Base Estimate	Contingency	Total
Investigations				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Project Development	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Consenting Fees, Community Engagement	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Consenting	[redacted]	[redacted]	[redacted]
Detailed Design				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Detailed Design	[redacted]	[redacted]	[redacted]
Procurement				
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Procurement	[redacted]	[redacted]	[redacted]
Construction				
	Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Physical Works	[redacted]	[redacted]	[redacted]
	Traffic Management	[redacted]	[redacted]	[redacted]
	Pipework - Open Cut	[redacted]	[redacted]	[redacted]
	Pipework - Pilot Bore	[redacted]	[redacted]	[redacted]
	Manholes and Shafts	[redacted]	[redacted]	[redacted]
	Pipework - Rising Main	[redacted]	[redacted]	[redacted]
	Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]
	Pipework - HDD River Crossing	[redacted]	[redacted]	[redacted]
	Pump Station	[redacted]	[redacted]	[redacted]
	Pump Station Storage	[redacted]	[redacted]	[redacted]
	Service Location works	[redacted]	[redacted]	[redacted]
	Service Relocation Works	[redacted]	[redacted]	[redacted]
	Outfall Works	[redacted]	[redacted]	[redacted]
		[redacted]	[redacted]	[redacted]
	Contractors Risk	[redacted]	[redacted]	[redacted]
	SubTotal	[redacted]	[redacted]	[redacted]
	On Site Overheads	[redacted]	[redacted]	[redacted]
	Off Site O/H & Profit	[redacted]	[redacted]	[redacted]
	Total Physical Works	[redacted]	[redacted]	[redacted]
	Total Construction	[redacted]	[redacted]	[redacted]
Base Estimate				
	Base Estimate	[redacted]	[redacted]	[redacted]
	Contingency	[redacted]	[redacted]	[redacted]
	Expected Estimate	[redacted]	[redacted]	[redacted]
95th Percentile Estimate				
	Funding Risk	[redacted]	[redacted]	[redacted]
	95th Percentile Estimate	[redacted]	[redacted]	[redacted]

Notes: This estimate is exclusive of escalation and GST.

Approvals	Name	Signature	Date
Prepared by:	[redacted]		
Reviewed by:	[redacted]		
Approved by:			

Option 01

Bill description	Unit	Quantity	Rate	Amount
Traffic Management		[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 2x TC with TMA (trenched)	Days	[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 3x TC with TMA	Days	[redacted]	[redacted]	[redacted]
Barrier install and removal	each	[redacted]	[redacted]	[redacted]
Barriers	Days	[redacted]	[redacted]	[redacted]
VMS trailer	Days	[redacted]	[redacted]	[redacted]
Portable NZTA Traffic Lights	Days	[redacted]	[redacted]	[redacted]
Pipework - Open Cut		[redacted]	[redacted]	[redacted]
DN450 In Road - 2-3m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road - 3-4m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road - 4-5m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road -5+m deep	m	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore		[redacted]	[redacted]	[redacted]
DN450 Pilot Bore	m	[redacted]	[redacted]	[redacted]
Manholes and Shafts		[redacted]	[redacted]	[redacted]
3m Dia Shaft 5m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 6m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 7m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 8m Deep	each	[redacted]	[redacted]	[redacted]
Pipework - Rising Main		[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
Air Valve / Sour Valve	each	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing		[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing		[redacted]	[redacted]	[redacted]
Pump Station	l/s	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station Storage	m³	[redacted]	[redacted]	[redacted]
	m³	[redacted]	[redacted]	[redacted]
Service Location works		[redacted]	[redacted]	[redacted]
	m	[redacted]	[redacted]	[redacted]
Service Relocation Works		[redacted]	[redacted]	[redacted]
	each	[redacted]	[redacted]	[redacted]
Outfall Works		[redacted]	[redacted]	[redacted]
Outfall Pipe - 450 2-3m deep	m	[redacted]	[redacted]	[redacted]
Outfall Strucutre	each	[redacted]	[redacted]	[redacted]
Onsite Overheads		[redacted]	[redacted]	[redacted]
Establish/Disestablish:	LS	[redacted]	[redacted]	[redacted]
P&G Fixed Costs	LS	[redacted]	[redacted]	[redacted]
Time-related Support:	months	[redacted]	[redacted]	[redacted]
Management Staff	months	[redacted]	[redacted]	[redacted]

Option 02

Bill description	Unit	Quantity	Rate	Amount
Traffic Management		[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 2x TC with TMA	Days	[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 3x TC with TMA	Days	[redacted]	[redacted]	[redacted]
Barrier install and removal	each	[redacted]	[redacted]	[redacted]
Barriers	Days	[redacted]	[redacted]	[redacted]
VMS trailer	Days	[redacted]	[redacted]	[redacted]
Portable NZTA Traffic Lights	Days	[redacted]	[redacted]	[redacted]
Pipework - Open Cut		[redacted]	[redacted]	[redacted]
DN375 In Road - 2-3m deep	m	[redacted]	[redacted]	[redacted]
DN375 In Road - 3-4m deep	m	[redacted]	[redacted]	[redacted]
DN375 In Road - 4-5m deep	m	[redacted]	[redacted]	[redacted]
DN375In Road -5+m deep	m	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore		[redacted]	[redacted]	[redacted]
DN450 Pilot Bore	m	[redacted]	[redacted]	[redacted]
Manholes and Shafts		[redacted]	[redacted]	[redacted]
3m Dia Shaft 5m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 6m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 7m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 8m Deep	each	[redacted]	[redacted]	[redacted]
Pipework - Rising Main		[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
Air Valve / Sour Valve	each	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing		[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing		[redacted]	[redacted]	[redacted]
Pump Station	l/s	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station Storage	m³	[redacted]	[redacted]	[redacted]
	m³	[redacted]	[redacted]	[redacted]
Service Location works		[redacted]	[redacted]	[redacted]
	m	[redacted]	[redacted]	[redacted]
Service Relocation Works		[redacted]	[redacted]	[redacted]
	each	[redacted]	[redacted]	[redacted]
Outfall Works		[redacted]	[redacted]	[redacted]
Outfall Pipe - 450 2-3m deep	m	[redacted]	[redacted]	[redacted]
Outfall Strucutre	each	[redacted]	[redacted]	[redacted]
Onsite Overheads		[redacted]	[redacted]	[redacted]
Establish/Disestablish:	LS	[redacted]	[redacted]	[redacted]
P&G Fixed Costs	LS	[redacted]	[redacted]	[redacted]
Time-related Support:	months	[redacted]	[redacted]	[redacted]
Management Staff	months	[redacted]	[redacted]	[redacted]

Option 03

Bill description	Unit	Quantity	Rate	Amount
Traffic Management		[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 2x TC with TMA	Days	[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 3x TC with TMA	Days	[redacted]	[redacted]	[redacted]
Barrier install and removal	each	[redacted]	[redacted]	[redacted]
Barriers	Days	[redacted]	[redacted]	[redacted]
VMS trailer	Days	[redacted]	[redacted]	[redacted]
Portable NZTA Traffic Lights	Days	[redacted]	[redacted]	[redacted]
Pipework - Open Cut		[redacted]	[redacted]	[redacted]
DN450 In Road - 2-3m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road - 3-4m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road - 4-5m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road -5+m deep	m	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore		[redacted]	[redacted]	[redacted]
DN450 Pilot Bore	m	[redacted]	[redacted]	[redacted]
Manholes and Shafts		[redacted]	[redacted]	[redacted]
3m Dia Shaft 5m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 6m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 7m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 8m Deep	each	[redacted]	[redacted]	[redacted]
Pipework - Rising Main		[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
Air Valve / Sour Valve	each	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing		[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing		[redacted]	[redacted]	[redacted]
Pump Station	l/s	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station Storage	m³	[redacted]	[redacted]	[redacted]
	m³	[redacted]	[redacted]	[redacted]
Service Location works		[redacted]	[redacted]	[redacted]
	m	[redacted]	[redacted]	[redacted]
Service Relocation Works		[redacted]	[redacted]	[redacted]
	each	[redacted]	[redacted]	[redacted]
Outfall Works		[redacted]	[redacted]	[redacted]
Outfall Pipe - 450 2-3m deep	m	[redacted]	[redacted]	[redacted]
Outfall Strucutre	each	[redacted]	[redacted]	[redacted]
Onsite Overheads		[redacted]	[redacted]	[redacted]
Establish/Disestablish:	LS	[redacted]	[redacted]	[redacted]
P&G Fixed Costs	LS	[redacted]	[redacted]	[redacted]
Time-related Support:	months	[redacted]	[redacted]	[redacted]
Management Staff	months	[redacted]	[redacted]	[redacted]

Option 04

Bill description	**Unit**	**Quantity**	**Rate**	**Amount**
Traffic Management		[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 2x TC with TMA	Days	[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 3x TC with TMA	Days	[redacted]	[redacted]	[redacted]
Barrier install and removal	each	[redacted]	[redacted]	[redacted]
Barriers	Days	[redacted]	[redacted]	[redacted]
VMS trailer	Days	[redacted]	[redacted]	[redacted]
Portable NZTA Traffic Lights	Days	[redacted]	[redacted]	[redacted]
Pipework - Open Cut		[redacted]	[redacted]	[redacted]
DN450 In Road - 2-3m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road - 3-4m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road - 4-5m deep	m	[redacted]	[redacted]	[redacted]
DN450 In Road -5+m deep	m	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore		[redacted]	[redacted]	[redacted]
DN450 Pilot Bore	m	[redacted]	[redacted]	[redacted]
Manholes and Shafts		[redacted]	[redacted]	[redacted]
3m Dia Shaft 5m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 6m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 7m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 8m Deep	each	[redacted]	[redacted]	[redacted]
Pipework - Rising Main		[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
Air Valve / Sour Valve	each	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing		[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing		[redacted]	[redacted]	[redacted]
Pump Station	l/s	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station Storage	m³	[redacted]	[redacted]	[redacted]
	m³	[redacted]	[redacted]	[redacted]
Service Location works		[redacted]	[redacted]	[redacted]
	m	[redacted]	[redacted]	[redacted]
Service Relocation Works		[redacted]	[redacted]	[redacted]
	each	[redacted]	[redacted]	[redacted]
Outfall Works		[redacted]	[redacted]	[redacted]
Outfall Pipe - 450 2-3m deep	m	[redacted]	[redacted]	[redacted]
Outfall Strucutre	each	[redacted]	[redacted]	[redacted]
Onsite Overheads		[redacted]	[redacted]	[redacted]
Establish/Disestablish:	LS	[redacted]	[redacted]	[redacted]
P&G Fixed Costs	LS	[redacted]	[redacted]	[redacted]
Time-related Support:	months	[redacted]	[redacted]	[redacted]
Management Staff	months	[redacted]	[redacted]	[redacted]

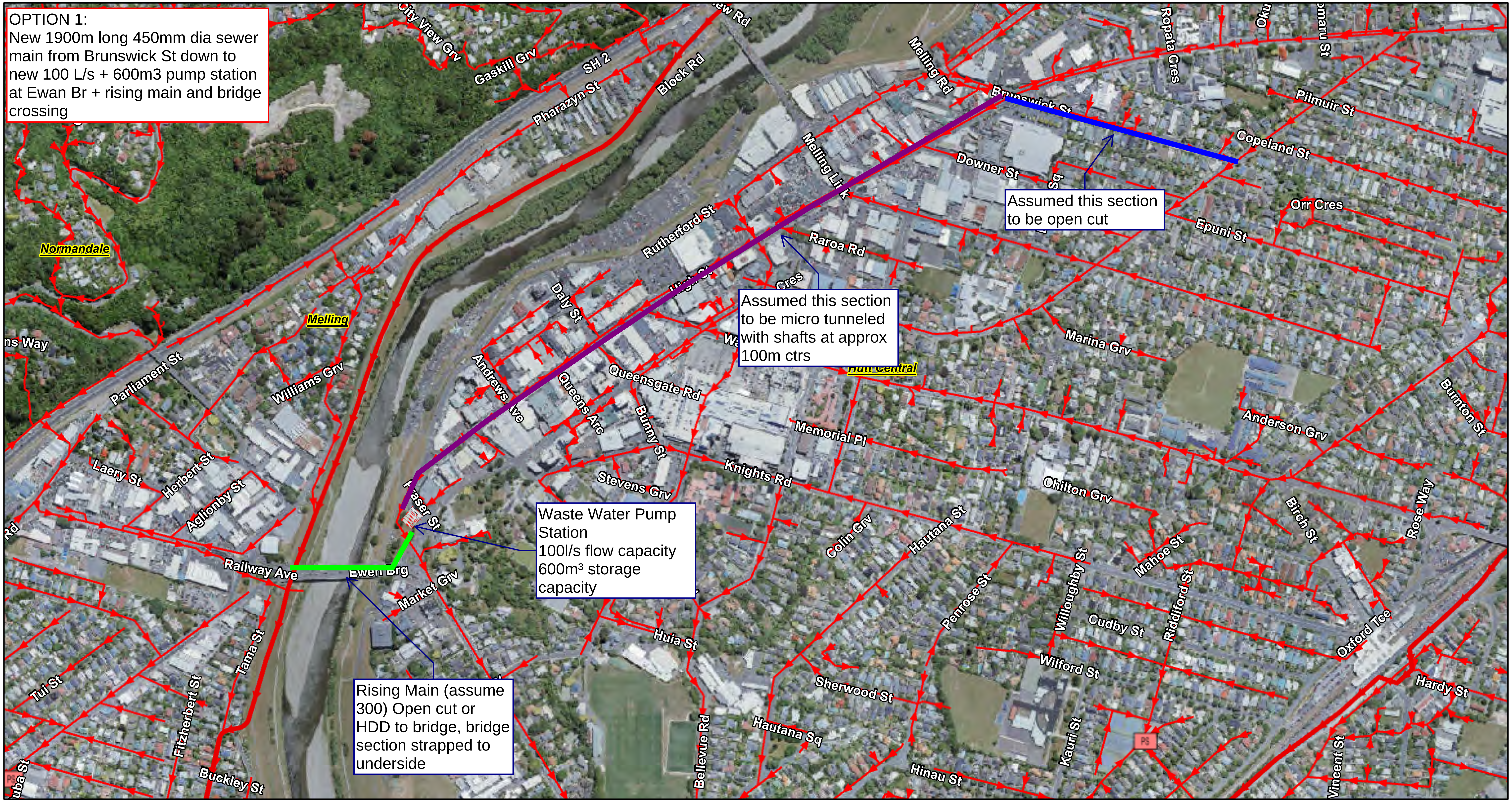
Option 05

Bill description	**Unit**	**Quantity**	**Rate**	**Amount**
Traffic Management		[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 2x TC with TMA	Days	[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 3x TC with TMA	Days	[redacted]	[redacted]	[redacted]
Barrier install and removal	each	[redacted]	[redacted]	[redacted]
Barriers	Days	[redacted]	[redacted]	[redacted]
VMS trailer	Days	[redacted]	[redacted]	[redacted]
Portable NZTA Traffic Lights	Days	[redacted]	[redacted]	[redacted]
Pipework - Open Cut		[redacted]	[redacted]	[redacted]
DN300 In Road - 2-3m deep	m	[redacted]	[redacted]	[redacted]
DN300 In Road - 3-4m deep	m	[redacted]	[redacted]	[redacted]
DN300 In Road - 4-5m deep	m	[redacted]	[redacted]	[redacted]
DN300 In Road -5+m deep	m	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore		[redacted]	[redacted]	[redacted]
DN450 Pilot Bore	m	[redacted]	[redacted]	[redacted]
Manholes and Shafts		[redacted]	[redacted]	[redacted]
3m Dia Shaft 5m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 6m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 7m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 8m Deep	each	[redacted]	[redacted]	[redacted]
Pipework - Rising Main		[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
Air Valve / Sour Valve	each	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing		[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing		[redacted]	[redacted]	[redacted]
Pump Station	l/s	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station Storage	m³	[redacted]	[redacted]	[redacted]
	m³	[redacted]	[redacted]	[redacted]
Service Location works		[redacted]	[redacted]	[redacted]
	m	[redacted]	[redacted]	[redacted]
Service Relocation Works		[redacted]	[redacted]	[redacted]
	each	[redacted]	[redacted]	[redacted]
Outfall Works		[redacted]	[redacted]	[redacted]
Outfall Pipe - 450 2-3m deep	m	[redacted]	[redacted]	[redacted]
Outfall Strucutre	each	[redacted]	[redacted]	[redacted]
Onsite Overheads		[redacted]	[redacted]	[redacted]
Establish/Disestablish:	LS	[redacted]	[redacted]	[redacted]
P&G Fixed Costs	LS	[redacted]	[redacted]	[redacted]
Time-related Support:	months	[redacted]	[redacted]	[redacted]
Management Staff	months	[redacted]	[redacted]	[redacted]

Option 06

Bill description	**Unit**	**Quantity**	**Rate**	**Amount**
Traffic Management		[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 2x TC with TMA	Days	[redacted]	[redacted]	[redacted]
1x STMS Level 2/3P + 3x TC with TMA	Days	[redacted]	[redacted]	[redacted]
Barrier install and removal	each	[redacted]	[redacted]	[redacted]
Barriers	Days	[redacted]	[redacted]	[redacted]
VMS trailer	Days	[redacted]	[redacted]	[redacted]
Portable NZTA Traffic Lights	Days	[redacted]	[redacted]	[redacted]
Pipework - Open Cut		[redacted]	[redacted]	[redacted]
DN300 In Road - 2-3m deep	m	[redacted]	[redacted]	[redacted]
DN300 In Road - 3-4m deep	m	[redacted]	[redacted]	[redacted]
DN300 In Road - 4-5m deep	m	[redacted]	[redacted]	[redacted]
DN300 In Road -5+m deep	m	[redacted]	[redacted]	[redacted]
Pipework - Pilot Bore		[redacted]	[redacted]	[redacted]
DN450 Pilot Bore	m	[redacted]	[redacted]	[redacted]
Manholes and Shafts		[redacted]	[redacted]	[redacted]
3m Dia Shaft 5m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 6m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 7m Deep	each	[redacted]	[redacted]	[redacted]
3m Dia Shaft 8m Deep	each	[redacted]	[redacted]	[redacted]
Pipework - Rising Main		[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
DN300 Rising Main	m	[redacted]	[redacted]	[redacted]
Air Valve / Sour Valve	each	[redacted]	[redacted]	[redacted]
Pipework - Bridge Crossing		[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
DN300 Pipe Bridge	m	[redacted]	[redacted]	[redacted]
Pipework - HDD River Crossing	m	[redacted]	[redacted]	[redacted]
DN300 HDD long shot	m	[redacted]	[redacted]	[redacted]
Pump Station	l/s	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station	LS	[redacted]	[redacted]	[redacted]
Pump Station Storage	m³	[redacted]	[redacted]	[redacted]
	m³	[redacted]	[redacted]	[redacted]
Service Location works		[redacted]	[redacted]	[redacted]
	m	[redacted]	[redacted]	[redacted]
Service Relocation Works		[redacted]	[redacted]	[redacted]
	each	[redacted]	[redacted]	[redacted]
Outfall Works		[redacted]	[redacted]	[redacted]
Outfall Pipe - 450 2-3m deep	m	[redacted]	[redacted]	[redacted]
Outfall Strucutre	each	[redacted]	[redacted]	[redacted]
Onsite Overheads		[redacted]	[redacted]	[redacted]
Establish/Disestablish:	LS	[redacted]	[redacted]	[redacted]
P&G Fixed Costs	LS	[redacted]	[redacted]	[redacted]
Time-related Support:	months	[redacted]	[redacted]	[redacted]
Management Staff	months	[redacted]	[redacted]	[redacted]

Wellington Water Ltd Map



OPTION 1:
New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 600m3 pump station at Ewan Br + rising main and bridge crossing

Assumed this section to be open cut

Assumed this section to be micro tunneled with shafts at approx 100m ctrs

Waste Water Pump Station
100l/s flow capacity
600m³ storage capacity

Rising Main (assume 300) Open cut or HDD to bridge, bridge section strapped to underside

5/11/2022, 12:06:34 PM

HAL Reference: AAG

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- PS Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 1 REV: 01

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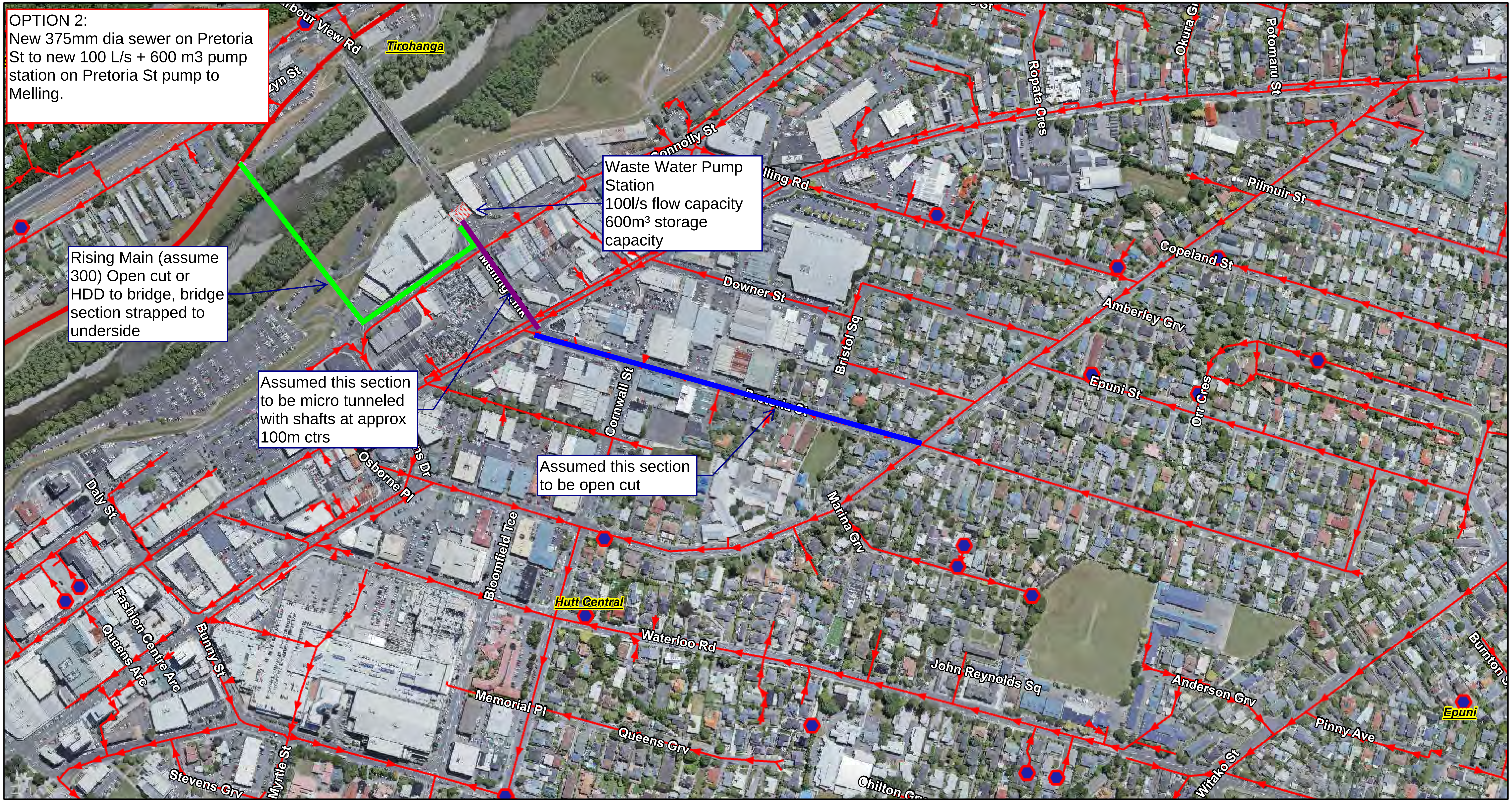

OPTION 2:
New 375mm dia sewer on Pretoria St to new 100 L/s + 600 m3 pump station on Pretoria St pump to Melling.

Waste Water Pump Station
100l/s flow capacity
600m³ storage capacity

Rising Main (assume 300) Open cut or HDD to bridge, bridge section strapped to underside

Assumed this section to be micro tunneled with shafts at approx 100m ctrs

Assumed this section to be open cut

5/5/2022, 9:49:59 AM

HAL Reference: AAJ

1:4,514

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

● Water Shut Valve

Wastewater Pipe

Trunk Main

Main

Discharge Pipe

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 23/06/2022

CSK: Option 2 REV: 02

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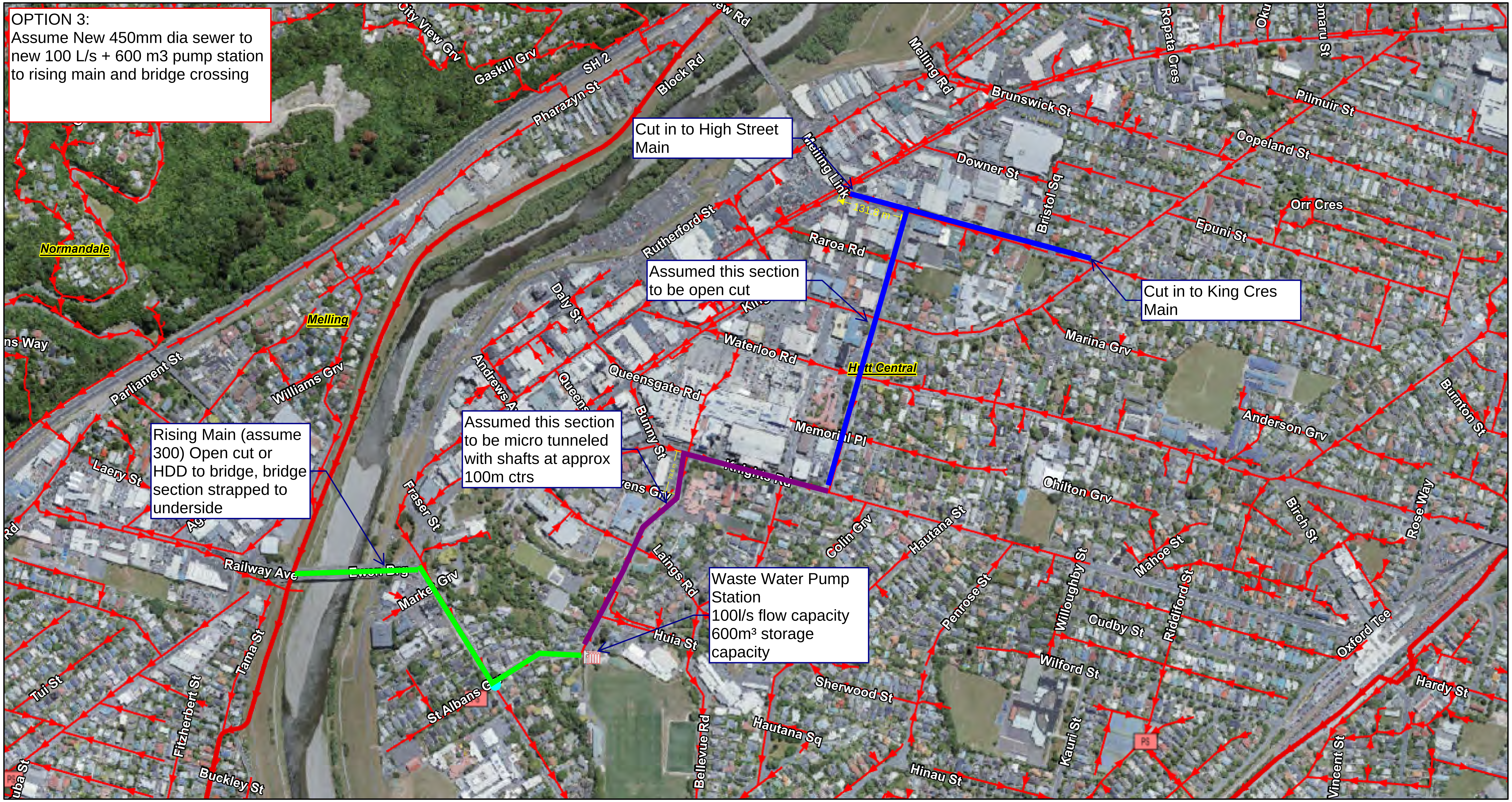

OPTION 3:
Assume New 450mm dia sewer to new 100 L/s + 600 m3 pump station to rising main and bridge crossing

Cut in to High Street Main

Assumed this section to be open cut

Cut in to King Cres Main

Rising Main (assume 300) Open cut or HDD to bridge, bridge section strapped to underside

Assumed this section to be micro tunneled with shafts at approx 100m ctrs

Waste Water Pump Station
100l/s flow capacity
600m³ storage capacity

5/11/2022, 12:06:34 PM

HAL Reference: ___

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

➞	Trunk Main
→	Main
—	Discharge Pipe
PS	Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass
JOB NO: 144418.53 DATE: 22/06/2022
CSK: Option 3 REV: DRAFT

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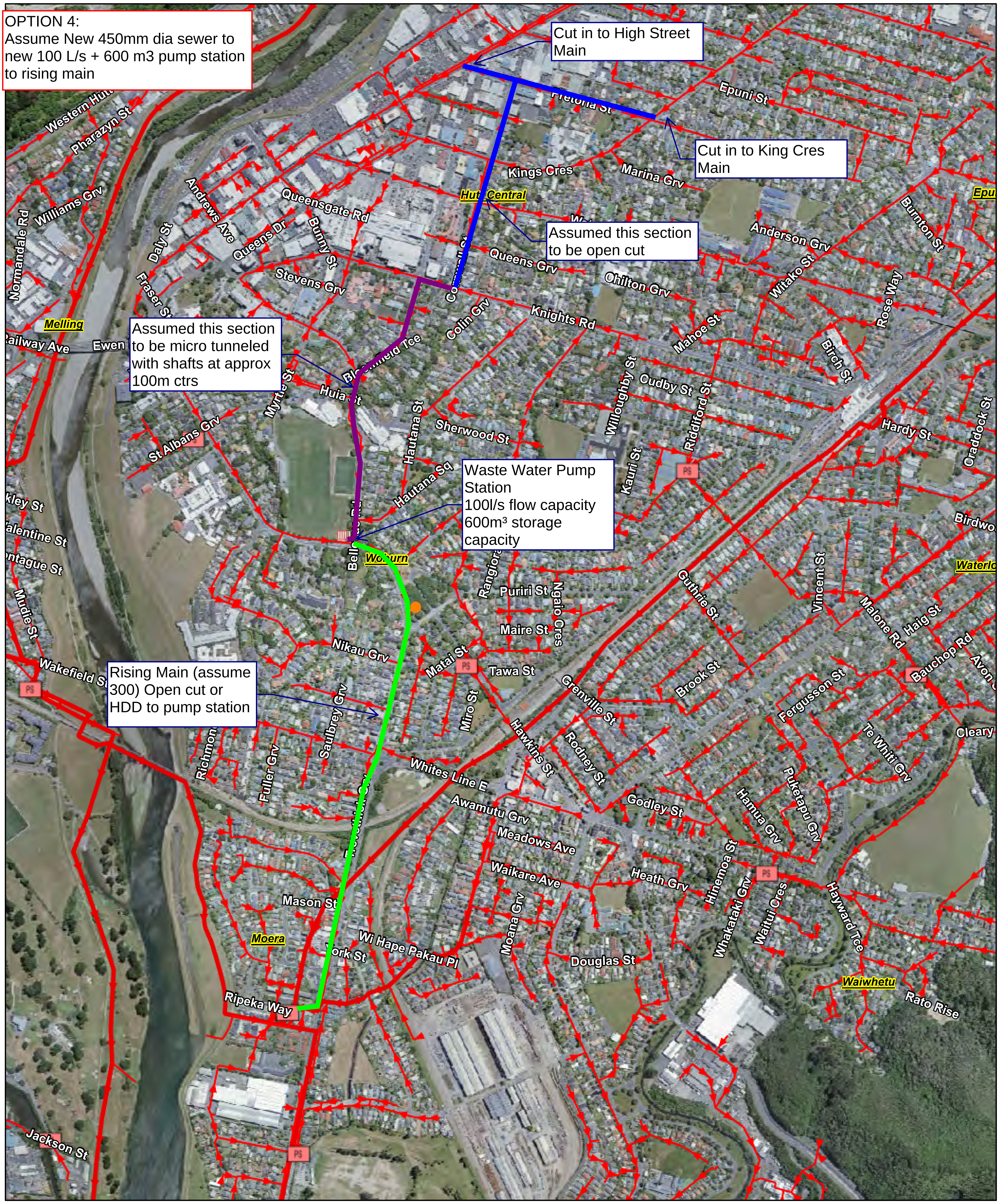
Wellington Water Ltd Map



OPTION 4:
Assume New 450mm dia sewer to new 100 L/s + 600 m3 pump station to rising main

Cut in to High Street Main

Cut in to King Cres Main

Assumed this section to be open cut

Assumed this section to be micro tunneled with shafts at approx 100m ctrs

Waste Water Pump Station
100l/s flow capacity
600m³ storage capacity

Rising Main (assume 300) Open cut or HDD to pump station

5/9/2022, 10:26:32 AM

Wastewater Pipe
- Trunk Main
- Main
- Discharge Pipe
- Other
- Wastewater Pipe
- PS Wastewater Pumpstation

HAL Reference: ___

1:9,028

0 0.1 0.2 0.4 mi

0 0.15 0.3 0.6 km

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 4 REV: DRAFT

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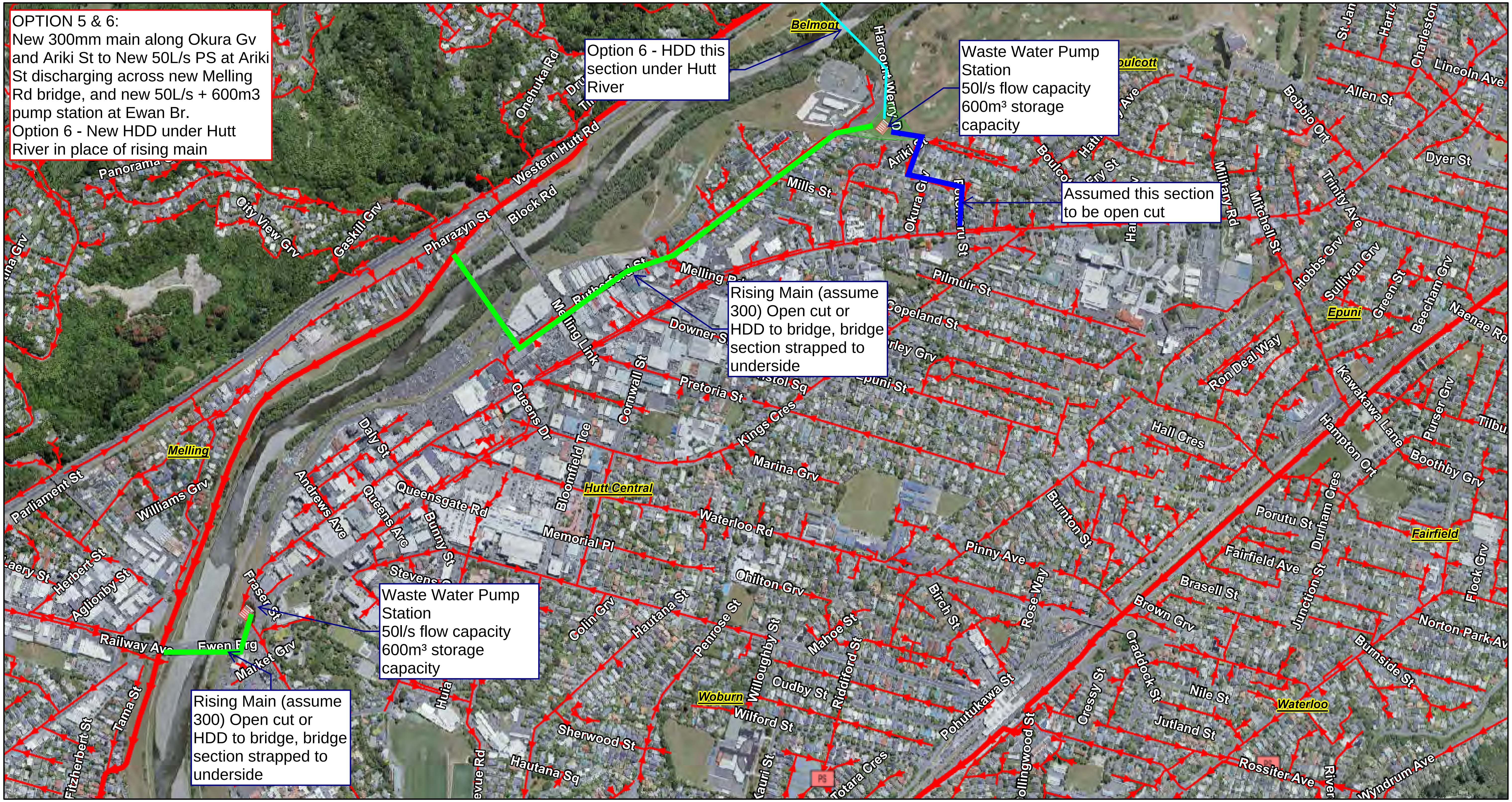


OPTION 5 & 6:
New 300mm main along Okura Gv and Ariki St to New 50L/s PS at Ariki St discharging across new Melling Rd bridge, and new 50L/s + 600m3 pump station at Ewan Br.
Option 6 - New HDD under Hutt River in place of rising main

Option 6 - HDD this section under Hutt River

Waste Water Pump Station
50l/s flow capacity
600m³ storage capacity

Assumed this section to be open cut

Rising Main (assume 300) Open cut or HDD to bridge, bridge section strapped to underside

Waste Water Pump Station
50l/s flow capacity
600m³ storage capacity

Rising Main (assume 300) Open cut or HDD to bridge, bridge section strapped to underside

5/23/2022, 11:24:52 AM

HAL Reference: AAL/AAM

1:9,028

Wastewater Pipe

Wastewater Trunk Main

Wastewater Pipe

Wastewater Service Connection

PS Wastewater Pumpstation

Holmes

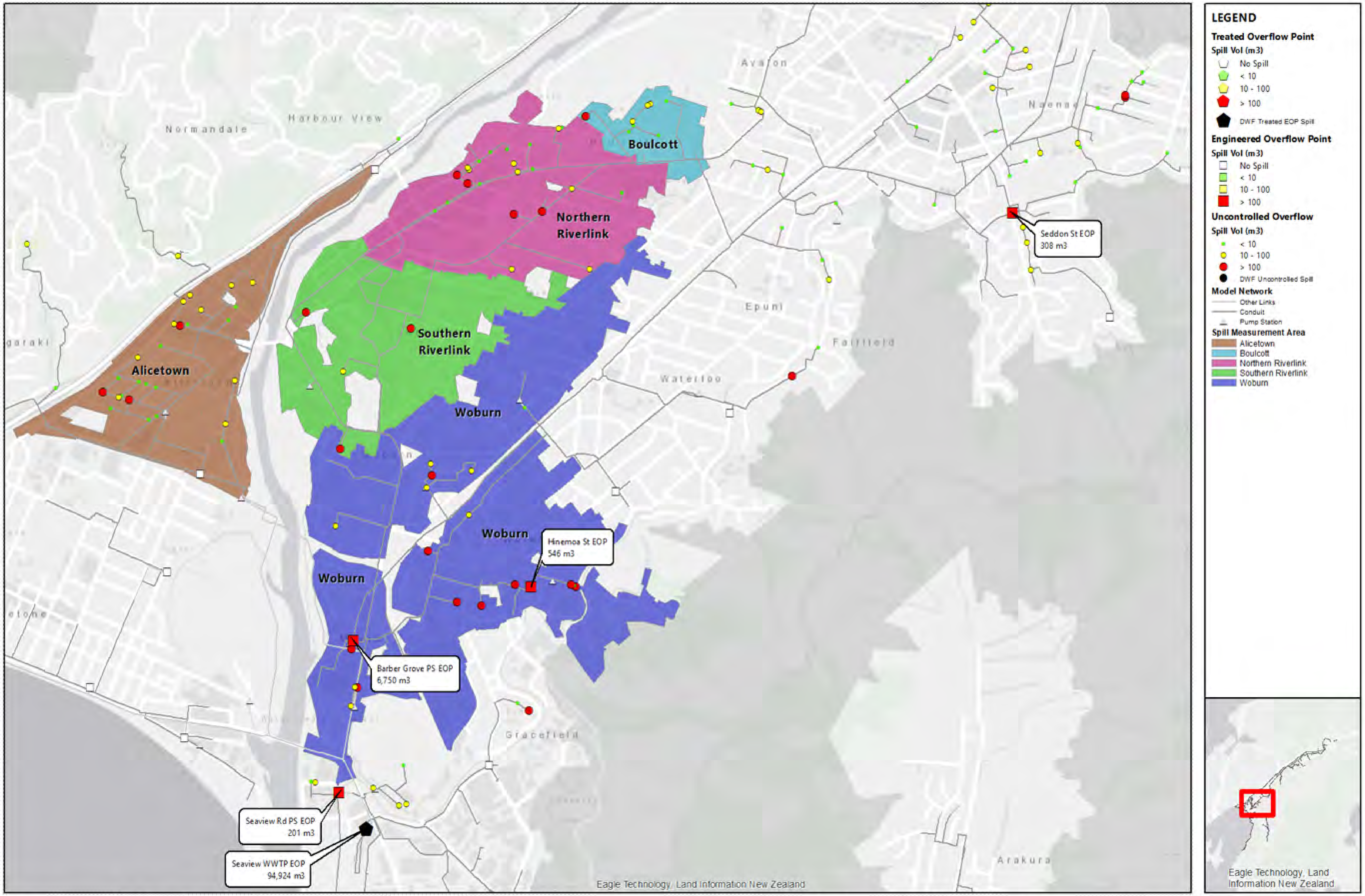
PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 5 REV: 01

Wellington Water Ltd
Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors | LINZ | Wellington Water Ltd | WWL | Wellington Water Ltd, HCC, PCC, SWDC, GWRC, UHCC, WCC | Wellington Water Ltd, Wellington City Council | Wellington Water Ltd, Greater Wellington Regional Council | Wellington

Appendix C – Hydraulic Modelling (for Longlist Assessment)



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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
MPD Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

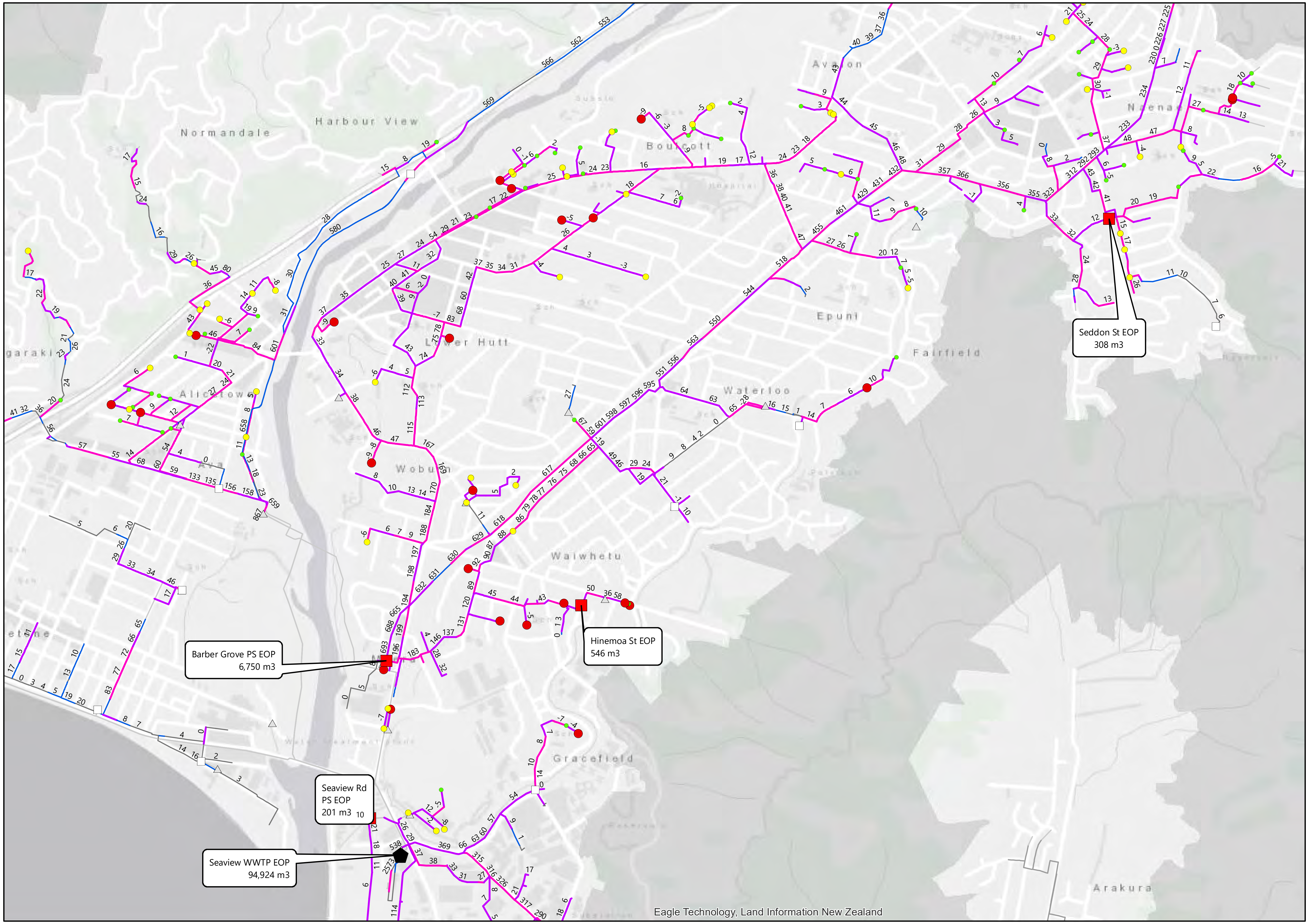
PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING No:

Longlist Assessment

			Change in Total Uncontrolled Spilling (m^3)				Change in EOP Spilling (m^3)					Change in Total Spilling (m^3)
Upgrade Option	**Description**	**Initial Observation**	**Northern Riverlink***	**Southern Riverlink***	**Further South***	**Total Unc.d**	**Barber Gr**	**Hinemoa St**	**Melling Station**	**Seview WWTP**	**Total EOP**	
MPD	Do nothing, 2070 scenario	*Baseline spill volume:*	*880*	*910*	*2,300*	*9,030*	*6,750*	*550*	*0*	*94,920*	*134,750*	*143,780*
AAA	New 1600m long 375mm dia sewer main to service RiverLink Development from Melling Rd down to new pump station. Includes also side connections.	Relief throughout Riverlink area network	-590	-910	-190	-1,670	1,780	-10	0	-70	1,480	-190
AAB	New 1000m long 375mm dia sewer main from Kings Cres down to new 80L/s pump station at Ewan Br - pumped across Bridge	Relief in the south-western end of Riverlink area, but spilling still predicted in Melling Rd / Brunswick St end	-120	-910	-330	-1,320	1,380	-10	0	-320	1,200	-120
AAC	New 1000m long 375mm dia sewer main from Kings Cres down to new 80L/s pump station at Ewan Br - pumped to Barber Gr	Demonstrates that RM route has minimal impact on the solution outcome in Riverlink (ie equivalent benefit if RM crosses Ewan Br or stays on true left bank of Hutt River)	-120	-910	-230	-1,250	1,270	-10	0	-230	1,210	-40
AAD	New 80L/s pump station at Ewan Br.	Some relief in the south-western end of Riverlink area, but spilling still predicted in Melling Rd / Brunswick St end.	-100	-880	-140	-1,100	1,160	0	0	-110	1,260	160
AAE	New 80L/s pump station at Hutt Rec Park.	Relief to trunk main from Woburn to Barber Gr, but minimal impact in Riverlink area (interceptor needed)	190	5,130	-1,000	4,330	-170	-20	0	-4,550	-4,500	-170
AAF	New 1900m long 375mm dia sewer main from Brunswick St down to new 80 L/s pump station at Ewan Br.	Relief throughout Riverlink area network	-870	-900	-180	-1,980	1,840	-10	0	-30	1,620	-360
AAG	New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 600m3 pump station at Ewan Br.	Relief throughout Riverlink area network, with additional benefit over AAF	-870	-910	-380	-2,180	1,950	-10	0	-80	2,050	-130
AAH	New 1500m long 450mm dia sewer main from Pretoria St down to new 100 L/s + 600m3 pump station at Ewan Br.	Relief throughout Riverlink area network, though some spilling still remains in Melling Rd area	-770	-910	-460	-2,120	1,640	-10	0	-40	1,890	-230
AAI	New 1000m long 450mm dia sewer mainfrom Margaret St to new 100 L/s + 600 m3 pump station at Hutt Rec Park.	Relief to trunk main from Woburn to Barber Gr, and some benefit to south-western Riverlink area	-60	1,470	-960	460	710	-20	0	-1,970	-1,310	-850
AAJ	New 375mm dia sewer on Pretoria St to new 100 L/s + 600 m3 pump station on Pretoria St pump to Melling.	Relief throughout Riverlink area network, but would require upgrade to WHMS to avoid spilling at Melling EOP	-770	-910	-310	-2,020	1,780	-10	410	-130	2,260	240
AAK	New 1000m long 450mm dia sewer mainfrom Margaret St to new 200 L/s + 600 m3 pump station at Hutt Rec Park.	Relief to trunk main from Woburn to Barber Gr, and so southern Riverlink area. Spilling remains in Melling Rd area	-150	-910	-820	-1,880	1,870	-20	0	-210	1,870	-10
AAL	New 300mm main along Okura Gv and Ariki St to New 50L/s PS at Ariki St discharging across new Melling Rd bridge, and new 50L/s + 600m3 pump station at Ewan Br.	Relief throughout Riverlink area network, though some spilling still remains in Melling Rd and Kings Cres areas	-690	-890	-120	-1,720	1,700	0	0	-130	1,760	40
AAM	New 450mm main from Kings Cres along Okura Gv and Ariki St to New 50L/s PS at Ariki St discharging across new Melling Rd bridge, and new 50L/s + 600m3 pump station at Ewan Br.	Relief to trunk main from Woburn to Barber Gr, and so southern Riverlink area. Spilling remains in Melling Rd area	-730	-890	-150	-1,900	1,960	0	0	20	2,150	250
AAN	New 1700m long 450mm dia sewer main from Pretoria St to new 200 L/s + 600 m3 pump station at Myrtle St.	Relief throughout Riverlink area network, though some modelled spilling remains in Melling Rd area	-770	-910	-930	-2,590	2,340	-20	0	190	2,480	-110
AAO	New 1800m long 450mm dia sewer main from Pretoria St to new 200 L/s + 600 m3 pump station at Hutt Rec Park.	Relief throughout Riverlink area network, though some modelled spilling remains in Melling Rd area	-770	-870	-760	-2,460	2,210	-20	0	70	2,480	20



LEGEND

Treated Overflow Point

Spill Vol (m3)

- ⬠ No Spill
- ⬠ < 10
- ⬠ 10 - 100
- ⬠ > 100
- ⬟ DWF Treated EOP Spill

Engineered Overflow Point

Spill Vol (m3)

- ☐ No Spill
- 🟩 < 10
- 🟨 10 - 100
- 🟥 > 100

Uncontrolled Overflow

Spill Vol (m3)

- ● < 10
- ● 10 - 100
- ● > 100
- ● DWF Uncontrolled Spill

Links.Surcharge

- Surcharged by Flow
- Surcharge by DS Constraint
- Pipe > half full
- Acceptable

Model Network

- Other Links
- Conduit
- △ Pump Station

REV	AMENDMENTS	BY	DATE		BY	DATE
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				FILENAME		
				APPROVED		

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0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

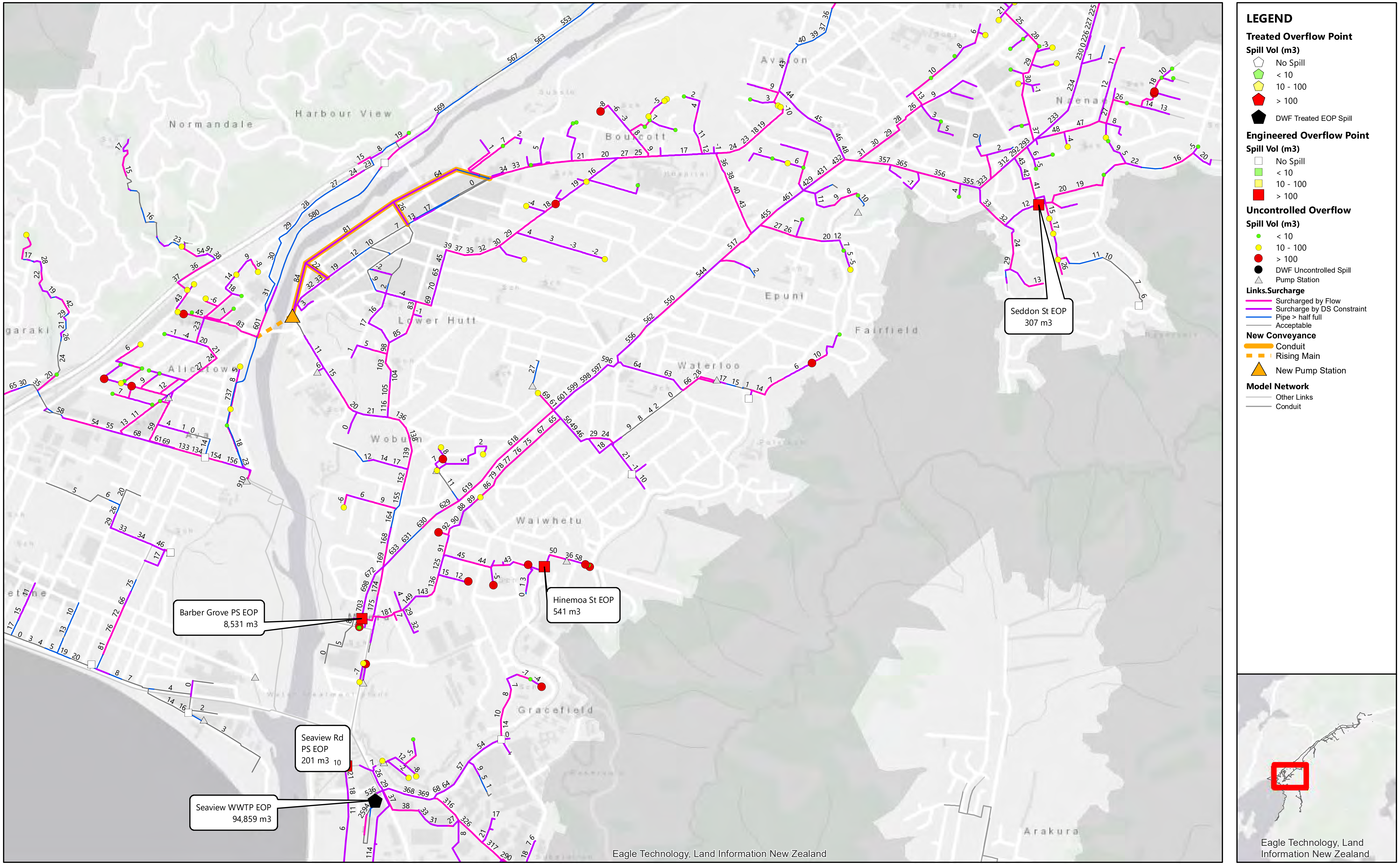
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
MPD Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING No:



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SCALE (at A3)
1:20,000

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Wellington Water

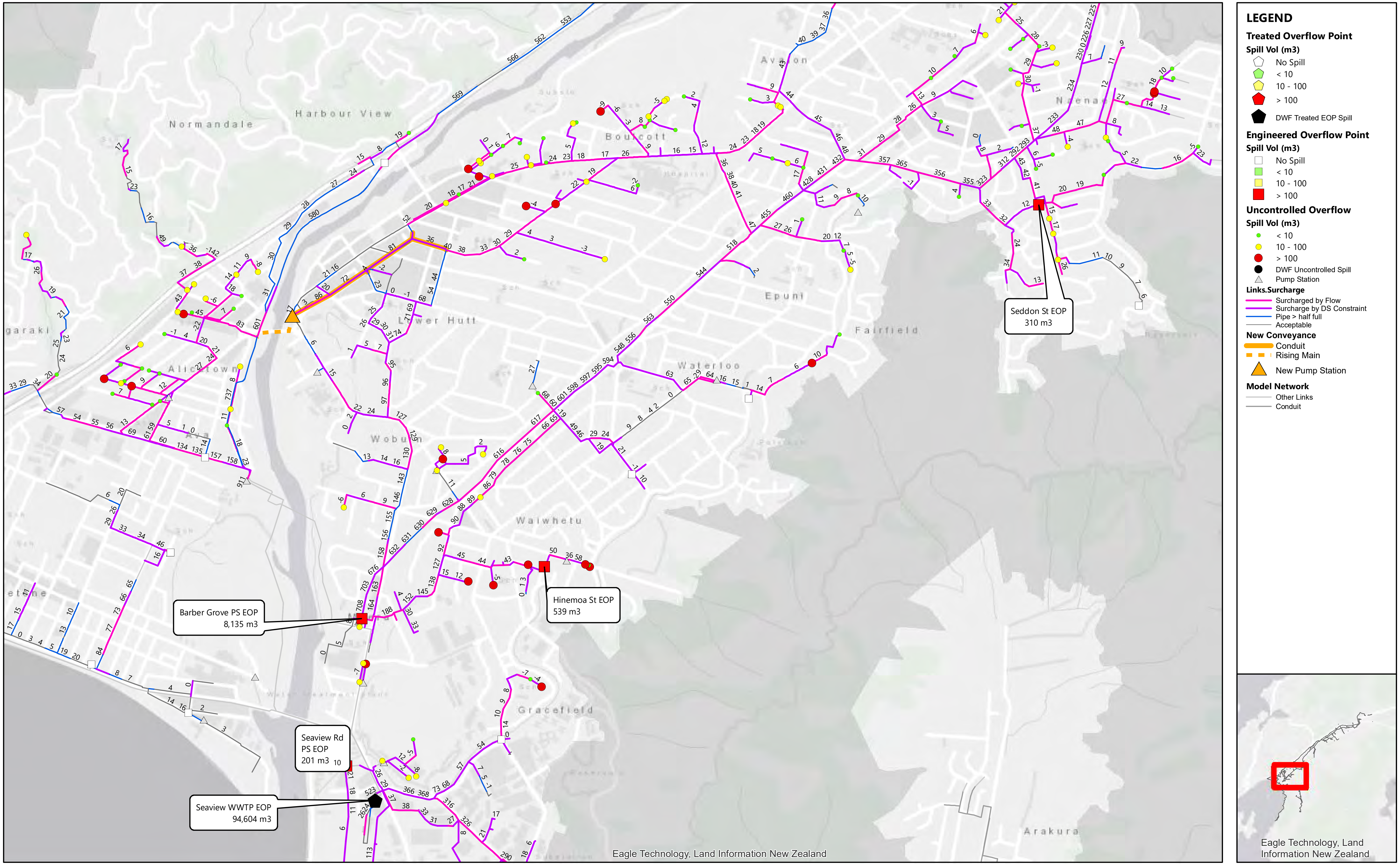
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAA Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING No:



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0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

PROJECT:

STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

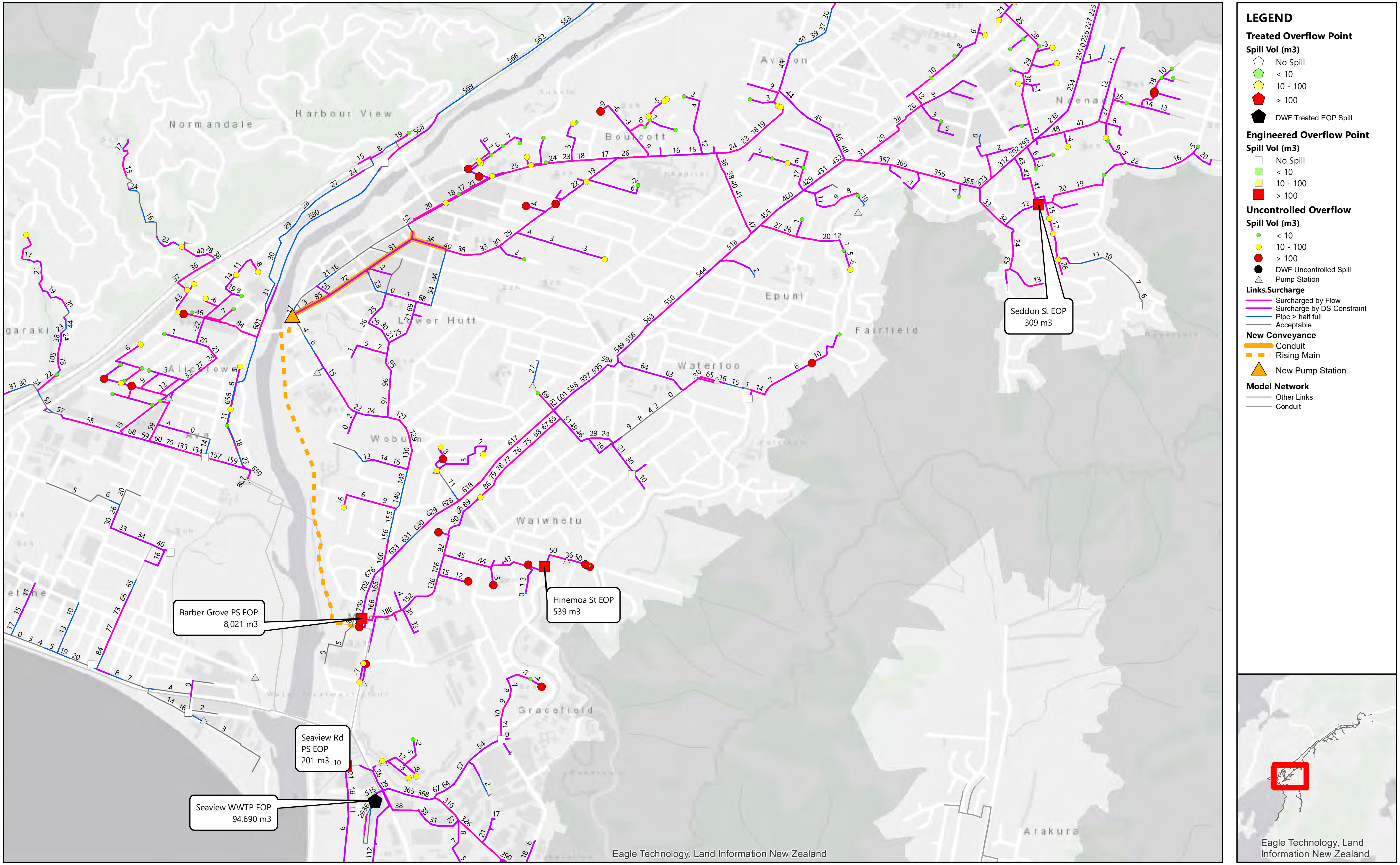
DRAWING TITLE:

Overflow Performance Assessment
AAB Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO: J0414

ISSUE DRAFT A

DRAWING No:



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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

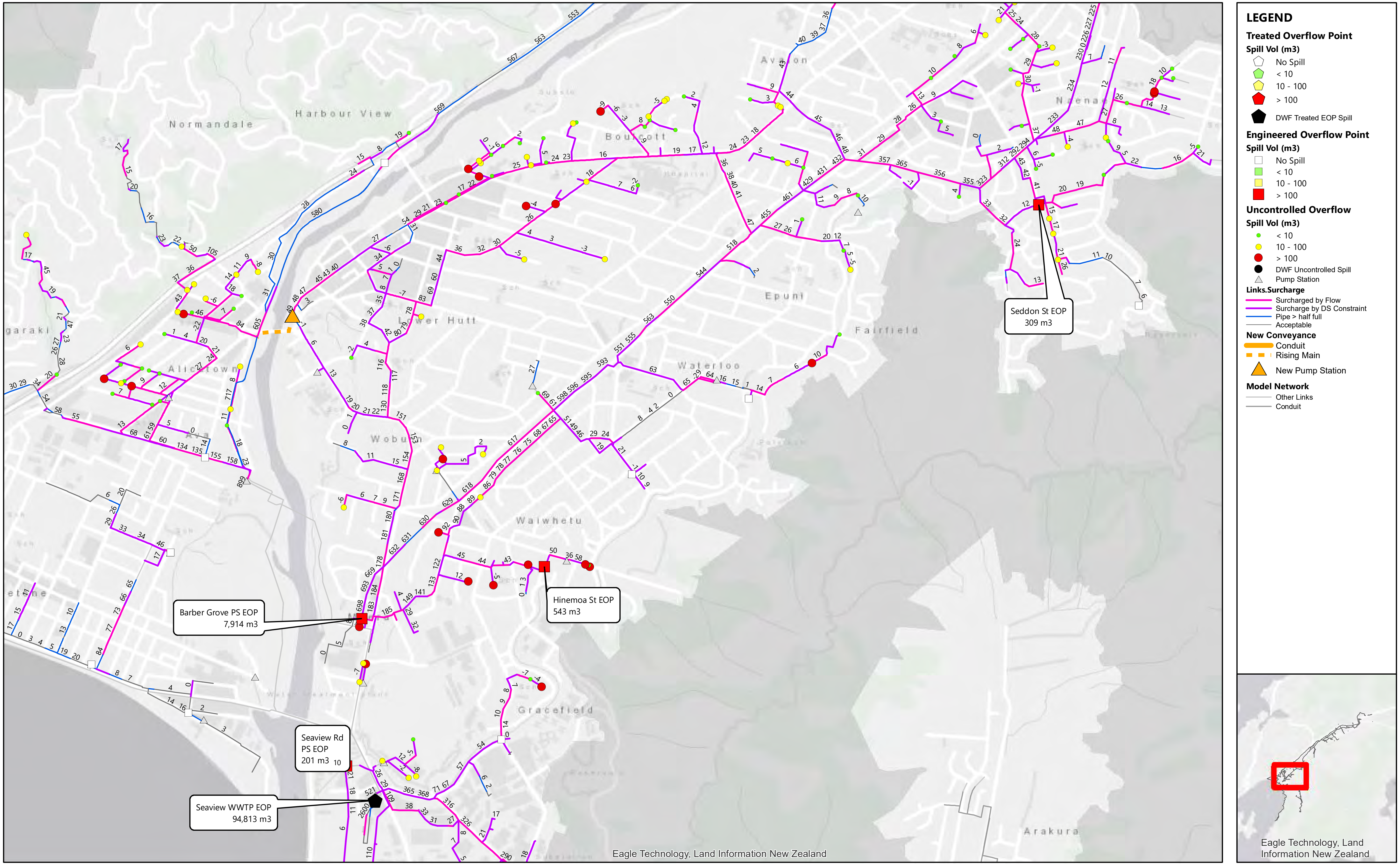
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAC Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO: J0414

ISSUE: DRAFT A

DRAWING No:



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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
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DRAWING TITLE:
Overflow Performance Assessment
AAD Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

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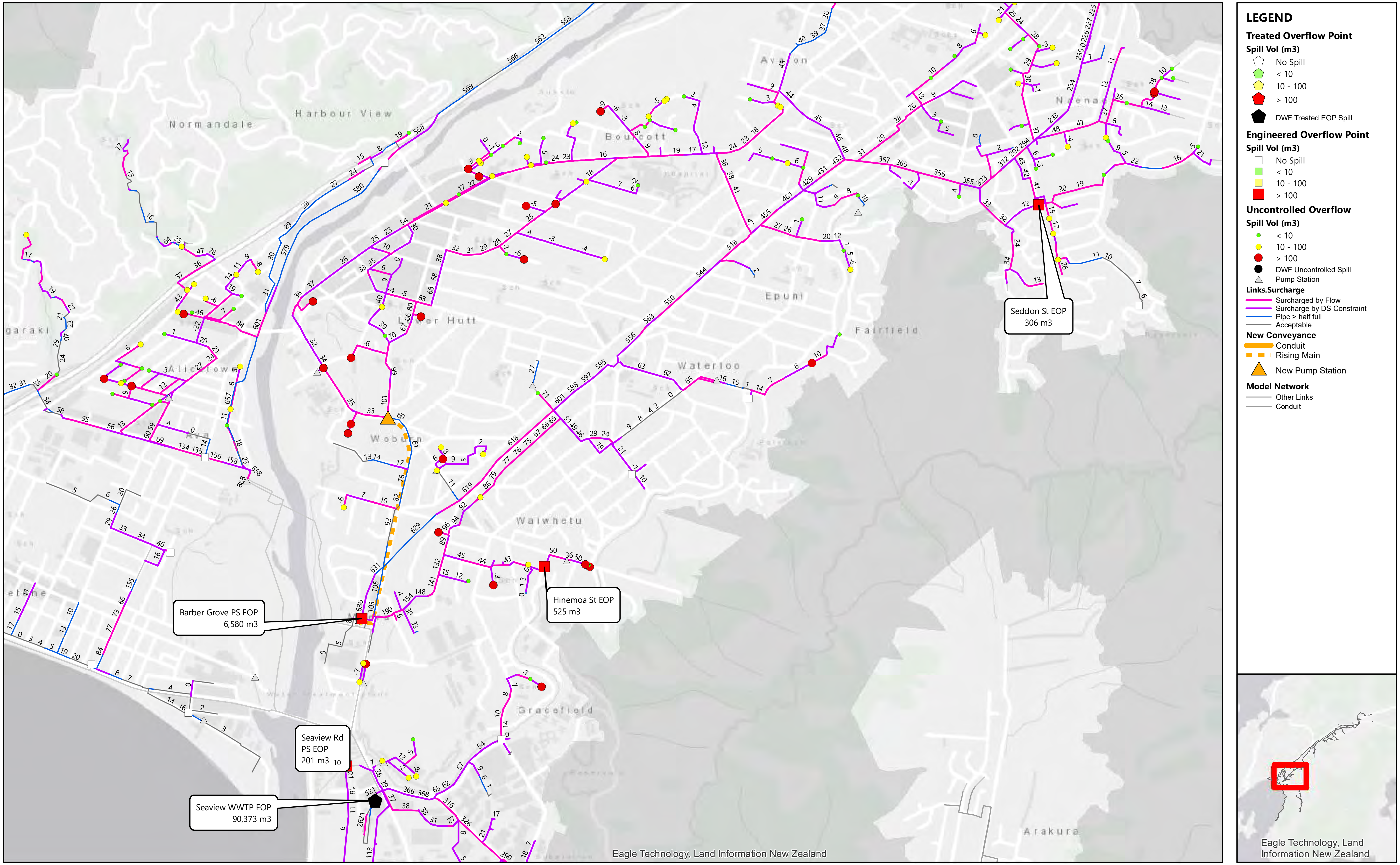

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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
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PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO: J0414

ISSUE: DRAFT A

DRAWING TITLE:
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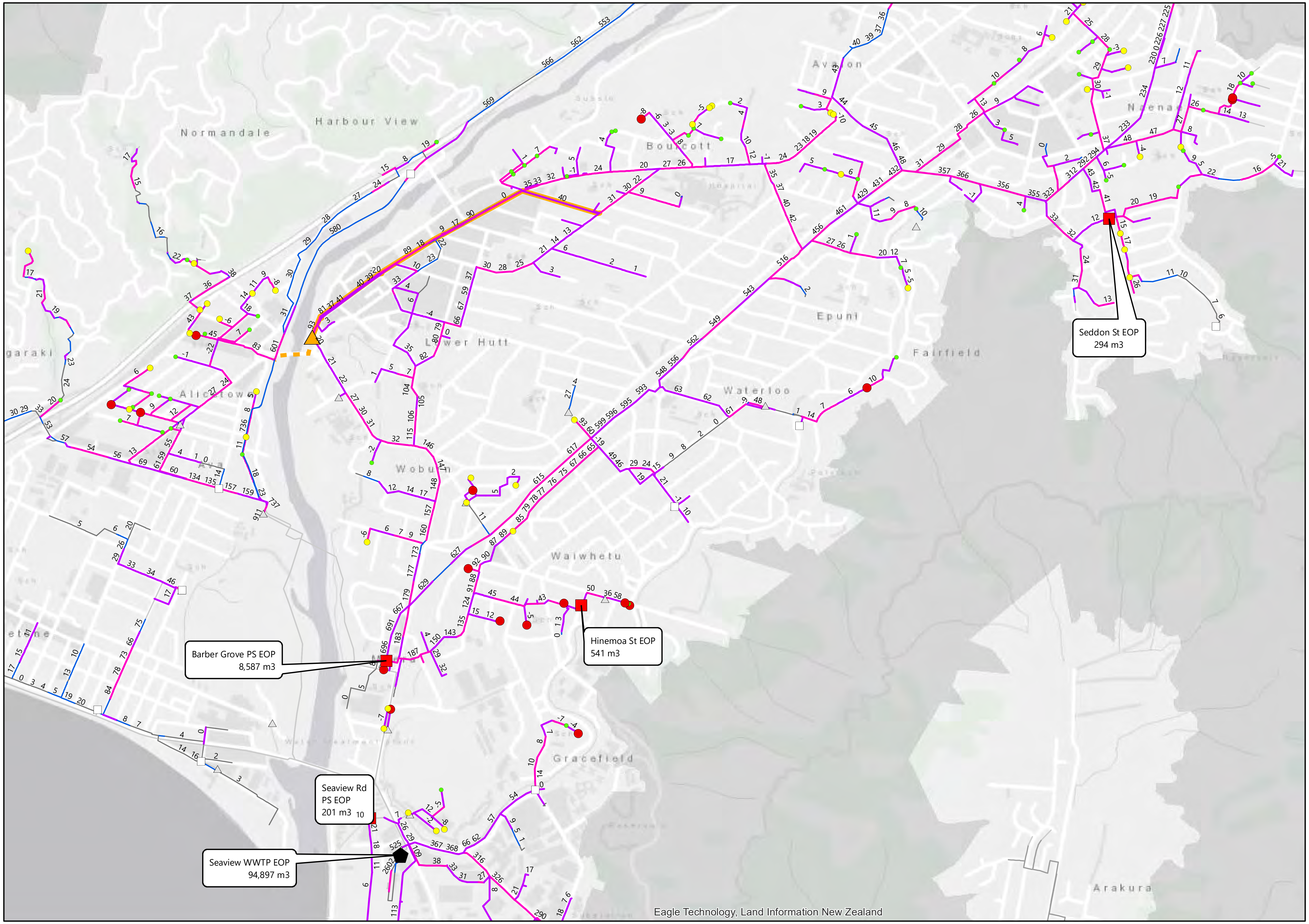
AAE Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

DRAWING No:



LEGEND

Treated Overflow Point

Spill Vol (m3)

- ⬠ No Spill
- ⬠ < 10
- ⬠ 10 - 100
- ⬠ > 100
- ⬟ DWF Treated EOP Spill

Engineered Overflow Point

Spill Vol (m3)

- ☐ No Spill
- 🟩 < 10
- 🟨 10 - 100
- 🟥 > 100

Uncontrolled Overflow

Spill Vol (m3)

- ● < 10
- ● 10 - 100
- ● > 100
- ● DWF Uncontrolled Spill
- △ Pump Station

Links.Surcharge

- Surcharged by Flow
- Surcharge by DS Constraint
- Pipe > half full
- Acceptable

New Conveyance

- Conduit
- Rising Main
- ▲ New Pump Station

Model Network

- Other Links
- Conduit

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0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

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DRAWING TITLE:
Overflow Performance Assessment
AAF Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO:
J0414

ISSUE
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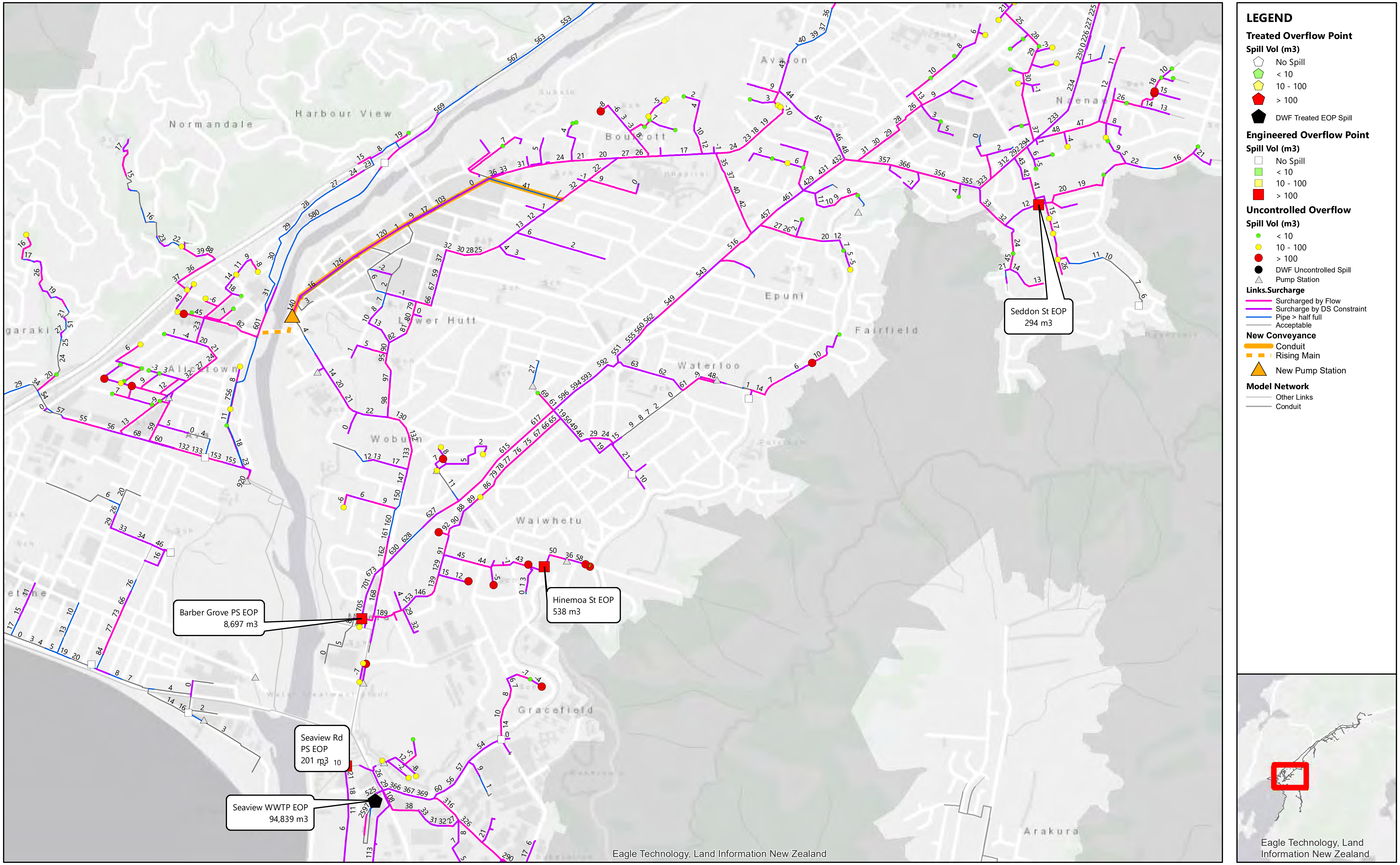
DRAWING No:



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0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

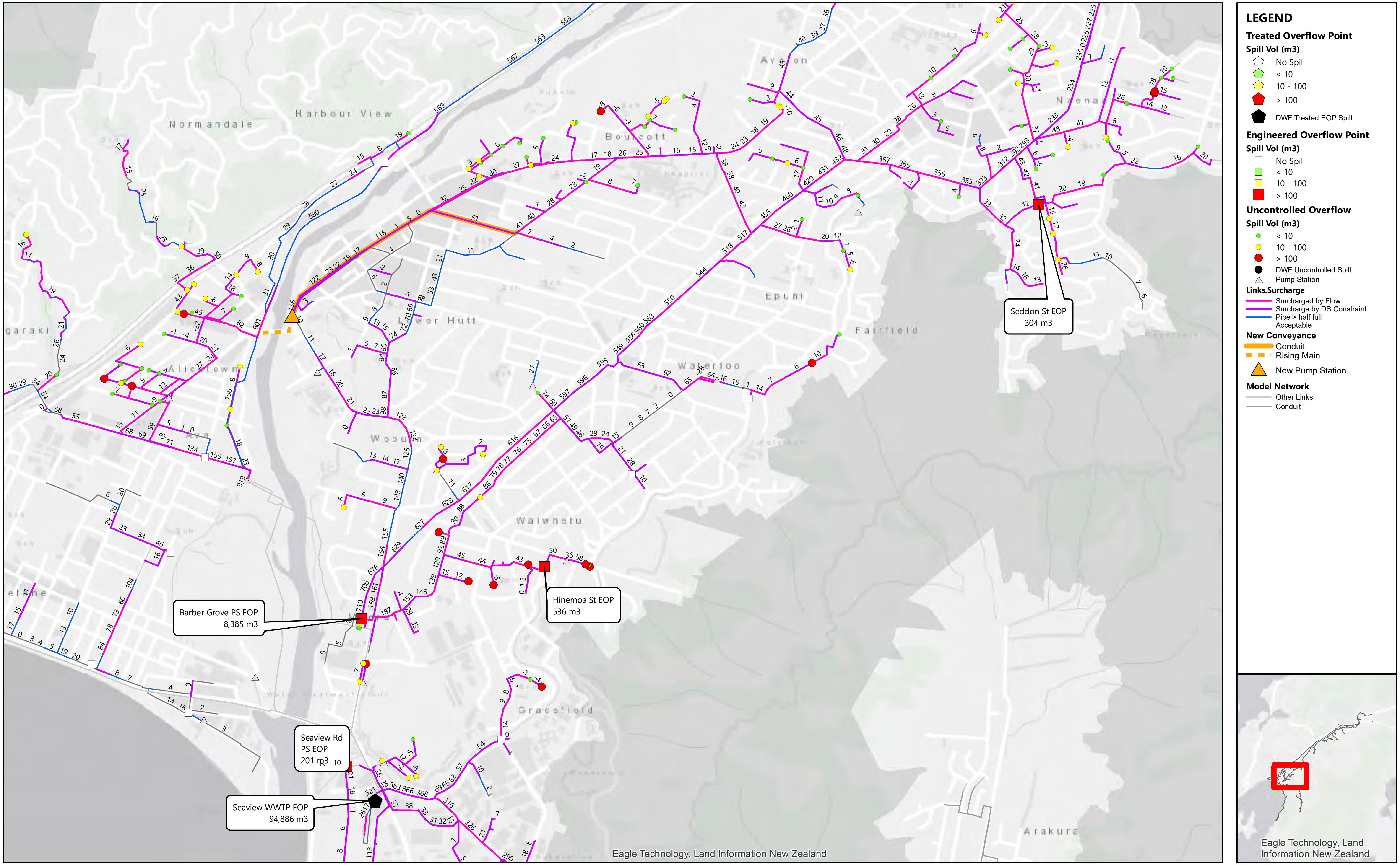
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAG Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING No:



Seddon St EOP
304 m3

Barber Grove PS EOP
8,385 m3

Hinemoa St EOP
536 m3

Seaview Rd
PS EOP
201 m3

Seaview WWTP EOP
94,886 m3

Eagle Technology, Land Information New Zealand

Eagle Technology, Land Information New Zealand

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0 10,500 21,000 42,000 63,000 84,000
Meters

SCALE (at A3)
1:20,000

PROJECT NO:
J0414

ISSUE
DRAFT A

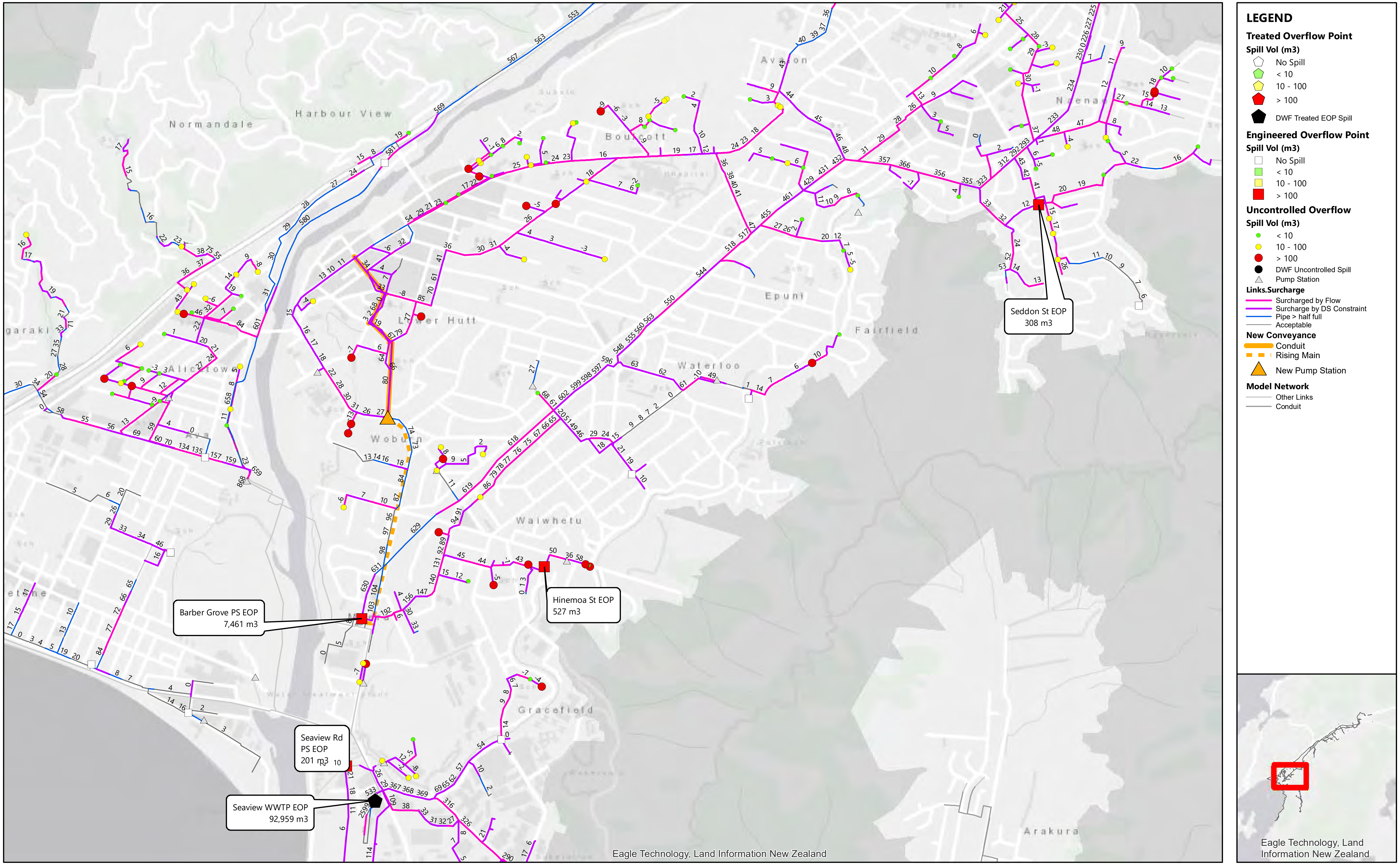
DRAWING No:

PROJECT:

STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:

Overflow Performance Assessment
AAH Scenario - 1yr ARI Design Storm (11-13 Mar 2017)



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0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

PROJECT NO:
J0414

ISSUE
DRAFT A

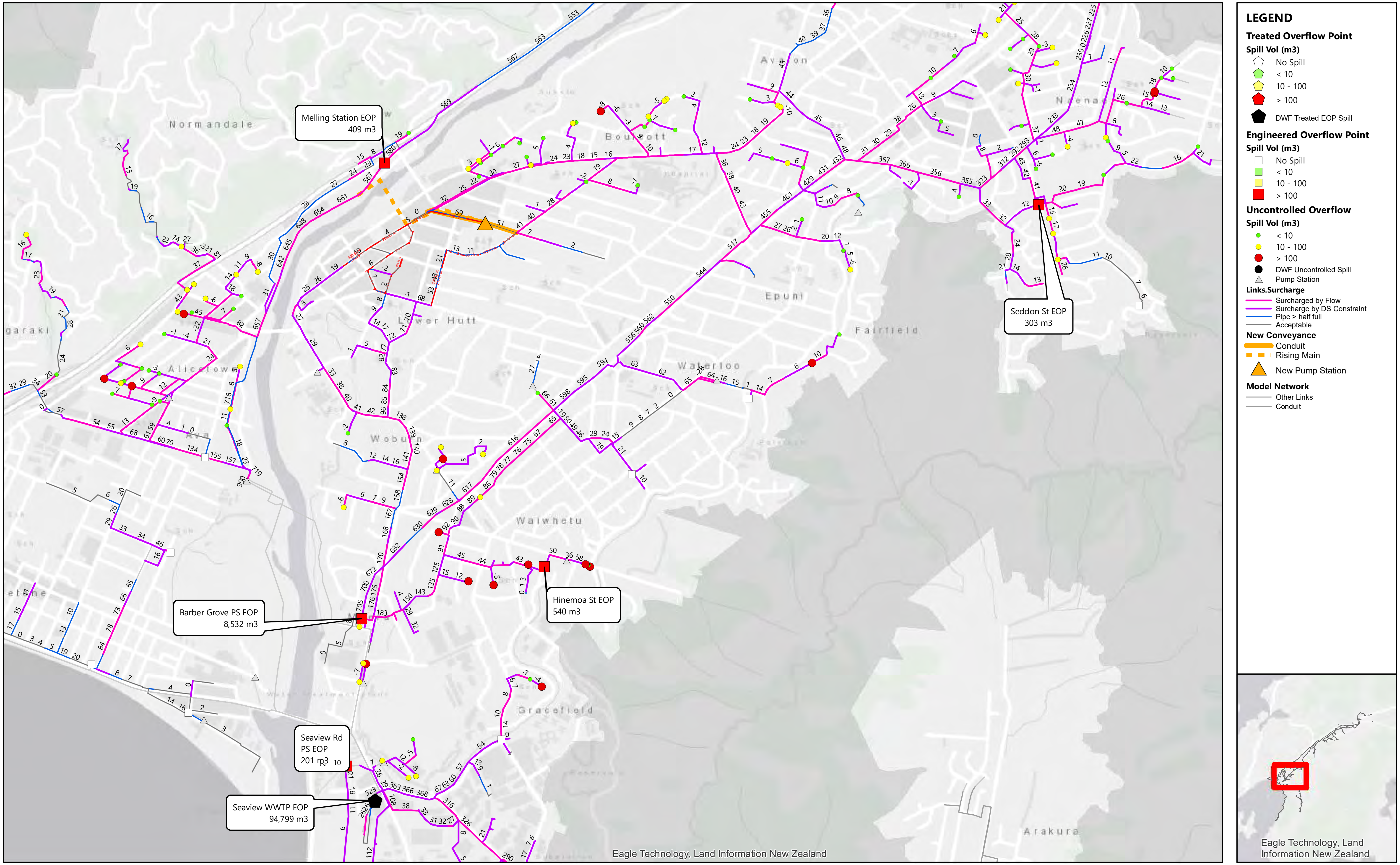
DRAWING No:

PROJECT:

STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:

Overflow Performance Assessment
AAI Scenario - 1yr ARI Design Storm (11-13 Mar 2017)



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HAL HYDRAULIC ANALYSIS LIMITED

Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

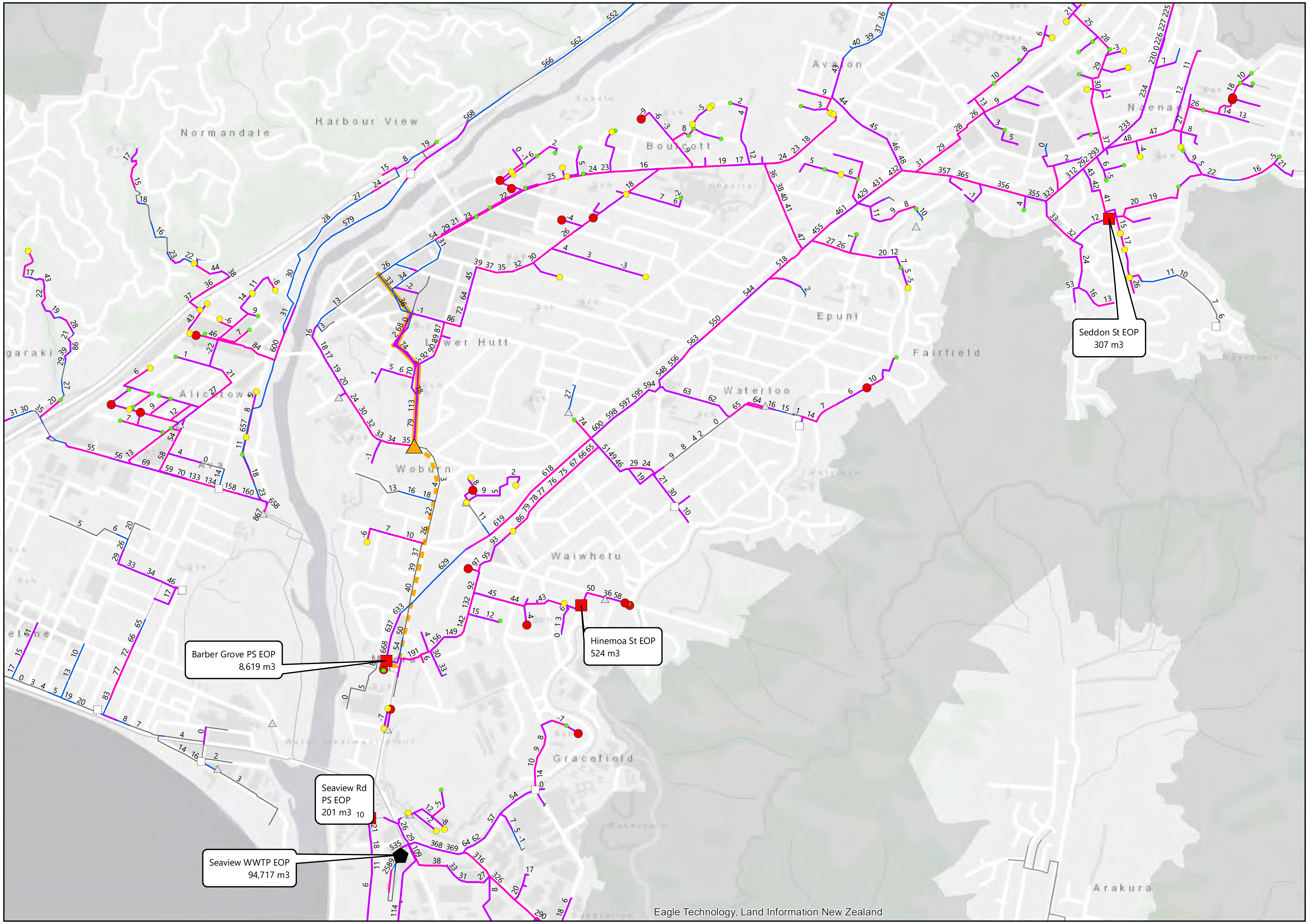
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
AAJ Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

DRAWING No:



LEGEND

Treated Overflow Point

Spill Vol (m3)
- ⬠ No Spill
- ⬠ < 10
- ⬠ 10 - 100
- ⬠ > 100
- ⬟ DWF Treated EOP Spill

Engineered Overflow Point

Spill Vol (m3)
- ☐ No Spill
- 🟩 < 10
- 🟨 10 - 100
- 🟥 > 100

Uncontrolled Overflow

Spill Vol (m3)
- ● < 10
- ● 10 - 100
- ● > 100
- ● DWF Uncontrolled Spill
- △ Pump Station

Links.Surcharge
- Surcharged by Flow
- Surcharge by DS Constraint
- Pipe > half full
- Acceptable

New Conveyance
- Conduit
- Rising Main
- ▲ New Pump Station

Model Network
- Other Links
- Conduit

REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	MAY 2022	DESIGN	N/A	
				DRAWN	[redacted]	MAY 2022
				DWG CHECKED	XX	XX
				STATUS		
				FILENAME		
				APPROVED		

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0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

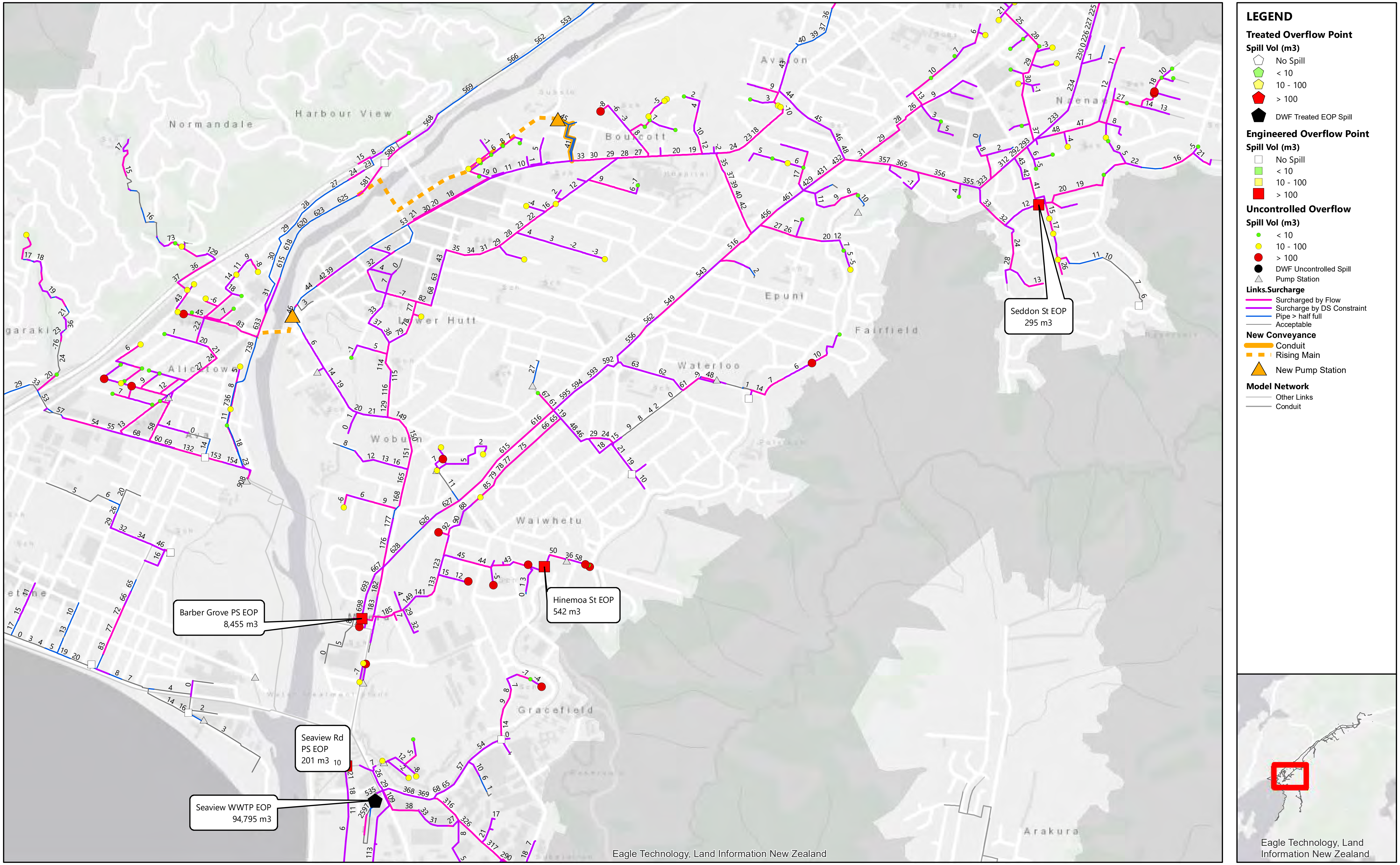
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAK Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING No:



Seddon St EOP
295 m3

Hinemoa St EOP
542 m3

Barber Grove PS EOP
8,455 m3

Seaview Rd
PS EOP
201 m3

Seaview WWTP EOP
94,795 m3

Eagle Technology, Land Information New Zealand

REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	MAY 2022	DESIGN	N/A	
				DRAWN	[redacted]	MAY 2022
				DWG CHECKED	XX	XX
				STATUS		
				FILENAME		
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000
Meters

SCALE (at A3)
1:20,000

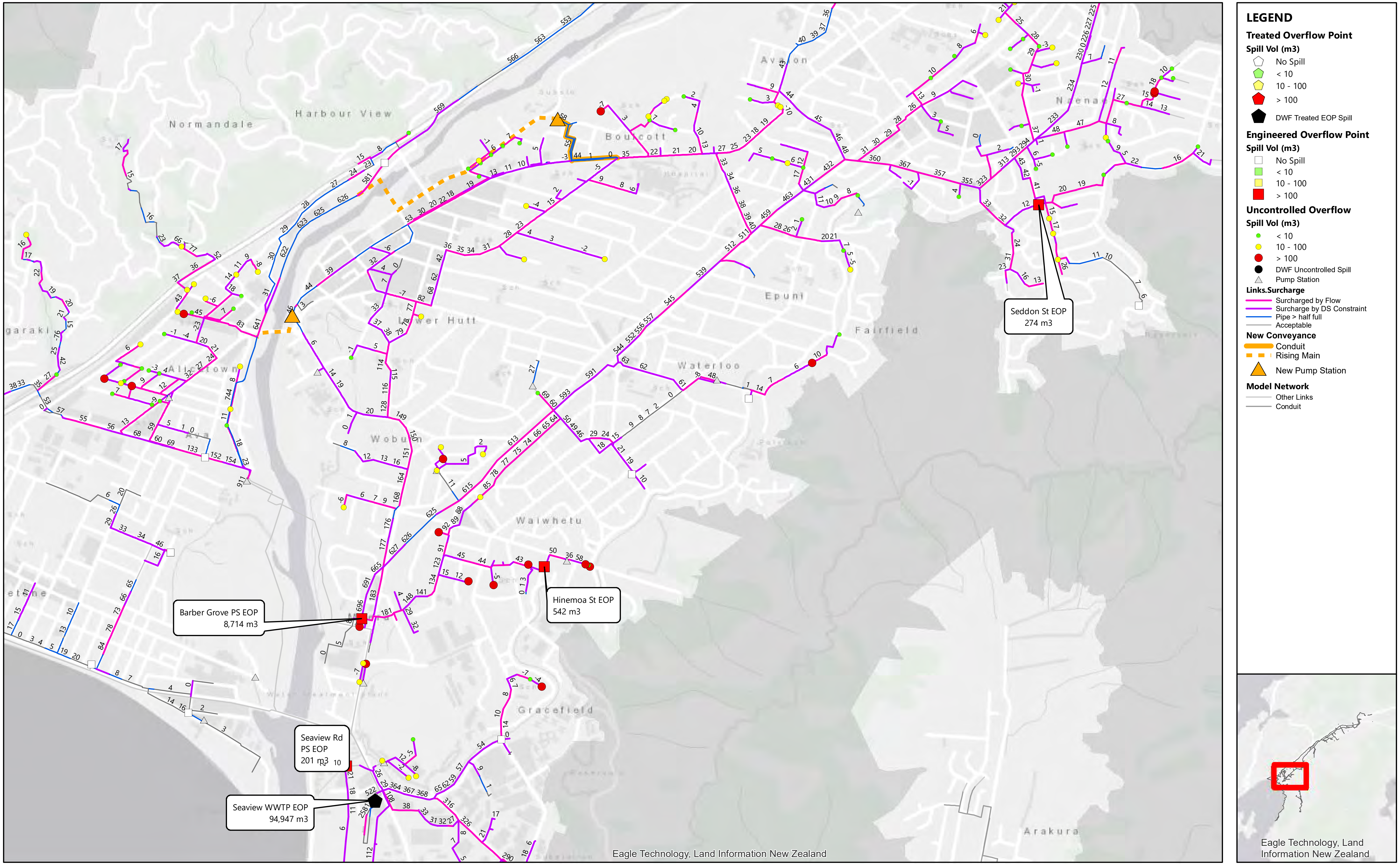
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
AAL Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

DRAWING No:



REV	AMENDMENTS	BY	DATE
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	BY	DATE
DESIGN	N/A	
DRAWN	[redacted]	MAY 2022
DWG CHECKED	XX	XX
STATUS		
FILENAME		
APPROVED		

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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

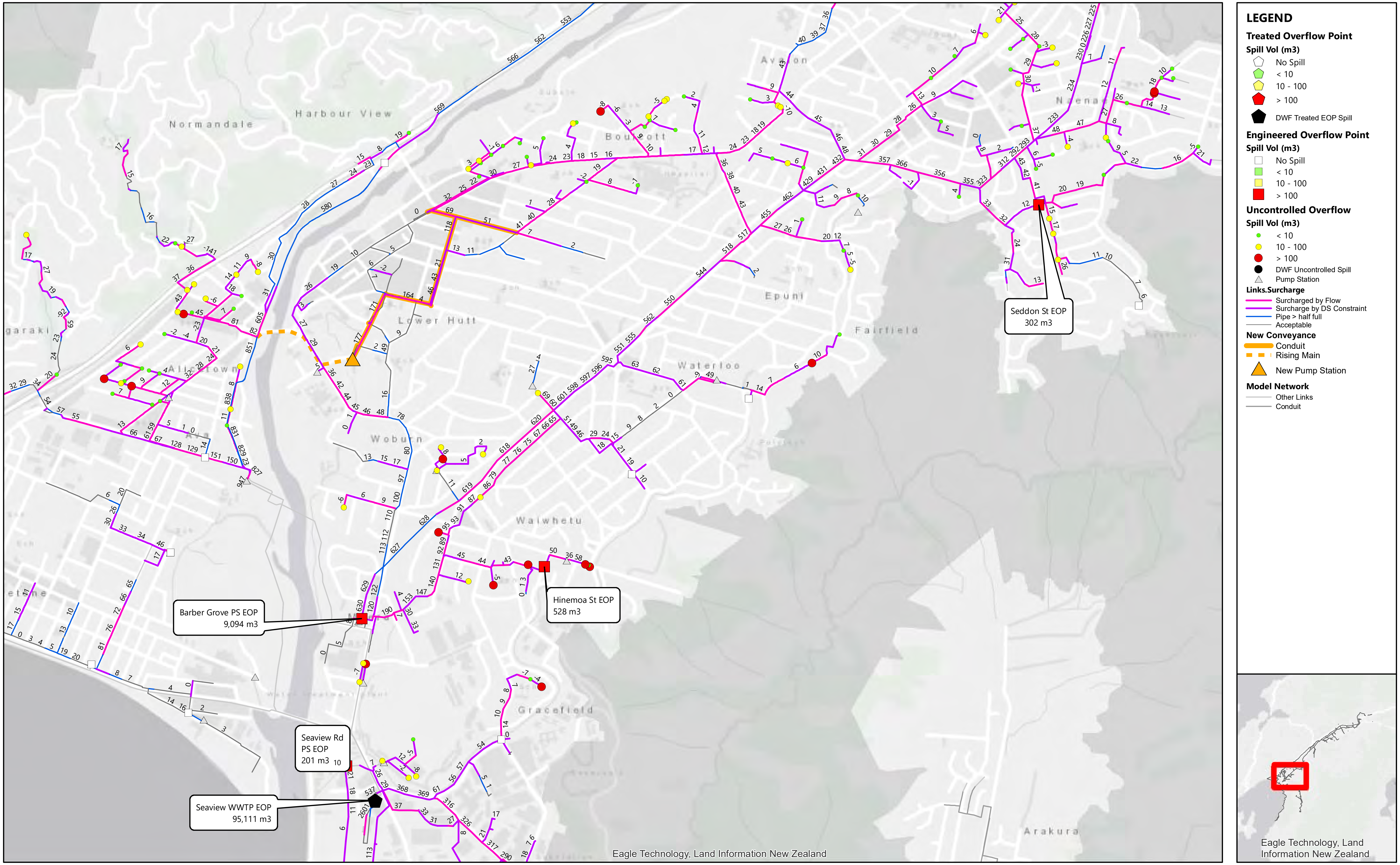
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
AAM Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

DRAWING No:



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				FILENAME		
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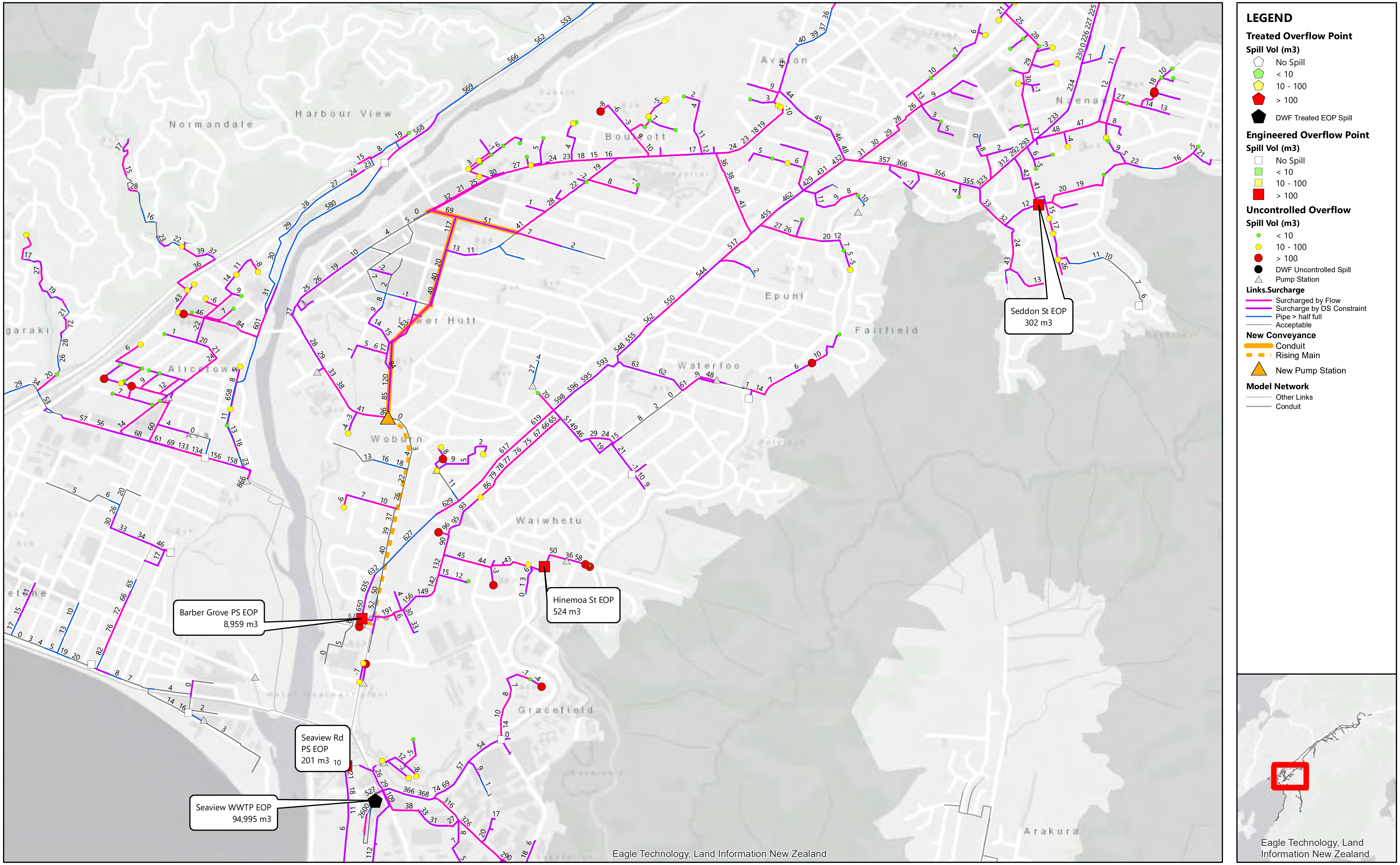
0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAN Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO: J0414
ISSUE: DRAFT A
DRAWING No:



REV	AMENDMENTS	BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	JUNE 2022

	BY	DATE
DESIGN	N/A	
DRAWN	[redacted]	JUNE 2022
DWG CHECKED	XX	XX
STATUS		
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAO Scenario - 1yr ARI Design Storm (11-13 Mar 2017)

PROJECT NO:
J0414

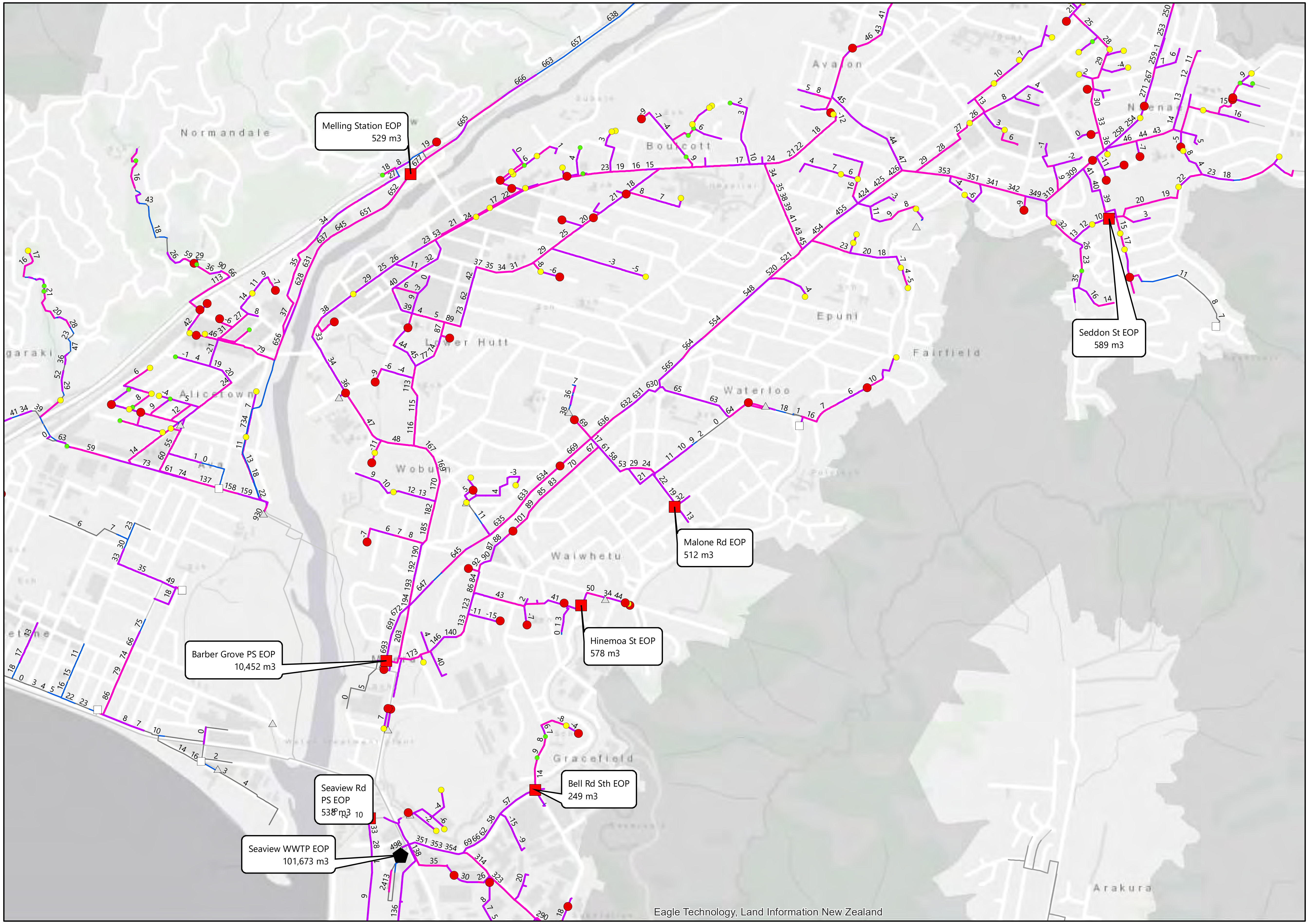
ISSUE
DRAFT A

DRAWING No:

Shortlist Assessment & Storage

Upgrade Option	Description	~2yr ARI Event (14-16 November 2016)						
		Simulated Uncontrolled Spilling (m^3)						
		Northern Riverlink*	Southern Riverlink*	Boulcott*	Alicetown *	Woburn*	Elsewhere	Total Unc.d
Base	Do nothing, 2070 scenario	*1,660*	*1,640*	*450*	*1,960*	*5,170*	*12,930*	*23,800*
AAG (Option 1)	New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 600m3 pump station at Ewan Br.	30	340	420	2,560	4,950	12,900	21,190
AAJ (Option 2)	New 375mm dia sewer on Pretoria St to new 100 L/s + 600 m3 pump station on Pretoria St pump to Melling.	450	330	420	1,980	4,880	12,950	21,010
AAM (Option 5)	New 450mm main from Kings Cres along Okura Gv and Ariki St to New 50L/s PS at Ariki St discharging across new Melling Rd bridge, and new 50L/s + 600m3 pump station at Ewan Br.	570	440	330	2,270	4,960	12,840	21,410
AAN (Option 3)	New 1700m long 450mm dia sewer main from Pretoria St to new 200 L/s + 600 m3 pump station at Myrtle St.	470	20	420	3,350	4,350	12,950	21,560
AAO (Option 4)	New 1800m long 450mm dia sewer main from Pretoria St to new 200 L/s + 600 m3 pump station at Hutt Rec Park.	520	770	420	1,960	4,830	12,930	21,440
AAP	New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 2400m3 pump station at Ewan Br.	30	200	420	1,970	4,890	12,890	20,390
AAQ	New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 3600m3 pump station at Ewan Br.	30	110	420	1,960	4,820	12,900	20,240

Upgrade Option	Description	~2yr ARI Event (14-16 November 2016)							
		Simulated EOP Spilling (m^3)							Total Spilling (m^3)
		Riverlink	Barber Gr	Melling Station	62 Wakefield St	Hinemoa St	Seaview WWTP	Total EOP	
Base	Do nothing, 2070 scenario	-	*10,450*	*530*	*0*	*580*	*101,670*	*160,770*	*184,570*
AAG (Option 1)	New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 600m3 pump station at Ewan Br.	-	12,100	670	130	570	101,590	162,670	183,860
AAJ (Option 2)	New 375mm dia sewer on Pretoria St to new 100 L/s + 600 m3 pump station on Pretoria St pump to Melling.	-	11,220	2,260	0	570	101,310	163,070	184,080
AAM (Option 5)	New 450mm main from Kings Cres along Okura Gv and Ariki St to New 50L/s PS at Ariki St discharging across new Melling Rd bridge, and new 50L/s + 600m3 pump station at Ewan Br.	-	11,700	1,370	0	580	101,400	162,670	184,080
AAN (Option 3)	New 1700m long 450mm dia sewer main from Pretoria St to new 200 L/s + 600 m3 pump station at Myrtle St.	-	11,260	1,050	610	570	101,300	162,370	183,930
AAO (Option 4)	New 1800m long 450mm dia sewer main from Pretoria St to new 200 L/s + 600 m3 pump station at Hutt Rec Park.	-	12,490	530	0	560	101,490	162,610	184,060
AAP	New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 2400m3 pump station at Ewan Br.	150	11,030	540	0	580	102,820	162,610	183,000
AAQ	New 1900m long 450mm dia sewer main from Brunswick St down to new 100 L/s + 3600m3 pump station at Ewan Br.	0	10,380	530	0	580	103,350	162,450	182,690



LEGEND

Treated Overflow Point

Spill Vol (m3)

- ⬠ No Spill
- ⬠ < 10
- ⬠ 10 - 100
- ⬠ > 100
- ⬟ DWF Treated EOP Spill

Engineered Overflow Point

Spill Vol (m3)

- ☐ No Spill
- 🟩 < 10
- 🟨 10 - 100
- 🟥 > 100

Uncontrolled Overflow

Spill Vol (m3)

- ● < 10
- ● 10 - 100
- ● > 100
- ● DWF Uncontrolled Spill

Links.Surcharge

- Surcharged by Flow
- Surcharge by DS Constraint
- Pipe > half full
- Acceptable

Model Network

- Other Links
- Conduit
- △ Pump Station

REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	JULY 2022	DESIGN	N/A	
				DRAWN	[redacted]	JULY 2022
				DWG CHECKED	XX	XX
				STATUS		
				FILENAME		
				APPROVED		

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0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

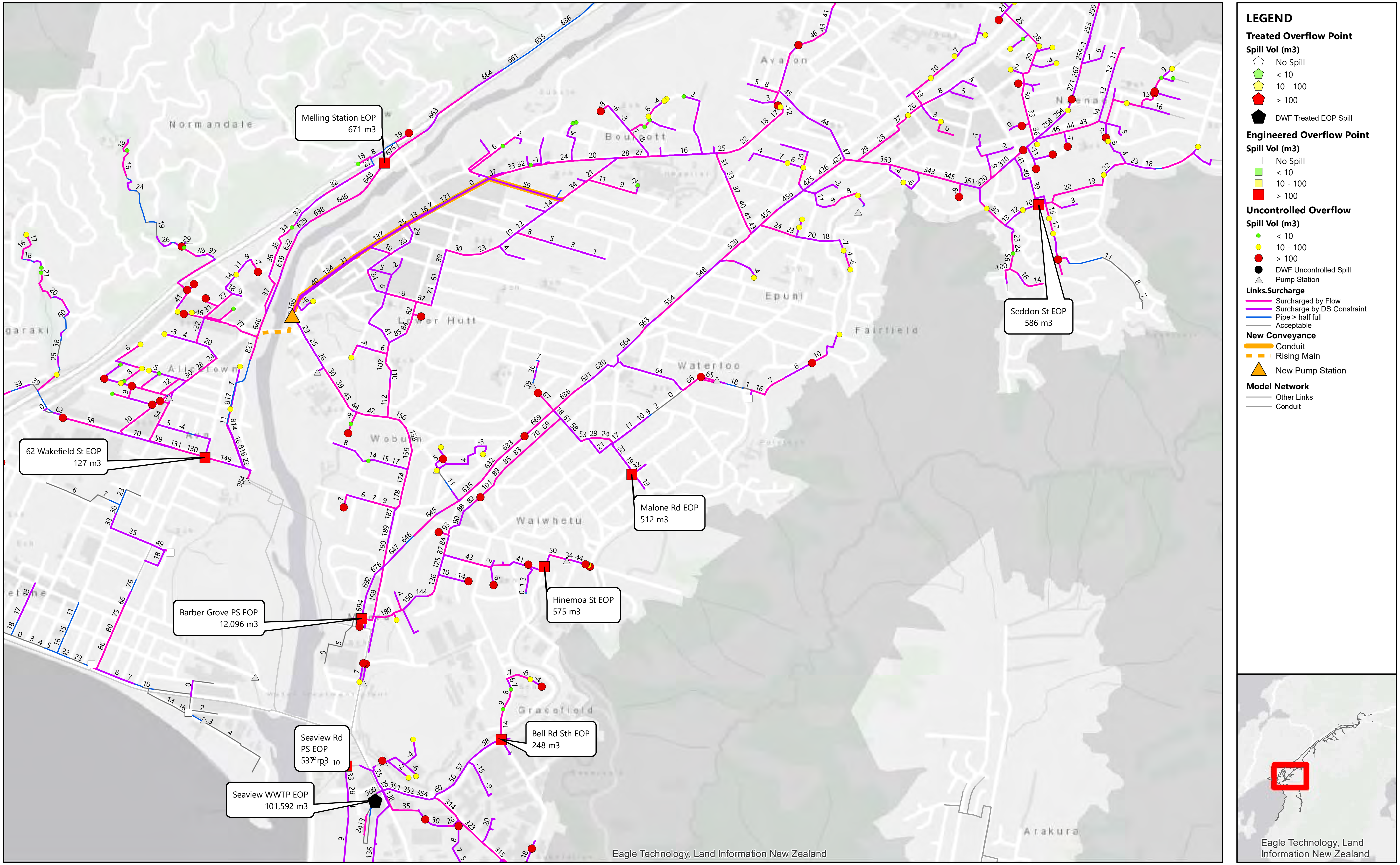
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
MPD Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

PROJECT NO: J0414

ISSUE: DRAFT A

DRAWING No:



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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

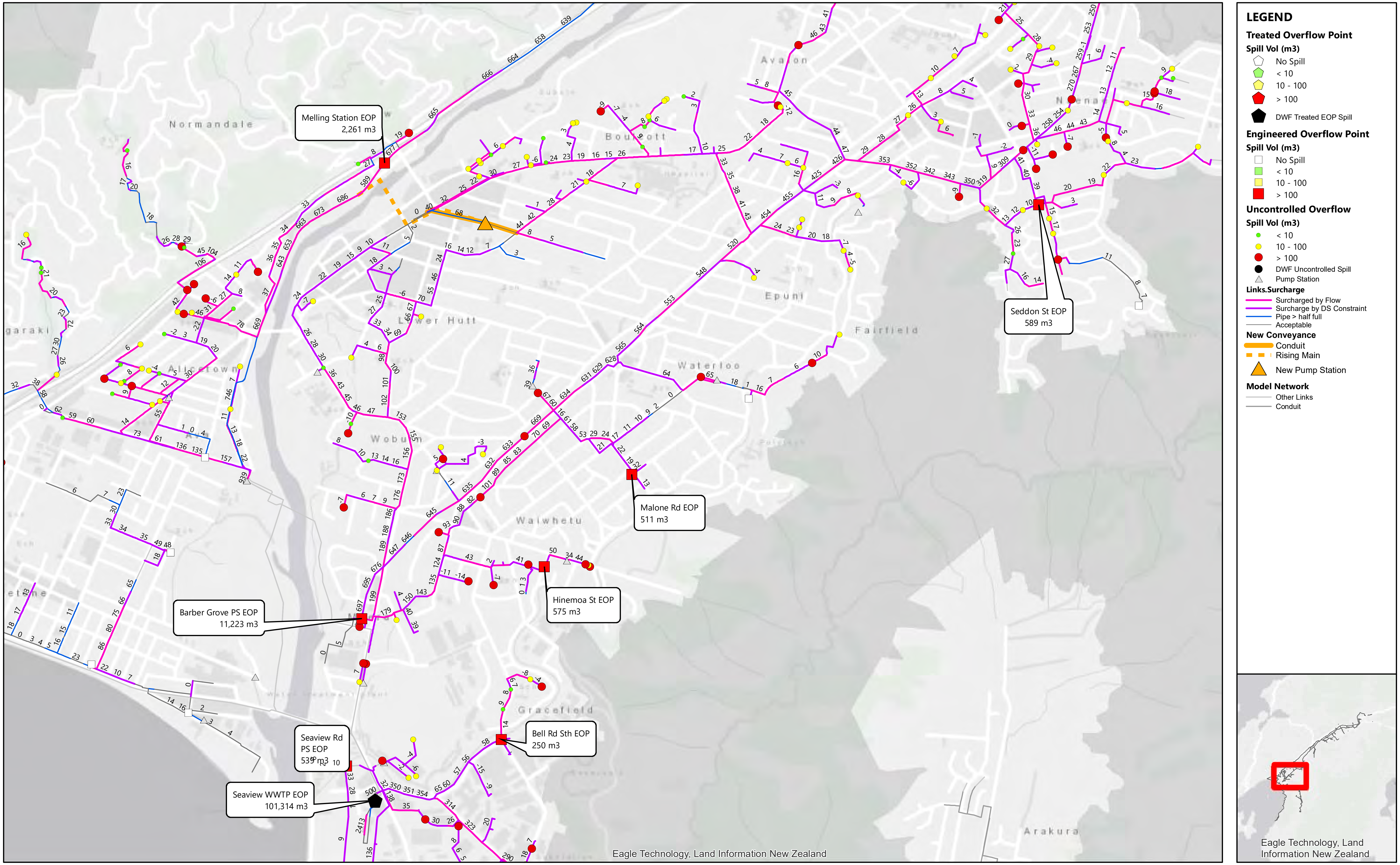
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
AAG Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

DRAWING No:



REV	AMENDMENTS	BY	DATE		BY	DATE
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000
Meters

SCALE (at A3)
1:20,000

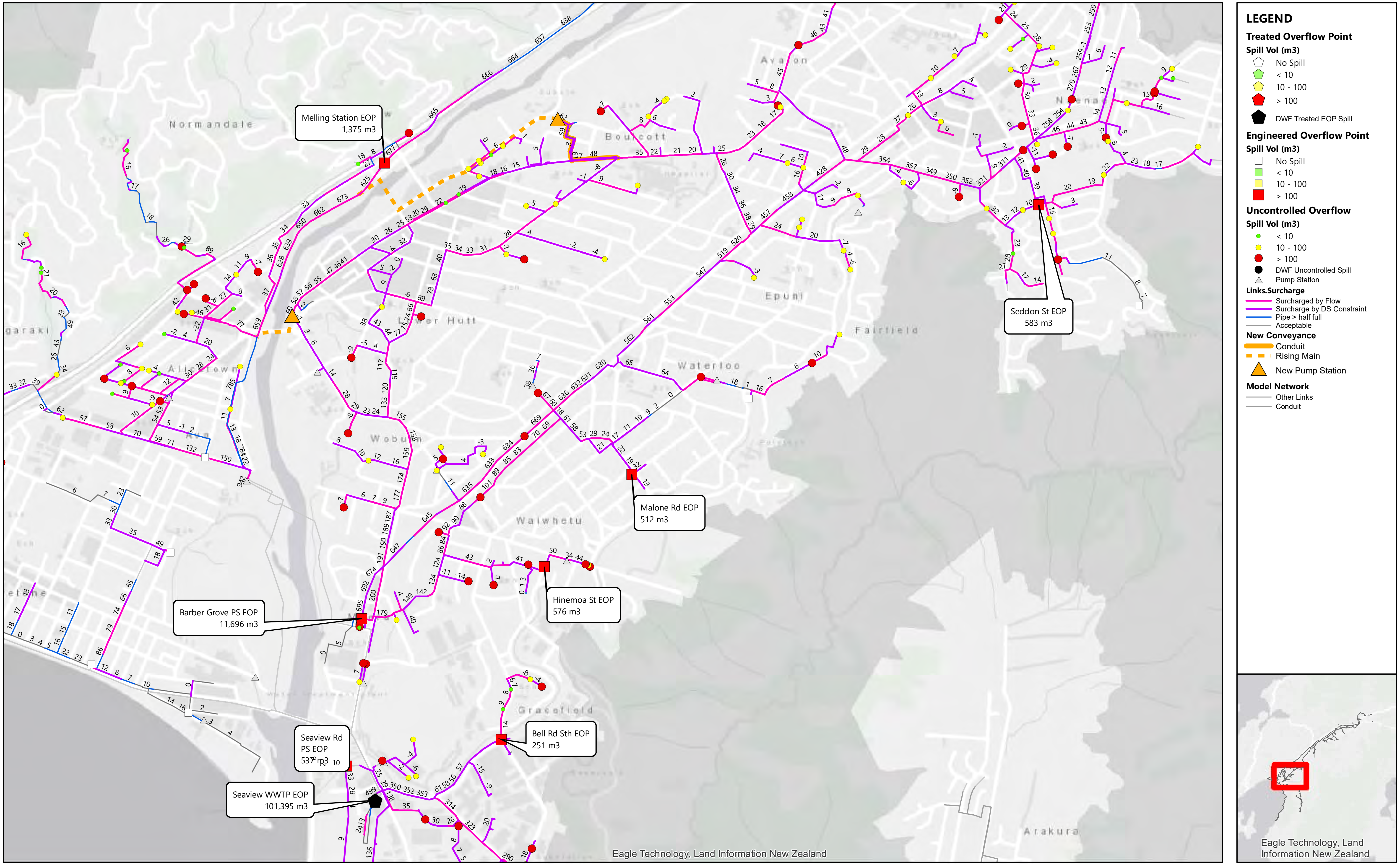
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
AAJ Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

DRAWING No:



Melling Station EOP
1,375 m3

Seddon St EOP
583 m3

Malone Rd EOP
512 m3

Hinemoa St EOP
576 m3

Barber Grove PS EOP
11,696 m3

Bell Rd Sth EOP
251 m3

Seaview Rd
PS EOP
537 m3

Seaview WWTP EOP
101,395 m3

REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	JULY 2022	**DESIGN**	N/A	
				DRAWN	[redacted]	JULY 2022
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

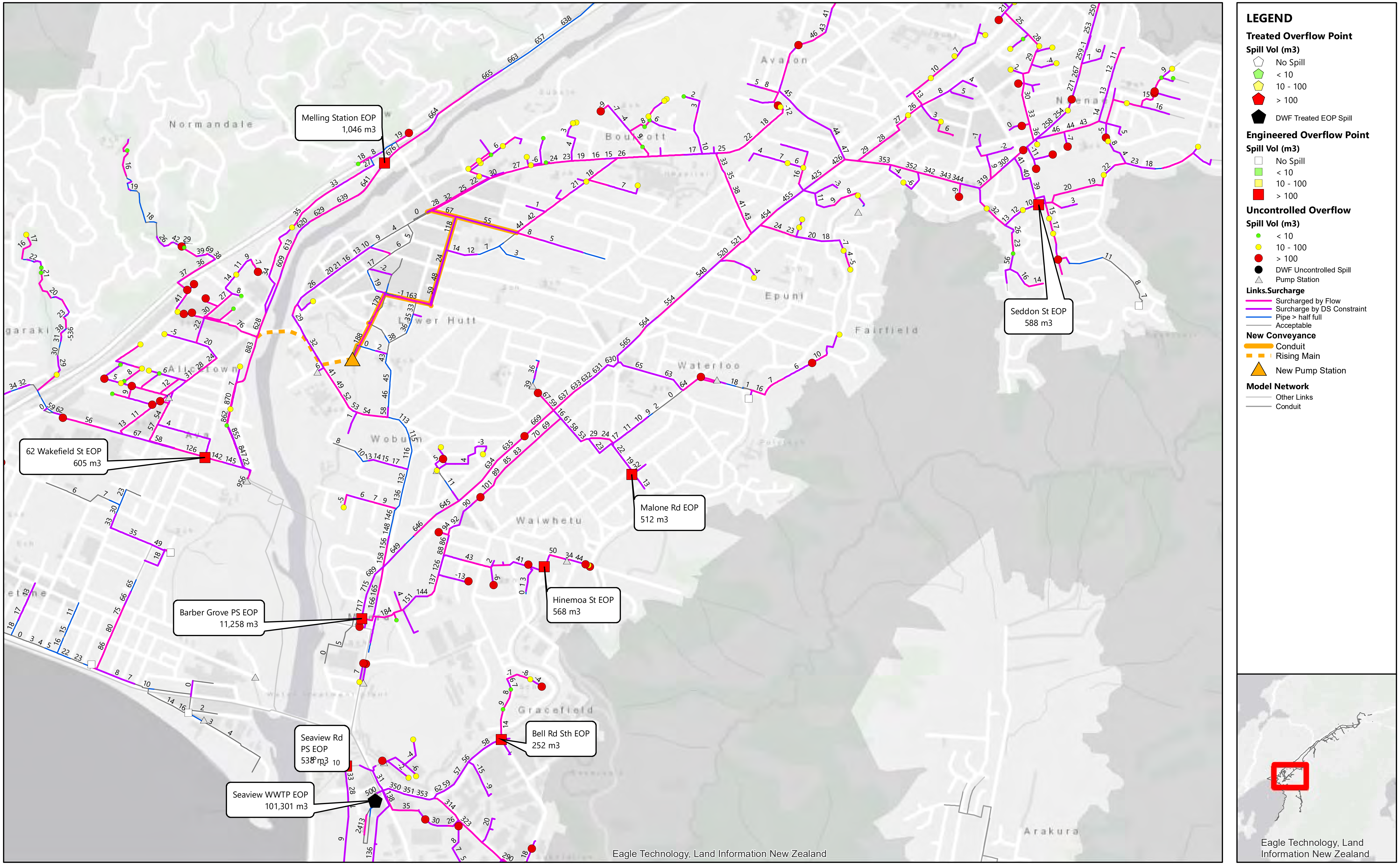
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAM Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

PROJECT NO: J0414

ISSUE DRAFT A

DRAWING No:



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Wellington Water

0 10,500 21,000 42,000 63,000 84,000
Meters

SCALE (at A3)
1:20,000

PROJECT:

STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

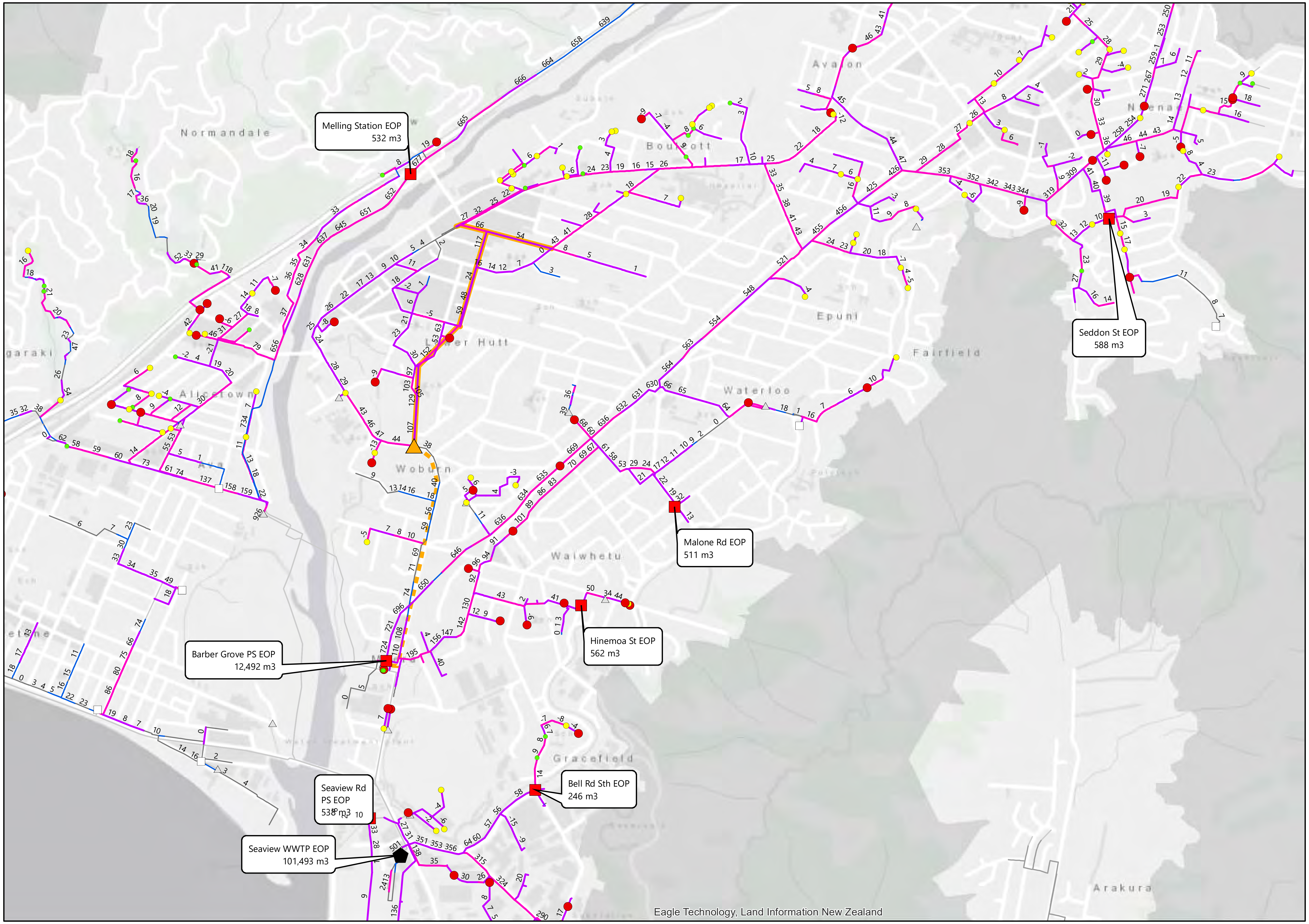
DRAWING TITLE:

Overflow Performance Assessment
AAN Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

PROJECT NO: J0414

ISSUE DRAFT A

DRAWING No:



Melling Station EOP
532 m3

Seddon St EOP
588 m3

Malone Rd EOP
511 m3

Hinemoa St EOP
562 m3

Barber Grove PS EOP
12,492 m3

Seaview Rd
PS EOP
538 m3

Bell Rd Sth EOP
246 m3

Seaview WWTP EOP
101,493 m3

Eagle Technology, Land Information New Zealand

LEGEND

Treated Overflow Point

Spill Vol (m3)

- ⬠ No Spill
- ⬠ < 10
- ⬠ 10 - 100
- ⬠ > 100
- ⬟ DWF Treated EOP Spill

Engineered Overflow Point

Spill Vol (m3)

- ☐ No Spill
- 🟩 < 10
- 🟨 10 - 100
- 🟥 > 100

Uncontrolled Overflow

Spill Vol (m3)

- ● < 10
- ● 10 - 100
- ● > 100
- ● DWF Uncontrolled Spill
- △ Pump Station

Links.Surcharge

- Surcharged by Flow
- Surcharge by DS Constraint
- Pipe > half full
- Acceptable

New Conveyance

- Conduit
- Rising Main
- ▲ New Pump Station

Model Network

- Other Links
- Conduit

Eagle Technology, Land Information New Zealand

REV	AMENDMENTS	BY	DATE		BY	DATE
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

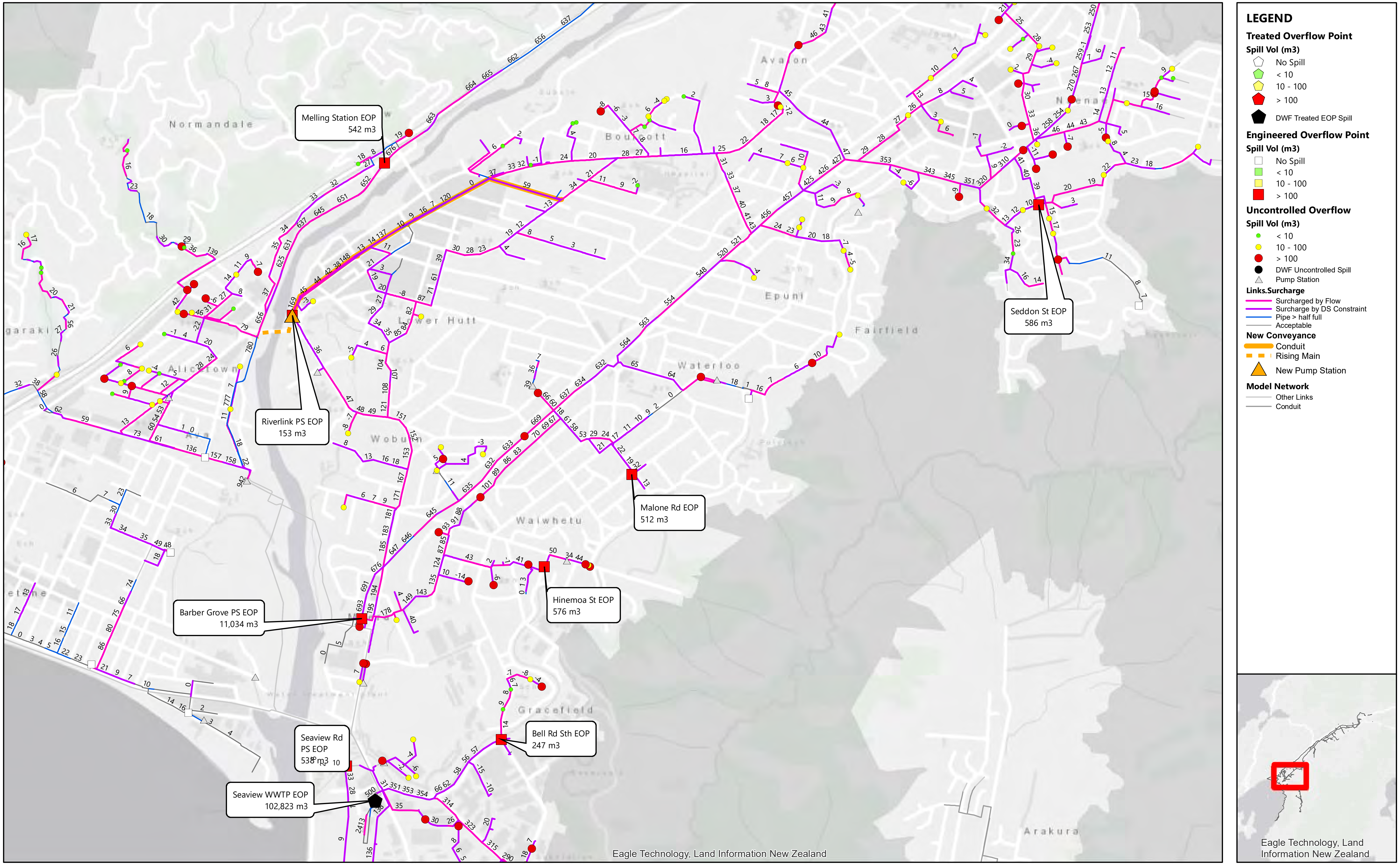
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAO Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING No:



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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

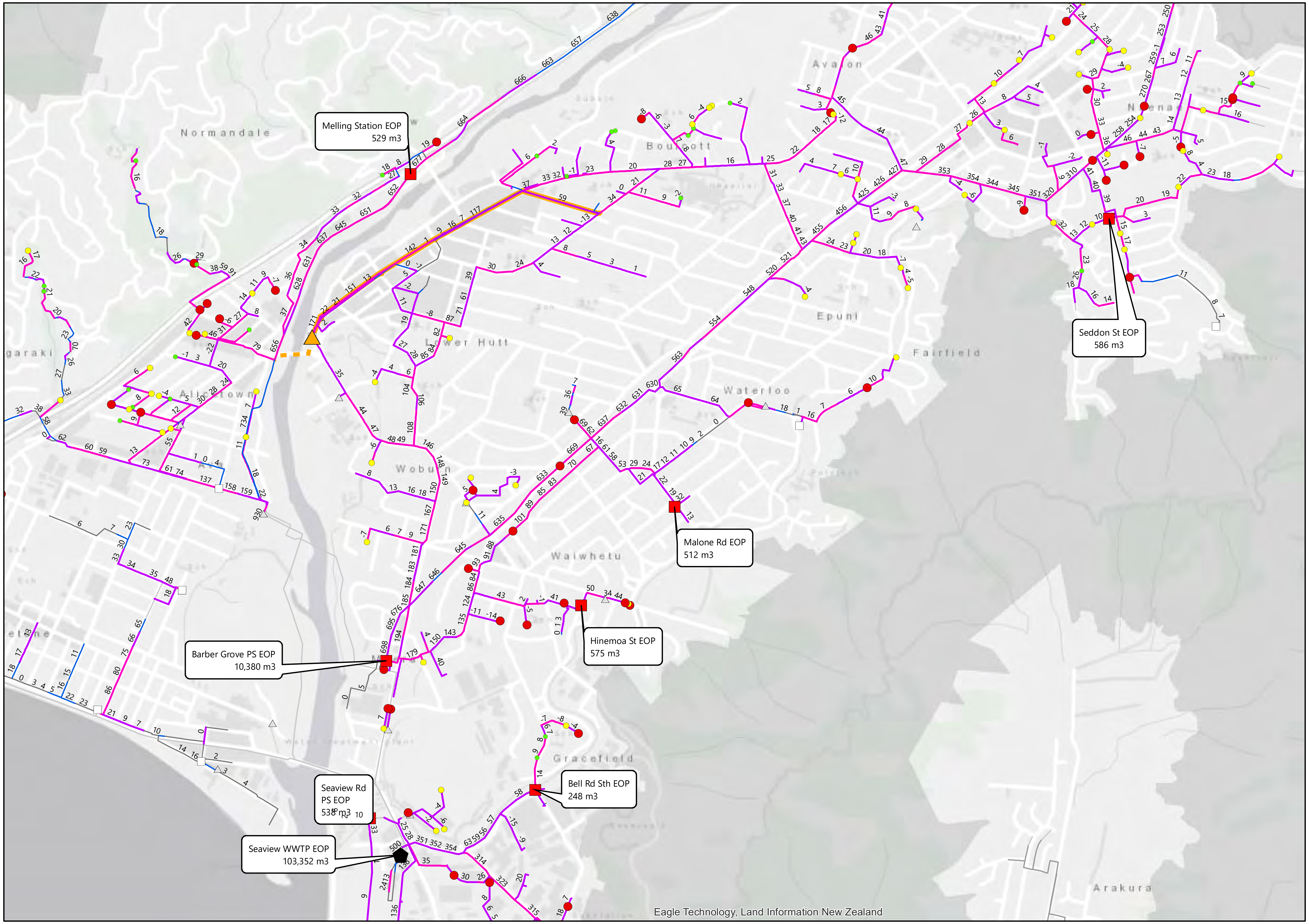
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
AAP Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

DRAWING No:



LEGEND

Treated Overflow Point

Spill Vol (m3)

- ⬠ No Spill
- ⬠ < 10
- ⬠ 10 - 100
- ⬠ > 100
- ⬟ DWF Treated EOP Spill

Engineered Overflow Point

Spill Vol (m3)

- ☐ No Spill
- 🟩 < 10
- 🟨 10 - 100
- 🟥 > 100

Uncontrolled Overflow

Spill Vol (m3)

- ● < 10
- ● 10 - 100
- ● > 100
- ● DWF Uncontrolled Spill
- △ Pump Station

Links.Surcharge

- — Surcharged by Flow
- — Surcharge by DS Constraint
- — Pipe > half full
- — Acceptable

New Conveyance

- — Conduit
- - - Rising Main
- ▲ New Pump Station

Model Network

- — Other Links
- — Conduit

REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	JULY 2022	DESIGN	N/A	
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:20,000

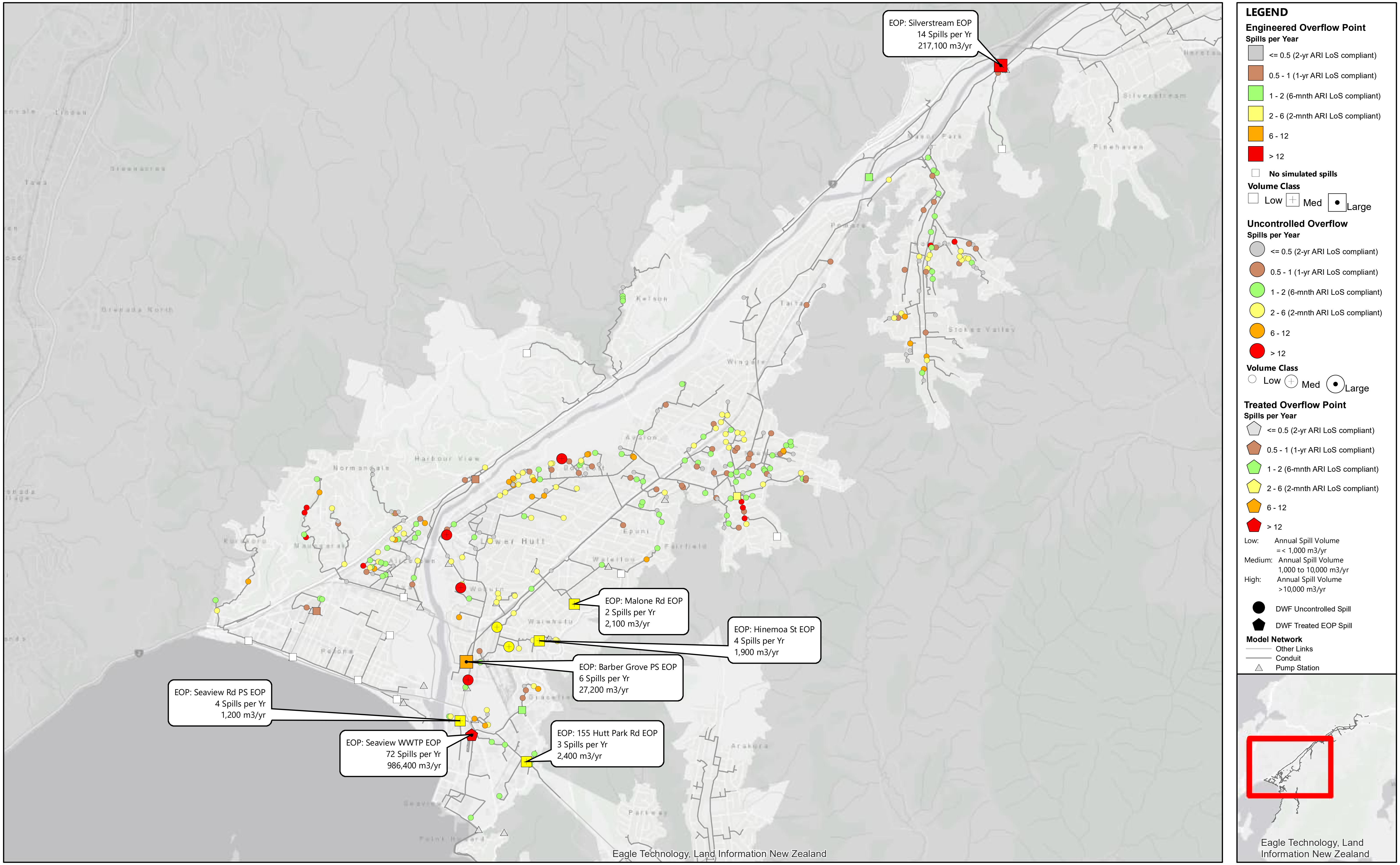
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Overflow Performance Assessment
AAQ Scenario - 2yr ARI Design Storm (14-16 Nov 2016)

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING No:



EOP: Silverstream EOP
14 Spills per Yr
217,100 m3/yr

EOP: Malone Rd EOP
2 Spills per Yr
2,100 m3/yr

EOP: Hinemoa St EOP
4 Spills per Yr
1,900 m3/yr

EOP: Barber Grove PS EOP
6 Spills per Yr
27,200 m3/yr

EOP: Seaview Rd PS EOP
4 Spills per Yr
1,200 m3/yr

EOP: Seaview WWTP EOP
72 Spills per Yr
986,400 m3/yr

EOP: 155 Hutt Park Rd EOP
3 Spills per Yr
2,400 m3/yr

REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	JULY 2022	**DESIGN**	N/A	
				DRAWN	[redacted]	JULY 2022
				DWG CHECKED	XX	XX
				STATUS		
				FILENAME		
				APPROVED		

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HAL HYDRAULIC ANALYSIS LIMITED

Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:50,000

PROJECT:

STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

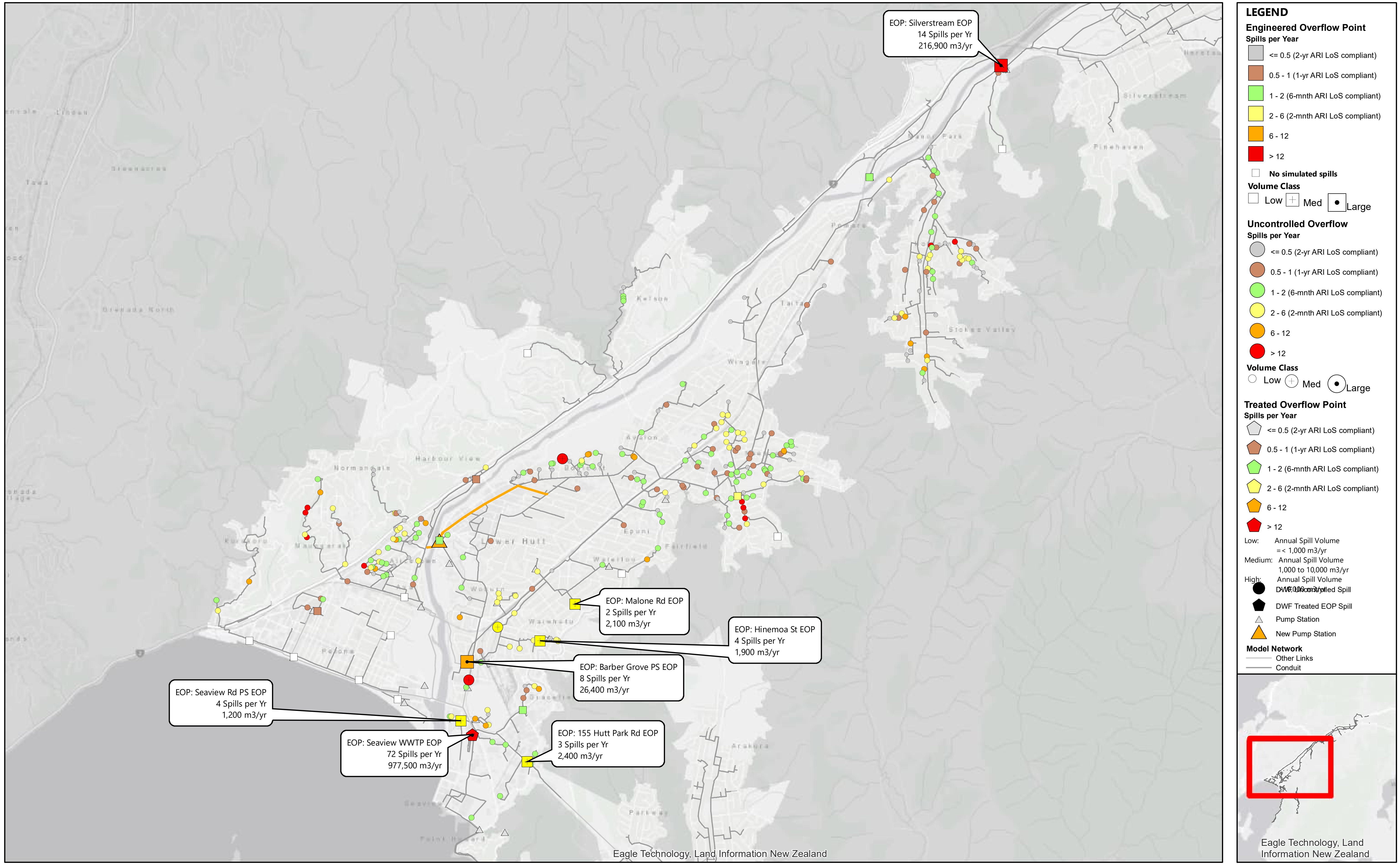
DRAWING TITLE:

Overflow Performance Assessment
MPD (2070) Scenario - 10-year LTS (2008-2017)

PROJECT NO: J0363

ISSUE DRAFT A

DRAWING No:



REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	JULY 2022	**DESIGN**	N/A	
				DRAWN	[redacted]	JULY 2022
				DWG CHECKED	XX	XX
				STATUS		
				FILENAME		
				APPROVED		

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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:50,000

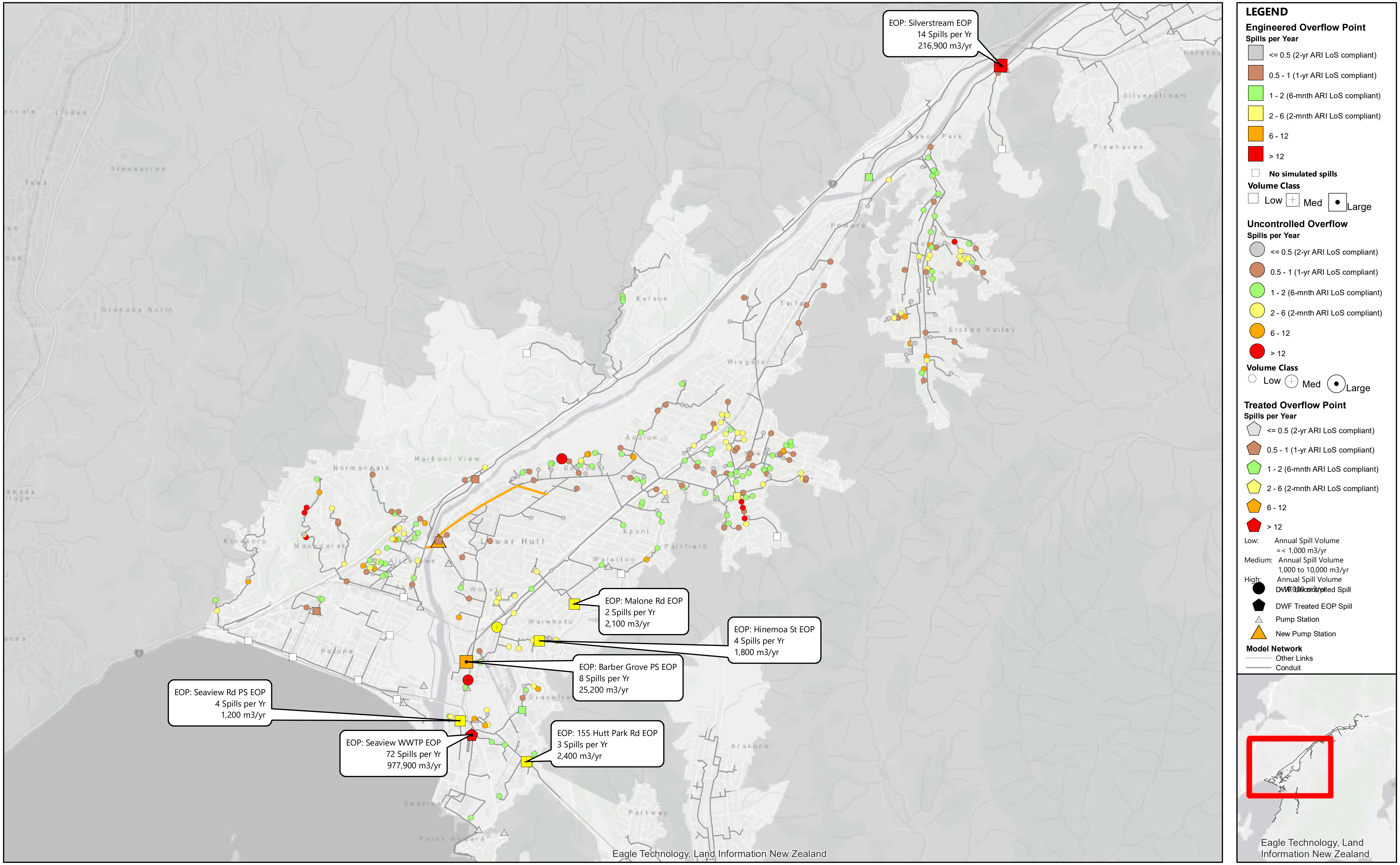
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0363

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
AAP (2070) Option - 10-year LTS (2008-2017)

DRAWING No:



EOP: Silverstream EOP
14 Spills per Yr
216,900 m3/yr

EOP: Malone Rd EOP
2 Spills per Yr
2,100 m3/yr

EOP: Hinemoa St EOP
4 Spills per Yr
1,800 m3/yr

EOP: Barber Grove PS EOP
8 Spills per Yr
25,200 m3/yr

EOP: Seaview Rd PS EOP
4 Spills per Yr
1,200 m3/yr

EOP: Seaview WWTP EOP
72 Spills per Yr
977,900 m3/yr

EOP: 155 Hutt Park Rd EOP
3 Spills per Yr
2,400 m3/yr

REV	AMENDMENTS	BY	DATE		BY	DATE
0	DRAFT FOR CLIENT APPROVAL	MRW	JULY 2022	**DESIGN**	N/A	
				DRAWN	[redacted]	JULY 2022
				DWG CHECKED	XX	XX
				STATUS		
				FILENAME		
				APPROVED		

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HAL HYDRAULIC ANALYSIS LIMITED

Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:50,000

PROJECT:

STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:

Overflow Performance Assessment

AAQ (2070) Option - 10-year LTS (2008-2017)

PROJECT NO: J0363

ISSUE DRAFT A

DRAWING No:

Appendix D – Effects Assessment for MCA

Hutt Central Sewer Bypass – MCA

Note:

- Report updated following MCA workshop (1.9.22)
- Report updated following:
    - alterations to Options 2 & 5
    - assessment of overflow pipeline from pump stations (27.9.22)

1. Social & Economic Impacts Assessment

Date: 27 September 2022

Author(s):	credentials
[redacted]	BRP (Hons), NZPI – Intermediate

Executive summary

These criteria consider the social and economic impacts on everyday life of public and business owners, including considerations of impacts of:

- temporary construction effects of having a construction site outside your house or business, including noise, vibration and dust (but excludes traffic and access);
- temporary construction effects of having a construction site outside your house or business on traffic and access; and
- permanent social and amenity effects, including effects of noise and odour.

Having assessed the five options, the following conclusions are made:

- Option 2 has the least impacts (both temporary and permanent)
- Option 4 has the most impacts (both temporary and permanent)

Background

Hutt City Council (HCC) have identified growth opportunities within Hutt Central associated with the Riverlink project. This is expected to significantly increase the population in Hutt Central, which will subsequently put additional pressure on the wastewater network.

The purpose of this project is to assess the feasibility and select a preferred option for a new wastewater trunk main and/or pump station to provide for the regeneration and growth within Hutt Central associated with the Riverlink project.

A short list of five options have been developed based on varying cut-in, pump station, and Engineered Overflow Point (EOP) locations. Input from HAL on hydraulics modelling was used to confirm the feasibility of the different shortlist options and eliminate options with any critical constraints.

A multi-criteria analysis (MCA) is being completed to systematically score and rank the shortlist options against a range of criteria to identify the preferred option.

It is noted that the effects of emergency overflows are not being considered as part of this assessment.

Introduction

This report sets out the Social and Economic Impact assessment criterion for the Multi Criteria Analysis (MCA) process for the five options proposed for the Project. These options are generally described below. Most options feature a combination of tunneling and drilling, in varying proportions, as shown in the diagrams attached in Appendix A.

Option 1

- Cut into existing mains at High Street and Kings Crescent junctions with Brunswick Street
- New 1900m long 450mm dia. sewer along High Street
- New 100 L/s pump station + 600m³ storage at southern end of High Street
- New 290m long rising main across Ewen Bridge and connect to existing Western Trunk Main in Railway Avenue

Option 2

- Cut into existing mains at High Street and Kings Crescent intersections with Pretoria Street
- New 450m long 375mm dia. sewer along Pretoria St.
- New 100 L/s pump station + 600m³ storage on Pretoria St, requiring the purchase of private property(s)
- New 1.14km long rising main from the pump station along Rutherford St. and across either new Melling road or pedestrian bridge to connect into the existing Western Hills Trunk Main

Option 3

- Cut into existing mains at High Street and Kings Crescent junctions with Pretoria Street
- New 1700m long 450mm dia. sewer main from Pretoria Street along Cornwall Street, Knights Road, and Myrtle Street
- New 200 L/s pump station + 600m³ storage at Northern end of the Hutt Recreation Ground
- New 685m long rising main along Myrtle St. and Woburn Rd. and across Ewen Bridge connect to the exiting Western Trunk Main in Railway Avenue

Option 4

- Cut into existing mains at High Street and Kings Crescent junctions with Pretoria Street
- New 1800m long 450mm dia. sewer main from Pretoria St., Cornwall St. and Bloomfield Trc.
- New 200 L/s pump station + 600m³ storage at Southern end of Hutt Recreation Ground
- New 1350m long rising main along Ludlam Cres. and Randwick Rd. and connect to Barber Grove pump station

Option 5

- Cut into existing main at High Street and Kings Crescent junction
- New 450m long 450mm dia. sewer main from Kings Cres. along Potomaru St. and Akiri St.
- New 50 L/s pump station at Ariki St.

- New 1.66km of rising main from the pump station along Connolly St. and Rutherford St. and across either the new Melling road or pedestrian bridge to connect into the existing Western Hills Trunk Main
- New 50 L/s pump station with approximately 600m^3 storage at the southern end of High Street
- New 290m new rising main from the pump station across Ewan Bridge to connect into the existing Western Hills Trunk Main in Railway Ave

The key purpose of the MCA process is to inform WWL decision-making on the preferred option to take forward to concept design.

Criteria being assessed

This criterion considers the temporary and permanent social and economic impacts on everyday life of public and business owners. The assessment criterion was broken down into sub-criteria as demonstrated in Table 2 below.

Methodology

A review of the area using Google Maps was undertaken to assess the potential social and economic impacts of the options. The methodology also included:

- Discussions held with Jordan Ware, Holmes;
- Meetings held with Holmes and Dentons;
- Baseline information used for this assessment included:
  - MCA Briefing Pack received from Jordan Ware.
  - Emails and attachments received from Jordan Ware and Ezekiel Hudspith.

Key evaluation assumptions were made during this review as follows.

It is assumed that:

1. All EOPs will be into Te Awa Kairangi.
2. Drilling methodology includes:
   - big machinery sitting above-ground and smaller below-ground footprint.
   - one pit at the start and end - they can be quite long.
   - every change of direction requires a new pit to be constructed.
3. Tunnelling methodology includes:
   - smaller above-ground footprint but bigger below-ground footprint.
   - tunnelling has shafts approximately every 100m.
4. All earthworked and exposed areas will be reinstated to existing (or better) state.
5. It is assumed that a number of businesses and private landowners will be consulted with that are situated along the works area.
6. It is assumed that landowner agreements will be obtained where works are undertaken, and pump stations are constructed on private property.
7. Works will not impact the golf course.
8. Mitigation planting has not been taken into account.
9. Noise expected from the pump station will be noticeable, however at time of assessment, levels were not known.

10. It is assumed that the pump station will measure approximately 1.5m in height.
11. It is assumed that open trenching will create more dust and noise than tunnelling. However, if very little dust or noise will be generated by either option, then it really doesn't matter how sensitive the adjoining land uses are. They can be super sensitive to dust, but if there is no dust there is no adverse effect.
12. It is noted that the effects of vibration between open trenching and tunnelling was discussed at the MCA workshop, where it was determined that effects would be similar between the two options.
13. The construction of the EOP pipeline from the pump stations will be open cut.
14. The construction of the EOP pipeline, if in the same location as the wastewater trunk main, will be constructed at the same time, reducing impacts on the surrounding environment.

Comparative assessment

The following 7-step numerical scoring system was used to score the options:

Table 1: Numerical scoring system

Score	Scoring Description
3	**Minimal Negative Impacts:** Short to medium term. Definitely able to be managed or mitigated. Least sensitive location/receiving environment.
2	
1	
0	**Moderate Negative Impact:** Short to long term. Highly likely to respond to management actions. Moderately sensitive location/receiving environment.
-1	
-2	
-3	**Significant Impact:** Significant impact requiring rescope or management strategies to mitigate effects. Most sensitive location/receiving environment.

Table 2 below illustrates the scoring of each option against each of the sub criteria for both the temporary and permanent effects associated with the works.

Table 2: Scoring of options

OPTION	TEMPORARY WORKS		PERMANENT WORKS	
	Noise, Vibration & Dust	Traffic & Access	Social / Amenity	
Option 1	-1	-1	2	
Option 2	0	0	-2	
Option 3	-1	-1	-2	
Option 4	-2	-2	-1	
Option 5	-1	-1	Ariki St P/S	-1
			Ewen Bridge P/S	2

Assessment explanations

The following tables sets out the impacts for each option and sub-criteria, in particular Table 3.

In summary, the following points should be noted:

- Trenching within the road reserve will cause higher impacts to road users.
- Trenching will be noisier than tunnelling and will cause greater dust effects.

- Trenching within the road reserve will cause greater access impacts. This includes to private properties and businesses, and to side streets.
- The longer the length of works, the higher the impacts.
- There are sensitive land uses along some routes, e.g. schools, libraries, churches that operate during the day that could have long term construction activities out front, causing more effects.
- Construction within a business area may cause more effects than in a residential area.
- A pump station in a sensitive location i.e residential area, or on a site that does not provide screening, will cause greater permanent amenity, noise and odour effects.

Table 3: Assessment of the options against the Temporary Works – sub-criteria

OPTION		TEMPORARY WORKS – SUB-CRITERIA	
		Noise, Vibration & Dust	Traffic & Access
Option 1	**Open cut (yellow)**	- Extends through residential area (eastern 3/4) - Auto centres and supermarkets, [redacted] (west)	- Access to a number of residential properties. - Access into [redacted] - Access into [redacted] (no other access point) - Access into [redacted] - Traffic through road from Melling Rd to Kind Cres?
	Micro tunnelled (solid green line)	- Construction of pump station will have effects on River Trail users - Impacts on businesses - Lesser effects than open cut - Still effects as approx. 30 shafts to be constructed. - Mostly businesses	- Approx. 30 shafts Section 1: Brunswick to Waterloo Rd - Access to [redacted] - Access to [redacted] - A large number of car yards, mechanics & tyre shops requiring access - Some commercial & industrial - Foot access to shops (although not as much as section 2) - A number of side roads Section 2: Waterloo to Fraser Street - Lots of smaller retail shops fronting street - Footpath access - A lot of carparks directly outside shops - A number of side streets
	Open cut (orange)	- Some screening in front of libraries, which may help mitigate effects - Effects on [redacted] – but assumption made works won't be undertaken during the weekend. But they may have week day services	- Around a roundabout – greater effect Assume lane closures
	Micro tunnelled (orange)	- Assume a couple of pits required – lesser effect on: - Library - Church - Govind Bhula Park & River Trail users	- Generally low impacts. Pits will be relatively small.
	EOP pipeline - open cut (dashed green line)	- Short length - Extends only through River Trail - Minimal effects	- Short length - Extends only through River Trail - No effect on roading network

CONCLUSION		**- A number of sensitive land uses will be affected by noise, dust and vibration i.e library, church, Govind Bhula Park and River Trail users** **- Scored at -1 overall**	**- Big retail stores will be impacted on access** **- Access to carparking areas may be disruptive for those with single entry/exit points** **- Scored at -1 overall**
Option 2	**Open cut (yellow)**	- Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field (minor effect) - Few residential properties than Option 1 – mostly businesses	- Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field access on southern side - Commercial / industrial sites e.g. mechanics and car services, [redacted] - Some retail (small amount) - [redacted] only entry - Cornwall Street = side street - Car parking in [redacted]area – only entrance
	Micro tunnelled (solid green line)	Not applicable	Not applicable
	Open cut (orange)	- Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field (minor effect) - Few residential properties than Option 1 – mostly businesses - River trail users on both sides of Te Awa Kairangi - Some businesses Low impact	- Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted] field access on southern side - Commercial / industrial sites e.g. mechanics and car services, [redacted] - Some retail (small amount) - [redacted] only entry - Cornwall Street = side street - Car parking in [redacted]area – only entrance - Car park on riverbank - Disruption for [redacted]site and carparking – only access - Other businesses access could be impeded, but could use RAB to obtain access - [redacted]– could use only High St exit - Some businesses with car parking areas could be impeded - Car parks - Car dealership and yard - Access into Riverbank Car Park Medium impact to construction

	Micro tunnelled (orange)	- River trail users on both sides of Te Awa Kairangi Low impact	- Access into businesses if shafts in way of entry / exit points Low impact
	EOP pipeline - open cut (dashed green line)	- Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field (minor effect) - Few residential properties than Option 1 – mostly businesses - River Trail users	- Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field access on southern side - Commercial / industrial sites e.g. mechanics and car services, [redacted] - Some retail (small amount) - [redacted] only entry - Cornwall Street = side street - Car parking in [redacted] area – only entrance - Melling Link road extending through roundabout = busy road - River Trail users High disruption
CONCLUSION		**- Fewer sensitive land uses will be affected by noise, dust and vibration – more residential and commercial** **- Scored at 0 overall**	**- Access to carparking areas may be disruptive for those with single entry/exit points** **- A number of car parks may be affected through open trenching along Rutherford St** **- Scored at 0 overall**
Option 3	**Open cut (yellow)**	Pretoria St. - Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field (minor effect) Cornwall St. - Hotel on western side – noise, vibration etc issues - An entrance to [redacted] - A lot of residential properties extending down Cornwall on eastern side	A number of side streets Pretoria St. - Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field access on southern side - Commercial / industrial sites e.g., mechanics and car services, [redacted] - Some retail (small amount) - [redacted] only entry - Cornwall Street = side street - Car parking in [redacted] area – only entrance Cornwall St. - An entrance to [redacted] - A lot of residential properties extending down Cornwall on eastern side - Some commercial properties with access from Cornwall on western side

	Micro tunnelled (solid green line)	- [redacted] and the school - Residential properties Will require a number of shafts, so could still be disruptive	Knights Rd - Outside Queensgate – footpath entrance - [redacted] and the school. Some access off Knights Rd and Myrtle St – staging for access? - Residential properties Myrtle St - [redacted] and the school. Some access off Knights Rd and Myrtle St – staging for access? - The [redacted] - Residential properties - [redacted] & access to Hutt Rec Ground, including [redacted] Big important access and carparking area – will shaft be in the way? Will require a number of shafts, so could still be disruptive
	Open cut (orange)	Myrtle Street - Residential properties - Businesses at western end – some small businesses look to be in 'residential' style dwellings Woburn Rd - Residential properties at eastern end - River trail users maybe - [redacted]	Myrtle Street - Residential properties - Businesses at western end. Access directly off Woburn Rd - RAB Woburn Rd - Residential properties at eastern end - [redacted] and other business access Ward St and Market Grove and associated businesses may be affected
	Micro tunnelled (orange)	Lower impact than open cut on residential properties and businesses	- Shafts still required. - Potential shafts around RAB, which will require lane closures. But less impact than open trench
	EOP pipeline - open cut (dashed green line)	- Assume EOP pipeline to be installed in Myrtle St at the same time as main pipeline to avoid doubling up of effects St Albans Grove - Residential properties - [redacted] – back entrance to school - River Trail users	- Assume EOP pipeline to be installed in Myrtle St at the same time as main pipeline to avoid doubling up of effects St Albans Grove - Residential properties - [redacted] – back entrance to school, some traffic impacts - River Trail users – minimal impacts
CONCLUSION		- **A number of sensitive land uses i.e. schools, churches, hotels, the Dowse will be affected by noise, dust and vibration** - **Scored at -1 overall**	- **Traffic access impacts on facilities i.e. schools, churches, Hutt Recreation Ground & rugby and cricket facilities** - **Scored at -1 overall**

Option 4	**Open cut (yellow)**	Pretoria St - Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field (minor effect) Cornwall St - Hotel on western side – noise, vibration etc issues	A number of side streets Pretoria St - Residential properties at eastern 1/2 of Pretoria on northern side, and eastern ¾ on southern side. - [redacted]field access on southern side - Commercial / industrial sites e.g. mechanics and car services, [redacted] - Some retail (small amount) - [redacted] only entry - Cornwall Street = side street - Car parking in [redacted] area – only entrance Cornwall St - An entrance to [redacted] - A lot of residential properties extending down Cornwall on eastern side - Some commercial properties with access from Cornwall on western side
	Micro tunnelled (solid green line)	Knights Rd - Residential properties Bloomfield Tce - [redacted]and the school – back entrance - A lot of residential properties Laings Rd - Residential properties Bellevue Rd - [redacted] - Residential properties extend along eastern side Low impact with tunnelling, although will need a number of shafts, s could still be disruptive	Knights Rd - Close to Queensgate – footpath entrance - Residential properties Bloomfield Tce - [redacted]and the school – back entrance. Some access off Knights Rd and Myrtle St – staging for access? - A lot of residential properties Laings Rd - Residential properties - Side road Bellevue Rd - [redacted]access - [redacted]– also access to pool via Huia St – a lot of carparking - [redacted]parking - Residential properties extend along eastern side Will require a number of shafts, so could still be disruptive
	Open cut (orange)	Ludlam Cres - Ludlam Park (eastern side @ northern end)	Ludlam Cres - Ludlam Park (eastern side @ northern end)

		- Residential (western side @ northern end) – few properties / larger sections and setbacks - Large amount of residential sections - Side roads <u>Randwick Rd</u> - Residential properties along western side – but Trevethick Grove provides a setback from works - [redacted] on eastern side – trees for screening - Railway line – assume attached to bridge) – higher noise environment - [redacted] – eastern side - Then residential to the south on eastern side - Some pocket (block) of retail / commercial i.e. takeaway shops & café Extremely busy road	- Residential (western side @ northern end) – few properties / larger sections and setbacks - Large amount of residential sections - Side roads <u>Randwick Rd</u> - Residential properties along western side – but Trevethick Grove provides a setback from works - [redacted] on eastern side – trees for screening - Railway line – assume attached to bridge) - [redacted] eastern side - Then residential to the south on eastern side - Some pocket (block) of retail / commercial i.e. takeaway shops & café - Extremely busy road High impact – especially along Randwick Road (i.e. MCA project)
	Micro tunnelled (orange)	<u>Ludlam Cres</u> - Ludlam Park (eastern side @ northern end) - Residential (western side @ northern end) – few properties / larger sections and setbacks - Large amount of residential sections - Side roads <u>Randwick Rd</u> - Residential properties along western side – but Trevethick Grove provides a setback from works - [redacted] on eastern side – trees for screening - Railway line – assume attached to bridge) – higher noise environment - [redacted] – eastern side - Then residential to the south on eastern side - A pocket (block) of retail / commercial i.e. takeaway shops & café on western side - Extremely busy road	<u>Ludlam Cres</u> - Ludlam Park (eastern side @ northern end) - Residential (western side @ northern end) – few properties / larger sections and setbacks - Large amount of residential sections - Side roads <u>Randwick Rd</u> - Residential properties along western side – but Trevethick Grove provides a setback from works - [redacted] on eastern side – trees for screening - Railway line – assume attached to bridge) - [redacted] – eastern side - Then residential to the south on eastern side - A pocket (block) of retail / commercial i.e. takeaway shops & café on western side - Extremely busy road
	EOP pipeline - open cut (dashed green line)	- Additional route of the EOP pipeline down: - residential properties along route - main entrance to Hutt Valley High School - Through River Trail. Moderate disruption to school and residential properties	- Additional route of the EOP pipeline down: - Woburn Rd = busy road - residential properties along route - main entrance to [redacted] - past [redacted] at rear of school. - Through River Trail.

			Moderate disruption
CONCLUSION		**Longest route = the biggest impact** **- A number of sensitive land uses i.e. schools, churches, hotels will be affected by noise, dust and vibration** **- Other recreation activities** **- Scored at -2 overall**	**Longest route = the biggest impact** **- Traffic access impacts on facilities i.e. schools, Huia Pool, Hutt Recreation Ground, churches, other recreation activities** **- Extends along Randwick Road – extremely busy road** **- Scored at -2 overall**
Option 5	**Open cut (yellow)**	- Residential properties along High St - Residential properties along Potomanru St, Ropata Cres and Ariki St. - **assume outside golf course** Medium impact to construction	- Residential properties along High St - Busy intersection with Kings Cres - Residential properties along Potomanru St, Ropata Cres and Ariki St. - River Trail users at northern end Medium impact to construction
	Micro tunnelled (solid green line)	Not applicable	Not applicable
	Open cut (orange)	- River Trail users at Connelly and Mills St area - Residential properties along western section along riverbank - Residential properties along Connelly St - Commercial / retail properties along Connelly and Rutherford St - River Trail users	- River Trail users at Connelly and Mills St area – low impact as could go around - Residential properties along Connelly St - Side roads - From intersection of Connelly St and Rutherford St = commercial and industrial businesses, with access off Rutherford Street - Rutherford St and Queens Dr intersection higher impact around RAB - Riverbank Market carpark - River Trail users - [redacted] - could use only High St exit - Some businesses with car parking areas could be impeded - Car parks - Car dealership and yard Medium impact to construction
	Micro tunnelled (orange)	Low impact with tunnelling, although will need a number of shafts, so could still be disruptive to residential areas and businesses	Low impact with tunnelling, although will need a number of shafts (approx. 12+), so could still be disruptive to residential areas and businesses
	EOP pipeline - open cut	Ariki Street / Harcourt Werry Drive	Ariki Street / Harcourt Werry Drive - Golf course impacted upon

	(dashed green line)	Minimal effects as away from sensitive land uses.	- River Trail users - Adjoins Melling Substation – assume keep access open - Some disruption to Connelly St / Harcourt Werry Drive = busy road
		Ewen Bridge - Short length - Extends only through River Trail Minimal effects	Ewen Bridge - Short length - Extends only through River Trail - No effect on roading network
CONCLUSION		**Medium impact to construction** **- Through residential and commercial** **- No tunnelling option** **- Fewer sensitive land uses will be affected by noise, dust and vibration – more residential and commercial** **- Scored at -1 overall**	**Medium impact to construction** **- Car park on riverbank** **- Disruption for Harvey Normal etc site and carparking – only access** **- Other businesses access could be impeded, but could use RAB to obtain access at Melling Link?** **- Disruption to [redacted] Only one entry/exit point left** **- No tunnelling option** **- Scored at -1 overall**

Table 4: Assessment of options against the Permanent Works

PERMANENT WORKS – SOCIAL & AMENITY		
OPTION		SCORE
Option 1	- Within Govind Bhula Park - Assume retain trees, or reinstate some planting around pump station = screened slightly from road - Away from residential properties re noise effects - Separated from businesses by roads re noise effects - Separated slightly from river trail. Low impact as will be screened from road and will not be located near residential properties. Located in a moderate – high noise environment with busy road and intersection.	2
Option 2	- Adjacent to residential and small commercial properties - Noise and odour impacts on adjoining properties - Might be viewed from road and adjoining properties if not screened High impact as noise impacts are anticipated to be high for adjacent residential properties and there is limited screening from those properties.	-2

Option 3	- Higher amenity impacts next to [redacted] - **check [redacted] setback rules for structures** - No / limited screening - Adjacent to residential properties – higher noise impacts than Option 1 – but need to determine level of noise from pump station. High impact as noise and odour effects are anticipated to be high for adjacent residential properties and there is limited screening from those properties and within Hutt Park.	-2
Option 4	- Existing screening around the site - Co-location with Hutt Valley monitoring bores cabinet? - **check [redacted] setback rules for structures** - Residential properties separated by Woburn and Bellevue Roads More of an impact compared to Option 1 as close to residential properties. However, screening could mitigate effects. Have scored -1, as anticipate effects of noise and odour could extend to nearby residential properties.	-1
Option 5	Ariki Street - Assume outside of [redacted] - Assume off River Trail - Potential noise effects on adjoining residential properties – depending on what side of 'bund' - Visual effects on adjoining residential properties as no screening in area - No / limited screening - Adjacent to residential properties – higher noise impacts than Option 1 – but need to determine level of noise from pump station. High impact as noise impacts are anticipated to be high for adjacent residential properties and there is limited screening from those properties and within the River Trail. Depending on location in relation to residential properties, this score could be lower/lesser effects, as there may be less impacts of noise and on amenity, if the pump station is located further away and is screened.	-1
	Ewen Bridge Low impact – as per Option 1, will be screened from road and will not be located near residential properties. Located in a moderate – high noise environment with busy road and intersection.	2

2. Proposed Natural Resources Plan - assessment against relevant PNRP Schedules

Prior to the MCA workshop, Holmes requested a brief assessment be undertaken, which looked to identify which, if any, of the EOPs into Te Awa Kairangi are located within the relevant Schedules of the PNRP. Holmes provided additional maps identifying the location of the proposed EOPs for each of the 5 options, which are attached as Appendix B.

Table 5 below illustrates whether the EOPs are located within a PNRP Schedule. A ✓ means that the EOP is located within a scheduled site. A X means that the EOP is not.

It is noted that an assumption was made that all EOPs would be to Te Awa Kairangi.

Table 5: Assessment of options against relevant schedules of PNRP

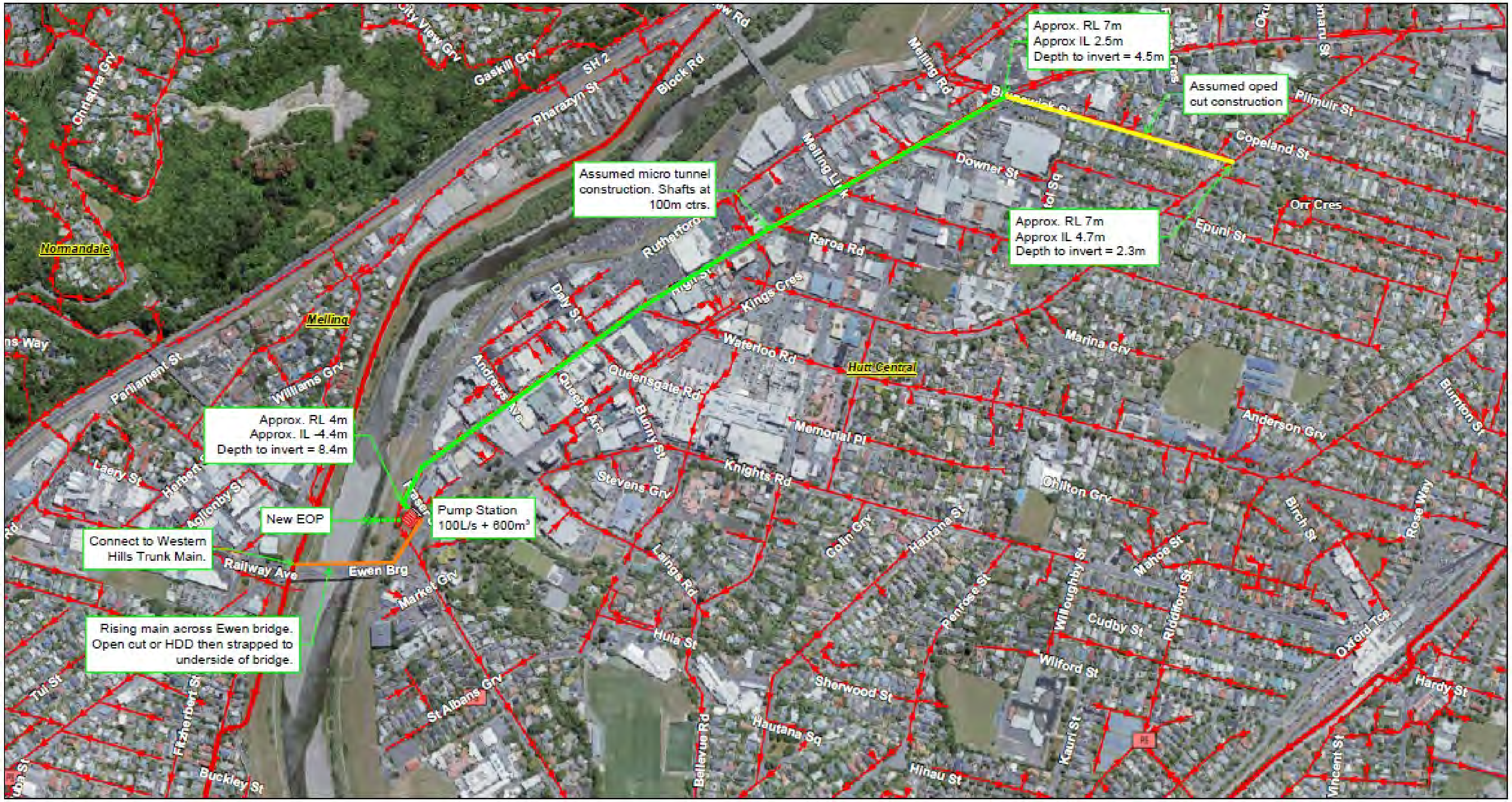
OPTION	PNRP SCHEDULE					
	Schedule C4: Sites of significance to Taranaki Whānui ki te Upoko o te Ika (Map 6)	Schedule F1: Rivers and lakes with significant indigenous ecosystems: habitat for indigenous threatened/ at risk fish species (Map 13b)	Schedule F1: Rivers and lakes with significant indigenous ecosystems: habitat for six or more migratory indigenous fish species (Map 13c)	**Schedule F1b: Known rivers and parts of the coastal marine area with inanga spawning habitat (Map 14)	Schedule H1: Significant primary contact recreation rivers and lakes (Map 20)	Schedule H2: Priorities for improvement of fresh and coastal water quality for contact recreation and Māori customary use
Option 1	X	✓	✓	✓?	✓	✓
Option 2	✓	✓	✓	X	✓	✓
Option 3	X	✓	✓	✓	✓	✓
Option 4	X	✓	✓	X	✓	✓

OPTION		PNRP SCHEDULE					
		Schedule C4: Sites of significance to Taranaki Whānui ki te Upoko o te Ika (Map 6)	**Schedule F1:** Rivers and lakes with significant indigenous ecosystems: habitat for indigenous threatened/ at risk fish species (Map 13b)	**Schedule F1:** Rivers and lakes with significant indigenous ecosystems: habitat for six or more migratory indigenous fish species (Map 13c)	****Schedule F1b:** Known rivers and parts of the coastal marine area with inanga spawning habitat (Map 14)	**Schedule H1:** Significant primary contact recreation rivers and lakes (Map 20)	**Schedule H2:** Priorities for improvement of fresh and coastal water quality for contact recreation and Māori customary use
Option 5	**Northern point**	✓	✓	✓	X	✓	✓
	Southern point	X	✓	✓	✓?	✓	✓

**Note: Schedules C4 and F1b should be mapped properly to identify if the EOPs are in fact within this area. I have made a best guess for the purpose of this report

Appendix A: Diagrams identifying the works area of the 5 options

Wellington Water Ltd Map



5/11/2022, 12:06:34 PM

HAL Reference: AAG

Option 1

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- PS Wastewater Pumpstation

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 1 REV: 01

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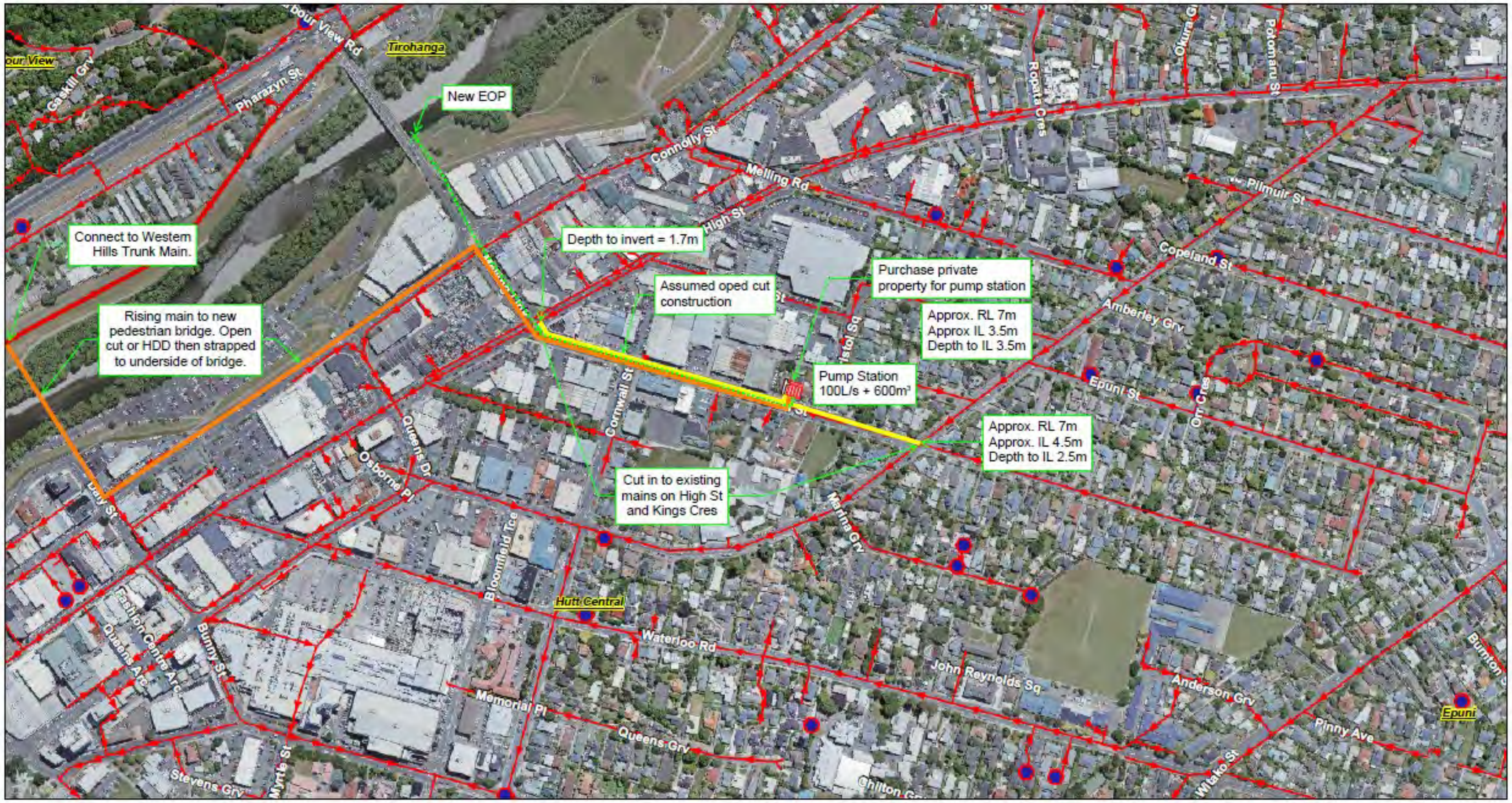
Wellington Water Ltd Map



5/5/2022, 9:49:59 AM

HAL Reference: AAJ

Option 2

1:4,514

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

● Water Shut Valve

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe

Holmes

PROJECT: Hutt CBD Wastewater Bypass

JOB NO: 144418.53 DATE: 07/09/2022

CSK: Option 2b REV: 01

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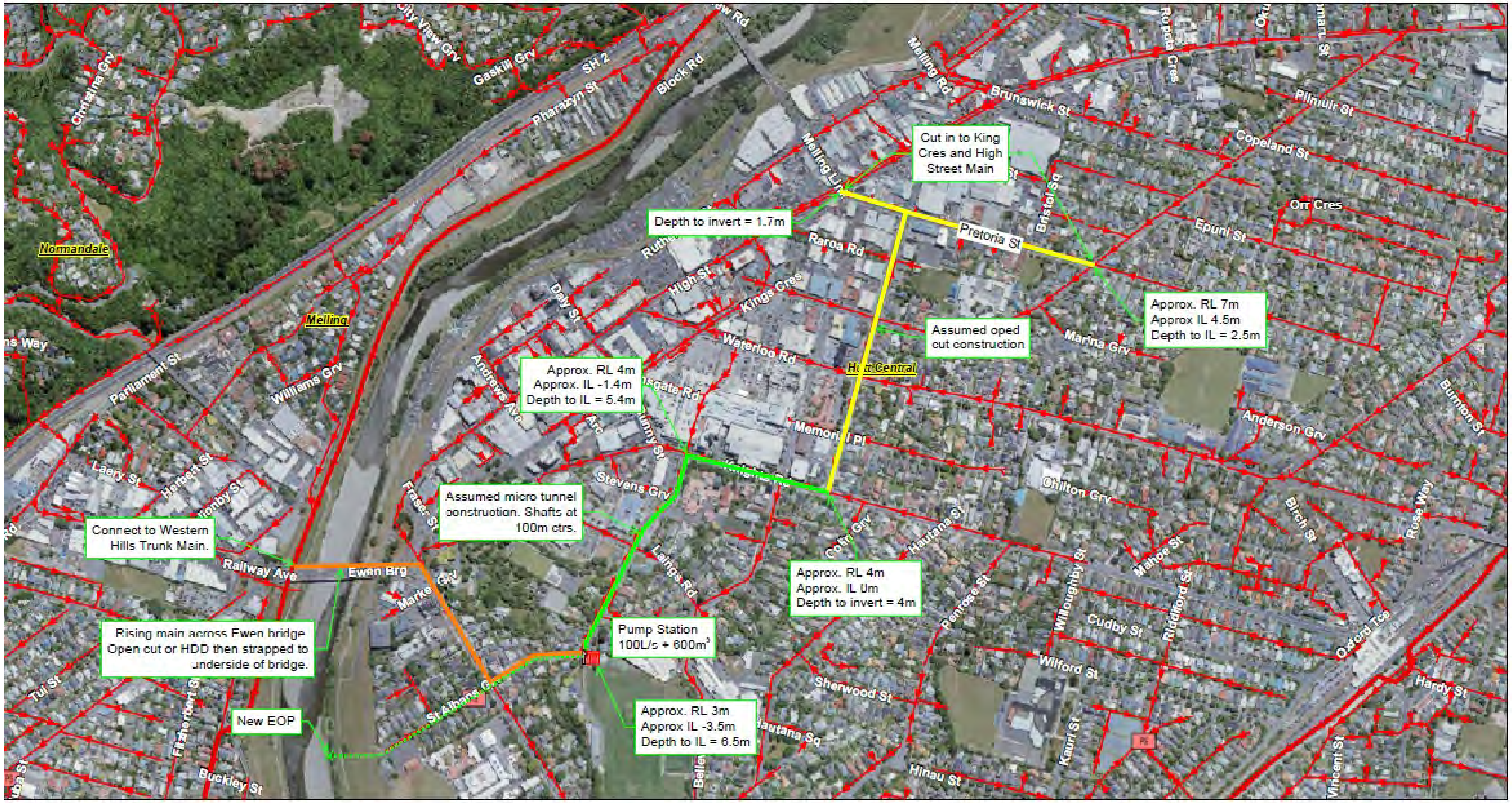
Wellington Water Ltd Map



Cut in to King Cres and High Street Main

Depth to invert = 1.7m

Approx. RL 7m
Approx IL 4.5m
Depth to IL = 2.5m

Assumed oped cut construction

Approx. RL 4m
Approx. IL -1.4m
Depth to IL = 5.4m

Assumed micro tunnel construction. Shafts at 100m ctrs.

Approx. RL 4m
Approx. IL 0m
Depth to invert = 4m

Connect to Western Hills Trunk Main.

Pump Station
100L/s + 600m^3

Rising main across Ewen bridge. Open cut or HDD then strapped to underside of bridge.

New EOP

Approx. RL 3m
Approx IL -3.5m
Depth to IL = 6.5m

5/11/2022, 12:06:34 PM

HAL Reference: AAN

1:7,000

Option 3

0	0.07	0.15	0.3 mi
0	0.13	0.25	0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 3 REV: DRAFT

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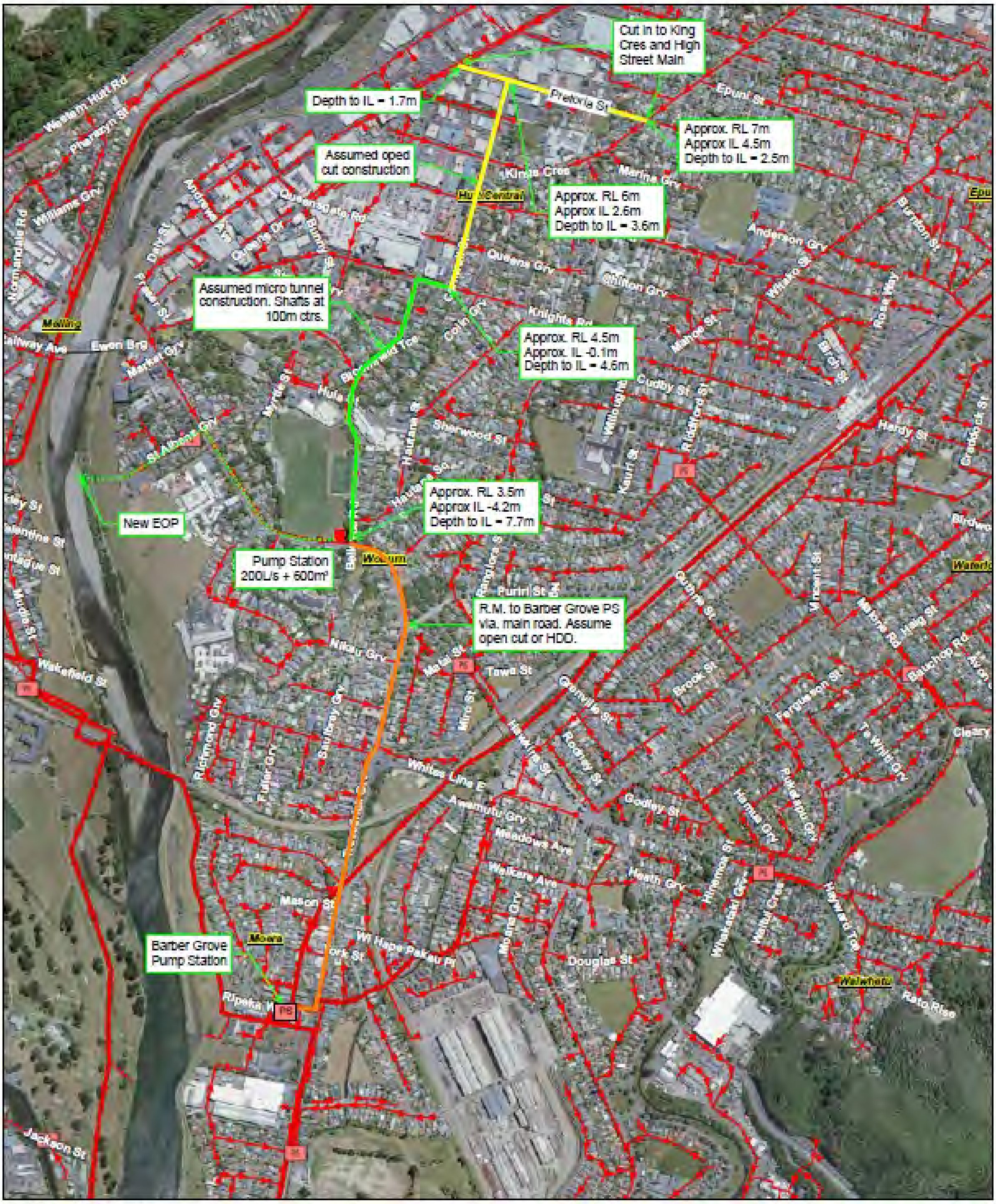
Wellington Water Ltd Map



5/9/2022, 10:26:32 AM

HAL Reference: AAO

Option 4

1:9,028

0 0.1 0.2 0.4 mi

0 0.15 0.3 0.6 km

Wastewater Pipe

━	Trunk Main
→	Main
—	Discharge Pipe
—	Other
—	Wastewater Pipe
PS	Wastewater Pumpstation

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 4 REV: DRAFT

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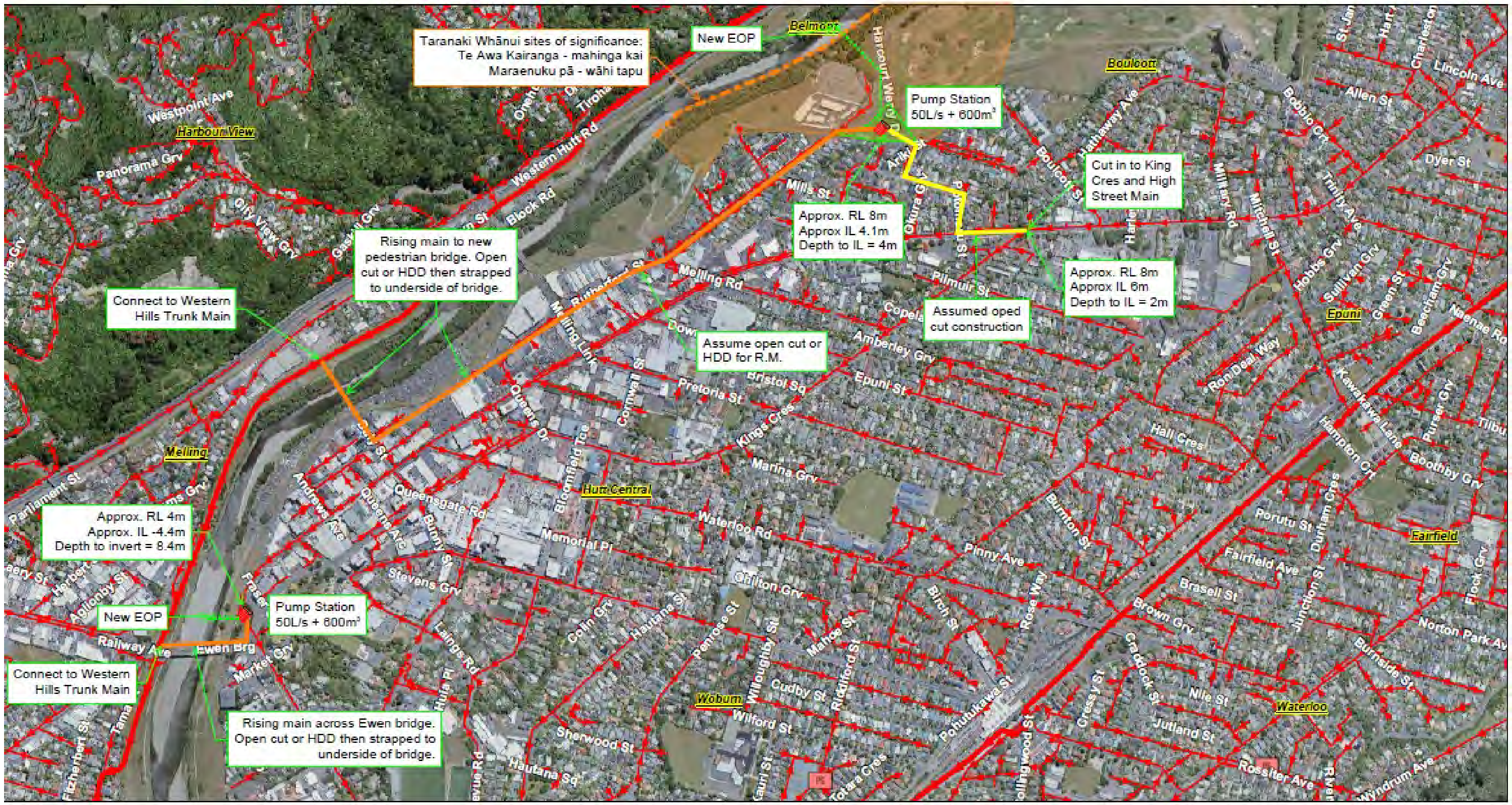
Wellington Water Ltd Map


Taranaki Whānui sites of significance:
Te Awa Kairanga - mahinga kai
Maraenuku pā - wāhi tapu

New EOP

Pump Station
50L/s + 600m³

Cut in to King
Cres and High
Street Main

Approx. RL 8m
Approx IL 4.1m
Depth to IL = 4m

Approx. RL 8m
Approx IL 6m
Depth to IL = 2m

Assumed oped
cut construction

Assume open cut or
HDD for R.M.

Rising main to new
pedestrian bridge. Open
cut or HDD then strapped
to underside of bridge.

Connect to Western
Hills Trunk Main

Approx. RL 4m
Approx. IL -4.4m
Depth to invert = 8.4m

New EOP

Pump Station
50L/s + 600m³

Connect to Western
Hills Trunk Main

Rising main across Ewen bridge.
Open cut or HDD then strapped to
underside of bridge.

5/23/2022, 11:24:52 AM

HAL Reference: AAL/AAM

Option 5

1:9,028

0	0.1	0.2	0.4 mi
0	0.17	0.35	0.7 km

Wastewater Pipe

- Wastewater Trunk Main
- Wastewater Pipe
- Wastewater Service Connection
- 🟥 Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 5 REV: 01

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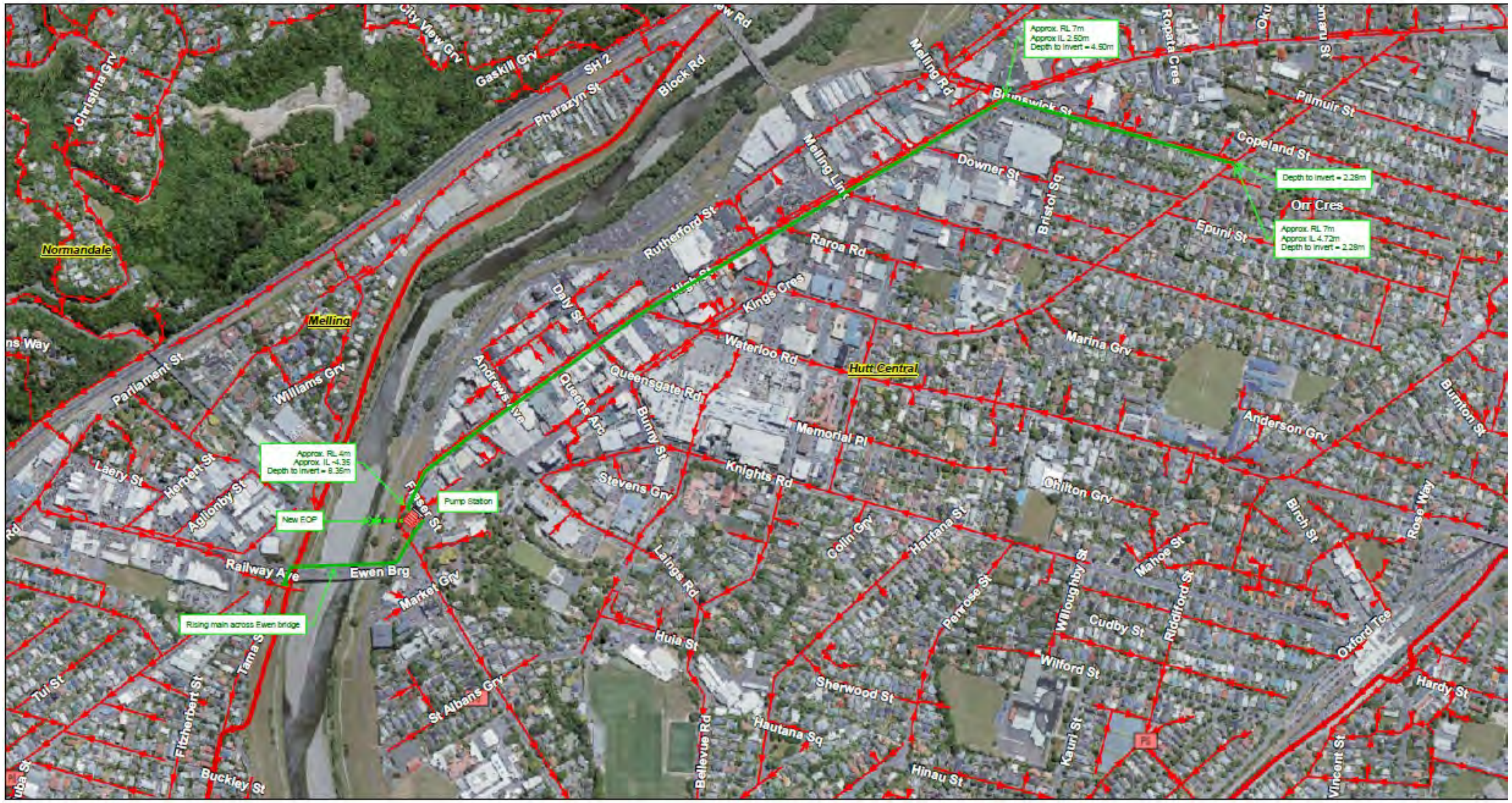
Appendix B: Emergency Overflow Point location maps

Option 1

Wellington Water Ltd Map



5/11/2022, 12:06:34 PM

HAL Reference: AAG

Option 1

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- PS Wastewater Pumpstation

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 1 REV: 01

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Option 2

Wellington Water Ltd Map

5/5/2022, 9:49:59 AM

● Water Shut Valve

Wastewater Pipe

Trunk Main

Main

Discharge Pipe

HAL Reference: AAJ

Option 2

1:4,514

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 23/06/2022

CSK: Option 2 REV: 02

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Option 3

Wellington Water Ltd Map

5/11/2022, 12:06:34 PM

HAL Reference: AAN

Option 3

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- Wastewater Pumpstation

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 3 REV: DRAFT

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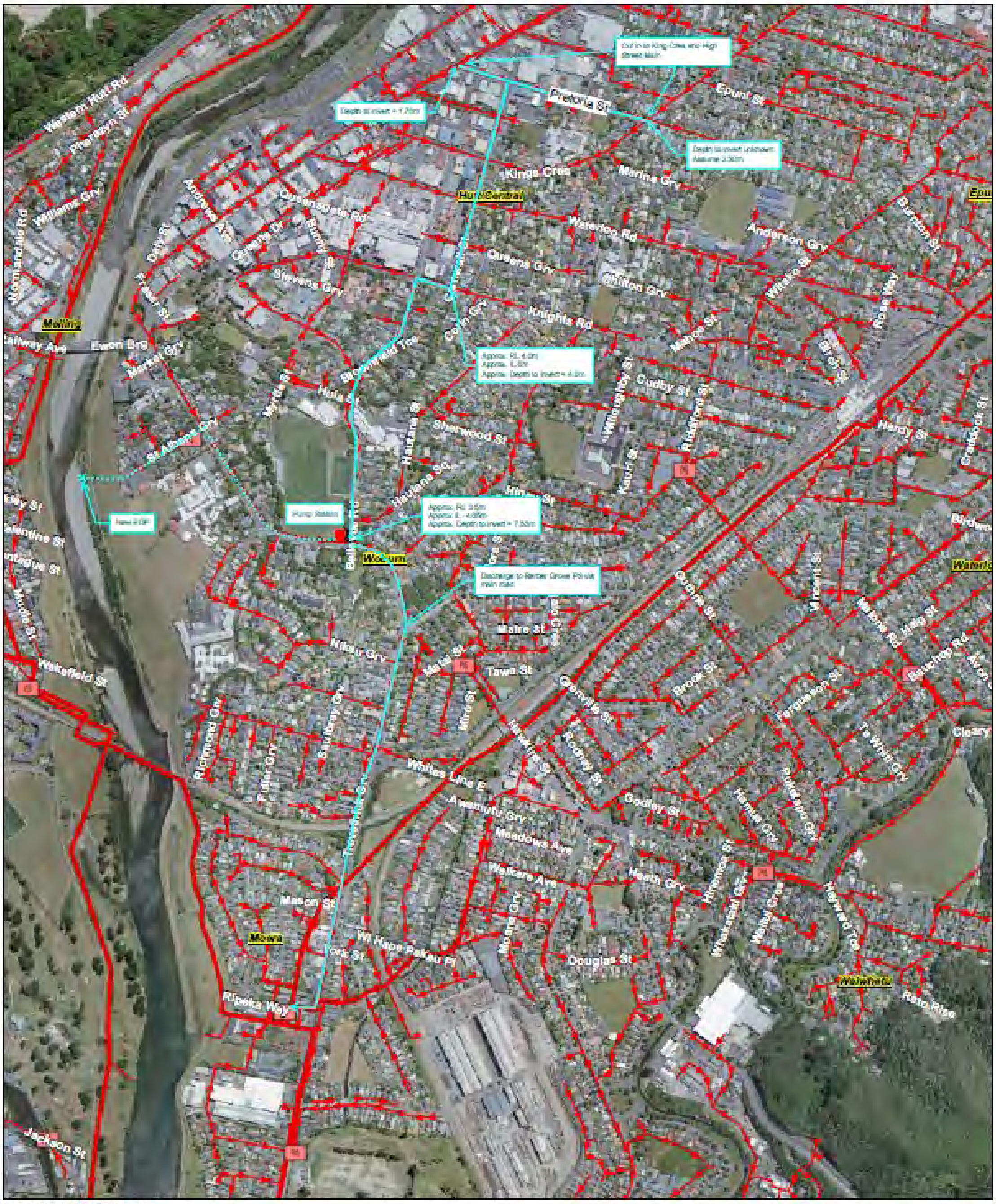
Option 4

Wellington Water Ltd Map



5/9/2022, 10:26:32 AM

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- Other
- Wastewater Pipe
- Wastewater Pumpstation

HAL Reference: AAO

Option 4

1:9,028

0 0.1 0.2 0.4 mi

0 0.15 0.3 0.6 km

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 4 REV: DRAFT

Wellington Water Ltd

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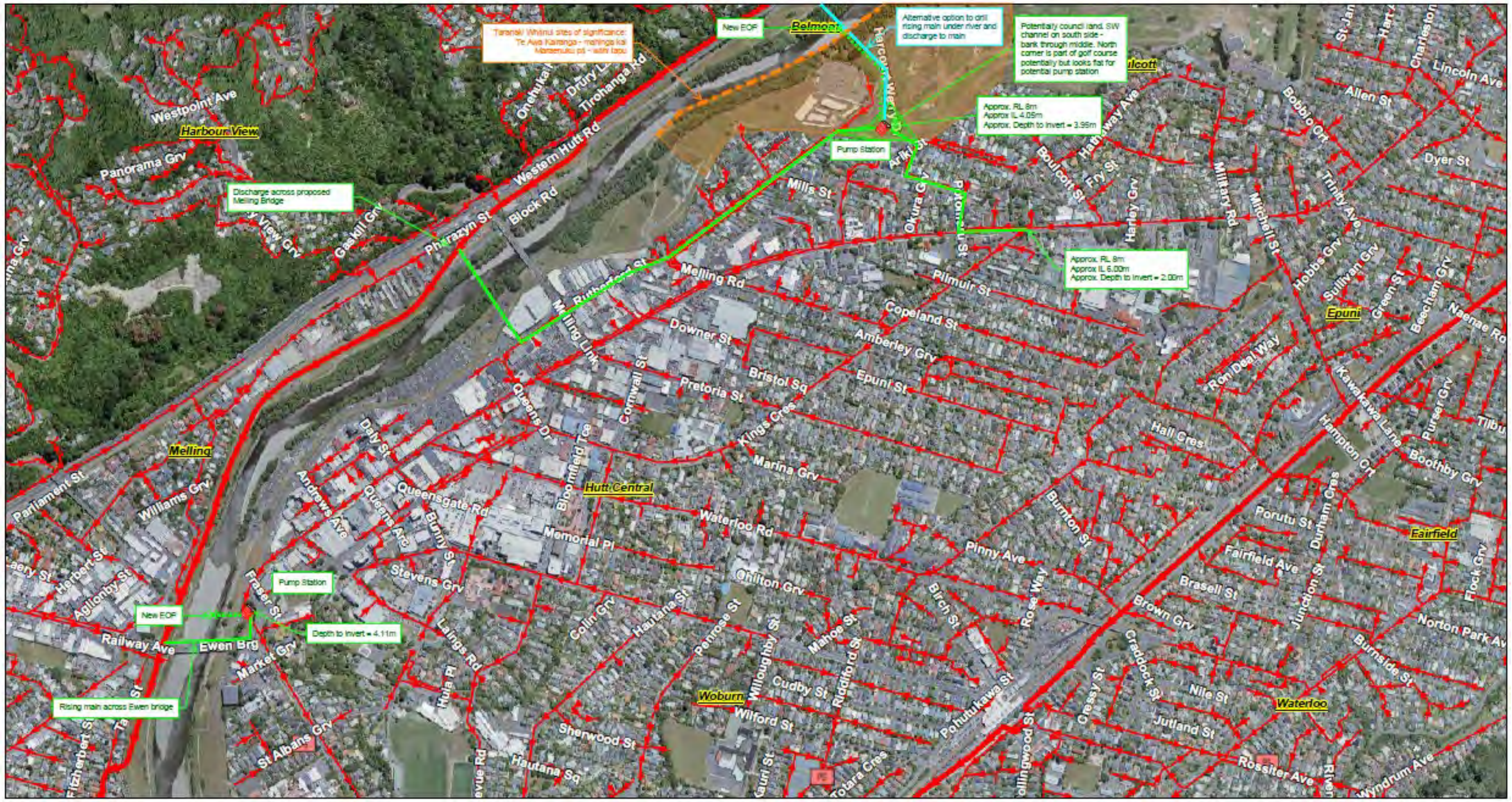
Option 5

Wellington Water Ltd Map



5/23/2022, 11:24:52 AM

HAL Reference: AAL/AAM

Option 5

1:9,028

0 0.1 0.2 0.4 mi
0 0.17 0.35 0.7 km

Wastewater Pipe

▬ Wastewater Trunk Main

→ Wastewater Pipe

Wastewater Service Connection

▨ Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 5 REV: 01

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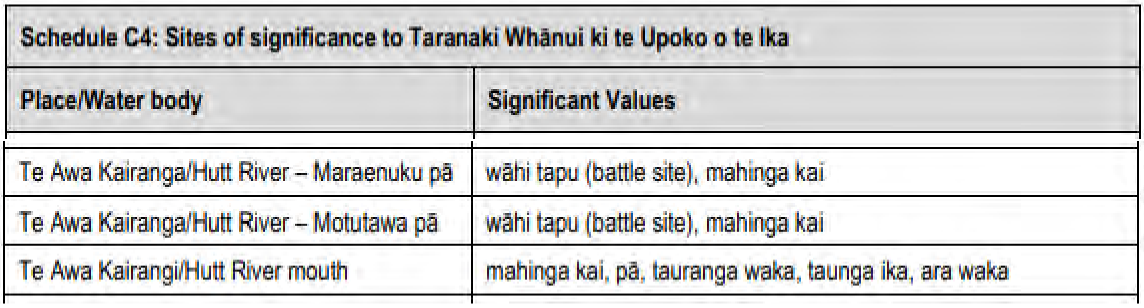
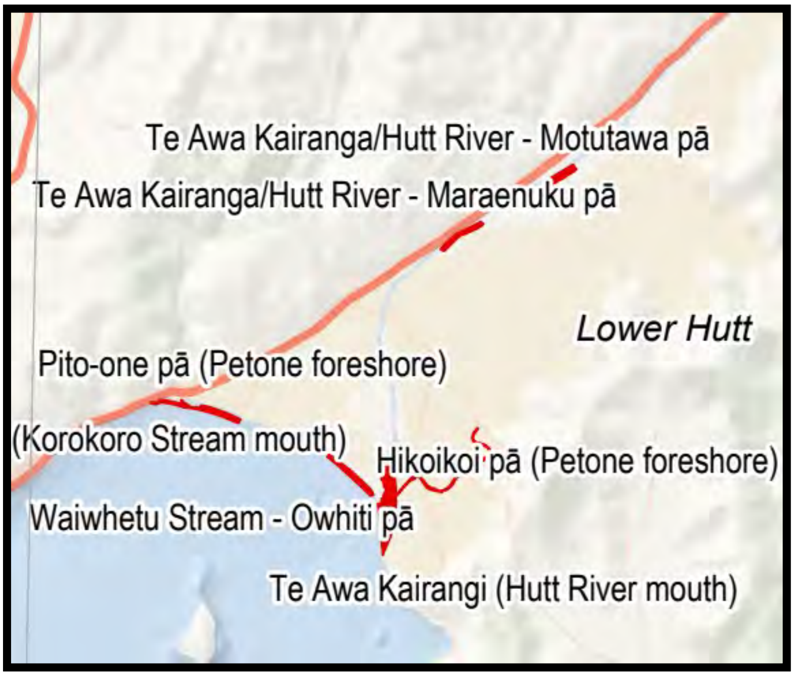
Appendix C: Relevant PNRP Schedule Maps

Schedule C4: Sites of significance to Taranaki Whānui ki te Upoko o te Ika



Schedule C4: Sites of significance to Taranaki Whānui ki te Upoko o te Ika

Place/Water body	**Significant Values**
Te Awa Kairanga/Hutt River – Maraenuku pā	wāhi tapu (battle site), mahinga kai
Te Awa Kairanga/Hutt River – Motutawa pā	wāhi tapu (battle site), mahinga kai
Te Awa Kairangi/Hutt River mouth	mahinga kai, pā, tauranga waka, taunga ika, ara waka



Schedule F: Ecosystems and habitats with significant indigenous biodiversity values

Rivers and lakes with significant indigenous ecosystems: habitat for indigenous threatened/ at risk fish species (Schedule F1)

Map 13b

This version of the map is not complete. The version of this map available online through the online web map viewer shows the complete, detailed information on a GIS overlay that is not shown on this hard copy. The online version is available on the Council's website at https://mapping.gw.govt.nz/gwrc/ (select theme Natural Resources Plan) and can be accessed from the Council offices or public library.

― State Highway	― Threatened/at risk fish habitat
-·-·- Region boundary line	▬ Lake with threatened/at risk fish habitat

0 10 20 40 km
1:850,000

Basemap: World Oceans Base
Projection: NZTM 2000

Copyright
Basemap: NIWA, Esri, DeLorme, NaturalVue
Topographic and Cadastral: LINZ & CoreLogic Ltd

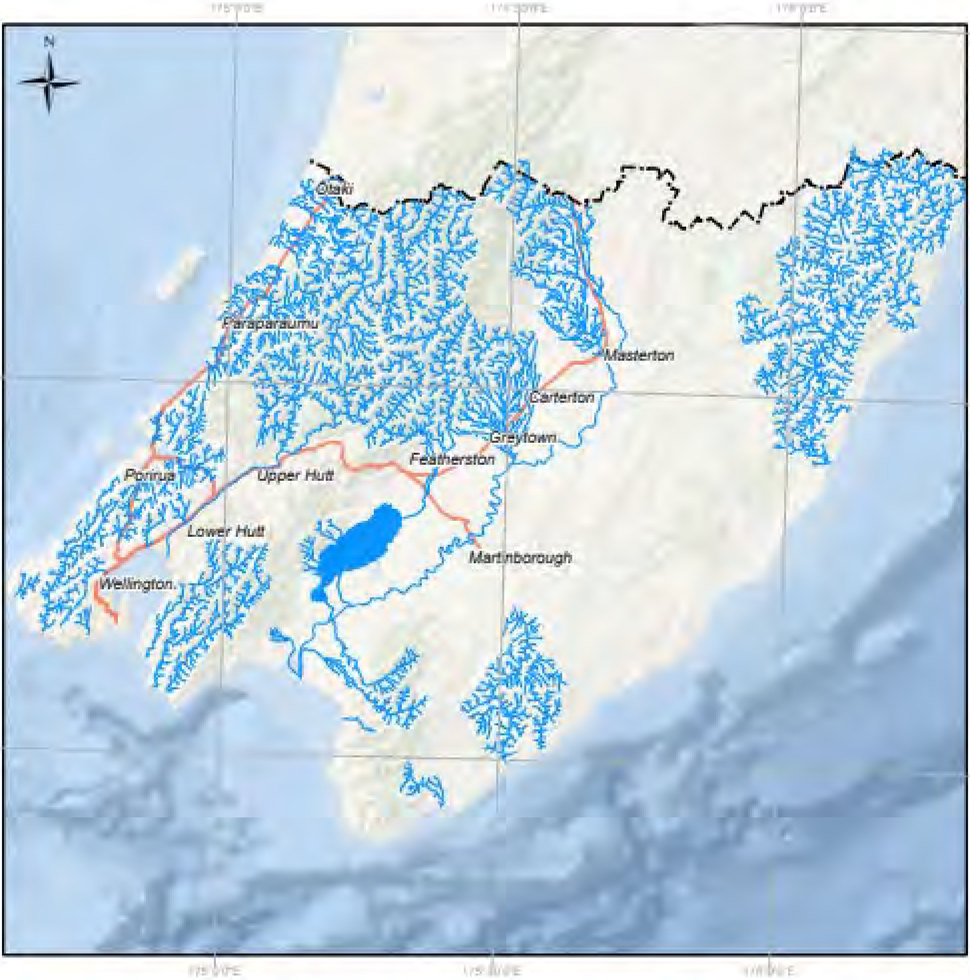
Map 20

Rivers and lakes with significant indigenous ecosystems: habitat for six or more migratory indigenous fish species (Schedule F1)

Dan Riddiford

Wellington Water Ltd

Map 13c



This version of the map is not complete. The version of this map available online through the online web map viewer shows the complete, detailed information on a GIS overlay that is not shown on this hard copy. The online version is available on the Council's website at https://mapping.gw.govt.nz/gwrc/ (select theme ~~Proposed~~ Natural Resources Plan ~~2015~~) and can be accessed from the Council offices or public library.

—	State Highway	—	Habitat of 6 or more migratory fish spp.
-·-·-	Region boundary line	■	Lake with habitat of 6 or more migratory fish spp.

0 10 20 40 km

1:850,000

Basemap: World Oceans Base
Projection: NZTM 2000

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Copyright
Basemap: NIWA, Esri, DeLorme, NaturalVue
Topographic and Cadastral: LINZ & CoreLogic Ltd

Known rivers and parts of the coastal marine area with inanga spawning habitat (Schedule F1b)

Dan Riddiford

Map 14

This version of the map is not complete. The version of this map available online through the online web map viewer shows the complete, detailed information on a GIS overlay that is not shown on this hard copy. The online version is available on the Council's website at https://mapping.gw.govt.nz/gwrc/ (select theme ~~Proposed~~ Natural Resources Plan ~~2015~~) and can be accessed from the Council offices or public library.

State Highway

Region boundary line

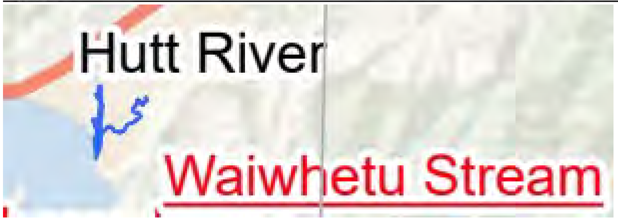
Inanga spawning site

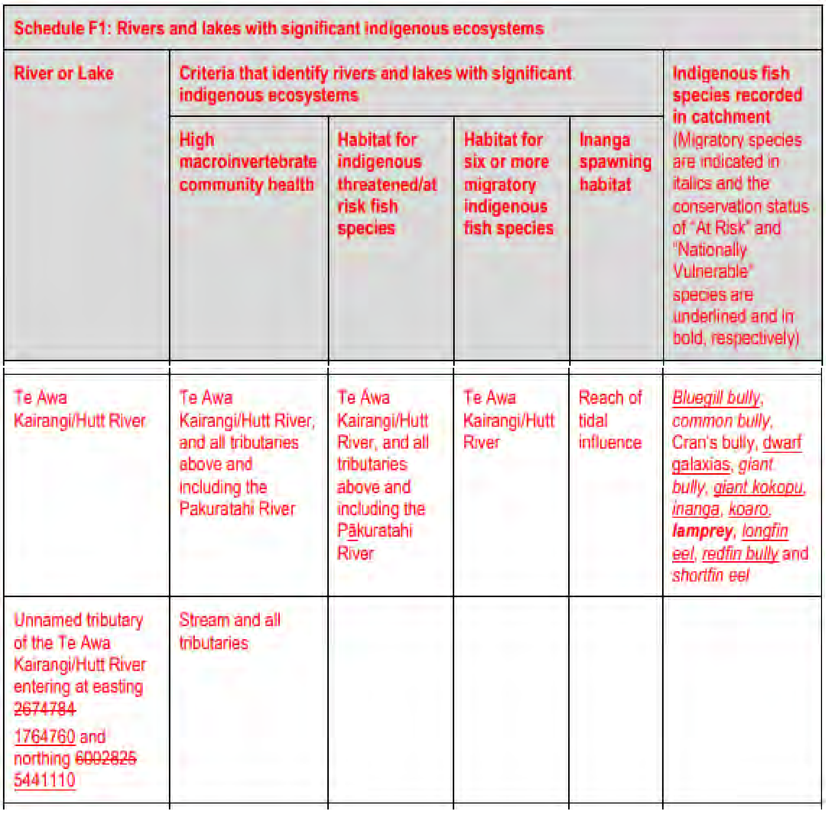
greater WELLINGTON REGIONAL COUNCIL Te Pane Matua Taiao

0 10 20 40 km
1:850,000

Basemap: World Oceans Base
Projection: NZTM 2000

Copyright
Basemap: NIWA, Esri, GEBCO, DeLorme, NaturalVue
Topographic and Cadastral: LINZ & CoreLogic Ltd





Schedule F1: Rivers and lakes with significant indigenous ecosystems

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Te Awa Kairangi/Hutt River	Te Awa Kairangi/Hutt River, and all tributaries above and including the Pakuratahi River	Te Awa Kairangi/Hutt River, and all tributaries above and including the Pākuratahi River	Te Awa Kairangi/Hutt River	Reach of tidal influence	*Bluegill bully*, *common bully*, Cran's bully, dwarf galaxias, *giant bully*, *giant kokopu*, *inanga*, *koaro*, ***lamprey***, *longfin eel*, *redfin bully* and *shortfin eel*
Unnamed tributary of the Te Awa Kairangi/Hutt River entering at easting ~~2674784~~ 1764760 and northing ~~6002825~~ 5441110	Stream and all tributaries				

Schedule H: Contact recreation and Māori customary use

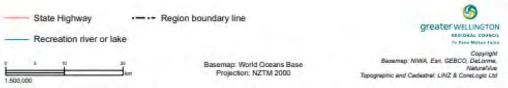
Schedule H1: Significant contact recreation freshwater bodies

Shown on Map 20.

Significant primary contact recreation rivers and lakes (Schedule H1)

Map 20

This version of the map is not complete. The version of this map available online through the online web map viewer shows the complete, detailed information on a GIS overlay that is not shown on this hard copy. The online version is available on the Council's website at https://mapping.gw.govt.nz/gwrc/ (select theme Natural Resources Plan) and can be accessed from the Council offices or public library.



Basemap: World Oceans Base
Projection: NZTM 2000

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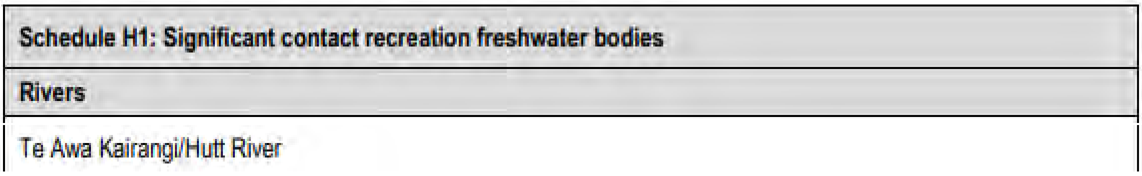
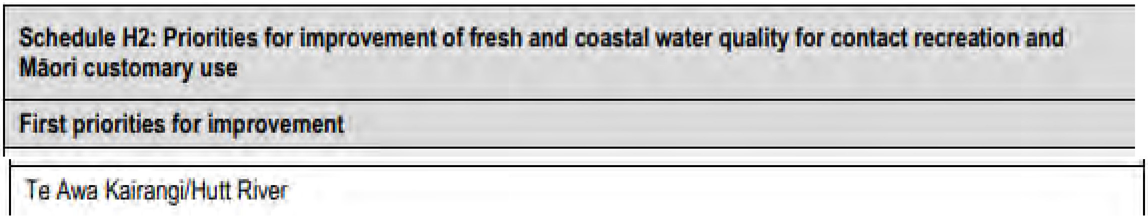
Basemap: NIWA, Esri, GEBCO, DeLorme, NaturalVue
Topographic and Cadastral: LINZ & CoreLogic Ltd



Schedule H1: Significant contact recreation freshwater bodies
Rivers
Te Awa Kairangi/Hutt River

Schedule H2: Priorities for improvement of fresh and coastal water quality for contact recreation and Māori customary use



Schedule H2: Priorities for improvement of fresh and coastal water quality for contact recreation and Māori customary use
First priorities for improvement
Te Awa Kairangi/Hutt River

Appendix E – Taranaki Whānui Engagement

TARANAKI WHĀNUI
KI TE UPOKO O TE IKA

22 March 2022

[redacted] Senior Advisor (RMA, Consents and Environment)
Wellington Water

By email: [redacted]

Kia ora [redacted]

Thank you for engaging with Taranaki Whānui regarding the 'Hutt City CBD Wastewater Duplication' project.

1. Our understanding of the project

Wellington Water is preparing for an increase in residential and commercial development associated with the RiverLink redevelopment.

Wellington Water is investigating the options to reduce the likelihood of wastewater overflows entering Te Awa Kairangi and Te Whanganui a Tara.

Wellington Water is investigating options to duplicate the existing wastewater pipes in the CBD to provide increased capacity. One option is to construct a wastewater pump station within the Hutt CBD and then attach a wastewater pipe on the existing Ewen Bridge over Te Awa Kairangi. The wastewater pipe would then connect to the existing wastewater network in Alicetown and then continue to Seaview Wastewater Treatment Plant via the Waione Bridge in Petone.

The project is in the early concept stage of scoping this work.

2. Engagement with Taranaki Whānui

A completed Taranaki Whānui Engagement Form was provided (dated 28/02/22), as well as high-level site plans showing the options being explored for new wastewater pipelines and new pump station.

The project team is seeking initial feedback from Taranaki Whānui during this early scoping investigation phase for the option that involves attaching a wastewater pipe on Ewen Bridge over Te Awa Kairangi to reduce the likelihood of wastewater entering Te Awa Kairangi and Te Whanganui a Tara.

3. Initial feedback from Taranaki Whānui

Taranaki Whānui recognise the importance of reducing wastewater overflows into the Te Awa Kairangi and Te Whanganui a Tara. The provision of additional wastewater infrastructure through new pipelines and a new pump station is an option that Taranaki Whanui does not inherently oppose at this early scoping phase.

However, Taranaki Whānui would like the project team to take into account the partially completed waka (up to 300 years old) accidentally found in 2006 in the vicinity. The waka was found 4.5m deep into the riverbank in the location circled red (more detail in the attachment):

Rough co-ordinates: -41.221618, 174.900726 (https://mapcarta.com/W489050536)

This ancient taonga has been treated by Te Papa, and appropriately stored. Here is a link to the news article about the taonga and the recent ceremony - Iwi join together to welcome back 300-year-old waka | RNZ.

As that was such an extraordinary find, it is very important to Taranaki Whanui that the project team is cognisant of the disturbance of land for proposed new wastewater infrastructure along this side of the Te Awa Kairangi, and whether it is appropriate for an archaeological assessment and/or application for an archaeological authority for any proposed ground investigation or excavation works as part of this project.

Taranaki Whānui would like to be kept up to date on what Wellington Water finds through further investigation e.g., archaeological assessment, and would expect to be appropriately engaged with should Wellington Water prepare an archaeological authority application.

In addition, Taranaki Whānui would expect for any ground investigation or excavation works in the vicinity of the waka find area, to have an Accidental Discovery Protocol in place, and for contractors to be suitably briefed about what the Accidental Discovery Protocol entails before works commenced.

4. Recommended next steps with Taranaki Whānui

Should the project proceed to design after award of funding, Taranaki Whānui request to be kept up to date with any further archaeological investigations for the area of proposed infrastructure upgrades, and at significant project milestone stages e.g., optioneering, preliminary design.

Nāku iti nei, na,

[redacted]

[redacted]
Chief Executive, Taranaki Whānui ki Te Upoko o Te Ika

From: [redacted]
To: [redacted]
Subject: FW: Case 2008-30: Hutt River Waka: Relocation and Claim Update
Date: Tuesday, 22 March 2022 10:01:54 am
Attachments: image002.png
image003.png
image004.png
image005.png
image006.png

Morena Sabrina, please see the location and details below,

Ngā mihi,

[redacted]

From: [redacted]
Sent: Tuesday, 22 March 2022 9:59 am
To: [redacted]
Subject: RE: Case 2008-30: Hutt River Waka: Relocation and Claim Update

Kia ora Lee,

For sure, here is what I can find, hope this helps! I can look through our offsite paper filing if you need more documentation.

Found by: Lower Hutt District Council contractors (Juno Civil Ltd) working on river, building flood barrier/embankment

Finder name: Paul Ashcroft

Find location: Hutt River pumping station, White Lane West, Woburn. Found in the Hutt River 4.5 metres down in silt near a gravel bottom during pumping house construction in October 2006. Contractors found the waka by chance during excavation work for a proposed pumping station at the end of Whites Line West. It was found approximately 4500mm deep, and in the silt layer of the riverbank. It was not found under an archaeological authority and no archaeological reporting was completed for the find.

Rough co-ordinates (pictures with red circles of the find location): -41.221618, 174.900726 (https://mapcarta.com/W489050536)

From: [redacted]
Sent: Tuesday, 22 March 2022 9:30 AM
To:[redacted]
Subject: RE: Case 2008-30: Hutt River Waka: Relocation and Claim Update

Morena [redacted]

I am engaged with a waste water consent and it includes the area where the waka was found between the two bridges in Te Awa Kairangi.

Are you able to share any documentation that I can attach with a response to Wellington Water Ltd illustrating the location and the find of our taonga?

Nga mihi

Lee

[redacted]
Taranaki Whanui ki te Upoko o te Ika a Maui
Port Nicholson Block Settlement Trust
TARANAKI WHĀNUI
P (+64) 4 472 3872
M (+64) 27 482 2367
E lee@portnicholson.org.nz
Tramway Building, Level 3, 1-3 Thorndon Quay, Wellington 6011

From[redacted]
Sent: Monday, 20 December 2021 3:55 pm
To:[redacted]
Cc:[redacted]>
Subject: RE: Case 2008-30: Hutt River Waka: Relocation and Claim Update

Kia ora kōrua,

Thanks for your time on Friday last week! It was great to meet you both.

Please find attached the discussion document regarding the Hutt River Waka. Please also note the proposed timeline for next steps in the document.

If you could reply to this email with who you would like to be invited to represent at the first virtual hui in late January, along with their email addresses, that would be appreciated.

Any questions please get in touch,

From:[redacted]
Sent: Thursday, 9 December 2021 8:52 PM
To: [redacted]
Subject: RE: Case 2008-30: Hutt River Waka: Relocation and Claim Update

Kei kōnei ki te tautoko

From: [redacted]
Sent: Thursday, 9 December 2021 11:04 am
To: protected objects <protected-objects@mch.govt.nz>
Cc: [redacted]
Subject: RE: Case 2008-30: Hutt River Waka: Relocation and Claim Update

Tena koe

Thank you for the email received. Is there a representative that I can meet and speak face to face please?

Ngā mihi

[redacted]

[redacted] Tumu Whakarae | Chief Executive
Taranaki Whānui ki te Upoko o te Ika a Maui | Port Nicholson Block Settlement Trust
Tramway Building Level 3, 1-3 Thorndon Quay, Wellington, 6011
Tauwaea : +64 4 472 3872 | +64 27 310 0335
Paetukutuku : [illegible] | [illegible]

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From: protected objects <protected-objects@mch.govt.nz>
Sent: Thursday, 9 December 2021 10:28 am
To [redacted]
Subject: Case 2008-30: Hutt River Waka: Relocation and Claim Update

Tēnā koe, e te Rangatira,

Ki ngā mate kua haoa e te waka o te rangi, haere atu rā. Ko te au o moe ki a rātou, ka hoki mai ki a tātou, tēnā tātou.

You are receiving this correspondence as you are a claimant for traditional ownership of the Hutt River Waka (the Waka) under the Protected Objects Act 1975.

The Waka was found waterlogged in Woburn, Lower Hutt in 2006 and has received conservation treatment since 2009. The Waka completed its treatment approximately 18 months ago and is being relocated to a more suitable housing arrangement.

Manatū Taonga, Ministry for Culture and Heritage wish to inform you that on **17 March 2022**, the Waka will be relocated, from Radio New Zealand House on The Terrace to Experience Wellington's storage facility in Naenae, Lower Hutt.

Manatū Taonga recognises that time has lapsed since the Waka was found and your claim was made, and we would appreciate if you could:

1. Reaffirm your interest on the claim.
2. Advise of the level of involvement you wish to have in the relocation of the Waka (this could include ceremonial representation on the day).

Specifically, if you would like to proceed with your claim, Manatū Taonga will arrange a hui with claimants in the coming months. The claimants as of 2015 are:

- Muaūpoko Tribal Authority
- Ngāti Wai o Ngāti Tama
- Port Nicholson Block Settlement Trust
- Tamarangi hapū o Muaūpoko
- Tanenuiarangi Manawatū Incorporated on behalf of Rangitāne o Manawatū
- Te Rūnanga o Toa Rangatira

Please direct your response to protected-objects@mch.govt.nz by **Friday, 21 January 2022**.

Hei konā mai i roto i ngā mihi.

Nāku noa, nā

[redacted]

[redacted]
Pou Mataaho o Te Hua (Taupua) | Deputy Chief Executive, Delivery (Acting)
Manatū Taonga Ministry for Culture & Heritage
Old Public Trust Building, Level 1, 131 Lambton Quay, PO Box 5364, Wellington 6011, New Zealand

TARANAKI WHĀNUI
KI TE UPOKO O TE IKA

---

25 August 2022

[redacted] Design Engineer, Civils
Holmes NZ LP

By email: [redacted]

Kia ora [redacted]

Thank you for engaging with Taranaki Whānui regarding the 'Riverlink Wastewater Bypass' project.

1. Our understanding of the project

Wellington Water has previously engaged with Taranaki Whānui during the early concept stage of scoping for this project. A feedback letter (dated 02/03/22) was provided to Wellington Water.

Taranaki Whanui understands that the purpose of the project is to investigate options to duplicate the existing wastewater pipes in the CBD to provide increased capacity from residential and commercial development associated with the RiverLink redevelopment. This will help to reduce the likelihood of wastewater overflows entering Te Awa Kairangi and Te Whanganui a Tara.

2. Engagement with Taranaki Whānui

An email from [redacted] was provided on 27 July 2022, seeking to engage with Taranaki Whānui to on MCA process scoring and commentary on five options for the Tangata Whenua values criteria. The criteria identified by Wellington Water's consultant Holmes is stated as *'Effects on mauri, mana hauora, kai moana, mahinga kai, heritage, and whakapapa.'*

A copy of the pre-workshop briefing pack with information on the MCA criteria and scoring, shortlisted options, and high-level site plans were provided.

3. Initial feedback from Taranaki Whānui

Taranaki Whānui recognise the importance of reducing wastewater overflows into the Te Awa Kairangi and ultimately the Te Whanganui-a-Tara. The provision of additional wastewater infrastructure through new pipelines and a new pump station is an option that Taranaki Whānui does not oppose in principle if the

Level 3
Tramways Building
1-3 Thorndon Quay
Freepost 166974
Wellington 6144

Telephone: (04) 472 3872
Email: reception@portnicholson.org.nz
Website: www.pnbst.maori.nz

outcome is an improvement to the quality of discharges to these two receiving environments which are sites of significance to Taranaki Whānui.

The scoring and comments associated with the shortlisted options are as follows:

Option	Scoring	Comments
1	-1	With the proposal for a new rising main crossing Te Awa Kairangi, it is preferable to keep wastewater away from or traversing the awa and mahinga kai. Wellington Water should be cognisant of the accidental find of the ancient waka on this side of Te Awa Kairangi.
2	-1	With the proposal for a new rising main crossing Te Awa Kairangi, it is preferable to keep wastewater away from or traversing the awa and mahinga kai. The 'result' of this option identifies the need for an upgrade to Western Hutt Mains sewer to avoid spilling at Melling EOP. It is unclear if Wellington Water are committed to upgrading the Western Hutt Mains sewer to avoid such spilling in conjunction with this option. It is important to Taranaki Whānui that there are no spills or overflows into awa.
3	-1	With the proposal for a new rising main crossing Te Awa Kairangi, it is preferable to keep wastewater away from or traversing the awa and mahinga kai. This option provides the greatest reduction in uncontrolled spills of all five options, which is looked upon favourably by Taranaki Whānui.
4	+3	This option is seen as having a strong positive impact on tangata whenua values as the new infrastructure directs wastewater to the WWTP via Barber Grove. This option is preferred as it doesn't include a new rising main crossing Te Awa Kairangi. The 'result' of this option also identifies a high reduction in uncontrolled spills, which is seen more favourably by Taranaki Whānui. Any reduction in wastewater entering the awa is seen positively.
5	-3 (option: rising main drilled under Te Awa Kairangi)	New rising main drilled under Te Awa Kairangi – considered to have a more negative impact on Te Awa Kairangi, given the potential for failure/spills into both groundwater and Te Awa Kairangi.
	-1 (option: rising main to discharge existing	With the proposal for a new rising main crossing Te Awa Kairangi, it is preferable to keep wastewater away from or traversing the awa and mahinga kai.

Taranaki Whānui would like to reiterate the information provided in the first feedback letter (dated 2/03/22) about the significant accidental find of a partially completed waka (up to 300 years old). As it was such an extraordinary find, it is very important to Taranaki Whānui that the project team is cognisant of the disturbance of land on this side of the Te Awa Kairangi. Wellington Water should consider whether it is appropriate for an archaeological assessment and/or application for an archaeological authority for any proposed ground investigations or disturbance of land as part of this project in proximity to the waka find.

Rough co-ordinates: -41.221618, 174.900726 (https://mapcarta.com/W489050536).

4. Recommended next steps with Taranaki Whānui

An update on the identified preferred option and an indication of the timing of further input required from Taranaki Whānui would be appreciated to be emailed to TWengagement@wellingtonwater.co.nz.

Nāku iti nei, na,

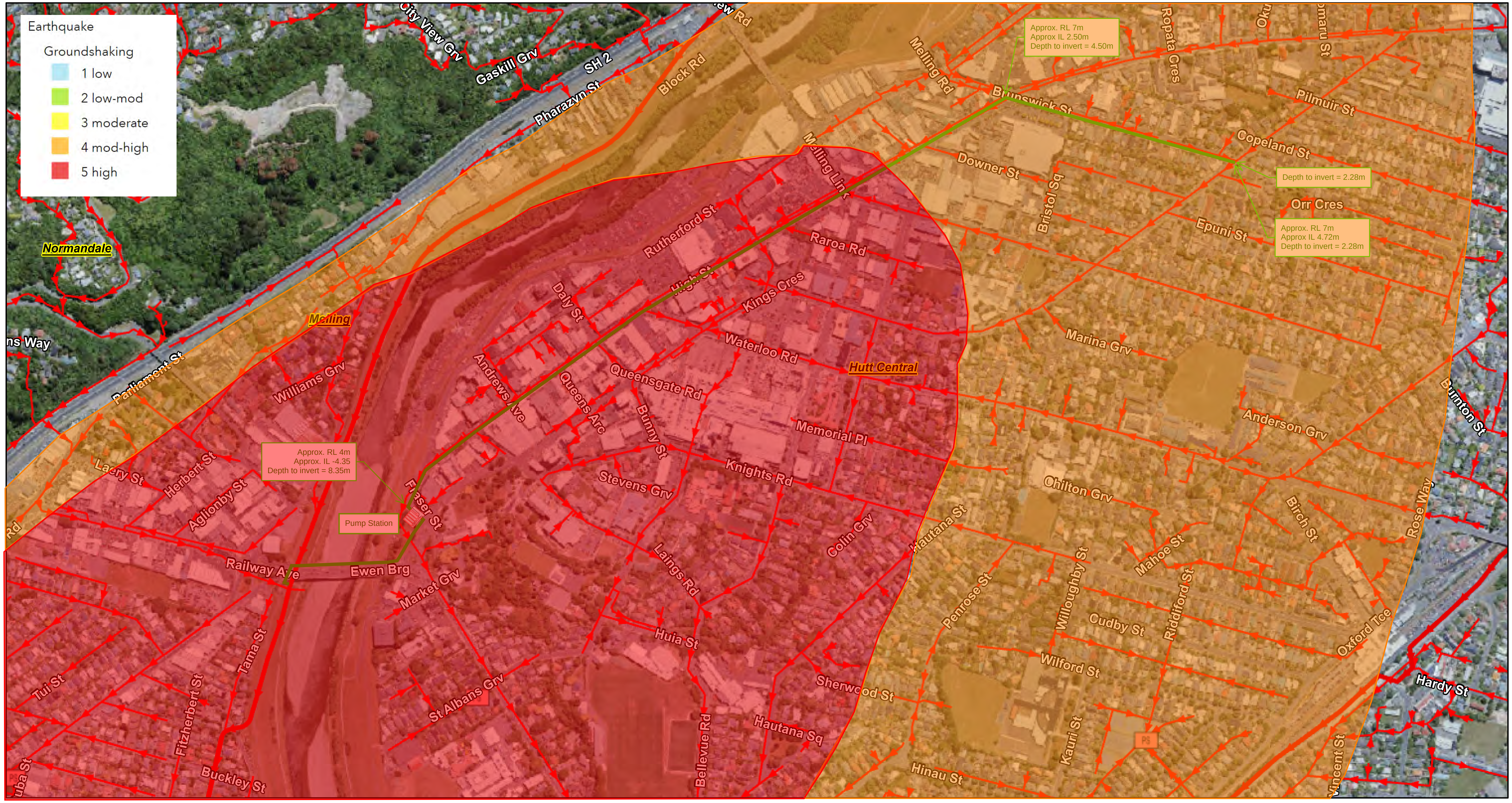
[redacted]

[redacted]

Chief Executive, Taranaki Whānui ki Te Upoko o Te Ika

Appendix F – Seismic Mapping for MCA

Wellington Water Ltd Map



5/11/2022, 12:06:34 PM

HAL Reference: AAG

1:7,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

Wastewater Pipe

Trunk Main

Main

Discharge Pipe

PS Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 1 REV: 01

Wellington Water Ltd
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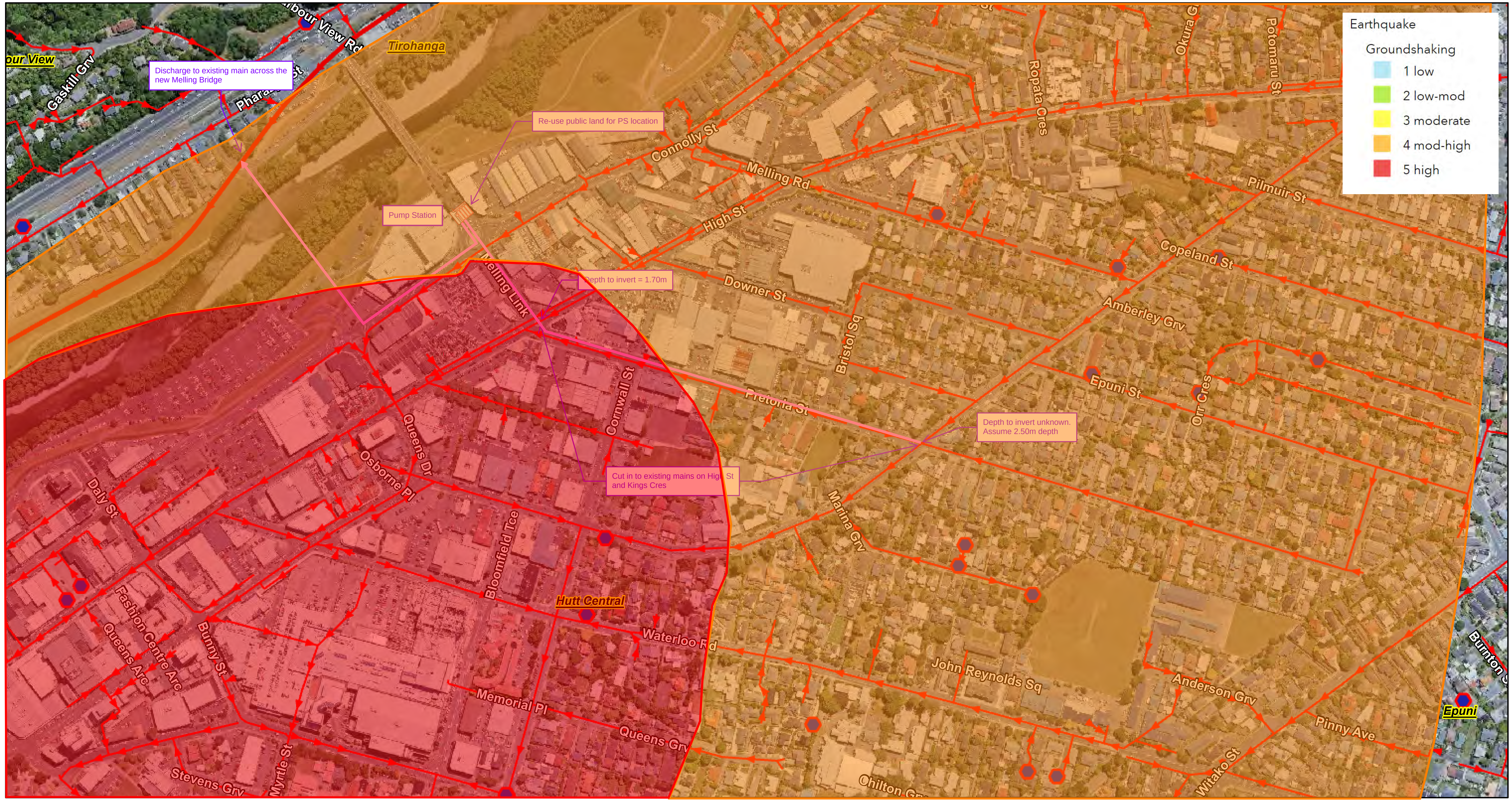
Wellington Water Ltd Map



Discharge to existing main across the new Melling Bridge

Re-use public land for PS location

Pump Station

Depth to invert = 1.70m

Depth to invert unknown. Assume 2.50m depth

Cut in to existing mains on High St and Kings Cres

5/5/2022, 9:49:59 AM

HAL Reference: AAJ

1:4,514

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

● Water Shut Valve

Wastewater Pipe

Trunk Main

Main

Discharge Pipe

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 23/06/2022

CSK: Option 2 REV: 02

Wellington Water Ltd

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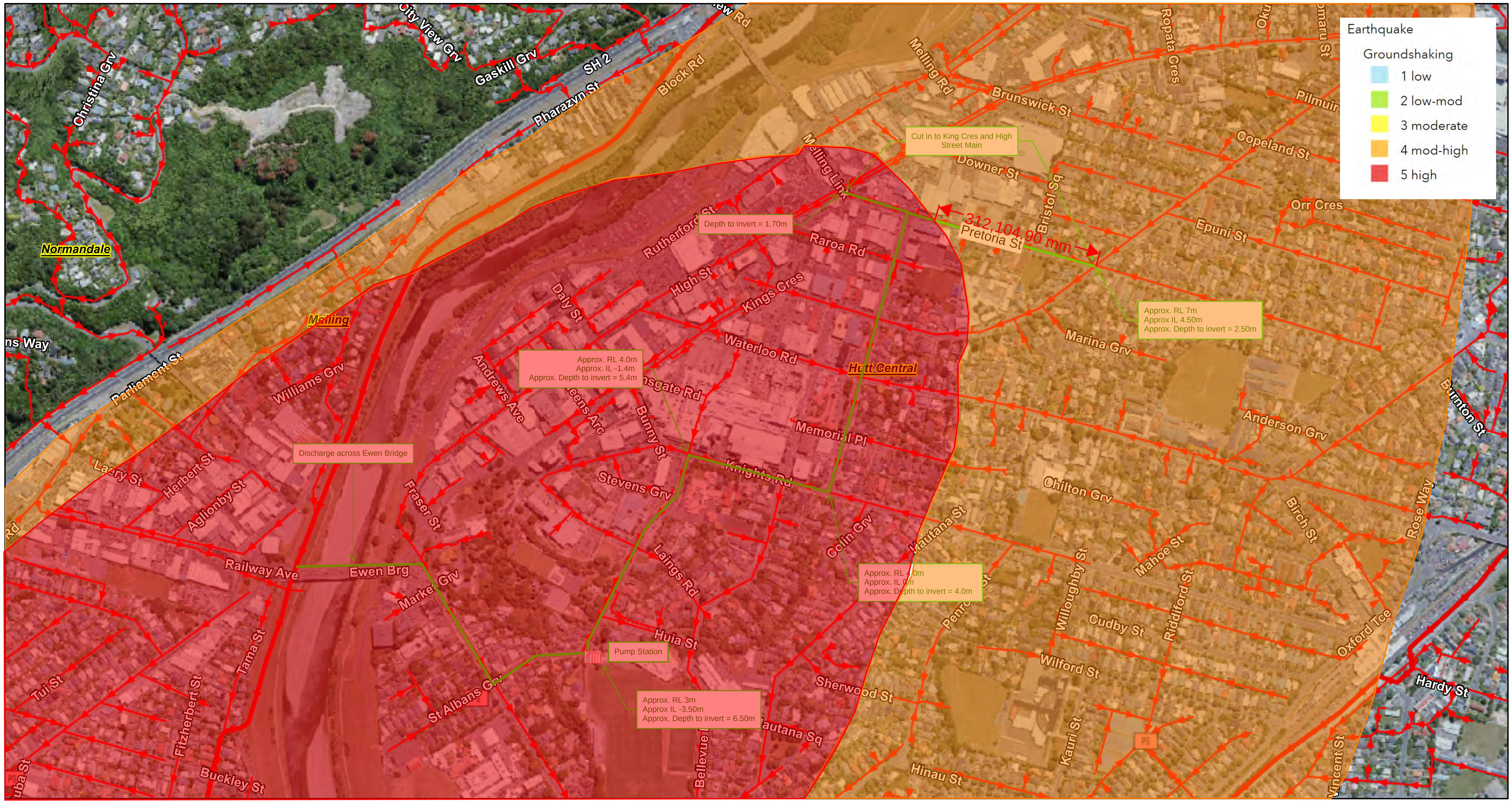
Wellington Water Ltd Map



5/11/2022, 12:06:34 PM

HAL Reference: AAN

1:7,000

0	0.07	0.15	0.3 mi
0	0.13	0.25	0.5 km

Wastewater Pipe

- Trunk Main
- Main
- Discharge Pipe
- PS Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 22/06/2022

CSK: Option 3 REV: DRAFT

Wellington Water Ltd

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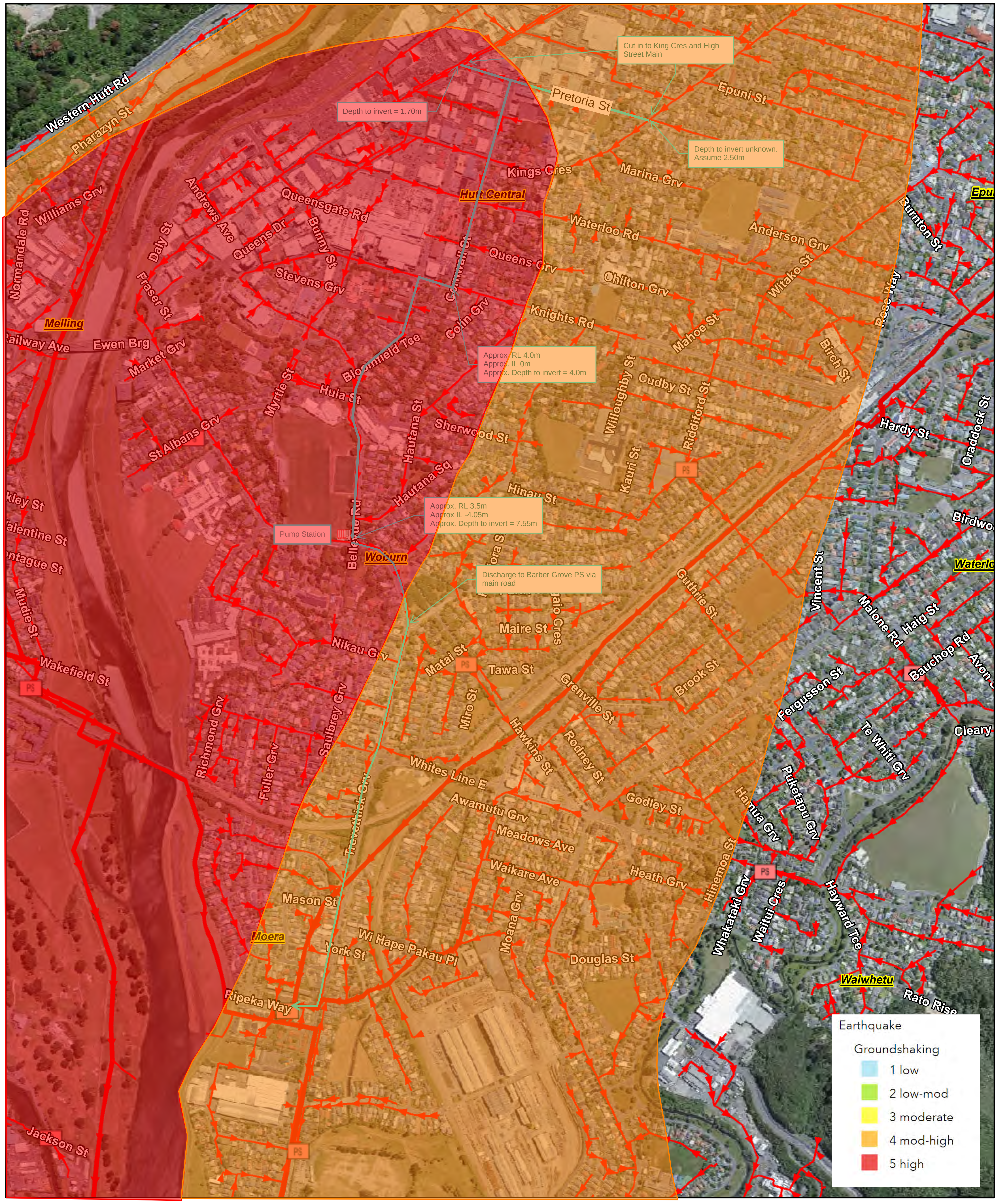
Wellington Water Ltd Map



Cut in to King Cres and High Street Main

Depth to invert = 1.70m

Depth to invert unknown. Assume 2.50m

Approx. RL 4.0m
Approx. IL 0m
Approx. Depth to invert = 4.0m

Pump Station

Approx. RL 3.5m
Approx IL -4.05m
Approx. Depth to invert = 7.55m

Discharge to Barber Grove PS via main road

5/9/2022, 10:26:32 AM

Wastewater Pipe
- Trunk Main
- Main
- Discharge Pipe
- Other
- Wastewater Pipe
- PS Wastewater Pumpstation

HAL Reference: AAO

1:9,028

0 0.1 0.2 0.4 mi
0 0.15 0.3 0.6 km

Holmes

PROJECT: Riverlink Wastewater Bypass
JOB NO: 144418.53 DATE: 22/06/2022
CSK: Option 4 REV: DRAFT

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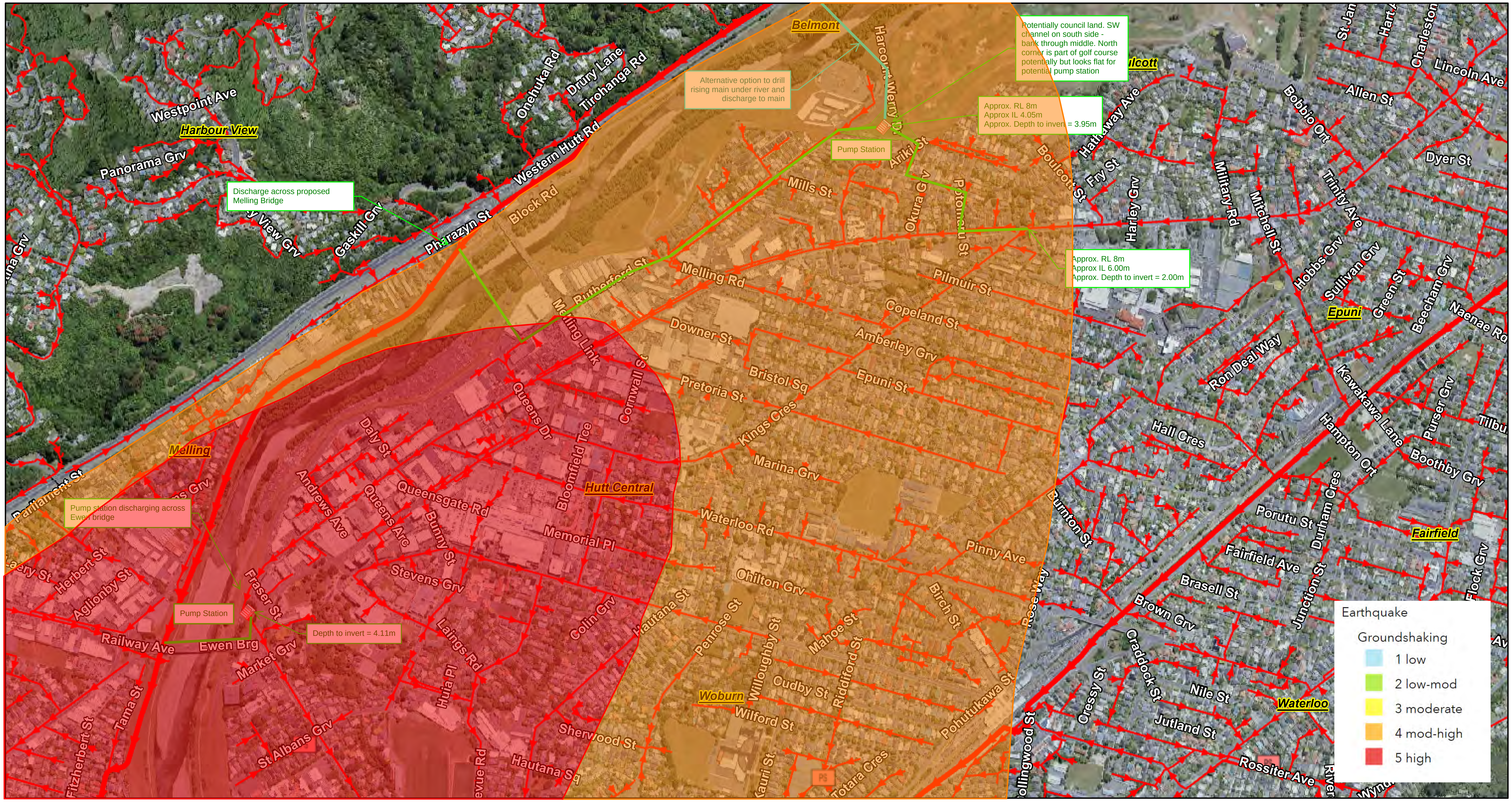
Wellington Water Ltd Map



Alternative option to drill rising main under river and discharge to main

Potentially council land. SW channel on south side - bank through middle. North corner is part of golf course potentially but looks flat for potential pump station

Approx. RL 8m
Approx IL 4.05m
Approx. Depth to invert = 3.95m

Pump Station

Discharge across proposed Melling Bridge

Approx. RL 8m
Approx IL 6.00m
Approx. Depth to invert = 2.00m

Pump station discharging across Ewen bridge

Pump Station

Depth to invert = 4.11m

5/23/2022, 11:24:52 AM

HAL Reference: AAL/AAM

1:9,028

0 0.1 0.2 0.4 mi
0 0.17 0.35 0.7 km

Wastewater Pipe

Wastewater Trunk Main

Wastewater Pipe

Wastewater Service Connection

PS Wastewater Pumpstation

Holmes

PROJECT: Riverlink Wastewater Bypass
JOB NO: 144418.53 DATE: 22/06/2022
CSK: Option 5 REV: 01

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Appendix G – Archaeological Assessment

ArchCheck

Hutt CBD Sewer Bypass

Date	09/08/2022
Project Location	Lower Hutt Central Business District
Project Code	OPC00004691
Project Contact	[redacted]
Prepared by	[redacted]– Archaeological Project Technician
Reviewed by	[redacted]– Senior Archaeologist
Risk rating and recommendations	Options vary from medium to very high – Archaeological Authority is recommended for all options. Please review Table 4 for risk rating on each option.

1. Introduction

This archaeological risk check has been prepared for the Hutt CBD Sewer Bypass Project, Lower Hutt (the project).

Hutt City Council have identified growth opportunities within Hutt Central associated with the Riverlink project. This is expected to significantly increase the population in Hutt Central, which will subsequently put additional pressure on the wastewater network. The purpose of this project is to assess the feasibility and select a preferred option for a new wastewater trunk main and/or pump station to provide for the regeneration and growth within Hutt Central associated with the Riverlink project. A short list of five options have been developed based on varying cut-in, pump station, and discharge locations.

This document aims to identify the risk of encountering archaeological deposits within the project area and to provide recommendations on the management of archaeological risk in line with the statutory requirements of the *Heritage New Zealand Pouhere Taonga Act 2014*.

1.1. Scope of this Report

This document aims to identify the risk of encountering archaeological deposits within the project area and to provide recommendations on the management of archaeological risk in line with the statutory requirements of the *Heritage New Zealand Pouhere Taonga Act 2014*.

1.2. Constraints and Limitations

1. This ArchCheck is a desktop assessment only and is a preliminary guide to identify potential risk and is not a complete archaeological assessment.
2. This report is not a full Archaeological Assessment of Effects and may not be used to apply for an Archaeological Authority or resource consent.
3. All archaeological sites are protected under the *HNZPTA*, whether they are recorded in ArchSite or not. It is illegal to modify or destroy an archaeological site without an Archaeological Authority from Heritage New Zealand Pouhere Taonga (HNZPT).
4. This report does not present the views of local iwi regarding the significance of the area to them. Such assessments can only be made by tāngata whenua, as Māori concerns may encompass a wider range of values than those associated with archaeological sites.
5. The New Zealand Archaeology Association's (NZAA) digital site record database ArchSite was the primary resource used for identifying recorded sites in the area. Archaeological site location data in ArchSite should be

regarded as a guide only as it is often based on reconnaissance rather than on accurate survey information. In addition to this, the area extents for many recorded sites are poorly defined.

2. Project Overview

Hutt City Council have identified growth opportunities within Hutt Central associated with the Riverlink project. This is expected to significantly increase the population in Hutt Central, which will subsequently put additional pressure on the wastewater network. The purpose of this project is to assess the feasibility and select a preferred option for a new wastewater trunk main and/or pump station to provide for the regeneration and growth within Hutt Central associated with the Riverlink project. A short list of five options have been developed based on varying cut-in, pump station, and discharge locations (Figure 1).

Figure 1: Hutt CBD Sewer Bypass extents. Note – each colour corresponds to a proposed route (Source –Holmes Riverlink Wastewater Pre-MCA Workshop Briefing Pack)

2.1. Option Descriptions

The following options have been reproduced from information sent by Holmes. The colours referred to in the option headings relate to Figure 1.

2.1.1. Option 1 - Green

Solution

- Cut into existing High Street and Kings Crescent main at Brunswick Street junctions
- New 1900m long 450mm diameter along High Street
- New 100 L/s + 600m³ pump at southern end of High Street
- New rising main across Ewen Bridge discharge to existing main in Railway Avenue

Construction

- Depth of wastewater main ranges from 2.3m at cut in point to 8.4m at the pump station
- Brunswick Street section is assumed to be open cut
- High Street section is assumed to be micro tunnelled, with shafts approx. every 100m
- Rising main assumed to be either open cut or horizontally directionally drilled (HDD) to Ewen Bridge then strapped to underside of Ewen Bridge

2.1.2. Option 2 – Yellow

Solution

- Cut into High Street and Kings Crescent main at Pretoria Street junctions
- New 650m long 375mm diameter along Pretoria St and Melling Link
- New 100 L/s pump station plus 600m³ storage at old Melling Bridge stub
- Discharge to existing main via new rising main across the new Melling Bridge

Construction

- Depth of excavation ranges from 2.5m at cut in to 5.7m at pump station
- Pretoria Street section assumed to be open cut
- Melling Link section is assumed to be micro tunnelled with shafts approx. every 100m
- Rising main assumed to be either open cut or horizontally directionally drilled (HDD) to the new Melling Bridge then strapped to the underside of the bridge.

2.1.3. Option 3 – Orange

Solution

- Cut into High Street and Kings Crescent main at Pretoria Street junctions
- New 1700m long 450mm diameter sewer main from Pretoria Street along Cornwall Street, Knights Road, and Myrtle Street
- New 200 L/s plus 600m³ pump station at Hutt Recreation Ground at Myrtle Street.
- New rising main across Ewen Bridge to discharge to existing main in Railway Ave

Construction

- Depth of excavation ranges from 2.5m at cut in to 6.6m at pump station.
- Pretoria Street and Cornwall Street section is assumed to be open cut
- Knights Road and Myrtle Street section is assumed to be micro tunnelled, with shafts approx. every 100m
- Rising main assumed to be either open cut or horizontally directionally drilled (HDD) to Ewen Bridge, then strapped to the underside of the bridge

2.1.4. Option 4 – Blue

Solution

- Cut in to High Street and Kings Crescent main at Pretoria Street junctions
- New 1800m long 450mm diameter sewer main from Pretoria Street
- New 200 L/s plus 600m³ pump station at Hutt Recreation Ground along Bellevue Road.
- New rising main discharging to Barber Grove pump station via main road.

Construction

- Depth of excavation ranges from 2.5m at cut in to 7.7m at the pump station.
- Pretoria Street and Cornwall Street is assumed to be open cut
- Knights Road and Bloomfield Terrace/Bellevue Street section is assumed to be micro tunnelled, with shafts approx. every 100m
- Rising main assumed to be either to be open cut or horizontally directionally drilled (HDD).

2.1.5. Option 5 – Red

Solution

- Cut in to main at High Street and Kings Crescent junction
- New 450m long 450mm diameter sewer main from Kings Crescent along Okura Grove and Akiri Street
- New 50 L/s pump station at Ariki St
- New rising main to discharge existing main across new Melling Rd bridge. Alternative option to drill rising main under river and discharge to main
- And a new 50 L/s pump station plus 600m³ pump station at Ewen bridge

Construction

- Depth of excavation ranges from 2.0m at cut in to 4.0m at pump station

- Potomaru Street and Ariki Street section is assumed to be open cut
- Rising main along Rutherford Street is assumed to be open cut or horizontally directionally drilled (HDD), then strapped to the underside of the new Melling Bridge.

3. Results

3.1. Archsite Review

3.1.1. General Archaeology Notes

Archsite is the New Zealand Archaeological Associations nationwide database of archaeological sites. These sites are geospatially recorded and provide insight into the archaeological landscape of an area, while also providing indication of what may be expected with regard to the survival of archaeological features.

The New Zealand landscape is typically under-recorded in terms of archaeology due to un-systematic surveys and ad hoc addition of archaeological sites to Archsite. This has resulted in a varied picture of the archaeological landscape. Recorded archaeological sites can provide information around previous research and investigations in the area as well as provide some indication of what to expect in regard to the survival of archaeological features.

Pre-European archaeology typically consist of few surface features but typically indicate a wider landscape use. These features tend to be easily disturbed and, in some cases, destroyed by modern modification of the landscape. Despite an apparent lack of recorded archaeology within a site some areas have inherently higher archaeological risk, such as their proximity to recorded sites but also other features such as rivers or coastlines.

Historic sites often only identify single buildings, such as houses, in wide landscapes such as most towns. While useful for indicating the occupation of an area, recognised Archaeological sites provide only record small portions of archaeological landscapes and should not be treated as a complete record.

3.1.2. Archsite Records

The following table outlines the currently recorded archaeological sites in proximity to the project area. Details of relevant archaeological sites are outlined in Table 1 and Figure 2 below.

Table 1: List of Archsites within the project area – (Source: Archsite).

Site Number	Site Name	Site Type	Description	Option Effected
R27/732	Maraenuku (Maraenuka) Pa	Colonial 1840-1900	The former site of Marae-nuku (also noted Marae-nuka) Pa, was in the vicinity of the present Connolly Street (formerly Riverbank Road) substation. This pa was constructed during the early 1840s by Te Kaeaea in response to disputes over settler land acquisitions and burnt down in 1847.	5
R27/639	White Villa Farm	Colonial 1840-1900	White Villa Farm, which comprises “a good dwelling house, containing nine rooms and a dairy together with two cottages, let to respectable tenants: a large garden, over an acre of ground, highly cultivated, and containing an orchard and the choicest of fruit trees now in full bearing. Also 10 acres of land mostly laid down in English grass, the land being the very richest soil in the Hutt, and it is all fenced in with posts and rails and hawthorn hedge. This land is divided by the main road and is adjoining Dr. Wilford's property on the one side.......A large barn. 40Ft x 20ft, stables for four horses, cow sheds for ten cows, pig-styes, fowl house &c, &c. A never failing spring of water on the land”.	1 & 5
R27/737	Historic High Street Lower Hutt	Colonial 1840-1900	Various survey plans show settlement in this area in the 1870s, which would have been a little later then the first Hutt settlement associated with the Hutt River Bridge settlement of the 1840s-1850s. The main survey plan showing detailed settlement along this section of High Street is SO11185 dating to 1876. SO11786 (1881) also shows a number of developments in the area, many of them labelled.	1 with minor effect on 2,4 & 3

Site Number	Site Name	Site Type	Description	Option Effected
R27/734	Hutt River Bridge Settlement	Colonial 1840-1900	The settlement developed around the bridge access and included a number of hotels and stores. Fort Richmond (later the Hutt Stockade) was present in the area from 1845 until around 1868 (recorded previously as R27/542). There were at least six different Hutt River Bridges constructed in the area also (recorded previously as R27/541). The bridge settlement along the main road included:	2 & 3
R27/542	Fort Richmond	Colonial 1840-1900	Fort Richmond was constructed in 1845 by settler Captain George Compton. The earthwork defences encompassed an area 85 x 85 feet. It was occupied by the 58th Regiment from April 1845. The Hutt Stockade was built on approximately the same site in 1860.	2 & 3
R27/603	Vogel House	Colonial 1840-1900	During the mid to late 19th century the land was owned (at different times) by notable New Zealand Company settlers who played important roles in the early political and social life of the young colony. It is very likely that one early settler family, the Kelhams, built the small cottage that still survives today as a gatehouse in the 1870s to 1880s.	3
R27/232	Stone Fireplace	Colonial 1840-1900	Part of William Fitzherbert's homestead, and subsequently known as 'Tredenham'. This building was originally constructed in Sydney for Fitzherbert's wife and children who had fled Wellington following the 1848 earthquake. It was dismantled and relocated to Wellington when Fitzherbert's family joined him in 1852. Tredenham was largely destroyed by fire in 1893, but it appears part of the foundations remained in-situ.	3
R27/736	Site of 1890s buildings	Colonial 1840-1900	This site includes building development on a rural, probable farming property subdivided for Elizabeth J. Kingdon in 1897 (A885) and 1908 (DP 1731). Three buildings are show on Kingdon's property in 1897 in the vicinity of what is now 76 Pharazyn Street, the carriageway adjacent to 78-80 Pharazyn Street and 100 Pharazyn Street (corner of Block Road).	New Melling Bridge

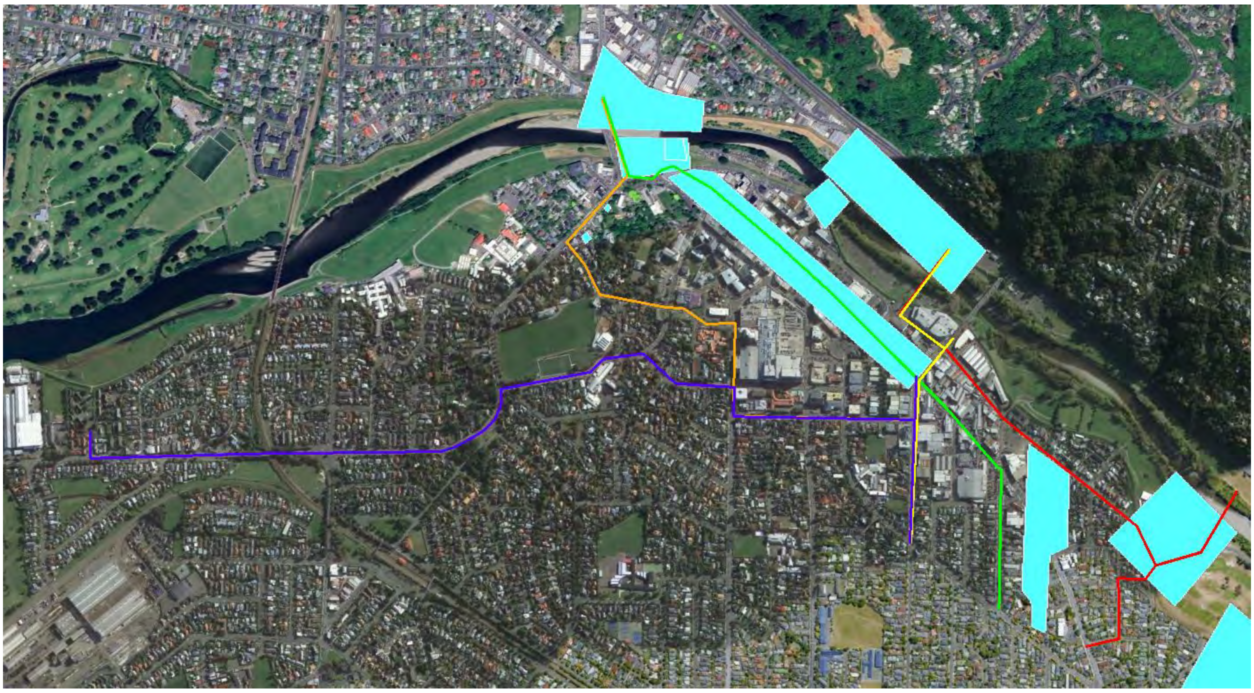

Figure 2: Current site extents of relevant recorded archaeological sites related to the project options are displayed in light blue, with the various sewer bypass options in their respective colours. (Source: Archsite)

3.1.3. Archsite Summary

Each option for the project site is impacted by the presence of a recorded archaeological site. This impact varies as the extents of many of the recorded archaeological sites in the Hutt area are not well known, with no systematic archaeological survey having taken place. At this stage in the Archcheck process, Option 4 impacts the least recorded archaeological area with a very brief intersection with Archsite R27/737, which is a broadly identified site of mid to late 19th century buildings.

3.2. Historic Survey Plans

Table 2 outlines the relevant survey plans in proximity to the project area.

Table 2: List of Survey Plans reviewed as part of this Archcheck (Source: GRIP).

Survey Plan	Area	Year	Plan Type	Relevant Details
A 885_B	Wellington	1897	Sketch	Far side of the Hutt River. Shows the alignment of the old Wellington to Wairapa railway. Alongside various dwellings.
SO 11185_C	Wellington	1897	Alignment Surveying	Alignment of the main Hutt Valley Road (now High Street) with detailed buildings
SO 11786_B	Wellington	1881	Property Boundaries	Detailed section plans along Hutt Valley Road (High Street)

The GRIP database contains thousands of cadastral surveys from 1840 onwards. By nature, surveys have a relatively high degree of accuracy and the ability to access historic digitised surveys allow for overlays and comparison to modern maps to identify archaeological features.

3.2.1. SO 11786_B

Plan SO 11786, dated 1881 (Figure 3), shows the clear alignment of Main Road, now High Street, Lower Hutt. This plan details several key dwellings and places of historical occupation as defined by Archsite R27/737.

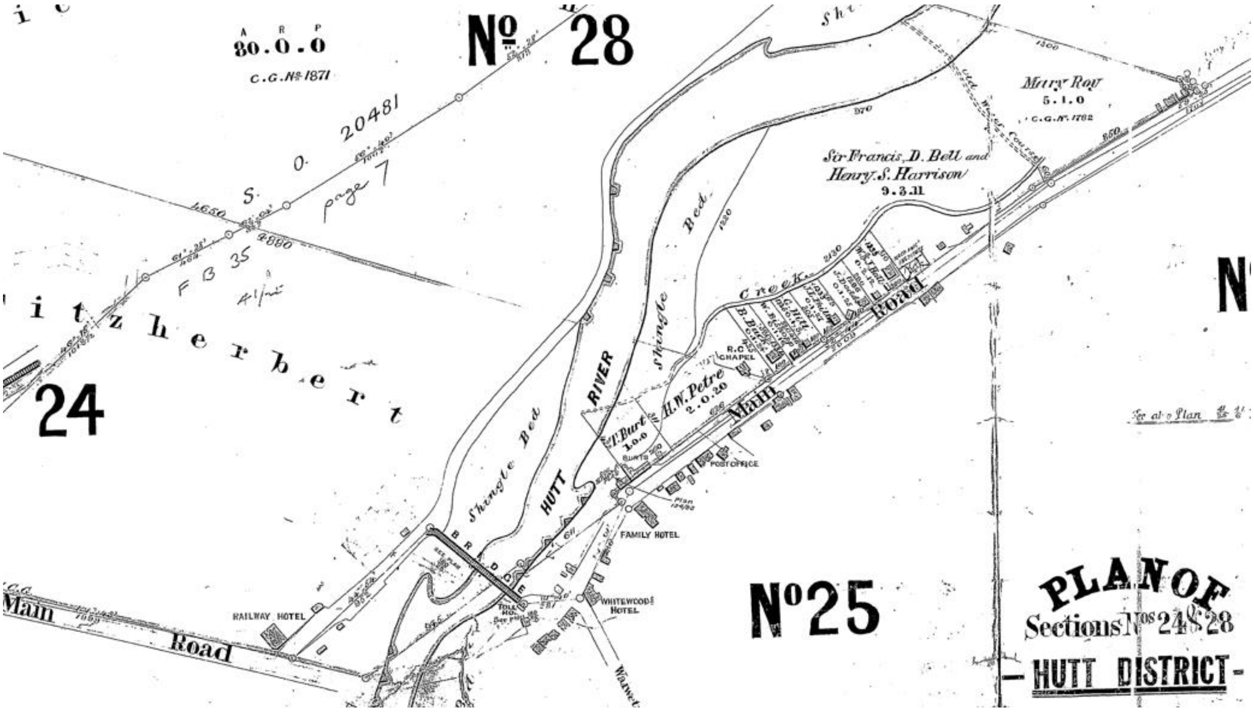

Figure 3: Survey So11786 dated 1881 (Source: LINZ)

3.2.2. Survey Plans Summary

Due to the complexity and patchy nature of the Hutt Valley historical survey plans, few key historic occupation sites can be defined by them. Exception to this are plans SO11786, 11185 and SO 10636_B which clearly show the town alignment, buildings and pā site respectively. While the latter plan, SO 10636 is difficult to geolocate due to the lack of key position features to compare to modern maps, the approximate area can be identified as being just north of the current CBD.

At this stage in the Archcheck process, two project options, Option's 1 & 5, cross areas of surveyed historical occupation.

3.3. Historic Aerial Photographs

Beginning in 1930, both local and national governments began a campaign of aerial photography to map New Zealand in detail. Typically taken at 9000 feet these Microfiche images provide great detail and when compared to modern satellite images allow for the changes that have occurred in the last 90 years to be accurately mapped.

This information is key to providing insight into the level of disturbance an archaeological site may have endured, and in some instances, whether or not the site had endured into the 20th century.

3.3.1. 1939 Aerials

The first year of aerial photographs identified in the Hutt Valley was 1939 (Figure 4). Significant development had taken place by 1939 with vast amounts of urban expansion occurring in the interwar years, with much of the expansion occurring on the back of the first and second state housing programs. This is clearly seen in the aerial photographs of the period with large scale and uniform expansion occurring outwards from the CBD area.

Figure 4: Year 1939 - Historic aerial snip focused on the project area (red)

3.3.2. Historic Aerials Summary

While a significant level of ground disturbance has occurred in and around the project area since 1900s, evidence of land modification around known historic occupation areas cannot conclusively rule out the presence of inground archaeology therefore the presence and depth of the remaining archaeology is an unknown.

3.4. Additional Sources

3.4.1. Rārangi Kōrero Pouhere Taonga (The List)

The New Zealand Heritage List/Rārangi Kōrero (formerly the Register) is Heritage New Zealand's database of Aotearoa's significant heritage places, including Ngā Manawhenua o Aotearoa me ōna Kōrero Tūturu/National Historic Landmarks. Table 3 shows the list entries were identified for this project.

Table 3: The list (Rārangi Kōrero Pouhere Taonga) entries.

List Entry Type	Name	Year of Construction	Additional Information	Effected Option
Historic Place Category 2	Former Post Office	1943	Art Deco Style Post Office Building	1
Historic Place Category 2	Civic Centre Historic Area	1953-1959	Garden City style complex consisting of a Civic Centre, Library, Town Hall, Horticultural Hall and Church	1 & 3
Historic Place Category 1	Vogel House	1870-1933	Neo-Georgian Style Home with extensive grounds and a gatehouse constructed in the 1870s	3
Historic Place Category 1	Nash House	1930	Two Bedroom Concrete 'Bungalow' style home of former prime minister Sir Walter Nash	Nil
Historic Place Category 2	Offices	1907	Single story Italianate style bay villa	4 & 3

3.5. Historic Images

Lower Hutt CBD in the mid-1880s show a clear occupation zone surrounding the main Hutt Road, with several businesses and other public buildings developing around the crossing of the Te Awa Kairangi River (Figure 5).

Figure 5: Annotated 1880s image of Lower Hutt CBD (Source – Victoria Grouden Archsite R27/734 Report)

4. Conclusions

4.1. Discussion

The historical landscape of the Lower Hutt central business district is diverse with several distinct eras of occupation. Archsite R27/732 is a Māori historical occupation zone with record of Maraenuku Pā from survey plan SO10636 showing the location of the pā on the bank of the Te Awa Kairangi River. The bypass Option 5 intercepts the Maraenuku Pā archaeological site, with the alternative discharge option angled directly through the pā site. Archsite R27/542 also provide context for the early to mid-19th century occupation of the area with localised conflict requiring the construction of a fort in 1845. The situation of this site is largely unknown and presents increased archaeological risk for the area. The likely options to be affected by this historical occupation is Option 1 with a possibility of Option 2.

Other archsites related to the project within the Hutt Valley area are recorded occupation sites from the latter half of the 19th century, with several homesteads, commercial buildings and other notable buildings included. These archsites impose on all project options, with Option 4 being the least likely effected.

Little further information can be ascertained with regard to the proximity of recorded archaeological sites and the project's effect on them without further detailed research into the historical occupation of the area. It is recommended this level of research is undertaken once the route Option is chosen.

4.2. Summary and Recommendations

All proposed options for the project incur some risk of encountering both known and unknown archaeological material. For the purpose of simplifying the risk analysis, Table 4 has been included to give a risk-based analysis of each site and proposed archaeological risk mitigation measure.

Table 4: Risk analysis for all options

Option	Largest known risk factor	Archaeological Risk	Mitigation measure
1	Various Historical occupation, farm sites, commercial buildings and historical infrastructure related to the CBD. Archsites R27/737, R27/734, R27/735	**High** – Several known archaeological sites are crossed	Archaeological Assessment of Effects report conducted with view of obtaining an Archaeological Authority. **This would likely be a legal requirement.**
2	Various Historical occupation, farm sites, commercial buildings and historical infrastructure related to the CBD. Archsites R27/737, R27/736	**High** – Several known archaeological sites are crossed	Archaeological Assessment of Effects report conducted with view of obtaining an Archaeological Authority. **This would likely be a legal requirement.**
3	Various Historical occupation, farm sites, commercial buildings and historical infrastructure related to the CBD. Archsites R27/737, R27/734, R27/735, R27/630, R27/232	**High** – Several known archaeological sites are crossed	Archaeological Assessment of Effects report conducted with view of obtaining an Archaeological Authority. **This would likely be a legal requirement.**
4	Single historical occupation site R27/737	**Medium** – One recorded site crossed with unknown extents	Archaeological Assessment of Effects report conducted with the possible view of obtaining an Archaeological Authority.
5	Various Historical occupation, farm sites, commercial buildings and historical infrastructure related to the CBD. Archsites R27/737, R27/736, R27/639, R27/732	**Very High** - Several known archaeological sites are crossed including historical pā	Archaeological Assessment of Effects report conducted with view of obtaining an Archaeological Authority. **This would likely be a legal requirement.**

Review of desktop plans and literature indicates a high density use of the project area in the latter half of the 19th century, with significant use of the wider Lower Hutt area in the preceding decades. Thus, there is likely extensive archaeological material in the area. While the area has been heavily modified with the intense urban expansion of the Hutt valley in the early to mid-20th century, the likelihood of inground archaeology being present in all areas of the project is high.

All project options present some archaeological risk, however, the risk of encountering known in-ground archaeological is higher on some options than others. It is recommended that for all options proposed an Assessment of Archaeological Effects report is undertaken with the likely requirement of obtaining an Archaeological Authority from Heritage New Zealand. However, from this ArchCheck/risk point of view, Option 4 is the lowest risk pipeline route as it only encounters one currently recorded archaeological site.

As a number of the recorded archaeological sites are of Māori origin it is recommended that consultation with relevant tāngata whenua is undertaken for the project in an early and meaningful way.

Appendix H – Risk Register (Concept Design Update)

Risk Register

Project/Contract: RiverLink - Hutt CBD Sewer Bypass
Project/Contract ID: OPC101481
WWL Lead: [redacted]

Document Date:
Supplier Lead: [redacted] | Holmes
RM Specialist: [Enter data in '2 Project Information New'] | [Enter data in '2 Project Information New']
Risk Tolerance Threshold: 21

										Current Exposure Semi-Quantitative			Treatment Strategy	Residual (Target) Exposure Semi-Quantitative					
Rank	RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Likely Cost ($M)	Likely Delay (Months)	Risk Score	Commentary & Closure Statement
2	R01	Funding Envelope	Description: There is a threat that the project cost is above the current approved funding amount of [redacted](rates and developer contributions) Cause: The cause of the threat is an underestimate of cost at budget setting stage and additional requirements and costs being identified during concept design Consequence: The consequence of the threat is insufficient funding to complete project resulting in project being cancelled and loss of funding or inability to meet project outcomes due to funding constraints	Project Manager	WWL	6/10/2022	Live - Treat	Construction	- Level 1 cost estimates undertaken by Alta as part of optioneering - MCA including capital cost + sensitivity testing on cost weighting - Cost estimate updated to Level 2 for concept design	High	very high	22	- Input updated expected cost into HCC annual plan review (October 2023) to increase project budget - Investigate and progress value for money ideas identified - Consider undertaking targetted value for money activities (workshop etc.)	High	Very Low	0.003	0.125	8	
3	R02	Riverlink Programme Tie-in	Description: There is an opportunity to hand the detailed design and construction of Hutt CBD Sewer to the Riverlink Alliance. Cause: The cause of the opportunity is the Riverlink Alliance, which includes HCC, is currently out to tender and the Hutt CBD Sewer can be incorporated in to the project scope Consequence: The consequence of the opportunity is coordinated scheduling of Riverlink works along with Hutt CBD Sewer project resulting in less disruption to the public and potential efficiencies (time and cost) in delivery	Project Manager	WWL	6/10/2022	Live - Treat	Design Development	- Ongoing engagement with HCC RiverLink project management - Hutt CBD sewer project timeframes aligning to RiverLink timeframes	Medium	High	17	- Present opportunity to RiverLink board to gain approval	Medium	Very High	10	6	18	
2	R03	Extent of Riverlink Designation	Description: There is a threat that the Hutt CBD Sewer project falls outside of the Riverlink consent designation. In particular the location and volume of the storage tank requires a separate consent. Cause: The cause of the threat is the Riverlink designation was obtained without the Hutt CBD Sewer project in frame Consequence: The consequence of the threat is Hutt CBD Sewer project will have to be consented separately, and that this will need to be done by WWL before passing to Riverlink Alliance. This could delay delivery of the project and ability to tie into main RiverLink works	Project Manager	WWL	6/10/2022	Live - Treat	Design Development	- Review possible consent triggers and highlight as part of optioneering - Complete planning assessment and include as part of concept design deliverables	High	very high	22	- Engage HCC and GWRC consenting teams with the project to understand requirements - Commence discussions with RiverLink on preferred approach - separate consenting vs changes to RiverLink consent designation	Medium	Low	0.03	0.5	11	
13	R04	IAF Funding Window	Description: There is a threat that the project cannot be delivered within the timeframe agreed with Kainga Ora - currently understood to be end of calendar year 2026. Cause: The cause of the threat is dependancies on to be constructed elements of the Riverlink works means the sewer bypass may be pushed to later stages by the Alliance Consequence: The consequence of the threat is that this could adversly effect HCC's reputation with Kainga Ora potentially putting at risk funding provided for other projects. This would require the shortfall to be found by HCC or the project cancelled due to insufficient funding	RiverLink Partner Lead	HCC	6/10/2022	Live - Parked	Detailed Design	- Options that utilised proposed Melling road bridge and/or existing Melling bridge stub updated to remove dependancies on those elements of the project - There is an opportunity to move the date as part of issuing of delivery plans - if the dates moved and there is justification this will probably be acceptable	medium	medium	15		medium	Medium	0.3	2	15	
	R05	Western Trunk Main Sewer Capacity	Description: There is a threat that the western trunk sewer and terminal pump station (Ava) have current operational risks that would be made worse by adding extra flow from Hutt CBD Cause: The cause of the threat is additional flow being sent to Western Trunk / Ava from Hutt CBD via the bypass and pump station Consequence: The consequence of the threat is that possibly more flow will need to be restricted at Silverstream and bypassed to storage/EOP causing additional spilling of wastewater at Silverstream. This may also contribute to complexities in operating the Western Trunk main increasing the risk of uncontrolled spilling at Ava pump station	Lead Designer	Holmes	6/10/2022	Closed	Operation	- Review alternate options with COG - MCA including cost, risk and COG inputs - Develop options to mitigate operational risk - Gain COG endorsement prior to commencing concept design	Very high	High	24				#N/A	#N/A	0	Solution developed to not increase peak flow in Western Trunk Main and mitigate any increase in uncontrolled spilling downstream of bypass discharge point
9	R06	Engineered Overflow Point Consenting	Description: There is a threat that the engineered overflow point needs to be consented to be built Cause: The cause of the threat is the current approach is to not consent the EOP but install it with a control valve. The EOP will then only be used in an emergency event and a decision can be made to open the EOP valve. Use will be covered under the emergency works provisions of the RMA. Consequence: The consequence of the threat is that the consent authority deems that the emergency works provisions of the RMA do not apply and consent is required. This may result in delays to the project to obtain the required consent or EOP not being constructed resulting in the project not being able to be operated as intended.	Project Manager	WWL	6/10/2022	Live - Parked	Design Development	- Awaiting outcome of WWL's current network discharge consent application - Seeking legal advice - Consenting requirements for EOP covered in planning assessment	high	Medium	19		high	Medium	0.3	2	19	
	R07	Stakeholder Buy-in	Description: There is a threat that the project will stall because a decision cannot be reached. Cause: The cause of the threat is stakeholders have opposing views that cannot be easily resolved. Consequence: The consequence of the threat is project delay or preferring an option that is not the highest scoring through the MCA	Lead Designer	Holmes	6/10/2022	Closed	Optioneering	- MCA process with all stakeholders included - Risk workshop to highlight risks and mitigation measures - Further work identified to mitigate risks highlighted by stakeholders - 3WDMC to make a call	medium	Medium	15				#N/A	#N/A	0	Preferred option endorsed by 3WDMC prior to concept design
6	R08	Storage Volume	Description: There is an opportunity to increase overflow storage capacity in Hutt CBD Cause: The cause of the opportunity is building a new pump station provides opportunity for storage Consequence: The consequence of the opportunity is that a larger storage capacity could reduce the overall spilling amount from nearby EOPs including Barber Grove.	Project Manager	WWL	6/10/2022	Live - Parked	Design Development	- Network modelling outlining storage options to reduce overflows - Alternative project to look at storage options and costs	Medium	low	11		medium	Low	0.03	0.5	11	
	R09	EOP Gravel Inundation	Description: There is a threat that an EOP to Hutt River may be subject to gravel aggradation / blockage. This is worse south of Ewen Bridge (affects Option 4) Cause: The cause of the threat is the section of river south of Ewan bridge is known aggrade gravel Consequence: The consequence of the threat is that any EOP outlet structure south of Ewan bridge may required additional maintenance to keep operational	Lead Designer	Holmes	6/10/2022	Closed	Operation	- Review location of EOP in relation to known opeational issues / gravel aggredation sites / proposed river bed levels	high	Low	16				#N/A	#N/A	0	EOP structure proposed north of Melling Bridge in area that doesn't accumilate gravels
	R10	Uncontrolled vs. Overall Spill Reduction	Description: There is a threat of negative implications when considering network discharge consent. Cause: The cause of the threat is that although project addresses reduction in uncontrolled spills, these are effectively moved to a controlled spilling point which, in some instances, results in an increase in spilling out of an EOP Consequence: The consequence of the threat is if criteria is to address overall spilling there would be significant implications to required storage volume. High level modelling indicates approximately 3,600m3 of storage required for project to reduce overall spilling to nil.	Project Manager	WWL	6/10/2022	Closed	Design Development	- Understand wider network and aim of reducing overall spilling. '- Project based on assessment of reduction in uncontrolled spilling meets secondary service objective.	Medium	Medium	15				#N/A	#N/A	0	3WDMC endorsed preferred solution including consequence of increased controlles spilling
13	R11	Sequencing of Project in Riverlink Programme	Description: There is a threat that works will be difficult to sequence if not aligned with Riverlink Alliance programme Cause: The cause of the threat is not delivering the project through the Alliance Consequence: The consequence of the threat is potential project delays, increase in cost and increased disruption to the public	Project Manager	WWL	6/10/2022	Live - Treat	Design Development	- Ongoing engagement with HCC RiverLink Partner Lead - Hutt CBD sewer project timeframes aligning to RiverLink timeframes	Medium	Medium	15	- Present opportunity to RiverLink board to gain approval	Medium	Very Low	0.003	0.125	4	
7	R12	Optimisation of Design	Description: There is an opportunity to optimise the storage and pump station size Cause: The cause of the opportunity is the new pump station and storage facility in Hutt Central Consequence: The consequence of the opportunity is the ability for Wellington Water to either reduce wider network spilling or reduce project cost through design optimisation	Project Manager	WWL	25/10/2022	Live - Parked	Design Development	- Run parallel project with new activity brief to look at optimising storage and pump station sizing	Low	Medium	10		Low	Medium	0.3	2	10	
	R13	Interface with Other works	Description: There is a threat that the location pump station for option 4 coincides a new water supply bore. Cause: The cause of the threat is that there is a water supply bore located in south east corned of Hutt Recreation Ground. Consequence: The consequence of the threat is that the water supply bore will need to be removed or an alternative location for the pump station found.	Lead Designer	Holmes	27/10/2022	Closed	Design Development	- Obtain as-builts, carry out site investigations: geotech, topo & existing services surveys. - Check design against positions of all known services at design phase.	Medium	low	11				#N/A	#N/A	0	Option this affected is not being taken forward
5	R14	Operation of EOP	Description: There is a threat that the new EOP wouldn't operate under high river flow conditions. Cause: The cause of the threat is that central Hutt is very flat when in flood river levels are above surrounding ground level Consequence: The consequence of the threat is that emergency overflows would not operate under high river flows possibly leading to uncontroleld overflows.	Project Manager	WWL	27/10/2022	Live - Parked	Operation	- Review EOP discharge location and route during design development - Option to provide pumped overflow for high river flow conditions	Very High	Low	20		Very High	Low	0.03	0.5	20	
4	R15	Interface with Stormwater Project	Description: There is an opportunity to align some of the wastewater works with the stormwater. Cause: The cause of the opportunity is linking IAF projects for more efficient delivery Consequence: The consequence of the opportunity is cost savings for the project, reduced risk of delays and reduced impact on the public.	Project Manager	WWL	27/10/2022	Live - Treat	Construction	- Ongoing engagement with HCC RiverLink Partner Lead - Commence development of stormwater projects to increase likelihood of combining with this project	Low	Low	6	- Progress drafting of activity brief to kick-off stormwater projects	Low	Very high	10	6	14	

Risk Register

Project/Contract: RiverLink - Hutt CBD Sewer Bypass
Project/Contract ID: OPC101481
WWL Lead: [redacted]

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RM Specialist: [Enter data in '2 Project Information New'] | [Enter data in '2 Project Information New']
Risk Tolerance Threshold: 21

										Current Exposure Semi-Quantitative			Treatment Strategy	Residual (Target) Exposure Semi-Quantitative					
Rank	RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Likely Cost ($M)	Likely Delay (Months)	Risk Score	Commentary & Closure Statement
9	R16	Ground Conditions / Other Services	Description: There is a threat that unkown services or ground conditions will be encountered in construction Cause: The cause of the threat is existing or redundent services not surveyed / located and variations in ground conditions not identified / recorded. Consequence: The consequence of the threat is delays to project or unforseen costs.	Project Manager	WWL	27/10/2022	Live - Treat	Design Development		High	Medium	19	- Obtain as-builts, carry out site investigations: geotech, topo & existing services surveys. - Check design against positions of all known services at design phase.	High	Very Low	0.003	0.125	8	
	R17	Alicetown Uncontrolled Spilling	Description: There is a threat that solutions connecting to the WHTM could have a knock-on effect downstream. Cause: The cause of the threat is connecting to WHTM and not addressing upgrade works inline with population growth. Consequence: The consequence of the threat is that uncontrolled spilling could occur in Alicetown or increased project costs to address knock-on effect.	Lead Designer	Holmes	31/10/2022	Closed	Operation	- Further work identified to understand immediate upgrades required to protect Alicetown and Ava pump station - Upgrade works for WHTM in HCC LTP - Solution developed to mitigate this risk	Very high	high	24				#N/A	#N/A	0	Solution developed so no longer increases uncontrolled spilling in Alicetown
2	R18	Availability of Resources	Description: There is a threat that HCC RiverLink Partner Lead has insufficient capacity to adequately support this project. Cause: The cause of the threat is this project is outside the original scope of the RiverLink project and is funded by IAF. Therefore, it hasn't been allowed for in the original resourcing plan. Consequence: The consequence of the threat is this project isn't adequately championed to the RiverLink board, and therefore doesn't become part of realising threat R11 and missing opportunity R02.	Project Manager	WWL	21/02/2023	Live - Treat	Procurement	- Continued engagement and pushing project with HCC RiverLink Partner Lead	High	Very High	22	- Continue to push agenda of this project with HCC RiverLink Partner Lead - Escalate within Wellington Water to enable escalation within HCC	Medium	Low	0.03	0.5	11	
1	R19	Groundwater Management	Description: There is a threat that the groundwater table needs to be drawn down to enable construction of the storage tank Cause: The cause of the threat is a high groundwater table and deep, buried storage tank. Consequence: The consequence of the threat is increase costs, potential programme delays and impacts on adjacent properties caused by settlement	Lead Designer	TBC	8/03/2023	Live - Treat	Construction		Very High	Medium	23	- Complete geotechnical site investigation including groundwater monitoring to confirm groundwater levels	Very High	Very Low	0.003	0.125	13	
11	R20	Consent Requirements	Description: There is a threat that resource consent for EOP will include additional requirements such as screening. Cause: The cause of the threat is the construction of a new EOP to the Hutt River and that conversations have not started with the consenting authority to understand their requirements Consequence: The consequence of the threat is additional capex and opex cost to install and maintain the additional infrastructure	Project Manager	WWL	7/03/2023	Live - Treat	Design Development		Medium	High	17	- Engage consenting authority on construction of new EOP to understand their requirements	Medium	Medium	0.3	2	15	
13	R21	Ground Conditions and high groundwater table	Description: There is a threat that the ground conditions are poor or will become consolidated and a high groundwater table Cause: The cause of the threat is unknown ground conditions and groundwater level being allowed for in the design of the storage tank Consequence: The consequence of the threat is the design of the storage tank will have to account for poor ground and/or settlement and high groundwater table	Lead Designer	TBC	8/03/2023	Live - Treat	Detailed Design		Medium	Medium	15	- Complete geotechnical site investigation to confirm ground conditions and groudnwater table at location of storage tank	Low	Medium	0.3	2	10	
4	R22	Storage Tank Operation	Description: There is an opportunity to improve the operability and maintenance of the storage tank through designing out seals and including a bypass pipe to bypass the pump station Cause: The cause of the opportunity is early engagement of COG in the design of the storage tank Consequence: The consequence of the opportunity is reduction in operation and maintenance costs including need to overpump when accessing the pump station wet well	Lead Designer	TBC	8/03/2023	Live - Treat	Design Development		Low	Very Low	2	- Explore option to include as part of design development	Low	Very High	10	6	14	
5	R23	Private Property Purchase	Description: There is a threat that a suitable site cannot be purchased to locate the pump station and storage tank Cause: The cause of the threat is the need to purchase private property to locate the pump station and storage tank Consequence: The consequence of the threat is the project cannot progress	Project Manager	WWL	8/03/2023	Live - Treat	Design Development	- Engage HCC RiverLink Partner Lead to progress private property discussions	Very High	Low	20	- Commence discussions with property owners on Pretoria Street	Medium	Very Low	0.003	0.125	4	
1	R25	Private Property Purchase	Description: There is an opportunity to locate the pump station and storage tank on the Melling stub, which is HCC owned land or other land purchased as part of RiverLink Cause: The cause of the opportunity is the RiverLink project already purchasing land in Hutt CBD and the project creating new public spaces Consequence: The consequence of the opportunity is private property purchase will not be required for the project, removing threat R23	Project Manager	WWL	14/03/2023	Live - Treat	Design Development	- Engage HCC RiverLink Partner Lead to understand properties purchased and areas of new open space being created by RiverLink	Very High	Low	20	- Engage HCC RiverLink Partner Lead to understand requirements and flexibility with IAF timeframes - Progress investigation of alternative pump station and storage tank location based on available land	Very High	Very High	10	6	25	
2	R26	Wetwell Only Pump Station	Description: There is an opportunity for the pump station to be a wetwell only pump station with submersible pumps, instead of a wetwell drywell pump station Cause: The cause of the opportunity is the location of the proposed pump is outside of central Hutt CBD and modern pumps and washdown systems Consequence: The consequence of the opportunity is reduced construction cost and reduce consequence of threat R21	Lead Designer	TBC	14/03/2023	Live - Treat	Design Development		High	Medium	19	- Check with WWL Design Team if dispensation from Regional Standards for Water Services to enable this would be possible - Confirm with COG this would be an acceptable solution	High	Very High	10	6	22	
5	R27	Consenting of Project	Description: There is a threat that the project is unconsentible Cause: The cause of the threat is the project will trigger levels that require it to be consented under th District and Regional Plans Consequence: The consequence of the threat is the project will not be able to go ahead	Project Manager	WWL	14/03/2023	Live - Treat	Design Development	- Complete Planning Assessment to understand consenting risk	Very High	Low	20	- Engage with HCC and GWRC about project	Medium	Low	0.03	0.5	11	
13	R28	Uplift forces on storage tank	Description: There is a threat that the storage tank will float Cause: The cause of the threat is the high groundwater table and proposed large underground storage tank Consequence: The consequence of the threat is the storage tank floats and work needs to be done to mitigate this	Lead Designer	TBC	30/03/2023	Live - Treat	Operation		Medium	Medium	15	- Complete geotechnical site investigations to determine groundwater table at location of site - Design tank for floatation	Medium	Very Low	0.003	0.125	4	
17	R29	Stop Bank Integrity	Description: There is a threat that the integrity of the stopbank is compromised by the rising main or EOP Cause: The cause of the threat is the rising main and EOP routes crossing underneath the Hutt River stopbank Consequence: The consequence of the threat is failure of the stopbank and flooding of properties	Lead Designer	TBC	30/03/2023	Live - Treat	Operation		Very High	Very Low	13	- Assess impact of pipe penetrations on stopbank integrity	Medium	Very Low	0.003	0.125	4	
5	R30	Aquifer Contamination	Description: There is a threat that the aquifer becomes contaminated Cause: The cause of the threat is potential penetration of the Waiwhetu aquifer during construction or damage to the aquiclude creating a contamination pathway Consequence: The consequence of the threat is contamination of the water supply from Waterloo WTP	Lead Designer	TBC	30/03/2023	Live - Treat	Construction	- Check aquifer depth and design structures to not penetrate aquifer	Very High	Low	20	- Complete geotechnical site investigation to confirm aquifer and aquiclude depth - Consider depth of aquifer and aquiclude in design - Talk to GWRC about mitigation measures to protect aquifer	Very High	Very Low	0.003	0.125	13	
11	R31	Settlement of surrounding properties	Description: There is a threat that the properties surrounding the proposed pump station and storage tank settle Cause: The cause of the threat is creating large excavations to enable construction of the storage tank and pump station Consequence: The consequence of the threat is work needs to be done on the neighbouring properties need to mitigate the effects of settlement	Project Manager	WWL	30/03/2023	Live - Treat	Construction	- Propose purchase of neighbouring properties to increase space between excavation and adjacent buildings - Consider site layout to increase distance between excavation and adjacent buildings	Medium	High	17	- Purchase sufficient land to enable safe construction of the proposed storage tank. Consider purchasing properties to enable construction with the intention to resell afterwareds - Consider construction methods to reduce settlement on adjacent buildings	Low	Low	0.03	0.5	6	
18	R32	Seismic Resilience of River Crossing	Description: There is a threat that the bridge carrying the rising main with fail during an earthquake Cause: The cause of the threat is the rising main crossing the Hutt River in an earthquake zone Consequence: The consequence of the threat is failure of the bypass causing uncontrolled overflows in Hutt CBD	Lead Designer	TBC	30/03/2023	Live - Parked	Operation	- Solution proposes to use new bridge for crossing with greater seismic resilience and desgn for inclusion of the rising main	High	Very Low	8		High	Very Low	0.003	0.125	8	
																#N/A	#N/A		

Risk Status	
Draft	0
Live - Treat	19
Live - Parked	6
Impacted	0
Closed	6
Rejected	0
TOTAL	**31**

Current Risk Score	
Extreme	6
High	19
Moderate	5
Low	1
Zero	12
TOTAL	**43**

Residual Risk Score			
Extreme			2
High			9
Moderate			10
Low			4
Zero			12
TOTAL			**37**

Appendix I – COG Presentation

Hutt CBD Sewer Bypass – Updates to WHMS Option and Mitigation of Operational Risks

Wellington Water

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Purpose

- Provide overview of changes made to Option 2
- Demonstrate how these mitigate operational risks identified with WHMS and Ava PS
- Discuss any outstanding concerns or confirm happy this option is acceptable by operations

Background / Refresher

Meeting in August following MCA Workshop

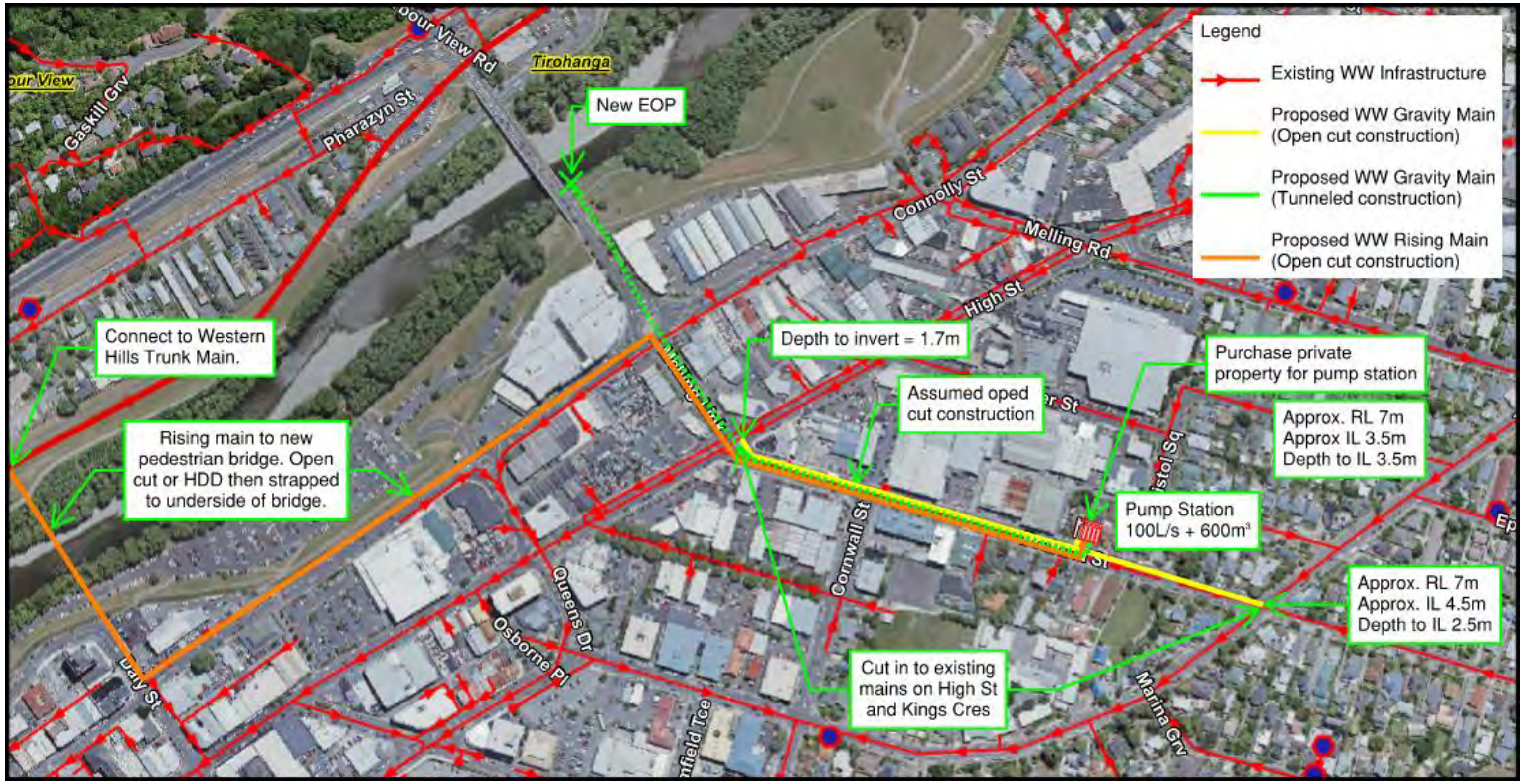
- Five options presented for Hutt CBD sewer bypass:
  - 4x options connected to Western Hutt Main Sewer (WHMS) – this included highest scoring option from MCA (Option 2)
  - 1x option connected directly to Barber Grove PS (Option 4)
- Significant operational concerns raised with options that connect to WHMS
  - Capacity of WHMS and Ava PS – currently throttling at Silverstream to prevent spilling at Ava PS
  - Condition of WHMS and ability to connect to the existing main

Risk Workshop in October

- Operational risks (above) reiterated
- Agreed Option 2 cannot be compared to Option 4 due to these risks
- Actions agreed to review and update Option 2 to mitigate these risks

Refresher - Option 2 and Option 4

Option 2



New EOP

Connect to Western Hills Trunk Main.

Rising main to new pedestrian bridge. Open cut or HDD then strapped to underside of bridge.

Depth to invert = 1.7m

Assumed oped cut construction

Purchase private property for pump station

Approx. RL 7m
Approx IL 3.5m
Depth to IL 3.5m

Pump Station
100L/s + 600m³

Approx. RL 7m
Approx. IL 4.5m
Depth to IL 2.5m

Cut in to existing mains on High St and Kings Cres

Option 4

Cut in to King Cres and High Street Main

Depth to IL = 1.7m

Approx. RL 7m
Approx IL 4.5m
Depth to IL = 2.5m

Assumed oped cut construction

Approx. RL 6m
Approx IL 2.6m
Depth to IL = 3.6m

Assumed micro tunnel construction. Shafts at 100m ctrs.

Approx. RL 4.5m
Approx. IL -0.1m
Depth to IL = 4.6m

New EOP

Approx. RL 3.5m
Approx IL -4.2m
Depth to IL = 7.7m

Pump Station
200L/s + 600m³

R.M. to Barber Grove PS via. main road. Assume open cut or HDD.

Barber Grove Pump Station

Subsequent Work

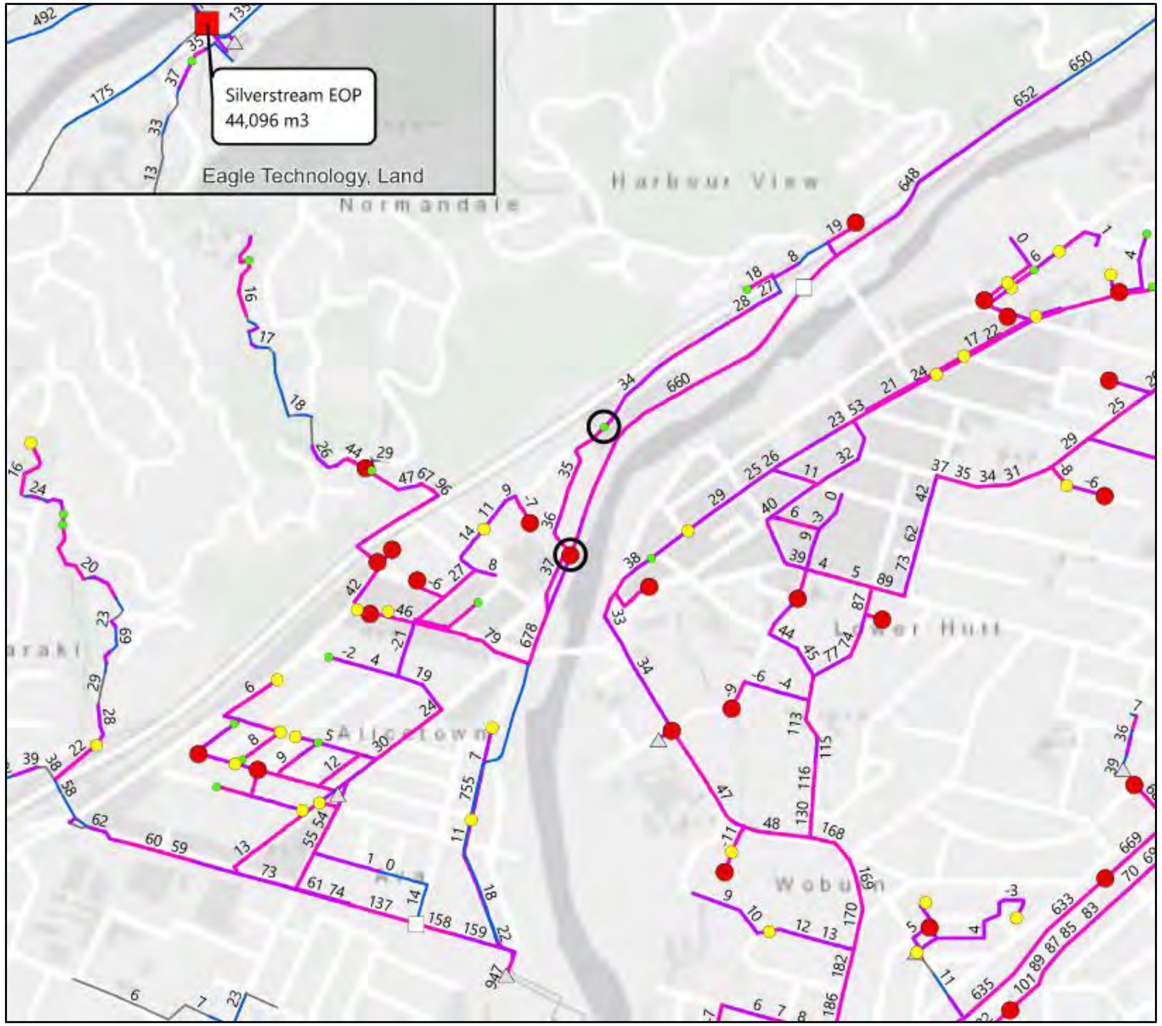
1. Review modelling of Option 2 to understand capacity constraints
2. Identify options to mitigate capacity constraints and operational risks
3. Complete modelling to confirm capacity constraints have been mitigated and that updated Option 2 meets project outcomes
4. Complete modelling to demonstrate operational risks are mitigated and there will be no impact on Ava PS / Silverstream throttling once commissioned

Note re: modelling results:

- 2070 growth scenario unless otherwise stated
- 2-year ARI scenario
- Throttle of 400L/s at Silverstream

1. Modelling Review

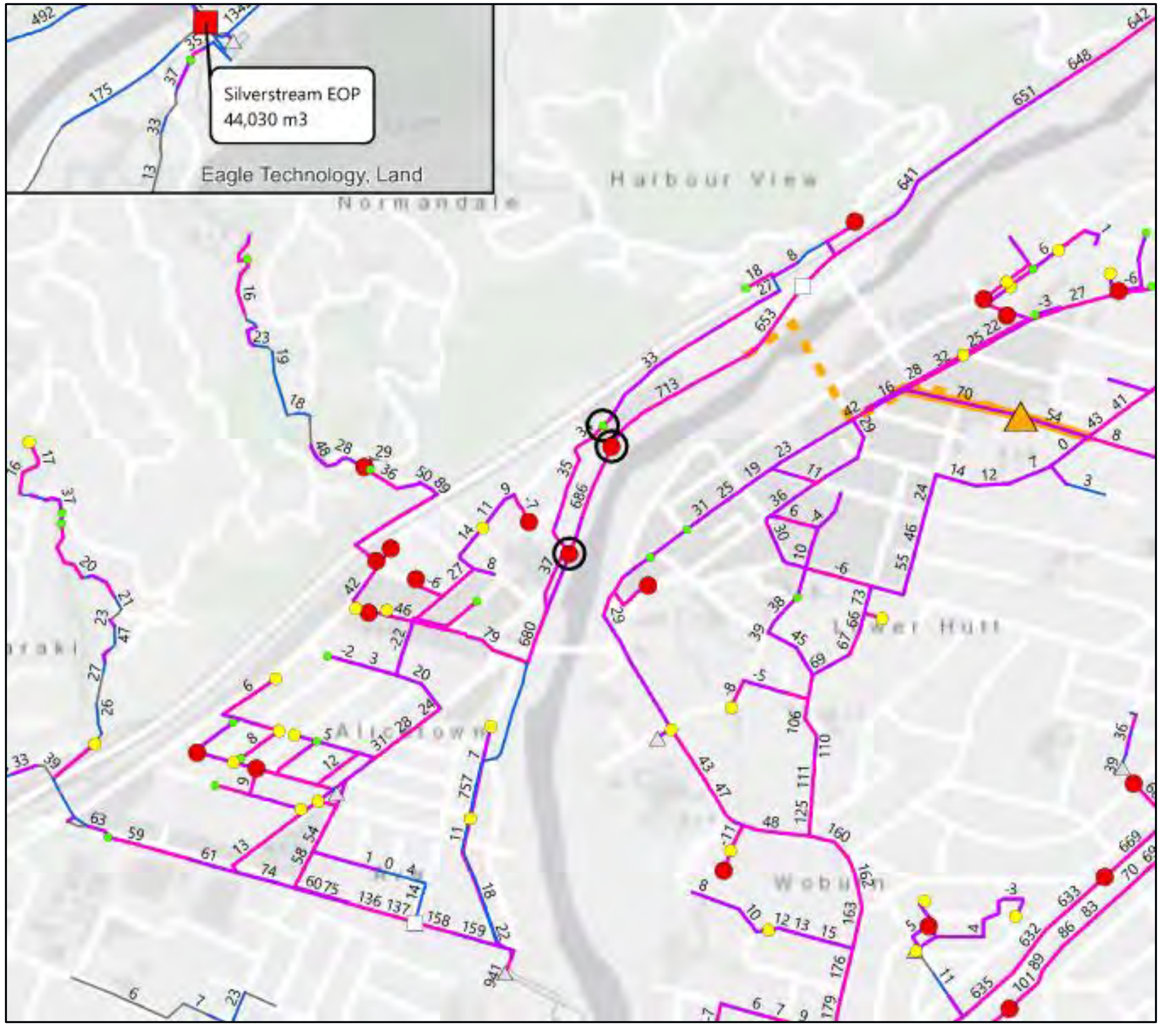
- Review of model identified engineered overflow point (EOP) at Melling Station that spills in the 2070 MPD scenario and Option 2
  - Investigation confirmed this is a scour point and shouldn't spill
  - This was masking capacity issues on WHMS
- Model updated to close this EOP
- Results showed new spilling on WHMS during 2070 MPD scenario



1. Modelling Review

Rerunning Option 2 with Melling EOP closed showed:

- 4x new locations of uncontrolled spilling on WHMS (940m³)
- Increase spilling in Alicetown (50m³)



Silverstream EOP
44,030 m3

Eagle Technology, Land

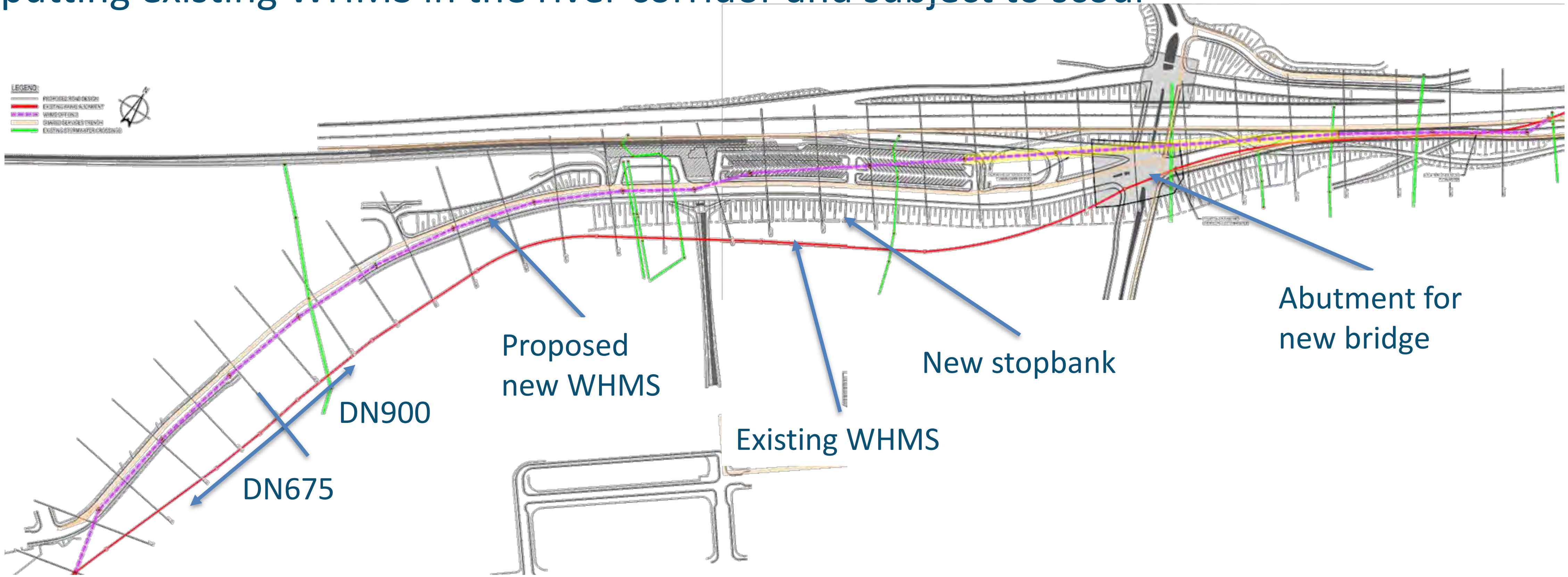
2. Options Development

Options identified to mitigate new spilling on WHMS:

1. Increase throttling and storage at Silverstream – Discounted due to:
    - Starting to store dry weather flows (DWF)
    - Increased spill volume by 20,000m³
2. Increase pipe size of WHMS – Included in model:
    - Already proposed as part of RiverLink project
3. New EOP at Ava PS – Discounted due to:
    - Majority of spilling due to capacity of WHMS
4. More storage at new pump station (PS) – Included in model:
    - Storage increased from 600m³ to 2000m³

2. Options Development
– RiverLink Changes to WHMS

RiverLink project is moving stopbanks between Melling Bridge and Ewen Bridge putting existing WHMS in the river corridor and subject to scour



Abutment for new bridge

Proposed new WHMS

New stopbank

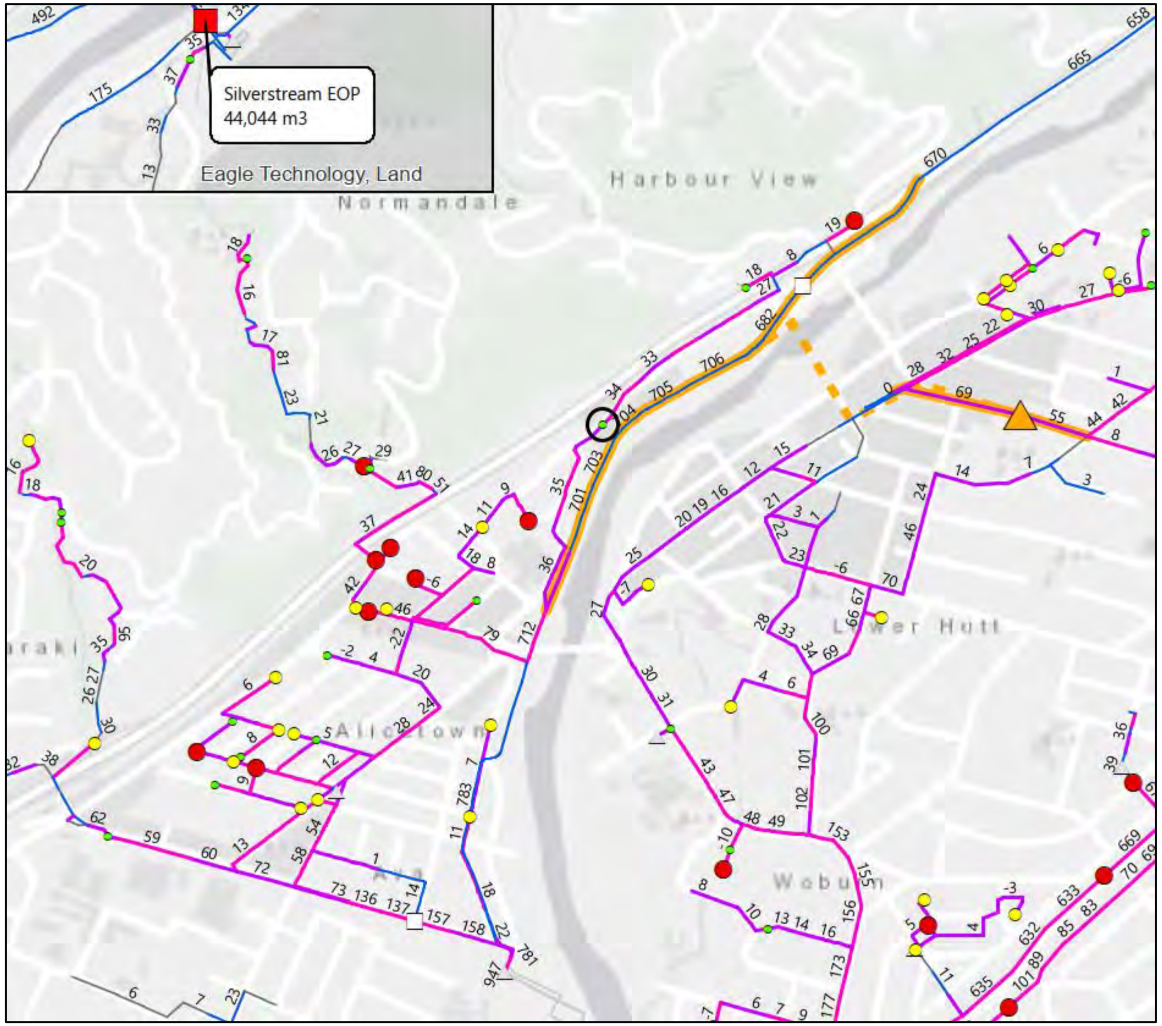
DN900

Existing WHMS

DN675

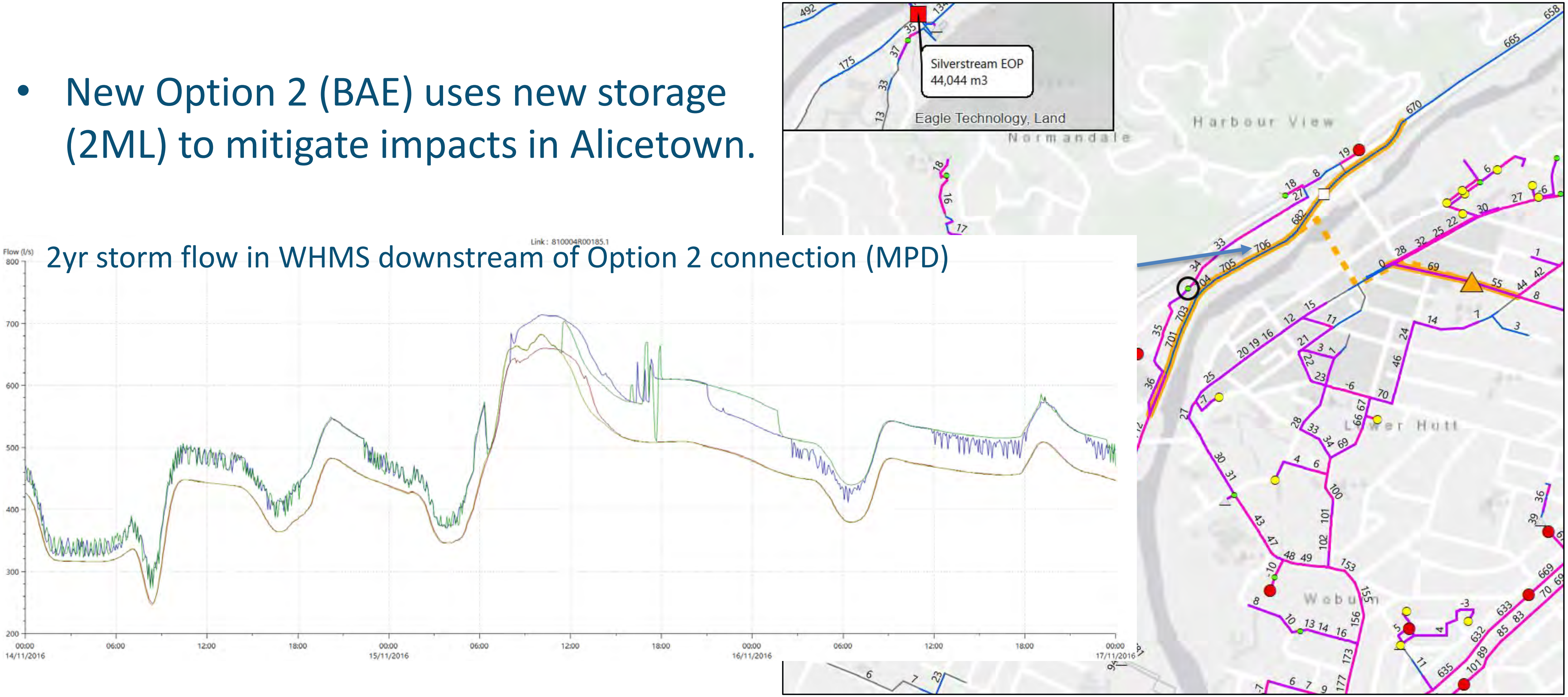
3. Mitigation of Capacity Constraints

- New Option 2 (BAE) uses new storage (2ML) to mitigate impacts in Alicetown.



3. Mitigation of Capacity Constraints

- New Option 2 (BAE) uses new storage (2ML) to mitigate impacts in Alicetown.



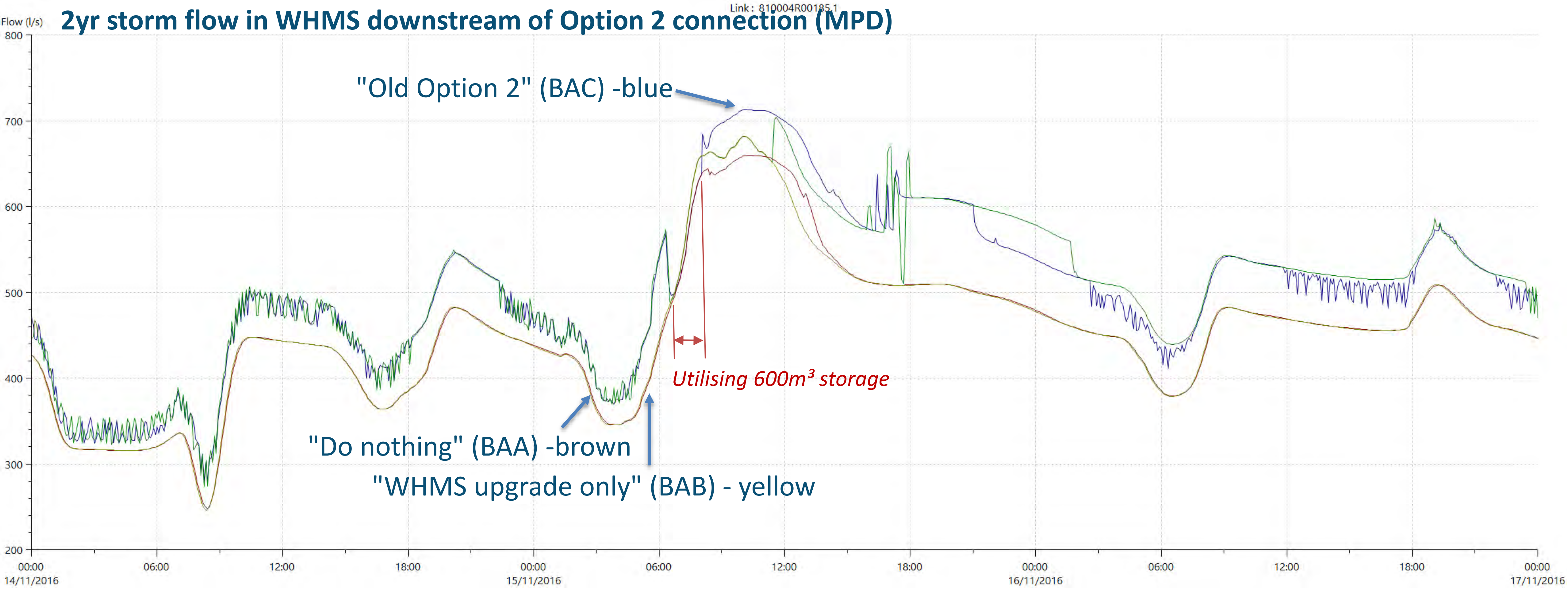
2yr storm flow in WHMS downstream of Option 2 connection (MPD)

Silverstream EOP
44,044 m3

Eagle Technology, Land

3. Mitigation of Capacity Constraints

2yr storm flow in WHMS downstream of Option 2 connection (MPD)



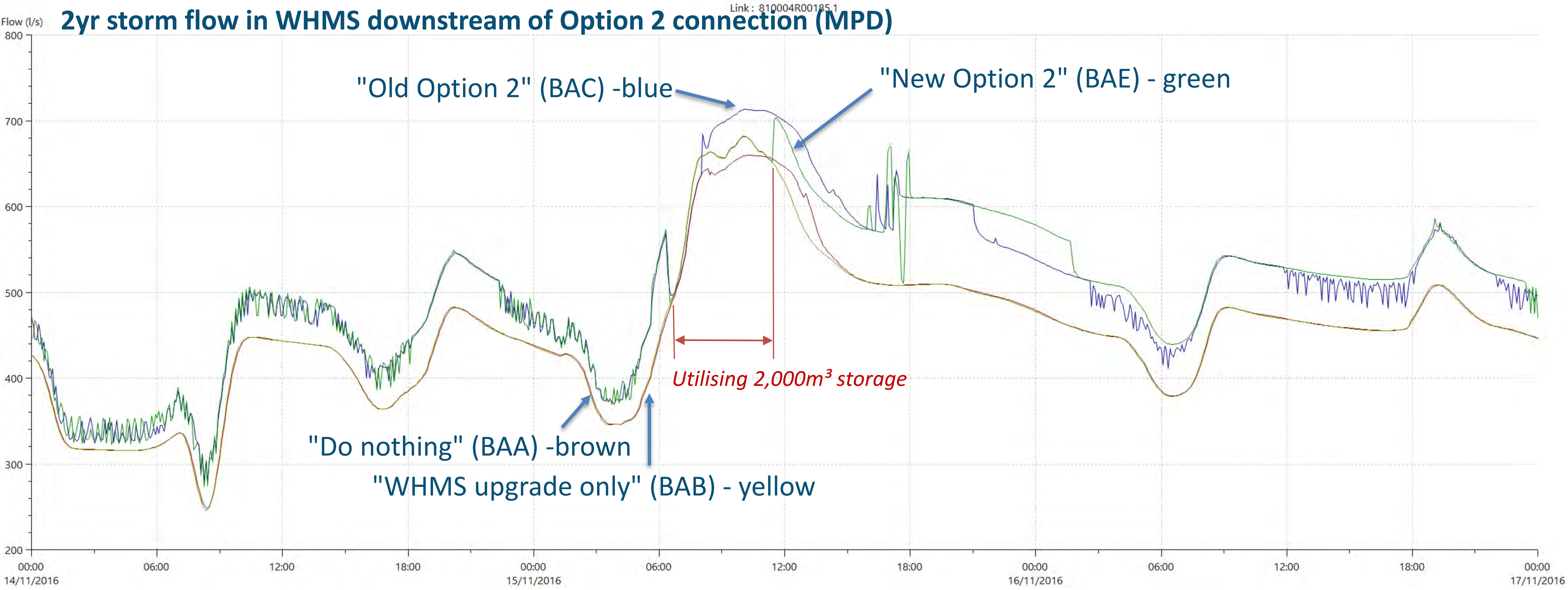
"Old Option 2" (BAC) -blue

Utilising 600m³ storage

"Do nothing" (BAA) -brown

"WHMS upgrade only" (BAB) - yellow

3. Mitigation of Capacity Constraints



2yr storm flow in WHMS downstream of Option 2 connection (MPD)

"Old Option 2" (BAC) -blue

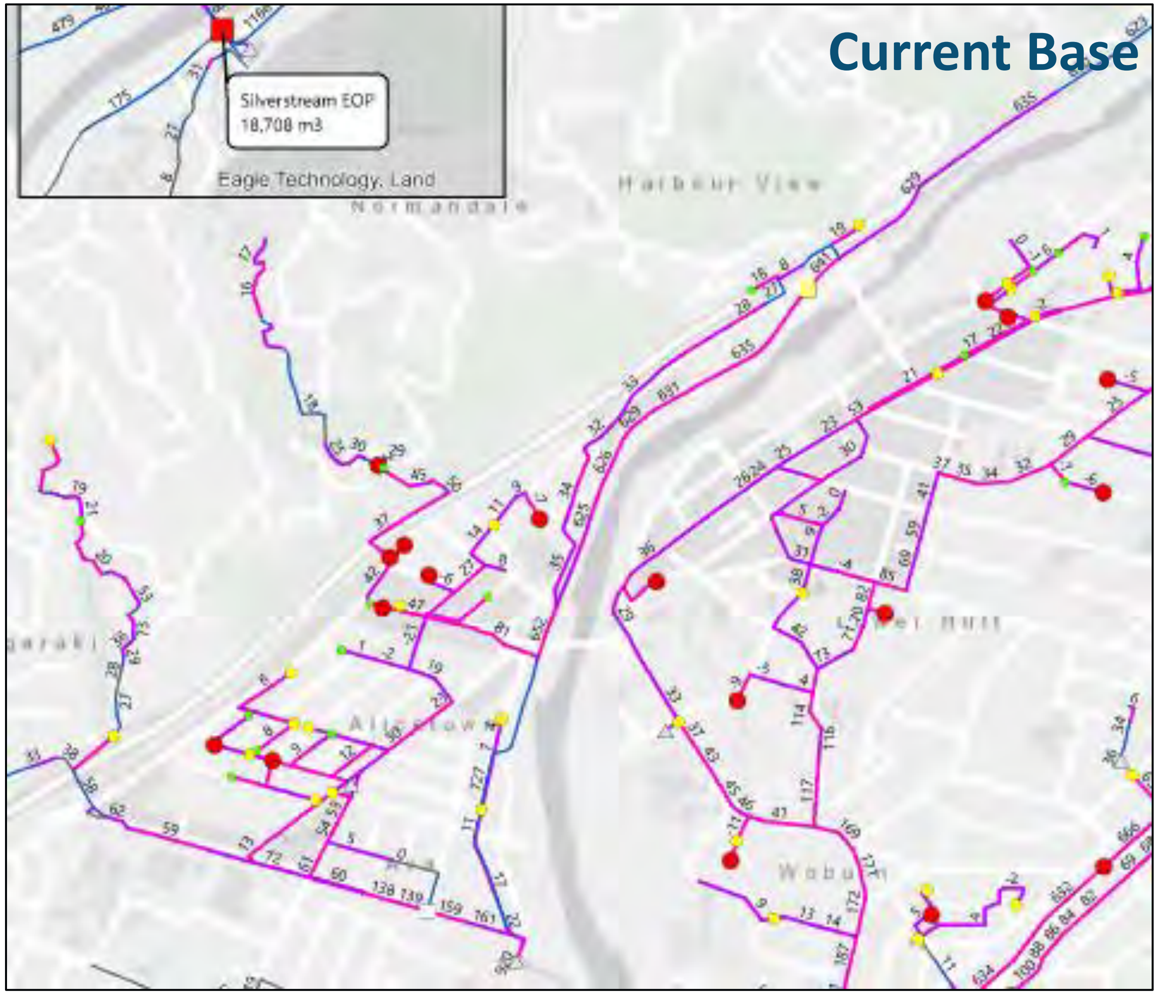
"New Option 2" (BAE) - green

Utilising 2,000m³ storage

"Do nothing" (BAA) -brown

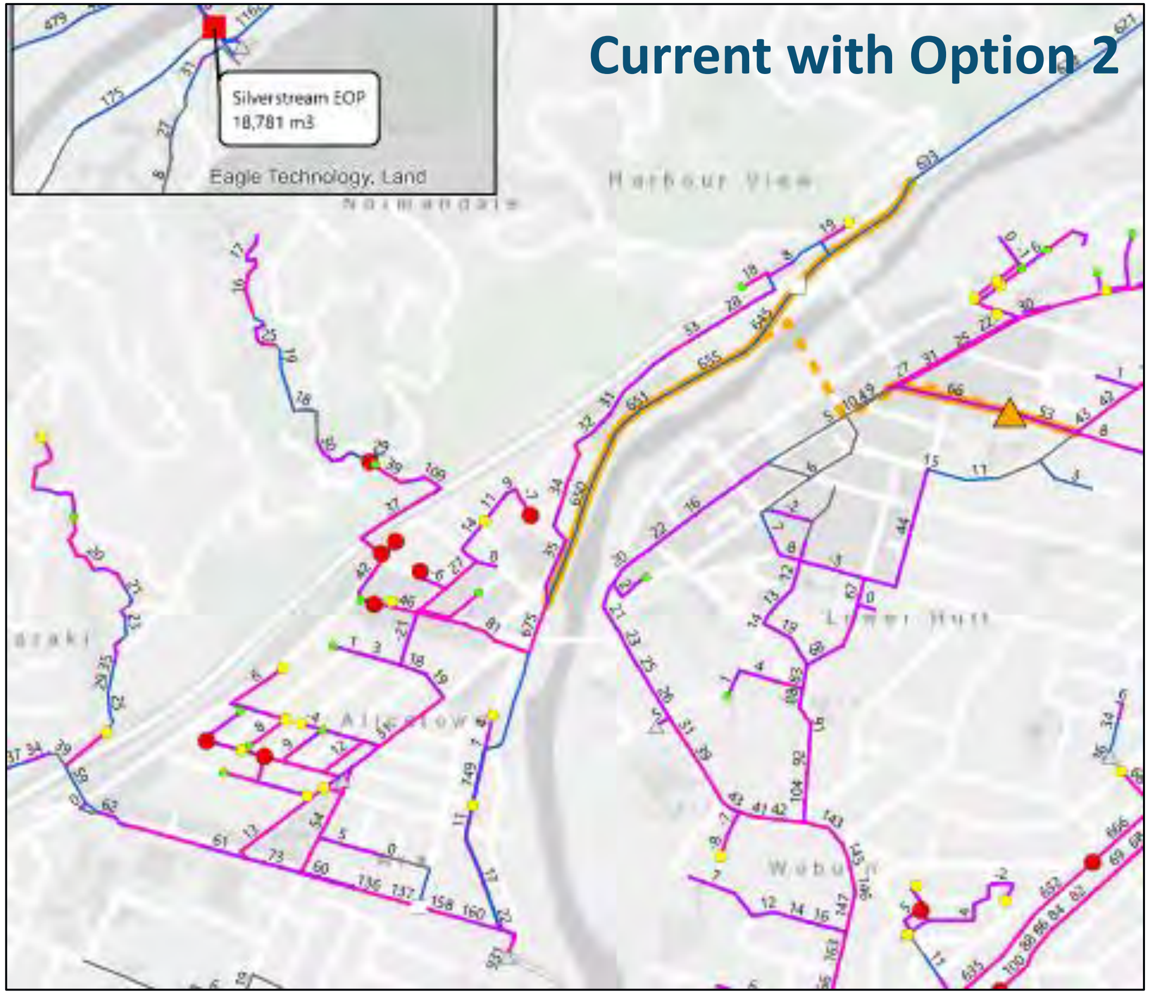
"WHMS upgrade only" (BAB) - yellow

4. Mitigation of Operational Risks



Current Base

Silverstream EOP
18,708 m3



Current with Option 2

Silverstream EOP
18,781 m3

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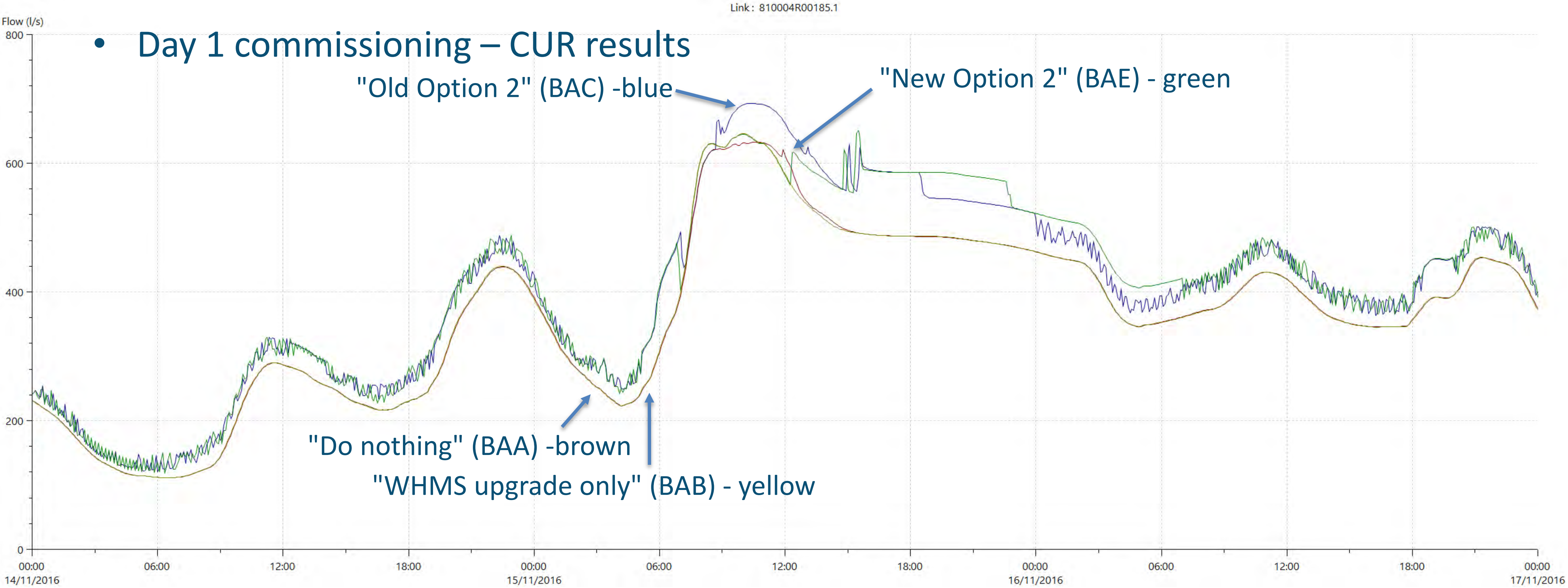
4. Mitigation of Operational Risks

- Day 1 commissioning – CUR results



"Old Option 2" (BAC) -blue

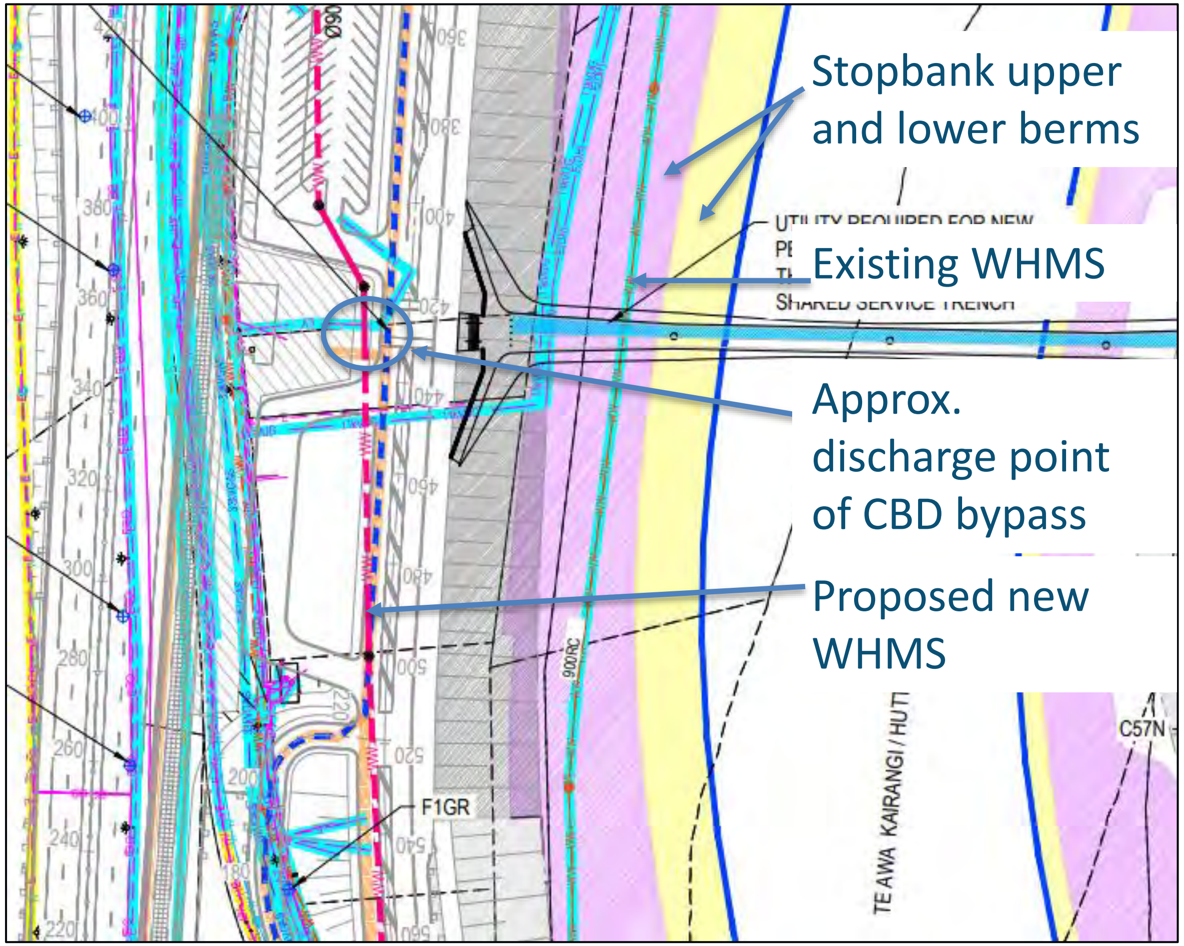
"New Option 2" (BAE) - green

"Do nothing" (BAA) -brown

"WHMS upgrade only" (BAB) - yellow

4. Mitigation of Operational Risks

- Proposed connection will be to upgraded WHMS



Stopbank upper and lower berms

Existing WHMS

Approx. discharge point of CBD bypass

Proposed new WHMS

Summary

- Changes made to Option 2 mitigate operational risks raised by:
    - Replacing under capacity section of WHMS (being done as part of RiverLink)
    - Protecting WHMS and Ava PS by providing storage and pump RTC so only discharging when there is capacity
    - Connecting to replaced section of WHMS

Questions?

Wellington
Water

Our water, our future.

Appendix J – 3WDMC Paper

3 Waters Decision Making Committee

Paper Title: Adoption of preferred option for Hutt CBD sewer bypass for concept design

Author: [redacted]

Reviewed By: Your paper should be reviewed by your Team leader and relevant Chief Advisor

Approved by: Your paper should be signed off by your Group Manager

Date: 19 January 2023

3 Waters Decision Making Committee's role (please tick required actions)

I am requiring **input or guidance** ☐

I am requiring a **technical decision** ☒

I am requiring **investment endorsement** ☒

I am providing **visibility** over a key issue ☐

Link with service goals

Please select a primary and secondary service goal and note how the proposed activity aligns with these:

Primary	We plan to meet future growth and manage demand	The proposed upgrades will increase capacity in the wastewater system to support population growth expected as part of the RiverLink development in Hutt Central.
Secondary	We minimise public health risks associated with wastewater and stormwater	The proposed upgrades will decrease the amount of uncontrolled wastewater overflows throughout the Riverlink catchment.

Purpose

The purpose of this paper is to seek endorsement from the 3WDMC of the recommended option as the preferred solution to increase sewer capacity in Hutt Central and to progress this to concept design.

Background and References

Finding a solution to upgrade the Lower Hutt wastewater network to mitigate constraints within the Hutt CBD area was outlined in an Activity Brief issued to Stantec in January 2022. Holmes, via Stantec, responded to the Brief with a Project Management Plan outlining an MCA process to score potential solution options and find the highest scoring against the selected criteria.

A longlist of potential options, including the option priced for IAF (Option 1), was compiled. This longlist was narrowed to a shortlisted based on modelled benefits in terms of overall reduction in wastewater spilling. This included options that discharge to the Western Hills Trunk Main (WHTM) and to Barber Grove PS.

An MCA process and workshop (15/08/22) was completed to score the five shortlisted options (4x discharging to WHTM, 1x discharging to Barber Grove PS) and a highest scoring option identified. Sensitivity testing was completed to confirm the validity of this as the highest scoring option.

Subsequent conversations with COG raised operational concerns with options that discharge to the WHTM, which included the highest scoring option, with a preference to the option that discharged to Barber Grove PS.

The outcome of the above process was summarised in the Draft Options Assessment Report and issued on 08/09/22. This identified the highest scoring option and recommended this was taken forward to concept design.

Following WWL review of the report it was identified that the risks raised by COG had not been fully addressed and that further work was required to confirm the preferred option that would be progressed to concept design.

A risk workshop was held 27/10/22 to gain a better understanding of operation risks and identify and understand all project risks. It was concluded that the highest scoring option (Option 2), was not a true comparison to the Barber Grove option (Option 4) due to capacity constraints on WHTM and at Ava PS with predicted increased uncontrolled spilling in nearby catchments .

Further investigation work was completed to update Option 2 so that there was not an increase in uncontrolled spilling elsewhere in the network. The Level 1 cost estimate for the option was updated to suit. This enabled a fair comparison to be made and a preferred option to be selected. This comparison is summarised in the Option Assessment section below.

Level of Service and Performance

The level of service (LoS) for the project is to provide a 2yr containment standard (2yr ARI overflow frequency) for the 2070 maximum probable development (MPD) growth scenario.

Option Assessment

The three options in consideration include:

- ‘Do Nothing’ Option
  - No additional infrastructure to be installed, i.e., project does not go ahead.
- Option 2
  - Cut into existing mains at High Street and Kings Crescent intersections with Pretoria Street
  - New 650m long 375mm dia. sewer along Pretoria Street
  - New 100 L/s pump station + 2000m^3 storage at Pretoria Street
  - New 440m long rising main along Rutherford Street and across new Melling pedestrian bridge and connect to the existing Western Trunk Main

- Option 4
  - Cut into existing mains at High Street and Kings Crescent junctions with Pretoria Street
  - New 1800m long 450mm dia. sewer main along Pretoria St., Cornwall St. and Bloomfield Trc.
  - New 200 L/s pump station + 600m^3 storage at Southern end of Hutt Recreation Ground
  - New 1350m long rising main along Ludlam Cres. and Randwick Rd. and connect to Barber Grove pump station

Refer to appended maps for details of Options 2 and 4.

Option	**Capital Cost (Level 1, 95%)**	**Total Spill Reduction**
Do Nothing	[redacted]	0m^3
Option 2	[redacted]	2520m^3
Option 4	[redacted]	2000m^3

Option	**Risks**	**Benefits**
Do Nothing	- WWL service goals not met, i.e. uncontrolled dry weather spills predicted to occur by 2040. - Reputational risk to WWL and HCC. - Does not meet funding intent of IAF application. - Future escalation of costs if works are not carried out alongside RiverLink.	- No capital cost meaning more funding is available for other infrastructure projects.
Option 2	- Is dependent on the WHTM being upgraded as part of Riverlink works. - Requires the purchase of private properties.	- Project area closer to extent of RiverLink designation i.e. less disruption. - Significant reduction in uncontrolled spill volumes across the RiverLink area in the 2yr ARI. - Level 1 95% estimate is closest to budget put forward in the IAF application.
Option 4	- Project capital cost [redacted] more than IAF application budget of [redacted] would leave less for SW projects. - Additional disruption to public due to large project area mostly outside of RiverLink designation.	- Direct to Barber Grove PS so is not dependent on WHTM upgrades. - Moderate to significant reduction in uncontrolled spill volumes across the RiverLink area in the 2yr ARI.

The preferred option is **Option 2 (pump station and storage on Pretoria Street)** as it is predicted to provide a significant reduction in uncontrolled spill volumes across the RiverLink area in the 2yr ARI, aligns with the wider RiverLink designation so has a high likelihood of achieving cost savings through coordinated design and construction, and has a capital cost estimate closest to the IAF application budget amount.

Risks

The main residual risks associated with the preferred / recommended option include:

- A dependency on the upgrade of WHTM as part of the RiverLink project. This is considered low-risk.
- Although closest to the IAF application budget, the current Level 1 95% estimate is [redacted] over, meaning that additional funding will need to be found for the project.
- The project may need consenting separately as the preferred / recommended option does fall partially outside of the RiverLink designation.
- If the project is not delivered through the Riverlink Alliance, it may be difficult to sequence the works with the Alliance programme.

Financial implications and benefits

The level 1, 95% estimate for the preferred / recommended option is [redacted]

This project is also subject to an Infrastructure Acceleration Fund (IAF) application that was granted based on an initial concept that was costed at [redacted] and [redacted] has now been approved in HCC's LTP to proceed with the project.

Legal implications

Adopting the highest scoring option as the preferred solution will require the purchase of private land to locate the pump station and storage. This will likely require negotiation with landowners.

The EOP for the proposed pump station will not be consented. A valve will be installed so that any overflow will be controlled manually and only in emergency situations.

Consultees

☒ NS&P ☒ ND&D ☒ NMG ☒ COG ☐ Business Services ☒ Other (specify)	Phil Garrity, (WWL) Clint Cantrell, (WWL) Steve Hutchinson, (WWL) Paul Winstanley, (WWL) John Baines, (WWL) Hannah Hyde, (WWL) Mohammed Hassan (WWL) Henry Willis, (Alta – ECI, pricing)

Customer and stakeholder implications and benefits

Lower Hutt customers – adopting the highest scoring option will provide an acceptable level of service as population grows.

HCC – adopting the highest scoring option will reduce the risk to Council of uncontrolled spilling and will provide for future growth.

Iwi – input has been sought from mana whenua. Feedback has been given by Taranaki Whānui. They are broadly supportive of works that reduce spills to the environment. They have expressed preference to options that avoid a new wastewater crossing of Te Awa Kairangi (Hutt River), and particularly options that avoid a wastewater pipe drilled under Te Awa Kairangi (Hutt River).

Communications Plan

A Communications and Engagement Plan is under development for the delivery of the project and will be issued as part of the Phase 3 deliverables.

Health and Safety implications

Adopting the preferred option through to construction will have standard health and safety implications associated with deep excavation and/or tunnelling, working with wastewater, working over water, coordinating with adjacent site works associated with the RiverLink project. These implications will be managed by the contractor.

Recommendation

This paper recommends that Option 2 is endorsed as the preferred option to be taken forward to concept design.

Meeting record: completed by the Author following distribution of approved meeting minutes and saved to relevant project folder in "Woogle"

Meeting date	Recommendation	Action	Who	Due date	Links

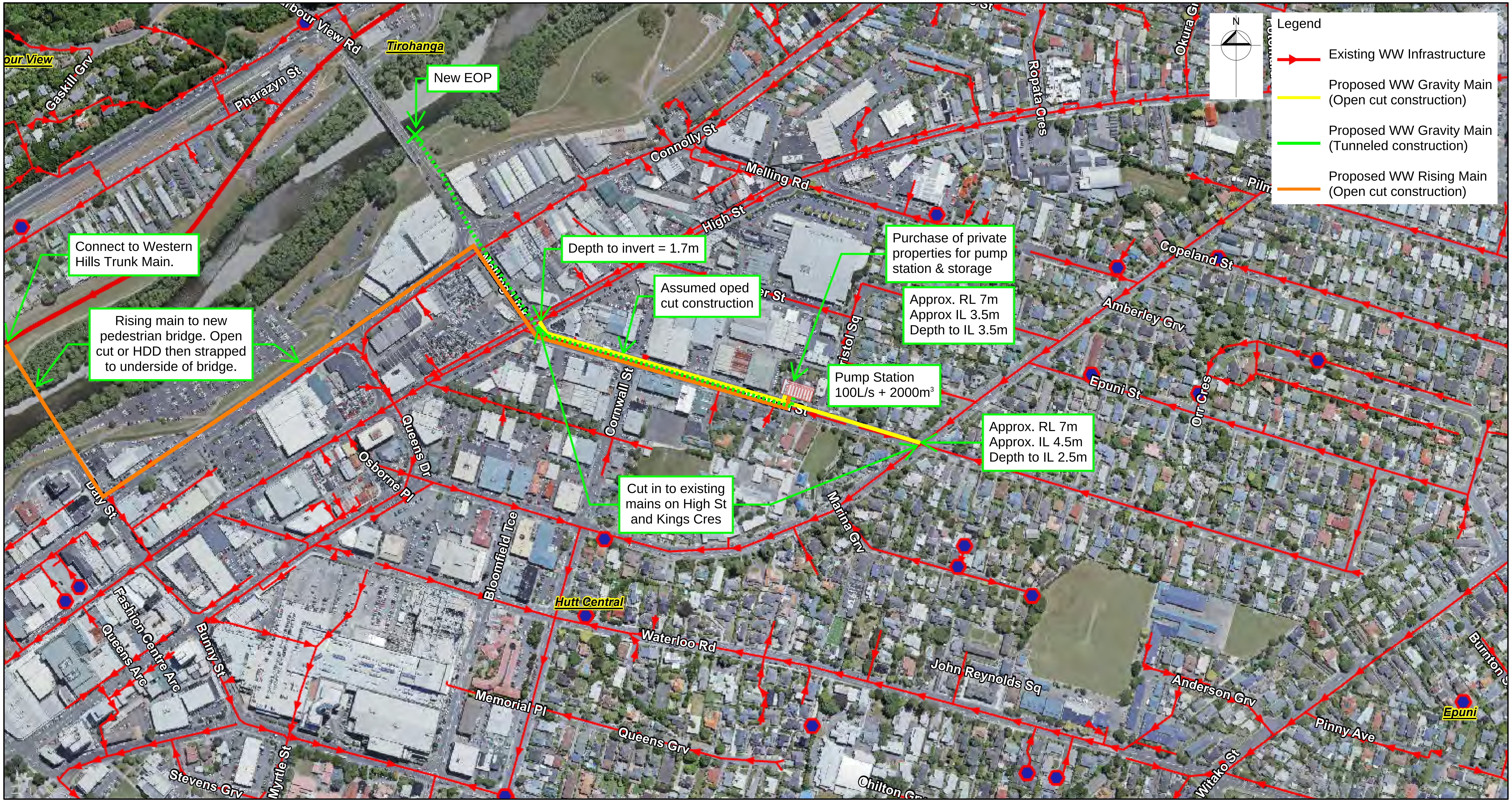
Tips for authors and reviewers

- It is recommended that this paper be no more than 4 pages in length.
- Aim to discuss the key issues in context of the 'bigger picture' and where possible, keep out of the detail of the technical issue. Technical information should be attached for reference only.
- Your report should tell a story of the problem and/or the opportunity, the service goal it links to, and the wider benefits (cost, community, other projects etc)
- Consider how GIS maps, photos and/or other graphics could be used to support your paper's message

Checklist for authors and reviewers

	Author/reviewer	
• Primary and secondary service goals identified and how activity links to this shown	☒	☐
• Problem/opportunity identified	☒	☐
• Current and future performance measure or level of service identified in relation to the primary service goal	☒	☐
• All options considered are identified including the consequence of doing nothing	☒	☐
• Risks have been identified and addressed, including consequential risks of doing nothing	☒	☐
• Funding source identified, whole of life (capex, opex, 3rd party) costs identified	☒	☐
• Legal implications identified	☒	☐
• Consultees identified including Service Planning, Chief Advisors, budget holder (for funding approval) and any affected team	☒	☐
• Customer and stakeholder implications/benefits identified	☒	☐
• Communications plan required and provided	☐	☐
• H&S implications and mitigations identified	☒	☐
• Ensure the recommendations tie back into what has been discussed in the main body of the paper	☒	☐
• Ensure relevant people are invited to the 3WDMC to support paper	☐	☐

Wellington Water Ltd Map



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HAL Reference: AAJ

Option 2

1:4,514

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

● Water Shut Valve

Wastewater Pipe

Trunk Main

Main

Discharge Pipe

Holmes

PROJECT: Hutt CBD Wastewater Bypass

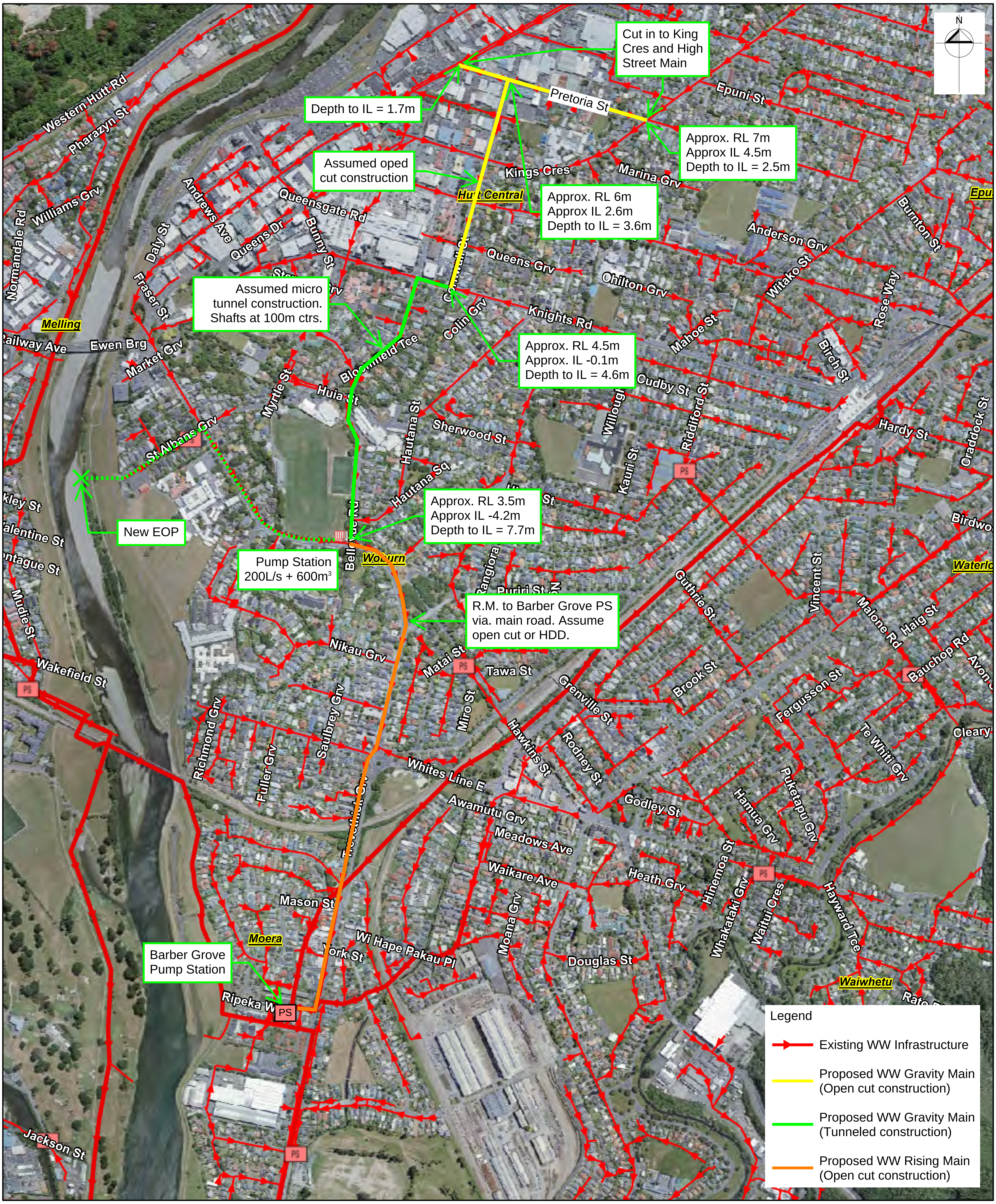
JOB NO: 144418.53 DATE: 11/01/2023

CSK: Option 2 REV: 01

Wellington Water Ltd

Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors | LINZ | Wellington Water Ltd | WWL | Wellington Water Ltd, HCC, PCC, SWDC, GWRC, UHCC, WCC | Wellington Water Ltd, Wellington City Council | Wellington Water Ltd, Greater Wellington Regional Council | Wellington

Wellington Water Ltd Map



Cut in to King Cres and High Street Main

Depth to IL = 1.7m

Approx. RL 7m
Approx IL 4.5m
Depth to IL = 2.5m

Assumed oped cut construction

Approx. RL 6m
Approx IL 2.6m
Depth to IL = 3.6m

Assumed micro tunnel construction. Shafts at 100m ctrs.

Approx. RL 4.5m
Approx. IL -0.1m
Depth to IL = 4.6m

New EOP

Approx. RL 3.5m
Approx IL -4.2m
Depth to IL = 7.7m

Pump Station 200L/s + 600m³

R.M. to Barber Grove PS via. main road. Assume open cut or HDD.

Barber Grove Pump Station

Legend

🟥	Existing WW Infrastructure
🟨	Proposed WW Gravity Main (Open cut construction)
🟩	Proposed WW Gravity Main (Tunneled construction)
🟧	Proposed WW Rising Main (Open cut construction)

5/9/2022, 10:26:32 AM

Wastewater Pipe

🟥	Trunk Main
🟥	Main
🟥	Discharge Pipe
🟥	Other
🟥	Wastewater Pipe
PS	Wastewater Pumpstation

HAL Reference: AAO

Option 4

1:9,028

0 0.1 0.2 0.4 mi

0 0.15 0.3 0.6 km

Holmes

PROJECT: Riverlink Wastewater Bypass

JOB NO: 144418.53 DATE: 11/01/2023

CSK: Option 4 REV: 01

Wellington Water Ltd

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Appendix K – SiD Register

Safety in Design H&S Risk Assessment

Administration

Project Name	RiverLink - Hutt CBD Sewer Bypass
Project No. (if applicable)	OPC101481

Assessment Date	7/03/2023	**Asset Type**	Wastewater - Pumping Station	**Location / Site Name**	Pretoria St, Hutt CBD
Designer	Jane Hancock	**SID Process Step**	Review H&S Risk Assessment (Step IV)		

Safety in Design Process Decisions

Opex: Technical Input Required? (Step III)	Yes
Design Meeting Required? (Step V)	Yes
Record decision reasoning for Step V:	Complexity of project and extreme and high risks identified
More Detailed Assessment (e.g. Hazop) Required? (Step VIII)	No
Record decision reasoning for Step VIII :	Project currently at concept stage therefore level of design doesn't support HAZOP. HAZOP likely to be required at later stage in design process due to construction of new assets requiring operational access.

Safety in Design Stakeholders

Name	[redacted]	**Role**	Designer
Name	[redacted]	**Role**	Designer
Name	[redacted]	**Role**	Designer
Name	[redacted]	**Role**	Project Manager
Name	[redacted]	**Role**	Designer
Name	[redacted]	**Role**	Specialist
Name	[redacted]	**Role**	Investigator
Name	[redacted]	**Role**	Operator
Name	[redacted]	**Role**	Operator
Name	[redacted]	**Role**	Operator
Name	[redacted]	**Role**	Operator
Name	[redacted]	**Role**	Project Manager
Name	[redacted]	**Role**	Specialist

If additional stakeholders are required, select the row above and insert new row. Record Name and Role as per Safety in Design Process.

Supporting documentation

Raw risk						Risk management								
Specific Asset Reference (if applicable)	Risk Source (Hazard)	Risk Description	Raw Consequence	Raw Likelihood	Raw Risk Rating	Control Measure	Control Type	Control Description	Control Justification (if not eliminated)	Control Owner	Residual Consequence	Residual Likelihood	Residual Risk Rating	Risk Owner
Trenches, launch/reception pits, new pump station, new storage tank	Excavation	Injury/death from falling into excavation, excavation collapse during construction or flooding of excavation from high groundwater	Major 70	Likely 5	Extreme 350	Minimise	1. Isolate	- Use of trenchless construction to reduce excavation - Construction methodology/sequencing to reduce open excavations - Use of trench shoring and edge protection	Excavations required to construct below ground structures	Contractor	Major 70	Rare 1	Moderate 70	Contractor
N/A	Traffic Or Pedestrian Movement	Injury/death by road traffic accident due to construction site within road reserve	Major 70	Likely 5	Extreme 350	Minimise	1. Substitute	- Consider location of pipelines and locate within footpaths, berms where possible	Locating pipelines out of road reserve would require access easements in private land causing operations and maintenance issues	Designer	Moderate 40	Highly Unlikely 2	Moderate 80	Designer
New pump station	Confined Spaces	Health risks/death associated with accessing new pump station as a confined space to operate and maintain	Major 70	Possible 4	High 280	Minimise	1. Substitute	- Locate instrumentation and controls in above ground building and provide actuators on valves etc. to reduce requirement to enter below ground structure	Below ground pump station required	Designer	Major 70	Rare 1	Moderate 70	Designer
N/A	Services – Working With Or Near	Injury/death associated with services strike	Major 70	Possible 4	High 280	Minimise	1. Isolate	- Complete services search / BeforeUdig, survey, potholing to identify services - Locate new infrastructure aware from critical services and with clearances identified in Regional Spec - Include location of services on drawings	Underground services present in location of proposed works	Designer	Major 70	Highly Unlikely 2	Moderate 140	Designer
New pipelines	Traffic Or Pedestrian Movement	Injury/death from traffic collision while accessing new pipeline for flushing and maintance	Major 70	Possible 4	High 280	Eliminate		- Locate manholes / access points in footpaths, berms and out of live traffic lanes					N/A	Designer
New pump station, storage tank or below ground structures	Working At Height or Raised and Falling Objects	Injury/death from falling from height or objects falling into new below ground structures during construction	Major 70	Possible 4	High 280	Minimise	1. Substitute	- Consider construction methodology that reduces need to work at height - Use of barriers etc. to protect workers from falling from height or falling objects	Below ground pump station required	Contractor	Major 70	Rare 1	Moderate 70	Contractor
New storage tank	Confined Spaces	Health risks/death associated with accessing new storage tank to clean and maintain	Major 70	Possible 4	High 280	Minimise	1. Substitute	- Include automated flushing devices - Consider proposed equipment to reduce need to access for maintenance - Locate access hatches at opposite ends to enable forced ventilation of tank while accessing for maintenance	Cannot eliminate need to access completely for maintenance	Designer	Moderate 40	Rare 1	Low 40	Designer
rising main (bridge sec	Working At Height or Raised and Falling Objects	Injusry / death associated with falling from height while retrofitting the rising main to the bridge	Major 70	Possible 4	High 280	Eliminate		Install rising main on bridge while bridge deck is being constructed						Project Manager
New storage tank	Excavation	Injury / death caused by collapse or groundwater inundation of storage tank due to deep excavation below ground water table	Major 70	Possible 4	High 280	Minimise	1. Engineering Control	- Complete geotechnical site investigation including groundwater monitoring at the site to confirm groundwater level and enable appropriate design and construction method to be chosen	Excavation below ground water table will be required to construct pump station	Designer	Moderate 40	Unlikely 3	Moderate 120	Designer
N/A	Vehicles And Mobile Equipment	Injury/death from being hit by vehical or mobile equipment during construction	Major 70	Unlikely 3	High 210	Minimise	1. Isolate	- Segredation of traffic on site	Mobile equipment will be needed to complete construction	Contractor	Moderate 40	Highly Unlikely 2	Moderate 80	Contractor
New pump station	Assets Or Fixed Plant	Injury from pumps or valves operating automatically	Major 70	Unlikely 3	High 210	Minimise	1. Isolate	- Locate areas requiring regular operational access away from automated machineary - Install barriers etc. to isolate machinary from operators	Automated equipment required as part of solution	Designer	Minor 10	Highly Unlikely 2	Low 20	Designer

Reference: HSI-S26-1

Specific Asset Reference (if applicable)	Risk Source (Hazard)	Risk Description	Raw Consequence	Raw Likelihood	Raw Risk Rating	Control Measure	Control Type	Control Description	Control Justification (if not eliminated)	Control Owner	Residual Consequence	Residual Likelihood	Residual Risk Rating	Risk Owner
New/existing wastewater structures	Confined Spaces	Health risks/death associated with accessing new or existing wastewater structures during construction	Major 70	Unlikely 3	High 210	Minimise	2. Adminstration Control	Apply confined spaces best practice	Access to confined spaces will be required as part of construction	Contractor	Minor 10	Highly Unlikely 2	Low 20	Contractor
New rising main (Hutt River Section), EOP outlet structure	Water - Being In, Near, Or On	Injury/death from drowning in Hutt River during construction of rising main over Hutt River and EOP outlet structure to Hutt River	Major 70	Unlikely 3	High 210	Minimise	1. Isolate	Consider construction methodology to reduce need to work near the river	Solution includes constructing assets over and near to Hutt River	Contractor	Major 70	Rare 1	Moderate 70	Contractor
New rising main (Hutt River Section)	Working At Height or Raised and Falling Objects	Injury/death from falling from height while installing new rising main on pedestrian bridge	Major 70	Unlikely 3	High 210	Eliminate		Consider installing rising main on bridge during fabrication					N/A	Contractor
New pump station, storage tank	Lifting operations	Injury/death from objects falling during lifting operations during construction	Major 70	Unlikely 3	High 210	Minimise	1. Isolate	Provide lifting plan including segredation of lifting equipment and workers	Lifting operations required as part of solution	Contractor	Major 70	Rare 1	Moderate 70	Contractor
New rising main (Hutt River Section)	Water - Being In, Near, Or On	Injury/death from drowning in Hutt River during maintenance of rising main over Hutt River	Major 70	Unlikely 3	High 210	Minimise	1. Isolate	- Consider and provide maintenance access requirements during the design of pipeline over bridge	Solution requires crossing of river and underneath provides maintenance issues	Designer	Major 70	Rare 1	Moderate 70	Designer
New rising main	Assets Or Fixed Plant	Located air valves where they can't be access for maintenace will result in them failing causing spilling of wastewater to the environment	Moderate 40	Likely 5	High 200	Eliminate		- Consider access requirements when locating air valves and ensure these can be accessed for maintenance					N/A	Designer
N/A	Manual Handling Or Body Stress	Injury caused by manual handling pumps to remove for maintenance	Moderate 40	Likely 5	High 200	Eliminate		Provide lifting equipment to remove pumps					N/A	Designer
N/A	Asbestos or Silica	Health risks associated with exposure to silica dust created from cutting into existing concrete pipes and manholes	Moderate 40	Possible 4	Moderate 160	Minimise	1. Substitute	Consider construction methodology and sequencing to reduce requirement to cut into / modify assets	Cutting into existing assets will be required as part of solution	Contractor	Moderate 40	Highly Unlikely 2	Moderate 80	Contractor
New rising main (Hutt River Section), EOP outlet structure	Natural Events	Equipment damage, injury caused by flooding of work site from Hutt River during construction	Moderate 40	Possible 4	Moderate 160	Minimise	2. Adminstration Control	Develop flood response plan for working in the river corridor	Work within river corridor required for solution	Contractor	Minor 10	Rare 1	Low 10	Contractor
N/A	Health, Wellbeing, Stress, Fatigue	Health risks associated with stress and fatigue caused by long working hours and/or high pressure environment during construction	Moderate 40	Possible 4	Moderate 160	Minimise	2. Adminstration Control	Manage programme to reduce stress and fatigue	Stress cannot be completely eliminated	Contractor	Minor 10	Unlikely 3	Low 30	Contractor
N/A	Health, Wellbeing, Stress, Fatigue	Health risks associated with stress and fatigue caused by long working hours and/or high pressure environment during operation	Moderate 40	Possible 4	Moderate 160	Eliminate		Consider operation and maintenance requirements of new assets to reduce stress on operators					N/A	Designer
N/A	Noise	Hearing damage caused by exposure to loud or persistent noise during construction	Moderate 40	Possible 4	Moderate 160	Eliminate		Eliminate construction activities that cause loud or persistent noises					N/A	Contractor
N/A	Tools And Equipment (Powered Or Hand)	Injury caused by incorrect use of tools and equipment	Moderate 40	Possible 4	Moderate 160	Eliminate		Eliminate need to use manual tools and equipment					N/A	Contractor
ipelines (trenchless se	Vehicles And Mobile Equipment	Injury from incorrect use of trenchless machinary	Moderate 40	Possible 4	Moderate 160	Minimise	1. Engineering Control	- Use of ECI to ensure proposed design supports best construction method	Trenchless techniques provides other H&S benefits	Designer	Moderate 40	Highly Unlikely 2	Moderate 80	Designer
New below ground assets	Adjacent structures	Property damage or excavation collapse caused by adjacent building and structures being compromised during construction	Moderate 40	Possible 4	Moderate 160	Eliminate		- Consider impact of construction activities on adjacent structures and ensure sufficient construction space provided to elimate impact					N/A	Designer
New pump station	Biological	Pump station not operating due to power cut causing spilling of wastewater into the environment	Moderate 40	Possible 4	Moderate 160	Eliminate		- Provide 8 hours DWF storage in the event of pump failure - Provide connection points for back up generator					N/A	Designer
New storage tank	Assets Or Fixed Plant	Injury from storage tank deluge buckets / flushing system operating automatically	Major 70	Highly Unlikely 2	Moderate 140	Minimise	1. Isolate	- Consider safety features of proposed flushing system during design	Flushing system required to maintain storage tank	Designer	Minor 10	Rare 1	Low 10	Designer
New EOP outlet structure	Water - Being In, Near, Or On	Injury/death from drowning in Hutt River during maintenance of new EOP outlet structure	Major 70	Highly Unlikely 2	Moderate 140	Minimise	1. Isolate	- Construction methodology to isolate EOP location from Hutt River flow during construction	EOP needs to discharge to Hutt River on bank	Contractor	Minimal 1	Rare 1	Low 1	Contractor
New rising main (Hutt River Section), EOP outlet structure	Natural Events	Construction of new rising main and EOP through the stopbank could reduce the level of flood protection provided to Hutt CBD	Substantial 100	Rare 1	Moderate 100	Eliminate		Choose construction methodology and sequencing that doesn't compromise existing flood protection						Contractor
New assets	Natural Events	Equipment damage, injury/death caused by earthquake during construction of new assets	Major 70	Rare 1	Moderate 70	Minimise	1. Engineering Control	- Consider construction sequencing and design of temporary works for earthquake	Earthquake risk cannot be eliminated	Designer	Minor 10	Rare 1	Low 10	Designer
New assets	Natural Events	Asset damage, injury/death caused by earthquake	Major 70	Rare 1	Moderate 70	Minimise	1. Engineering Control	- Design for earthquake risk	Earthquake risk cannot be eliminated	Designer	Minor 10	Rare 1	Low 10	Designer
New pump station, storage tank and manholes	Hazardous Substances, Chemicals	Chemical burns from contact with wet concrete during construction of new assets	Minor 10	Likely 5	Low 50	Minimise	1. Engineering Control	Use of plant / equipment to move and place wet concrete to reduce contact with it	Wet concrete will be required to complete construction of the proposed solution	Contractor	Minor 10	Unlikely 3	Low 30	Contractor
N/A	Manual Handling Or Body Stress	Injury caused by manual handling of large/bulky/heavy objects or poor manual handling technique	Minor 10	Likely 5	Low 50	Eliminate		Use of equipment to remove need to manually handle large, bulky or heavy items					N/A	Contractor
N/A	Work Environment (Housekeeping)	Slips, trips and falls from untidy work environment	Minor 10	Likely 5	Low 50	Eliminate		Maintain tidy site to remove slip/trip hazards					N/A	Contractor
N/A	Biological	Health risks associated with contact with wastewater during operation and maintenance	Minor 10	Possible 4	Low 40	Minimise	3. PPE	Provide washdown facilities at new pump station / storage tank	Network is for the conveyance of wastewater	Designer	Minor 10	Unlikely 3	Low 30	Designer
N/A	Contaminated land	Health risks associated with contact with contaminates during excavation of contaminated land	Minor 10	Possible 4	Low 40	Eliminate		SLUR site register checked and no SLUR sites in locaton of proposed works					N/A	Designer

Specific Asset Reference (if applicable)	Risk Source (Hazard)	Risk Description	Raw Consequence	Raw Likelihood	Raw Risk Rating	Control Measure	Control Type	Control Description	Control Justification (if not eliminated)	Control Owner	Residual Consequence	Residual Likelihood	Residual Risk Rating	Risk Owner
station, storage tank ar	Security	New pump station and storage tank will be operational site and access by unauthorised personnel could result in injury to the public or damage to assets	Minor 10	Possible 4	Low 40	Minimise	1. Isolate	Provide security fencing, locks on cabinets, buildings and access hatches and security cameras / lighting	Cannot locate site somewhere not accessible by the public	Designer	Minor 10	Highly Unlikely 2	Low 20	Designer
N/A	Biological	Health risks associated with contact with wastewater during construction	Minor 10	Unlikely 3	Low 30	Minimise	3. PPE	Use of PPE and handwashing after contact with wastewater or assets containing wastewater	Existing network will need to maintain operation during construction	Contractor	Minor 10	Rare 1	Low 10	Contractor
N/A	Asbestos or Silica	Health risks associated with exposure to asbestos fibres from asbestos containing materials	N/A		N/A								N/A	
N/A	Fires or Explosions or Hot Work	Injury/death from fires, explosions or hot work	N/A		N/A								N/A	
N/A	Extreme Temperature	Injury/death associated with exposure to extreme temperatures	N/A		N/A								N/A	
N/A	Working Remotely Or Isolated	Increase in consequence of hazard due to delay in response from remote/isolated working	N/A		N/A								N/A	

Appendix L – Level 2 Costing

Memorandum

To [redacted]/ Wellington Water
From [redacted]
Date 16 March 2022
Reference J000378
Subject Hutt CBD Sewer Bypass – Preferred Option

Dear Jane,

Alta has been engaged by Wellington Water to undertake a level 2 cost estimate for the Hutt CBD sewer bypass options.

Alta have been provided with preliminary drawings for each option in the form of a plan and long sections with invert levels and pipe sizes. In addition, Alta have attended two teams meeting with the designers to discuss the scheme details.

This memorandum outlines the process undertaken and the assumptions made to develop the level 2 cost estimate.

In Brief

Alta have used the Wellington Water Cost Manual as a basis for developing the cost estimates. Further cost and project risk review is recommended once the preferred option is selected to provide a business case budget for the project delivery.

Alta's level 2 cost estimate exclusive of escalation is as follows.

Project Base Estimate
[redacted]

Project Expected Estimate
[redacted]

95th Percentile Project Estimate
[redacted]

Pricing Method

Alta have used the Wellington Water cost estimating manual to develop the level 2 cost estimate. At this stage of the design there remains possible scope change. Alta have developed a schedule of quantities from the current design drawings. Risks have been calculated using the General method outlined in the cost estimating manual.

Where possible, Alta have estimated the works from first principles. These have been cross checked with bench marking of rates from other similar projects. Where rates and prices have been used from previous years, these have been escalated to net current cost. No allowance has been made for any future cost escalation.

Alta have undertaken a desk top study of the site including reviewing Google Street View and New Zealand Geotechnical Database and have not undertaken any site visits or site investigations.

Physical Works

Alta have been provided preliminary drawings. These have been reviewed with Holmes and used as the basis for the cost estimates. The drawings are attached in the appendix 1 for reference.

A summary of the pricing assumptions and methods for each section has been detailed below.

Traffic Management

Traffic Management has been priced based on a crew rate per day. The estimate also includes an allowance for barrier installation, temporary traffic lights and VMS boards.

The durations are calculated on open cut and trenchless pipe lay productivities. The traffic allowance for open cut crews is team of 4 traffic controls and associated vehicles for the duration of the open cut works. The allowance for the trenchless pipe work is a crew of 4 traffic controls and associated vehicles for 30 working days per launch pit and retrieval pit.

Pipework Overflow - Open Cut

Open cut pricing has been built up from first principles with crew pricing, material costs and assumed productivities. The pricing is based on high-density polyethylene pipe materials. The costs include for road reinstatement, tip fees and backfill.

Alta have calculated various rates for pipe size and pipe depth. These have been applied to the pipe alignments and depths as shown on the preliminary drawings provided.

Open trench construction methods have been assumed for all pipe installation up to a depth of approximately 4.5m. Where pipes are assumed to be deeper that 4.5m, trenchless methods have been assumed.

Alta have allowed a nominal amount for the outfall structure.

Pipework - Pilot Bore

Where the gravity pipe is indicated to be over 4.5m deep, trenchless pipe installation methods have been priced. The rate used is a based the work being installed using pilot bore methods. There is risk that this method will not be achievable in the ground conditions, especially if there are large stones or cobblers that obstruct the auger methods of tunnelling. The additional cost of changing from pilot boring methods to Micro Tunnelling methods has been included in the contingency on this item.

The pricing is benchmarked of projects with similar size trenchless pipe.

It is highly recommended that further geotechnical investigation is undertaken prior to settling on a construction method in the next design phase.

Manholes and Shafts

A pilot bore shaft has been priced at each manhole location. This is likely to be an appropriate length for pilot boring drives, however there may be some refinement and reduction in manhole numbers. In the case that Micro Tunnelling is the preferred construction method, a further reduction in manholes and shafts may be achievable.

The pricing allows for a temporary shaft, excavation and backfill. There are various ways of constructing temporary shafts, including solder pilers and timber lagging, sheet piling and caisson shafts.

Again, it is highly recommended that further geotechnical investigation is undertaken prior to settling on a construction method for each shaft. The ground conditions will have a large bearing on the preferred construction method and overall price.

Pipework - Rising Main

The rising main has been priced as open cut. The method for installing this pipe could be Horizontal directional drilling. A change in this method is unlikely to have a significant impact on the cost of pipe installation. The pricing has been built up from first principles with crew pricing, material costs and assumed productivities. These prices have been reviewed against other similar projects in the area.

The pricing is based on high-density polyethylene pipe materials. The costs include for road reinstatement, tip fees and backfill.

Pipework - Bridge Crossing

Pipe bridge costs are based on a ductile Iron pipe being connected to an existing bridge. The pricing allows for access scaffold for the installation, brackets, pipe materials and connection to the bridge. Alta has assumed that the bridge has sufficient capacity to support the pipework.

Note that there is some opportunity to reduce the costs of construction on the pipe bridge if the works are complete during the bridge construction.

Pump Station

Pump station pricing has been built up from elements of similar project, first principle pricing and benchmarking pricing from similar projects.

The pricing includes for all typical pump station equipment including wet well, pumps, flow meters, odour management, electrical equipment, and controls.

Some details including external power supply are not clear at this stage in the design.

The allowance for risk on this section of the pricing has been set at 30% based on the ground condition risk and potential for scope creep.

Pump Station Storage

Storage pricing is based on 2000m³ concrete storage tank buried next to the pump station. The pricing included for temporary works and removal of excavated material and backfill with aggregates.

The storage tank is at scheme level and design development there is likely to be significant increase in complexity and scope. This is reflected in the high-risk profile allocated below.

There is additional risk on the ground conditions and consent conditions that have been considered in the contingency.

Service Location Works

Service location works is based on the required length of pipe to be installed. The rate includes for traffic management, hydro excavation, and temporary reinstatement.

Service Relocation Works

An allowance has been included for service relocation. Further investigation is recommended into the service relocation required by relevant service providers. A nominal value has been used with a higher risk profile.

Contractors Risk

Alta have included an allowance of 3% for contractor’s construction risk.

Onsite Overheads

Alta have built up a site management cost. The project delivery team is assumed to consist of two project managers for the pump station and the pipework, associated project engineers and site engineers, and other support staff including Health and Safety, Communications and Quality staff, surveyors, and contract and commercial management support.

Site facilities have been included, along with a site compound and site consumables, insurances and bonds and IT costs. Project duration is assumed to be 18 months.

Offsite Overheads and Profit

An allowance of [redacted] has been applied to the direct costs and onsite overheads for contractor’s offsite overheads and profit.

Consultancy Fees (MSQA)

An allowance of [redacted]% of the physical works cost has been made for management, surveillance and quality assurance costs during the project delivery phase.

Investigations

Consultancy fees of [redacted] of the physical works cost have been included for investigation design costs, along with a nominal allowance for initial site investigation and other costs.

Preliminary Design/Consenting

Consultancy fees of [redacted] of the physical works cost have been included for preliminary design costs, along with a nominal allowance for preliminary site investigation and other costs.

Detailed Design

Consultancy fees of [redacted] of the physical works cost have been included for detailed design costs, along with a nominal allowance for preliminary site investigation and other costs.

Procurement

Consultancy fees of [redacted] of the physical works cost have been included for the procurement costs.

Contingency & Funding Risk

The geotechnical conditions on site are likely to have a significant impact on the overall construction cost and methods used for the project. Alta have based the estimate on the ground conditions shown on the geotechnical study provided. The geotechnical information available from boreholes in the vicinity indicates that the ground conditions are likely to be Taita Alluvium consisting of silts, sands and gravels overlying the Waiwhetu Aquifer. The key risks around the ground conditions are associate with the following.

- Suitability of the ground for pilot bore methods.
- Ground water level and required dewatering costs.
- Contaminated ground along the pipe alignment or storage tank location.
- Suitability of the ground for sheet piling or other temporary ground support.
- Works result in Intuition into the Waiwhetu Aquifer

The project contingency and funding risks has been set in line with the Wellington Water Cost Estimation Manual, level two estimate, with the above geotechnical risks considered in each case.

The general risk assessment method is to apply a level of risk to each aspect of the project as detailed below. These are weighted to provide an overall project risk allowance.

Table 1: Risk Adjustments

	Project contingency	Funding Risk
Low	[redacted]	[redacted]
Medium	[redacted]	[redacted]
High	[redacted]	[redacted]

This has then been weighted based on the % each element is of the total cost to get an average P50 & P95

Table 3: Risk Weighting

	Project Contingency	Funding Risk
Traffic Management	[redacted]	[redacted]
Pipework - Open Cut	[redacted]	[redacted]
Pipework - Tunnel	[redacted]	[redacted]
Shafts	[redacted]	[redacted]
Pipework - Rising Main	[redacted]	[redacted]
Pipework - Bridge Crossing	[redacted]	[redacted]
Pump Station	[redacted]	[redacted]
Pump Station Storage	[redacted]	[redacted]
Service Location works	[redacted]	[redacted]
Service Relocation Works	[redacted]	[redacted]
Weighted Average	[redacted]	[redacted]

Escalation

The pricing is based on today's cost, with no allowance for future cost escalation. Nationally the construction market is currently experiencing higher than normal cost escalation. The market is seeing a range of increases across materials, labour and plant that varies between [redacted] and [redacted] ver the past 12 months.

The impact on project cost varies depending on the type of project and the input components. These projects are subject to escalation risk on the following key items

- Commodity prices for raw materials such as steel, copper, and aluminium.
- Increases in shipping costs.
- Increase in specialist equipment costs.
- Increased transport costs in New Zealand.
- Increased labour costs.

Property Costs

Alta have not made any allowance for property costs. These will be required for the pump station.

Conclusion

The cost estimate is aligned to the Level 2 process outlined in the Wellington Water cost estimating manual. This is to support the project development phase. There are still significant risks in the project design and assumed methodology. The key risk is associated with the site-specific geotechnical conditions. These will impact the pump station temporary works, excavation costs and groundwater management, in addition they will have a significant impact on the pipe installation methods, specifically the trenchless method used.

Atlas level 2 cost estimate excluding escalation is a base estimate o[redacted] Expected Estimate of[redacted]and 95th Percentile estimate of $[redacted]

Yours sincerely,

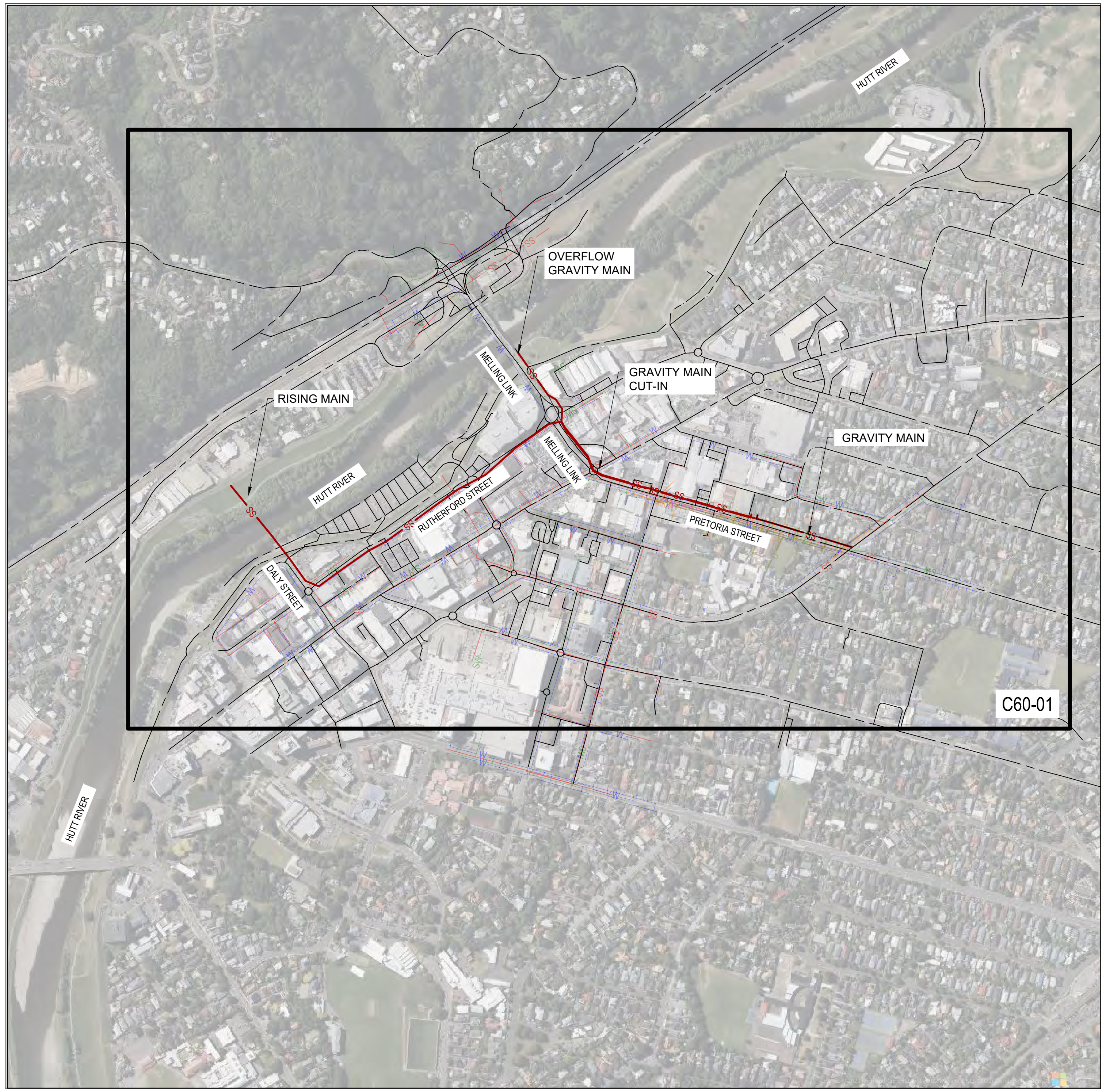
[redacted]

Alta Consulting Ltd
022 534 7879

Reviewed by: Henry Willis

APPENDIX 01 – PRELIMINARY DRAWINGS

RIVERLINK WASTEWATER TRUNK CBD BYPASS



LOCALITY PLAN

1:5000

0 2.5 5 7.5 10 12.5m

SCALE 1:250 AT ORIGINAL SIZE

A1 REPRODUCTION SCALE 100 80 60 40 20 0mm

A3 REPRODUCTION SCALE 50 40 30 20 10 0mm

DRAWING REGISTER, DISTRIBUTION AND TRANSMITTAL

CLIENT	WELLINGTON WATER LTD									
CONTRACTOR										
	DRAWING ISSUE STATUS OPTIONS FOR INFORMATION ONLY FOR APPROVAL FOR TENDER ONLY NOT FOR CONSTRUTION ISSUED FOT CONSTRUCTION AS BUILT (CONSTRUCTION RECORD)	ISSUE STATUS	FOR INFORMATION ONLY	-	-	-	-	-	-	-
	DRAWING PRINT SIZE		A3							
		DD	9							
CAD FILE REFERENCE	144418.50 M-P Cover page and Location 144418.50 M-P-Gravity Main 144418.50 M-P-Rising Main 144418.50 M-P-Gravity Main Cut-In 144418.50 M-P-Overflow Gravity Main	MM	2							
		YY	23							
DRAWING NUMBER	DRAWING TITLE		1							
C00-00	COVER SHEET AND DRAWING INDEX		1							
C00-01	PROJECT INFORMATION		1							
C60-01	PROPOSED WASTEWATER KEY PLAN		1							
C61-01	PROPOSED WASTEWATER GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-02	PROPOSED WASTEWATER GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-03	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-04	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-05	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-06	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-07	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-08	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-09	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-10	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-11	PROPOSED WASTEWATER GRAVITY MAIN CUT-IN PLAN AND LONGITUDINAL SECTIONS		1							
C61-12	PROPOSED WASTEWATER GRAVITY MAIN CUT-IN PLAN AND LONGITUDINAL SECTIONS		1							
C61-13	PROPOSED WASTEWATER OVERFLOW GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C61-14	PROPOSED WASTEWATER OVERFLOW GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS		1							
C63-01	PROPOSED PUMPSTATION PLAN VIEW		1							
C63-02	PROPOSED PUMSTATION LONGITUDINAL SECTIONS		1							

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DRG: 144418.50 M-P Cover page and Location.dwg
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PROJECTNAME: ----

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Auckland 1010
New Zealand
Holmesgroup.com
T: +64 9 965 4789

Original Scale (A1)
Reduced Scale (A3)
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Design			*Approved
Drawn	JR	01-03-2023	
*Dsg Verifier	NOT APPROVED		
*Dwg Check			Date
*Name Produced through Projectwise Signoff			

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: COVER SHEET
AND DRAWING INDEX

UNDER REVISION

Discipline

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GENERAL NOTES

1. SURVEY MARKS SHOWN ARE FROM LINZ DATA SERVICES AND ARE APPROXIMATE ONLY.

SURVEY NOTES

1. COORDINATES ARE IN TERMS OF NZTM 2000.
2. HEIGHT SHALL BE IN TERMS OF NZVD 2016.

STRUCTURE SCHEDULE: PROPOSED GRAVITY MAIN

NAME	LEVELS	COORDINATES	TYPE	COMMENTS
MH01	LL: 7.668 D: 2.500 IL out = 5.168	E: 1760533.367 N: 5436446.900	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH02	LL: 7.411 D: 2.639 IL in = 4.772	E: 1760447.230 N: 5436472.987	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.031	
MH03	LL: 7.784 D: 3.307 IL in = 4.485 IL out = 4.485	E: 1760384.872 N: 5436491.873	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH04	LL: 8.349 D: 4.188 IL in = 4.405	E: 1760367.238 N: 5436496.659	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH05	LL: 8.445 D: 5.025 IL in = 4.385 IL out = 3.420	E: 1760368.486 N: 5436500.999	1,800 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	

STRUCTURE SCHEDULE: PROPOSED OVERFLOW GRAVITY MAIN

Name	Levels	Coordinates	Type	Comments
MH11	LL: 6.456 D: 2.503 IL in = 3.953 IL out = 3.956	E: 1760054.606 N: 5436611.524	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.751	
MH12	LL: 5.988 D: 2.303 IL in = 3.686 IL out = 3.685	E: 1760017.301 N: 5436658.176	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH13	LL: 5.702 D: 2.140 IL in = 3.562 IL out = 3.562	E: 1760006.952 N: 5436674.709	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH14	LL: 5.271 D: 2.011 IL in = 3.260 IL out = 3.262	E: 1759982.322 N: 5436722.942	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH15	LL: 5.590 D: 2.662 IL in = 2.927 IL out = 2.927	E: 1759943.527 N: 5436777.476	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	

STRUCTURE SCHEDULE: PROPOSED GRAVITY MAIN CUT-IN

NAME	LEVELS	COORDINATES	TYPE	COMMENTS
MH06	LL: 7.318 D: 1.768 IL out = 5.550	E: 1760064.865 N: 5436586.168	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH07	LL: 7.612 D: 2.141 IL in = 5.471 IL out = 5.471	E: 1760080.695 N: 5436577.609	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH08	LL: 6.962 D: 1.887 IL in = 5.075 IL out = 5.075	E: 1760167.299 N: 5436553.118	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH09	LL: 7.000 D: 2.299 IL in = 4.701 IL out = 4.701	E: 1760249.091 N: 5436529.988	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	
MH10	LL: 8.098 D: 3.780 IL in = 4.318 IL out = 4.318	E: 1760332.797 N: 5436506.317	1,050 DIA CONCRETE MANHOLE SUMP DEPTH 0.000	

A1 REPRODUCTION SCALE
0mm 20 40 60 80 100

A3 REPRODUCTION SCALE
0mm 10 20 30 40 50

PIPE MATERIAL

CODE	DESCRIPTION	SUPERSEDED CODE
ABS	ACRYLONITRITE BUTADIENE STYRENE	
AC	ASBESTOS CEMENT	
AC-E	ASBESTOS CEMENT EVERITE	
AC-I	ASBESTOS CEMENT ITALITE	
AL	ALUMINIUM	
CI	CAST IRON	
CU	COPPER	
DI	DUCTILE IRON	
EW	EARTHEN WARE	
GI	GALVANISED IRON	
LBST	LOCKBAR STEEL	
MPVC	MODIFIED POLYVINYL CHLORIDE	
PE100	POLYETHYLENE HDPE	
PE80	POLYETHYLENE MDPE	
PVC	POLYVINYL CHLORIDE	
RC	REINFORCED CONCRETE	CC
SS	STAINLESS STEEL	
ST	MILD STEEL	
UNK	UNKNOWN	
UPVC	UNPLASTICISED POLYVINYL CHLORIDE	

PIPE LINING

CODE	DESCRIPTION	SUPERSEDED CODE
BL	BITUMEN	
CL	CONCRETE	
CML	CEMENT MORTAR	
CTL	COAL TAR ENAMEL	EL, CTE
EL	EPOXY	PL
NL	NO LINING	
TEL	COAL TAR EPOXY	CTE
UL	UNKNOWN LINING (use UL when not specified)	

PIPE COATING

CODE	DESCRIPTION	SUPERSEDED CODE
BC	BITUMEN	
CTE	COAL TAR ENAMEL, PITCH ENAMEL, ENAMEL	MC, EC
DC	DIMET (EPOXY)	
EC	EPOXY	
GC	GUNITE	
NC	NO COATING	
PC	POLYETHYLENE, POLYKEN TAPE	TC
PW	POLYETHYLENE WRAP (polyethylene sleeve on DI pipe)	
UC	UNKNOWN COATING (use UC when not specified)	KC

SERVICES LEGEND

NEW WATER MAIN	━━ W ━━
EXISTING WATER MAIN	—— W ——
NEW STORMWATER	━━ SW ━━
EXISTING STORMWATER	—— SW ——
NEW WASTEWATER	━━ SS ━━
NEW WASTEWATER RISING MAIN	━━ WWR ━━
EXISTING WASTEWATER	—— SS ——
ABANDONED SERVICE	— X — X — X —
PRIVATE WATER	– – – – – –
PRIVATE STORMWATER	– – – – – –
PRIVATE WASTEWATER	– – – – – –
KERBS	——
CONTOURS MAJOR	——
CONTOURS MINOR	——
PARCEL BOUNDARY	——
VALVE NEW OR EX. / REDUNDANT	Ⓥ Ⓥ
BOUNDARY VALVE	Ⓥ
HYDRANT NEW OR EX. / REDUNDANT	FH FH
MANIFOLD NEW / EXISTING	■ ☒
EXISTING TOBY	⊗
PUMP	▷
NEW SS/SW MANHOLE	◉ ◉
EXISTING SS/SW MANHOLE	◎ ◎
EXISTING SS/SW LHCE	▣ ▣
EXISTING SW SUMP	▥
PROPERTY NUMBER	1

UTILITIES LEGEND

GAS - POWERCO	—— G ——
GAS - NOVA	—— NG ——
U/G POWER	—— UP ——
400V U/G POWER	—— 400V ——
11kV U/G POWER	—— 11kV ——
33kV U/G POWER	—— 33kV ——
O/H POWER / TROLLEY WIRE	—— OH ——
TELECOMMS / CHORUS	—— T ——
OVERHEAD TELECOMMS	—— OH ——
VODAFONE	—— V ——
FIBRE OPTIC	—— FO ——
CITYLINK BROADBAND	—— B ——
VECTOR COMMS	—— VC ——
OIL	—— OIL ——
LINZ SURVEY MARK	◉ SM
POLE	●

MISCELLANEOUS

FENCE LINE	—— // ——
EXISTING FENCE	—— // ——
SECURITY FENCE	——o——

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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROJECT INFORMATION

UNDER REVISION

Discipline

Dwg No. C00-01

Rev. 1

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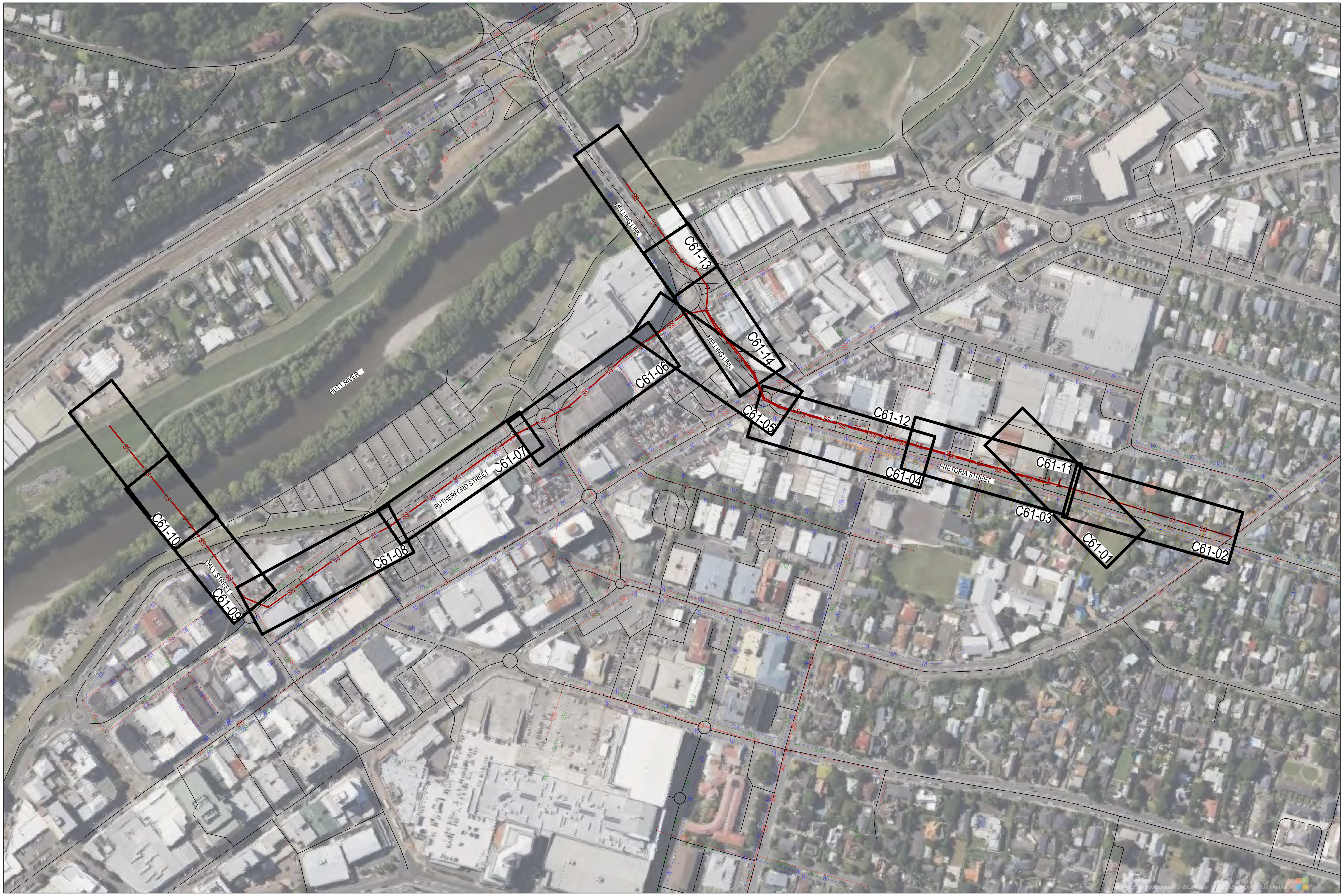

A1 REPRODUCTION SCALE
0mm 20 40 60 80 100

A3 REPRODUCTION SCALE
0mm 10 20 30 40 50

PROPOSED WASTEWATER KEY PLAN

1:2000

0 20 40 60 80 100m

SCALE 1:2000 AT ORIGINAL SIZE

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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED WASTEWATER
KEY PLAN

UNDER REVISION

Discipline

Drawing No. C60-01

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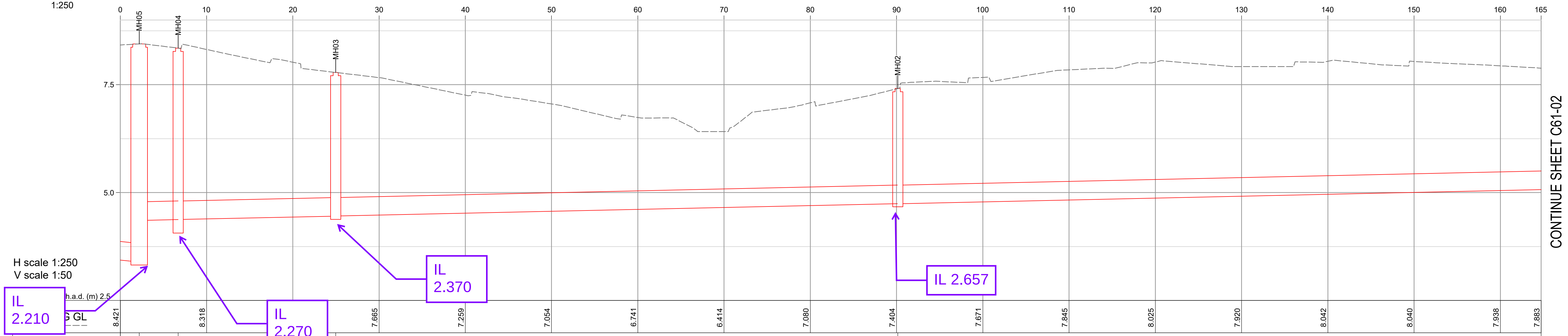
PLAN VIEW - PROPOSED WW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



LID LEVEL		8.445	8.349	7.784	7.411	
COVER TO PIPE	4.56	3.66	3.54	2.90	2.24	
PIPE DATA	375 NB UPVC SN16 -1:50 (-2.00%)	375 NB UPVC SN16 1:227 (0.44%)	375 NB UPVC SN16 1:227 (0.44%)	375 NB UPVC SN16 1:227 (0.44%)	375 NB UPVC SN16 1:227 (0.44%)	
INVERT LEVEL	3.464	3.420 4.385	4.405 4.405	4.485 4.485	4.772 4.772	5.168
MH CHAINAGE		2.191	6.706	24.979	90.134	

LONGITUDINAL SECTION GRAVITY MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m

HORIZONTAL 1:250
AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

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*Dwg Check			Date
*Name Produced through Projectwise Signoff			

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED GRAVITY MAIN
PLAN AND PROFILE SECTION

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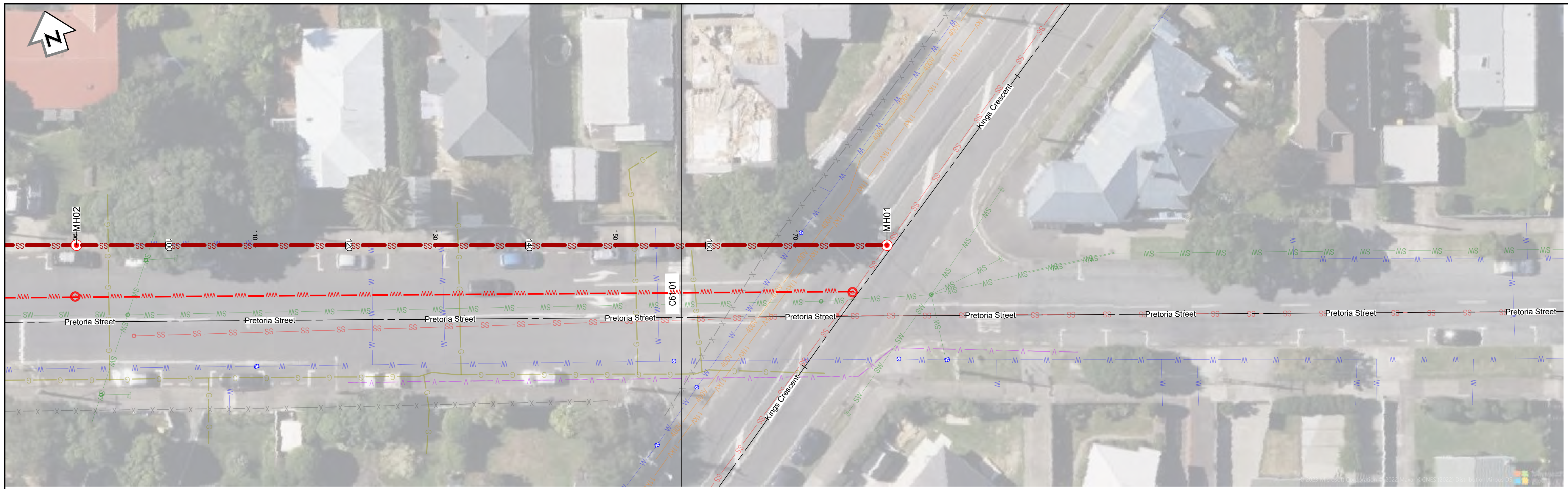
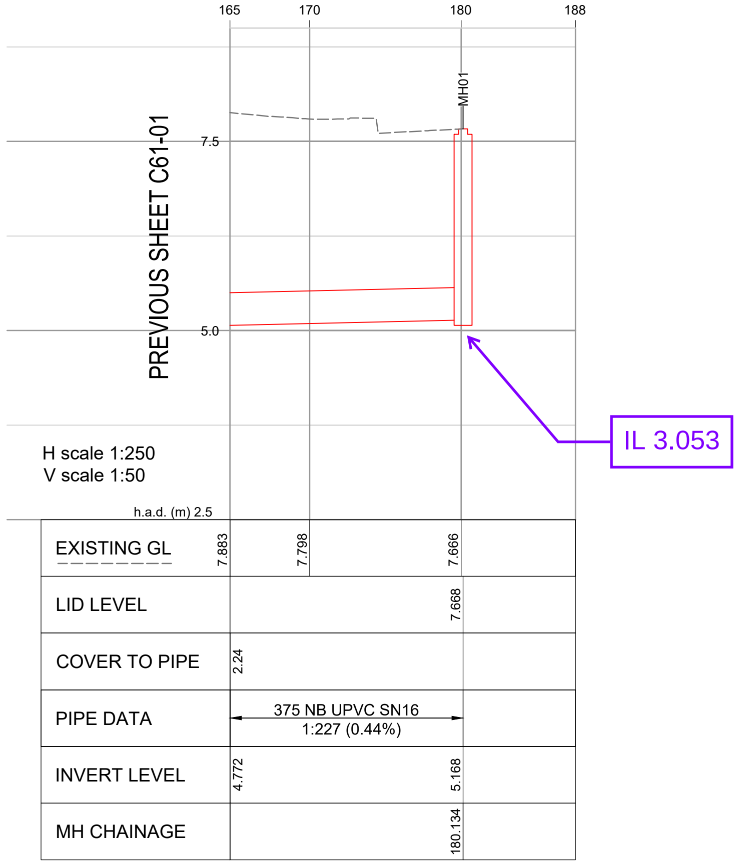


PLAN VIEW - PROPOSED WW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	7.883	7.798	7.666
LID LEVEL			7.668
COVER TO PIPE	2.24		
PIPE DATA	375 NB UPVC SN16 1:227 (0.44%)		
INVERT LEVEL	4.772		5.168
MH CHAINAGE			180.134

LONGITUDINAL SECTION GRAVITY MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250
AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED GRAVITY MAIN
PLAN AND PROFILE SECTION

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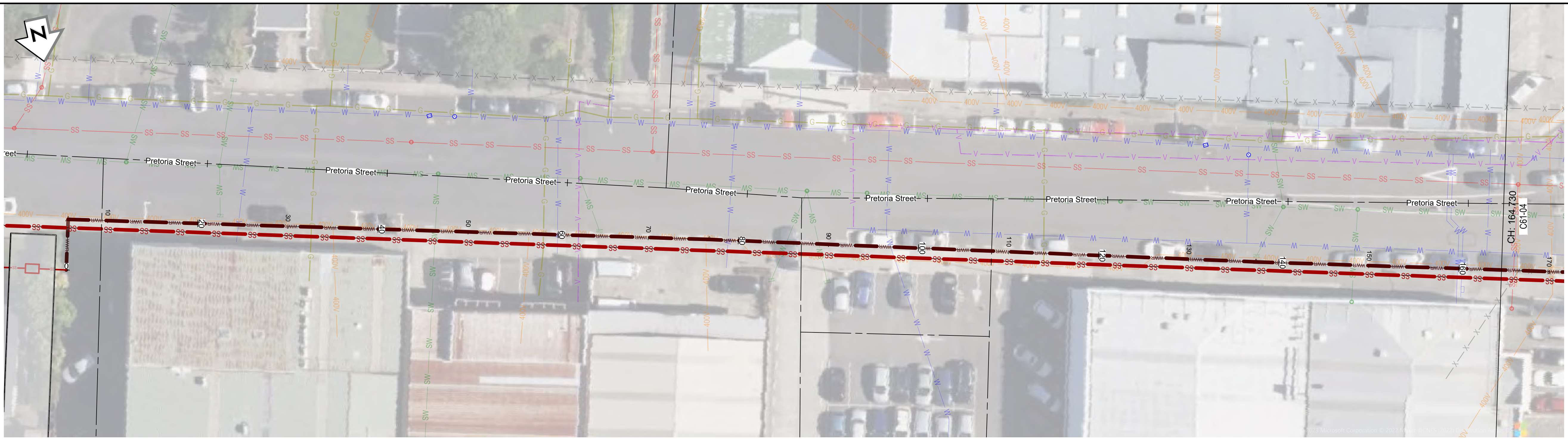
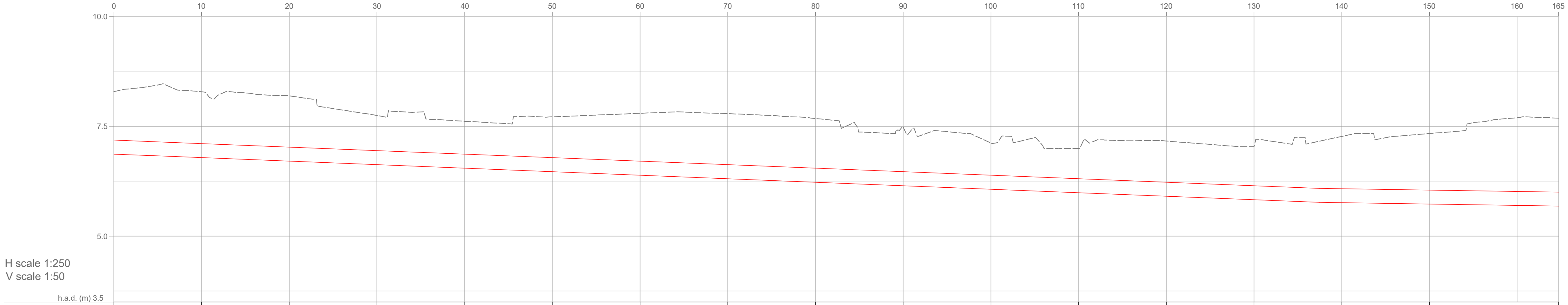


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



CONTINUES SHEET C61-04

EXISTING GL	8.295 8.287 8.197 7.751 7.617 7.717 7.797 7.790 7.680 7.484 7.121 7.000 7.167 7.037 7.272 7.337 7.697 7.687
LID LEVEL	7.204 7.159 6.590 6.104
COVER TO PIPE	1.11 1.33 1.15 1.08
PIPE DATA	315 NB PE100 PN16 1:125 (0.80%) 315 NB PE100 PN16 1:125 (0.80%) 315 NB PE100 PN16 1:125 (0.80%) 315 NB PE100 PN16 1:327 (0.31%)
INVERT LEVEL	6.900 6.855 6.855 6.286 6.286 5.800 5.800 5.492
CHAINAGE	0.000 5.617 76.769 137.479

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

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*Dsg Verifier			
*Dwg Check			Date

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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
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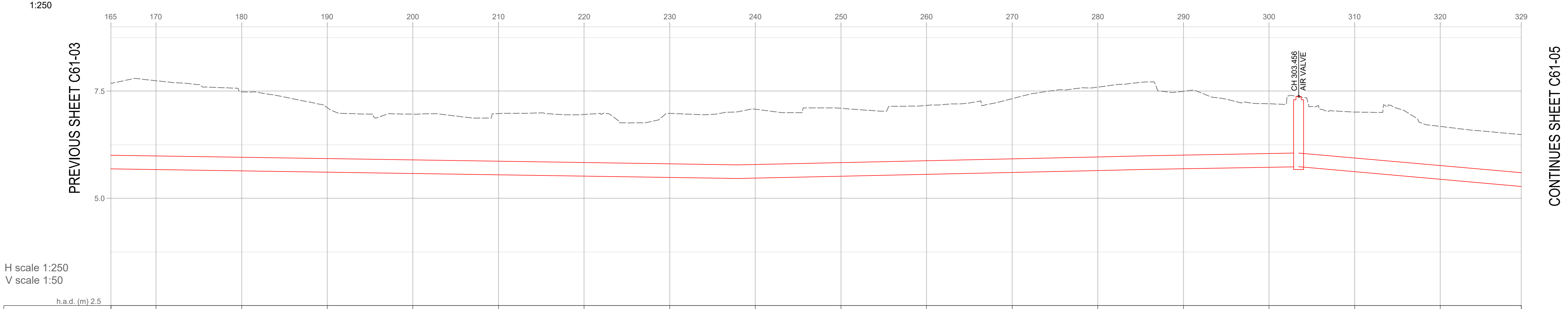
PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	7.687	7.743	7.483	7.114	6.962	6.976	6.954	6.980		7.077	7.099	7.167	7.324		7.593		7.496	7.207		7.009	6.676	6.486
LID LEVEL									5.796					5.978		6.008			[illegible]			
COVER TO PIPE	1.08								1.24					1.62		1.72			1.32			
PIPE DATA	315 NB PE100 PN16 1:327 (0.31%)								315 NB PE100 PN16 -1:227 (-0.44%)					315 NB PE100 PN16 -1:205 (-0.49%)		315 NB PE100 PN16 -1:278 (-0.36%)			315 NB PE100 PN16 1:56 (1.77%)			
INVERT LEVEL	5.800								5.492 5.492					5.674 5.674		5.704 5.704			5.768 5.768			5.281
CHAINAGE									237.991					279.444		285.566			303.456			

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

A3 REPRODUCTION SCALE
50
40
30
20
10
0mm

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE
0 0.5 1 1.5 2 2.5m

HORIZONTAL 1:250
AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
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Dwg No.
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Rev.
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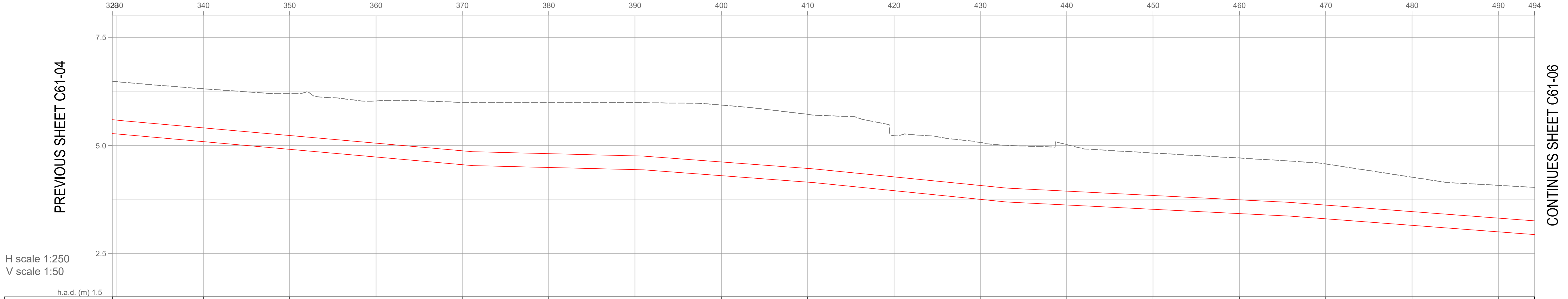
PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	6.486 6.476 6.311 6.205 6.030 6.000 6.000 5.990 5.934 5.718 5.225 5.073 5.019 4.826 4.710 4.573 4.266 4.077 4.031
LID LEVEL	5.585 4.871 4.772 4.475 4.028 3.700
COVER TO PIPE	1.32 0.89 1.15 1.23 1.24 0.99 0.96
PIPE DATA	315 NB PE100 PN16 1:56 (1.77%) 315 NB PE100 PN16 1:56 (1.78%) 315 NB PE100 PN16 1:200 (0.50%) 315 NB PE100 PN16 1:67 (1.50%) 315 NB PE100 PN16 1:50 (2.00%) 315 NB PE100 PN16 1:100 (1.00%) 315 NB PE100 PN16 1:67 (1.50%)
INVERT LEVEL	5.768 5.281 5.281 4.567 4.567 4.468 4.468 4.171 4.171 3.724 3.724 3.396 3.396 2.796
CHAINAGE	330.941 371.175 390.940 410.708 433.060 465.823

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING IN COLOUR

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12 Madden Street
Auckland 1010
New Zealand
Holmesgroup.com
T: +64 9 965 4789

Original Scale (A1)
Reduced Scale (A3) 1/2 SHOWN

Design			*Approved
Drawn	JR	16/02/2023	
*Dsg Verifier			NOT APPROVED
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

UNDER REVISION

Discipline

Dwg No. C61-05

Rev. 1

Plotted By Johan Rosendo

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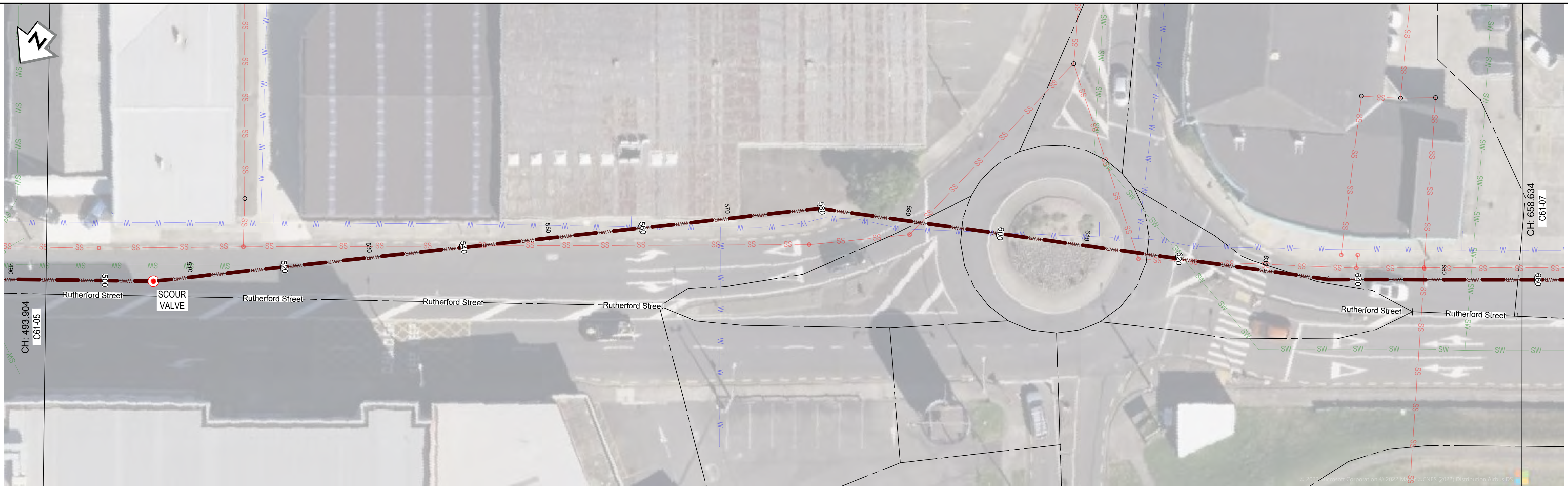
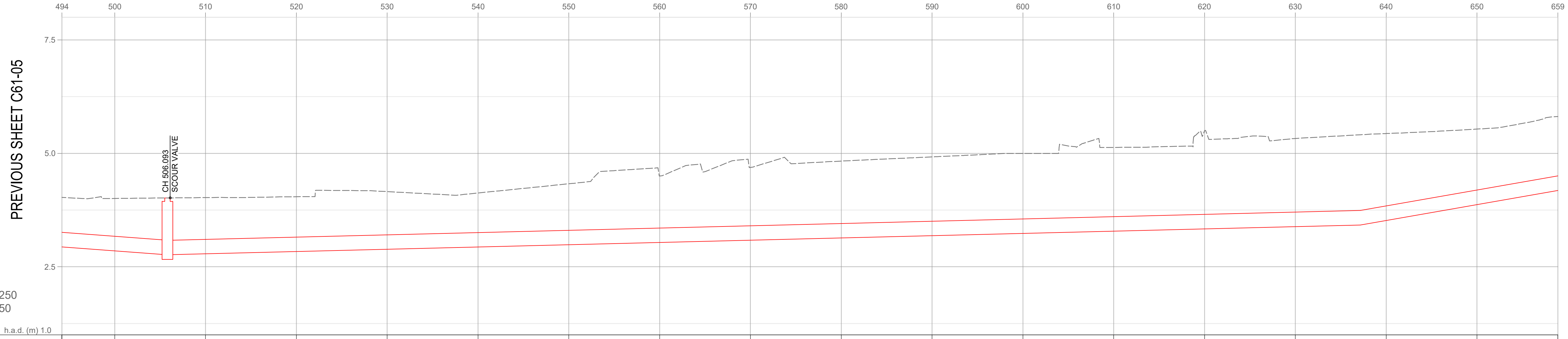


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250

PREVIOUS SHEET C61-05



CONTINUES SHEET C61-07

H scale 1:250
V scale 1:50

EXISTING GL	4.031	4.006	4.025	4.044	4.157	4.126	4.330	4.500	4.691	4.830	4.922	5.000	5.131	5.496	5.328	5.437	5.534	5.813

LID LEVEL		4.018	3.472	3.757	
COVER TO PIPE	0.96	0.93	1.38	1.67	
INVERT LEVEL	3.396	2.796 2.796	3.168 3.168	3.453 3.453	5.506
CHAINAGE		505.807	580.158	6[illegible]7.156	

PIPE DATA	315 NB PE100 PN16 1:67 (1.50%)	315 NB PE100 PN16 -1:200 (-0.50%)	315 NB PE100 PN16 -1:200 (-0.50%)	315 NB PE100 PN16 -1:29 (-3.50%)

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE
0mm
20
40
60
80
100

A3 REPRODUCTION SCALE
0mm
10
20
30
40
50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250
AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

CHECK PRINT
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DISTRIBUTION	SIGN	DATE
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New Zealand
Holmesgroup.com
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Original Scale (A1)
Reduced Scale (A3)
1/2 SHOWN

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Drawn	JR	16/02/2023	
*Dsg Verifier			NOT APPROVED
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

UNDER REVISION

Discipline

Dwg No. C61-06

Rev. 1

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Document No. 144418.50 M-P-RISING MAIN-2.DWG

Plotted By: Johan Rosendo

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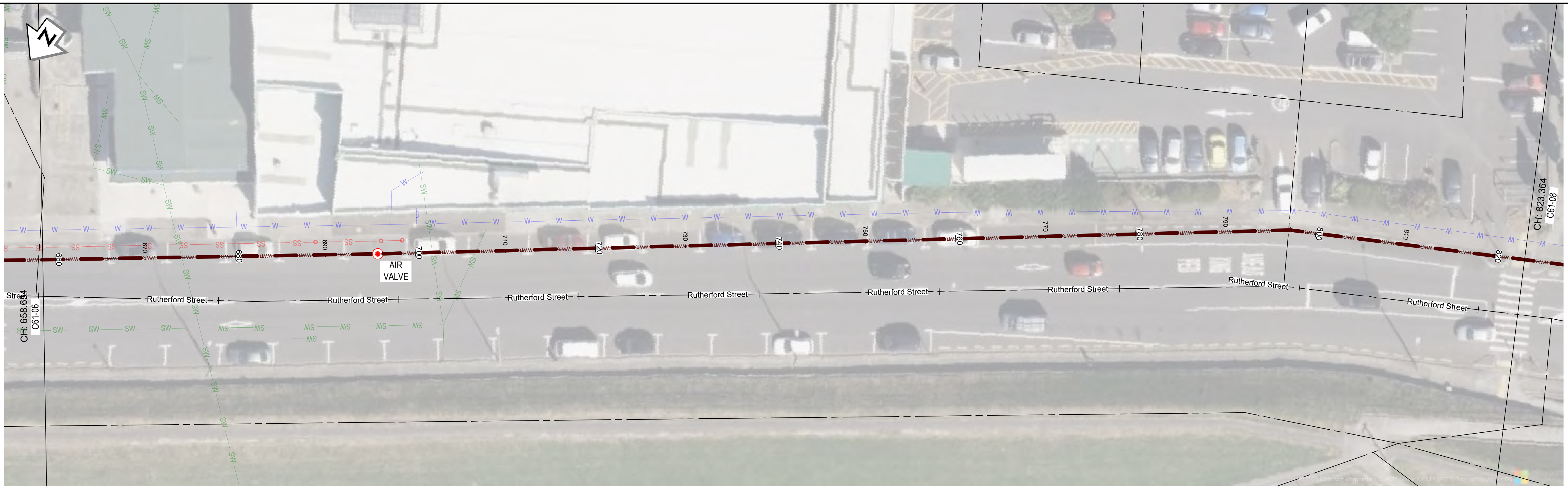
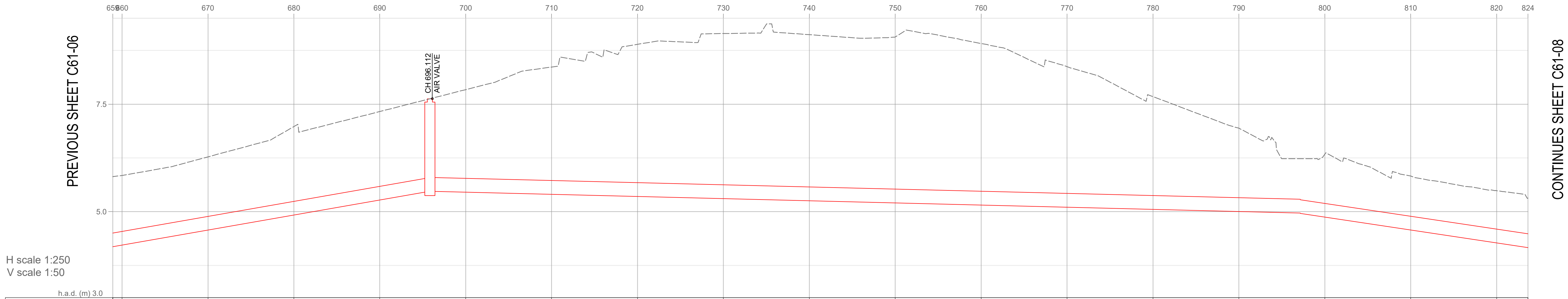


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	5.813 5.842 6.275 6.978 7.330 7.839 8.365 8.893 9.144 9.118 9.063 8.912 8.374 7.675 6.942 6.335 5.829 5.489 5.313
LID LEVEL	7.626 5.304
COVER TO PIPE	1.67 1.83 0.95
PIPE DATA	315 NB PE100 PN16 -1:29 (-3.50%) 315 NB PE100 PN16 1:200 (0.50%) 315 NB PE100 PN16 1:33 (3.00%)
INVERT LEVEL	3.453 5.506 5.506 4.999 4.990 3.926
CHAINAGE	695.826 79 158

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE 100 80 60 40 20 0mm

A3 REPRODUCTION SCALE 50 40 30 20 10 0mm

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

CHECK PRINT
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DATE: 01 Mar 2023 9:10 AM
PROJECTNAME: ----

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ORIGINAL DRAWING IN COLOUR

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Holmes

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Original Scale (A1)
Reduced Scale (A3) 1/2 SHOWN

Design			*Approved
Drawn	JR	16/02/2023	
*Dsg Verifier	NOT APPROVED		
*Dwg Check		Date	
*Name Produced through Projectwise Signoff			

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

UNDER REVISION

Discipline

Dwg No. C61-07

Rev. 1

Plotted By:Johan Rosendo

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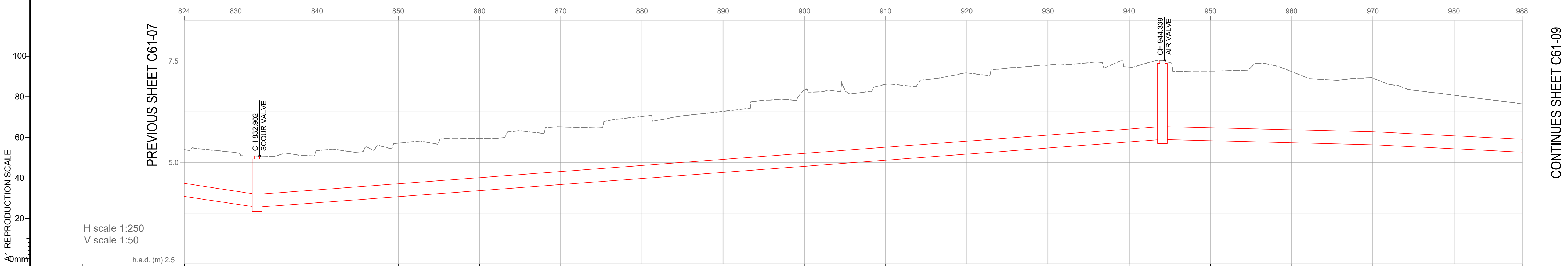
PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	5.313	5.240	5.292	5.476	5.590	5.877	6.135	6.260	6.784	6.928	7.207	7.402	7.352	7.253	7.239	7.078	6.659	6.444
LID LEVEL	5.159	5.058	7.517	5.773														
COVER TO PIPE	0.95	0.94	1.17	1.63	1.33													
PIPE DATA	315 NB PE100 PN16 1:33 (3.00%)	315 NB PE100 PN16 -1:67 (-1.50%)	315 NB PE100 PN16 -1:67 (-1.50%)	315 NB PE100 PN16 1:200 (0.50%)	315 NB PE100 PN16 1:100 (1.00%)													
INVERT LEVEL	4.990	3.926 3.926	4.754 4.754	5.598 5.598	5.469 5.469	4.961												
CHAINAGE	832.617	887.820	944.082	969.913														

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

CHECK PRINT
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ORIGINAL DRAWING IN COLOUR

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NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

A3 REPRODUCTION SCALE 50 40 30 20 10 0mm

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

No.	Revision	By	Chk	Appd	Date

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Holmes NZ LP
12 Madden Street
Auckland 1010
New Zealand
Holmesgroup.com
T: +64 9 965 4789

Original Scale (A1)
Reduced Scale (A3)
1/2 SHOWN

Design
Drawn JR 16/02/2023
*Dsg Verifier
*Dwg Check
*Approved
Date
NOT APPROVED
*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

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Discipline
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Rev. 1

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Document No. 144418.50 M-P-RISING MAIN-2.DWG

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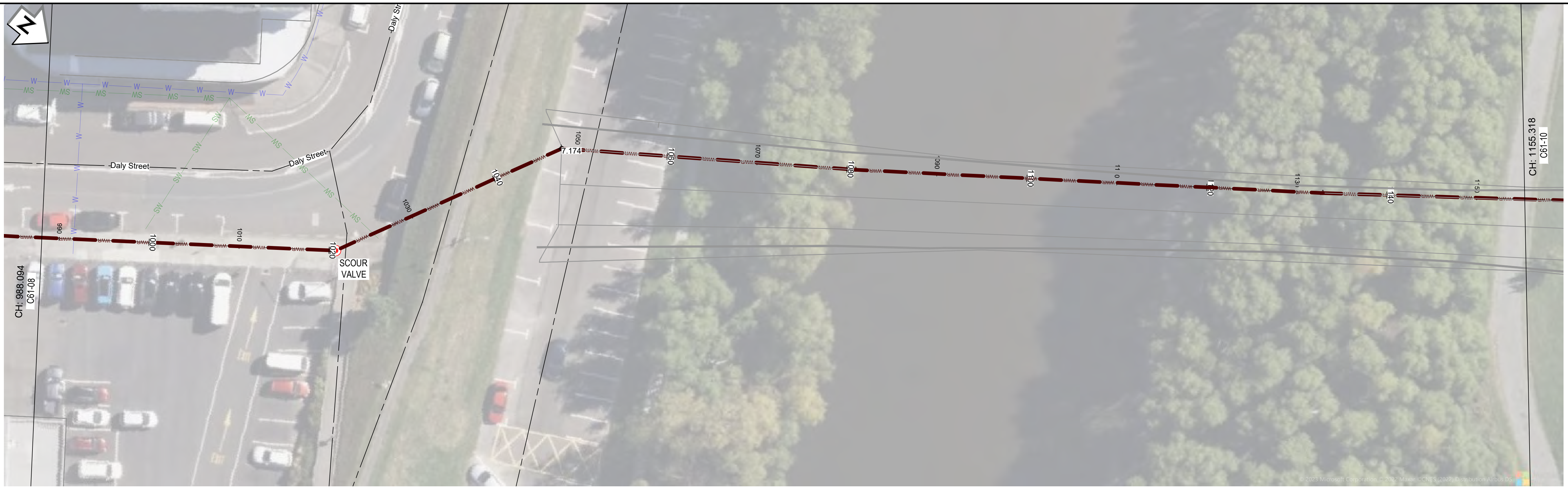
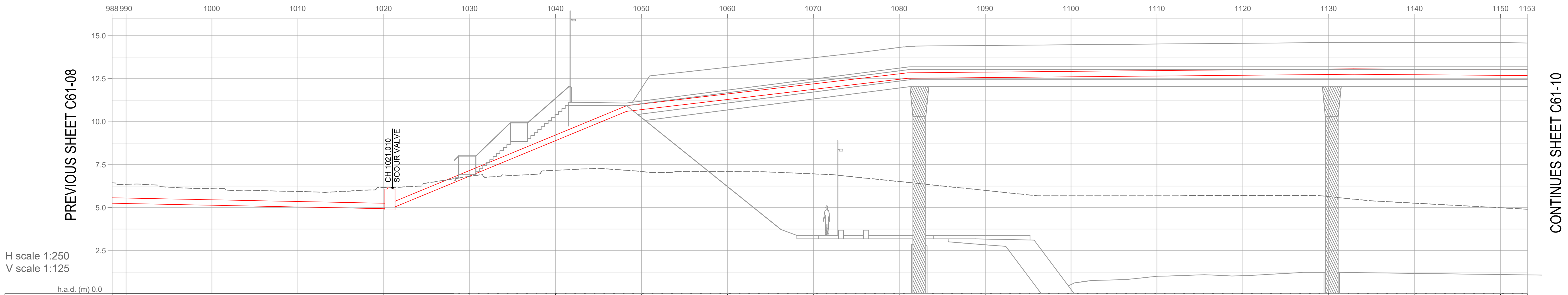


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	6.444	6.358	6.130	5.939	6.163	6.820	7.173	7.106	7.096	6.964	6.520	6.004	5.690	5.695	5.700	5.645	5.263	4.995	4.911

LID LEVEL		6.161	10.940	12.864	13.091	
COVER TO PIPE	1.33	0.91	-3.75	-6.38	-7.58	
PIPE DATA	315 NB PE100 PN16 1:100 (1.00%)	315 NB PE100 PN16 -1:5 (-20.61%)	315 NB PE100 PN16 -1:17 (-5.88%)	315 NB PE100 PN16 -1:228 (-0.44%)	315 NB PE100 PN16 1:299 (0.33%)	
INVERT LEVEL	5.469	4.961 4.961	10.636 10.636	12.560 12.560	12.788 12.788	12.652
CHAINAGE		1020.725	1048.262	1080.985	11[illegible]2.898	

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

A3 REPRODUCTION SCALE
50
40
30
20
10
0mm

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED
4. PEDESTRIAN BRIDGE ALIGNMENT AND PROFILE SHOWED FOR COORDINATION PURPOSED

CHECK PRINT

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ORIGINAL DRAWING IN COLOUR

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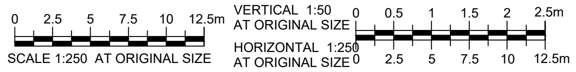

SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE
HORIZONTAL 1:250
AT ORIGINAL SIZE

PROPOSED SERVICES LEGEND

NEW WASTEWATER	▬ SS ▬
NEW WASTEWATER RISING MAIN	▬ WWR ▬

No.	Revision	By	Chk	Appd	Date

Holmes

Drawing Originator
Holmes NZ LP
12 Madden Street
Auckland 1010
New Zealand
Holmesgroup.com
T: +64 9 965 4789

Original Scale (A1)
Reduced Scale (A3)
1/2 SHOWN

Design			*Approved
Drawn	JR	16/02/2023	
*Dsg Verifier			
*Dwg Check			Date
*Name Produced through Projectwise Signoff			

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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

UNDER REVISION

Discipline

Dwg No. C61-09

Rev. 1

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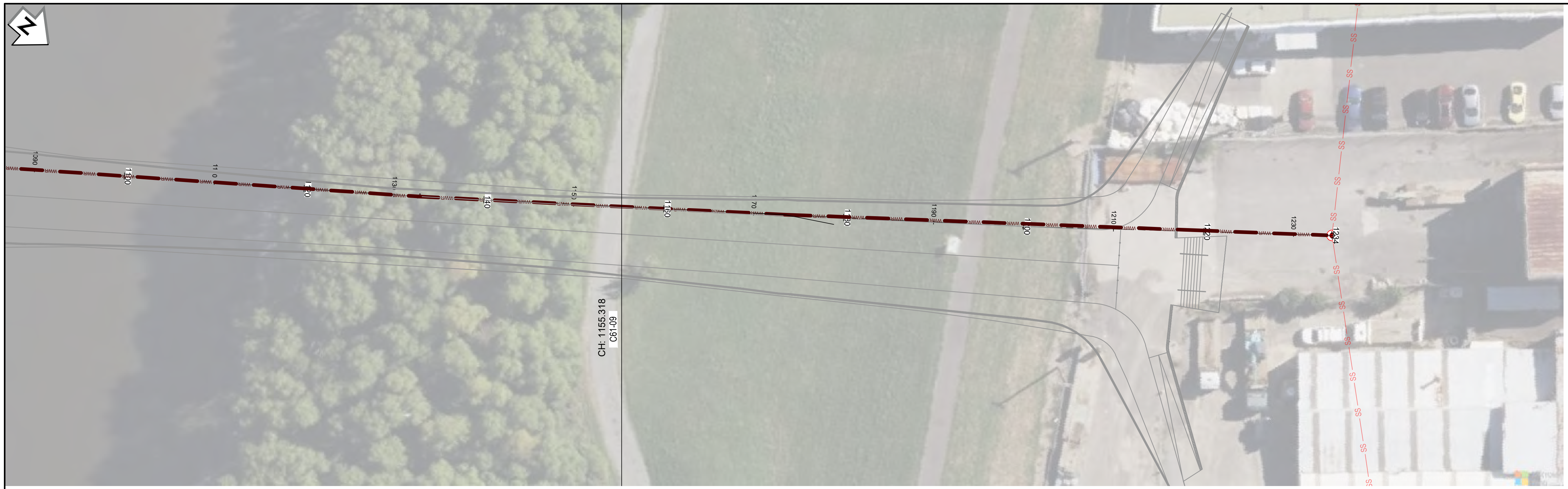
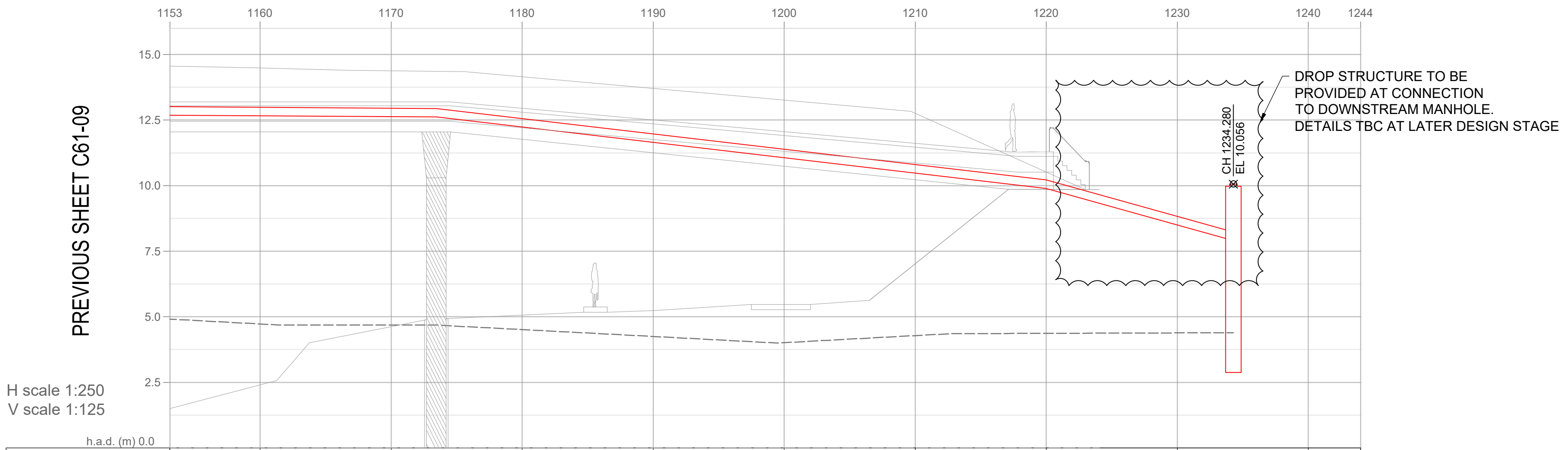


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



DROP STRUCTURE TO BE
PROVIDED AT CONNECTION
TO DOWNSTREAM MANHOLE.
DETAILS TBC AT LATER DESIGN STAGE

H scale 1:250
V scale 1:125

EXISTING GL	4.911	4.726	4.684	4.512	4.249	4.013	4.283	4.368	4.385	
LID LEVEL			12.956					10.230	10.056	
COVER TO PIPE	-7.58		-8.26					-5.84		
PIPE DATA	315 NB PE100 PN16 1:299 (0.33%)			315 NB PE100 PN16 1:17 (5.86%)				315 NB PE100 PN16 1:7 (13.90%)		
INVERT LEVEL	12.788		12.652 12.652					9.926 9.926	7.942	
CHAINAGE			1173.459					1220.000	1234.280	

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED
4. PEDESTRIAN BRIDGE ALIGNMENT AND PROFILE SHOWED FOR COORDINATION PURPOSED

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

A3 REPRODUCTION SCALE
50
40
30
20
10
0mm

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE
0 0.5 1 1.5 2 2.5m

HORIZONTAL 1:250
AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

CHECK PRINT

DRG: 144418.50 M-P-Rising Main-2.dwg
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New Zealand
Holmesgroup.com
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Original Scale (A1)
Reduced Scale (A3) 1/2 SHOWN

Design			*Approved
Drawn	JR	16/02/2023	
*Dsg Verifier	NOT APPROVED		
*Dwg Check			Date
*Name Produced through Projectwise Signoff			

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
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UNDER REVISION

Discipline

Dwg No. C61-10

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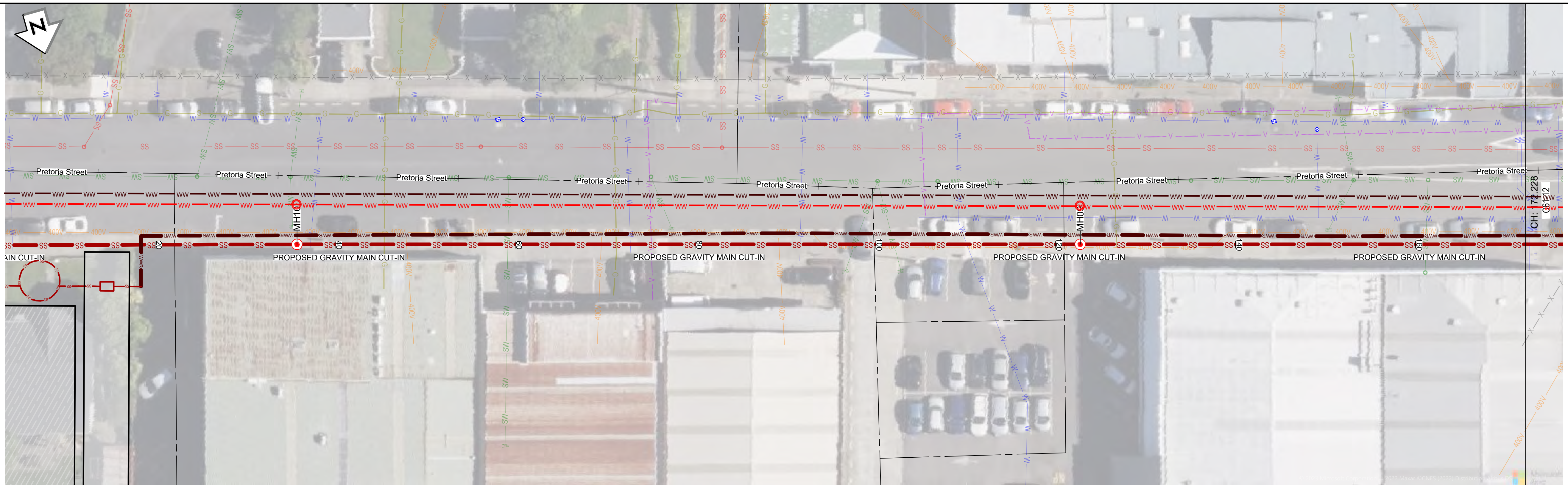
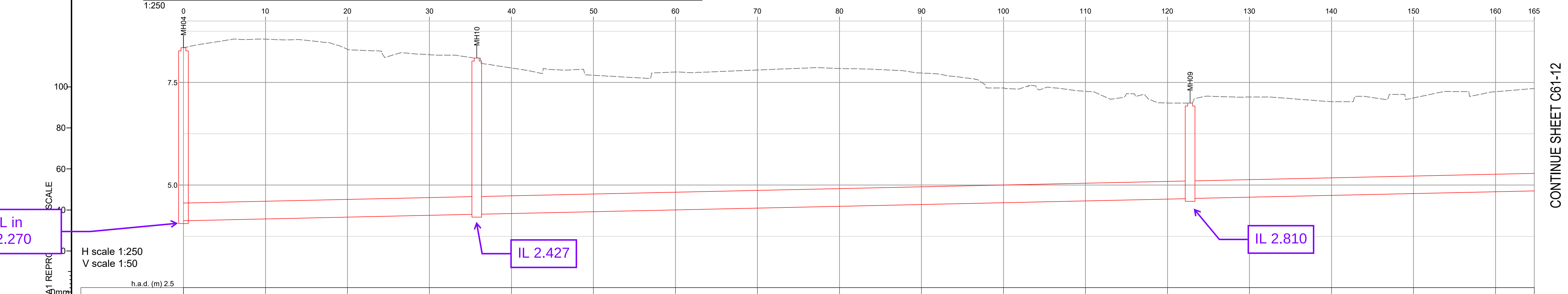


PLAN VIEW - PROPOSED WW GRAVITY MAIN CUT-IN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	8.349	8.556	8.309	8.176		7.854	7.676	7.755	7.805	7.840	7.729	7.365	7.285	7.000		7.146	7.031	7.122	7.276	7.352
LID LEVEL					8.098										7.000					
COVER TO PIPE	3.79				3.38										1.90					
PIPE DATA	375 NB UPVC SN16 1:227 (0.44%)				375 NB UPVC SN16 1:227 (0.44%)										375 NB UPVC SN16 1:227 (0.44%)					
INVERT LEVEL	4.161				4.318 4.318										4.701 4.701					5.075
MH CHAINAGE					35.769										122.758					

LONGITUDINAL SECTION PROPOSED GRAVITY MAIN CUT-IN ALIGNMENT

A1 REPRODUCTION SCALE 100 80 60 40 20 0mm

A3 REPRODUCTION SCALE 50 40 30 20 10 0mm

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

CHECK PRINT
DRG: 144418.50 M-P-Gravity Main Cut-In-2.dwg
DATE: 06 Mar 2023 10:35 AM
PROJECTNAME: ----

DISTRIBUTION	SIGN	DATE
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DRAFTER		
CHECKER		

ORIGINAL DRAWING IN COLOUR

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Auckland 1010
New Zealand
Holmesgroup.com
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Original Scale (A1)
Reduced Scale (A3)
1/2 SHOWN

Design			*Approved
Drawn	JR	06-03-2023	
*Dsg Verifier			NOT APPROVED
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED GRAVITY MAIN CUT IN
PLAN AND PROFILE SECTION

UNDER REVISION

Discipline

C61-11

Rev. 1

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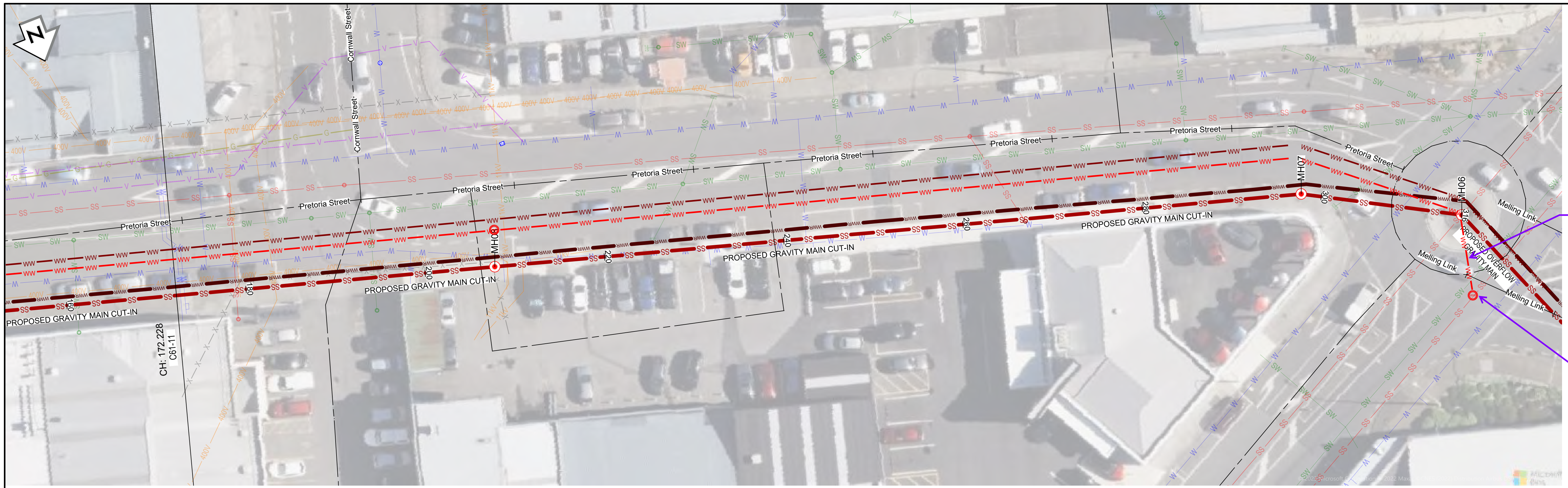
Document No. 144418.50 M-P-GRAVITY MAIN CUT-IN-2.DWG



300mm uPVC pipe @ min 1:230

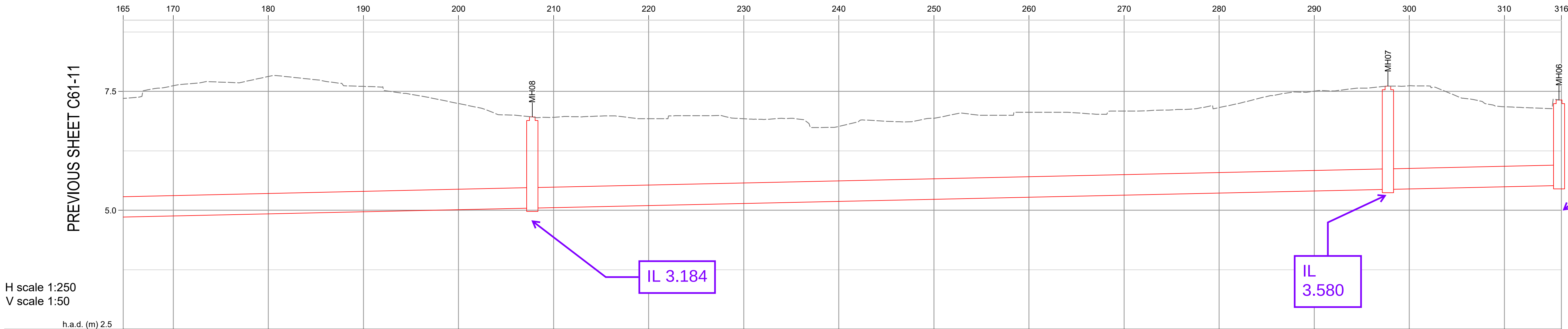
Add a cut-in manhole here
IL 3.8

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

PLAN VIEW - PROPOSED WW GRAVITY MAIN CUT IN (OPEN CUT CONSTRUTION)

1:250



IL 3.184

IL 3.580

IL level out 3.659

EXISTING GL	7.352	7.619	7.814	7.606	7.245		6.956	6.928	6.926	6.764	6.936	7.063	7.085	7.161	7.506		7.619	7.177	
LID LEVEL						6.962										7.612			7.318
COVER TO PIPE	1.90					1.49										1.74			
PIPE DATA	375 NB UPVC SN16 1:227 (0.44%)					375 NB UPVC SN16 1:227 (0.44%)										375 NB UPVC SN16 1:227 (0.44%)			
INVERT LEVEL	4.701					5.075 5.075										5.471 5.471			5.550
MH CHAINAGE						207.758										297.758			315.753

LONGITUDINAL SECTION PROPOSED GRAVITY MAIN CUT-IN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m

HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

CHECK PRINT
DRG: 144418.50 M-P-Gravity Main Cut-In-
DATE: 06 Mar 2023 10:35 AM
PROJECTNAME: ----

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Drawn	JR	06-03-2023	
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*Dwg Check			Date

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*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED GRAVITY MAIN CUT IN
PLAN AND PROFILE SECTION

UNDER REVISION

Discipline

Dwg No. C61-12 Rev. 1

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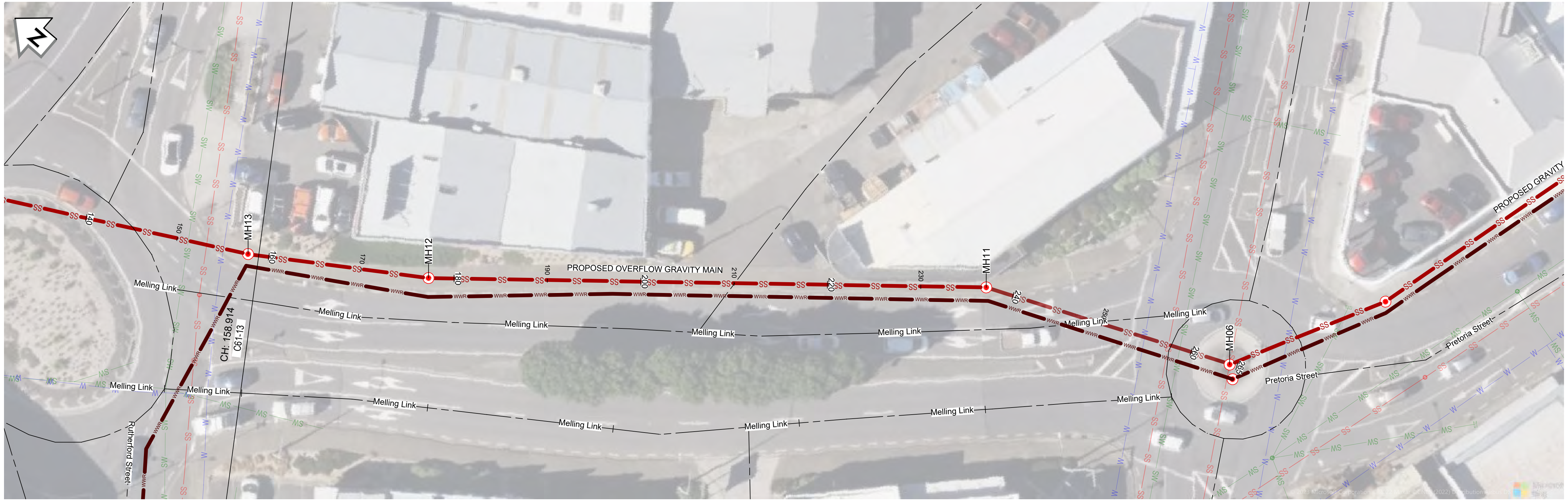
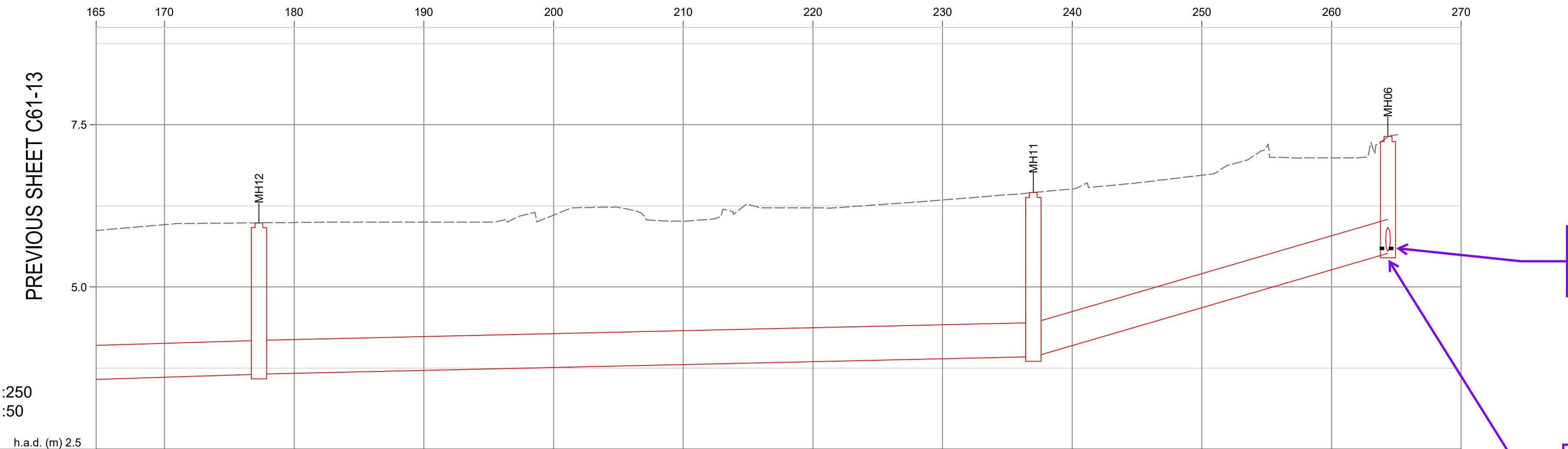


PLAN VIEW - PROPOSED WW OVERFLOW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



Also add dashed line showing weir level: 4.41

Change outlet IL to 4.054

H scale 1:250
V scale 1:50

h.a.d. (m) 2.5

EXISTING GL	5.869	5.962		5.994	6.000	6.107	6.013	6.218	6.340		6.511	6.723	6.989	
LID LEVEL			5.988							6.456				
COVER TO PIPE	1.65		1.81							2.01				
PIPE DATA	475 NB UPVC SN16 1:158 (0.63%)		475 NB UPVC SN16 1:221 (0.45%)							475 NB UPVC SN16 1:17 (5.85%)				
INVERT LEVEL	3.562		3.685 3.686							3.956 3.953				5.550
MH CHAINAGE			177.268							237.002				

LONGITUDINAL SECTION PROPOSED OVERFLOW GRAVITY MAIN ALIGNMENT

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

A3 REPRODUCTION SCALE
50
40
30
20
10
0mm

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

CHECK PRINT
DRG: 144418.50 M-P-Overflow Gravity Main-2.dwg
DATE: 06 Mar 2023 3:43 PM
PROJECTNAME: ----

DISTRIBUTION	SIGN	DATE
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CHECKER		

ORIGINAL DRAWING IN COLOUR

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0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

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Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED OVERFLOW
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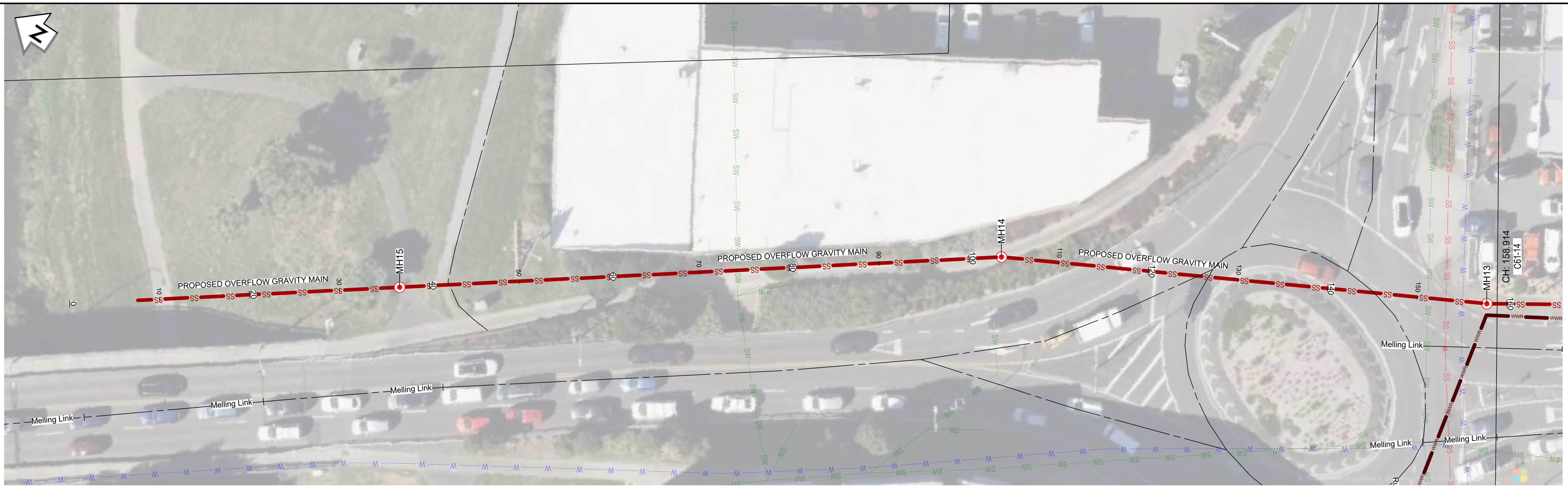
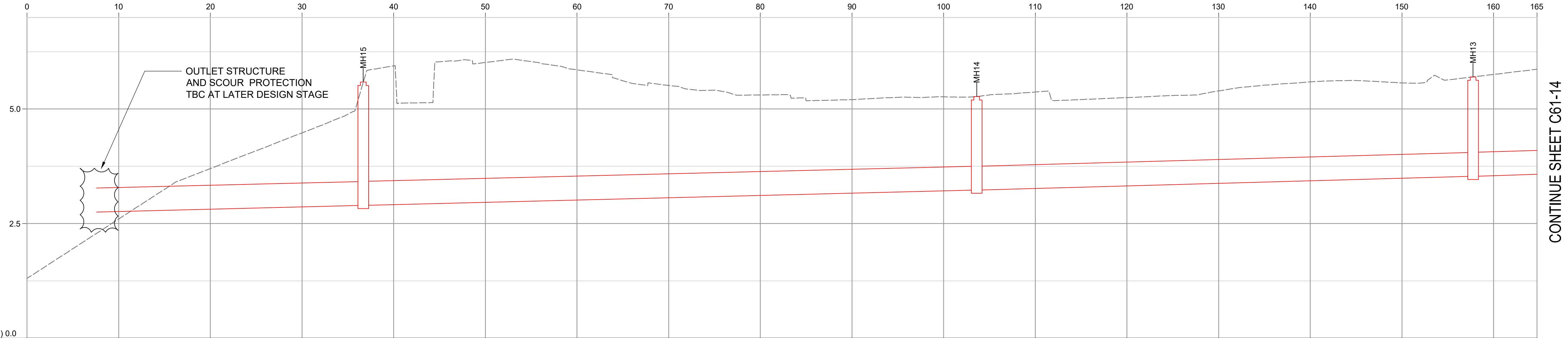


PLAN VIEW - PROPOSED WW OVERFLOW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



OUTLET STRUCTURE
AND SCOUR PROTECTION
TBC AT LATER DESIGN STAGE

H scale 1:250
V scale 1:50

h.a.d. (m) 0.0

EXISTING GL	1.303		2.600	3.700	4.480		5.945	6.017	5.855	5.515	5.307	5.205	5.268		5.372	5.250	5.394	5.592	5.570		5.755	5.869
LID LEVEL						5.590								5.271						5.702		
COVER TO PIPE		-0.99				2.17								1.52						1.65		
PIPE DATA		475 NB UPVC SN16 1:200 (0.50%)				475 NB UPVC SN16 1:200 (0.50%)								475 NB UPVC SN16 1:179 (0.56%)						475 NB U 1:158 (C		
INVERT LEVEL		2.782				2.927 2.927								3.262 3.260						3.562 3.562		3.685
MH CHAINAGE						36.680								103.605						157.764		

LONGITUDINAL SECTION PROPOSED OVERFLOW GRAVITY MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

CHECK PRINT

DRG: 144418.50 M-P-Overflow Gravity Main-2.dwg
DATE: 06 Mar 2023 3:43 PM
PROJECTNAME: ----

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NOTES:

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3. PIPE SIZE TO BE CONFIRMED

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

ORIGINAL DRAWING IN COLOUR

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0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

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Reduced Scale (A3)	*Dsg Verifier	NOT APPROVED		
1/2 SHOWN	*Dwg Check			Date
	*Name Produced through Projectwise Signoff			

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Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED OVERFLOW
GRAVITY MAIN PLAN AND PROFILE
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W...

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[redacted]

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2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 4.5 9 Meters

CHECK PRINT

DRG: 144418.50 M-P Pumpstation.dwg
DATE: 01 Mar 2023 3:52 PM
PROJECTNAME: ----

DISTRIBUTION	SIGN	DATE
ORIGINATOR		
DRAFTER		
CHECKER		

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Reduced Scale (A3) 1/2 SHOWN	Drawn	JR 01-03-2023	
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Project:

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Title: PROPOSED PUMPSTATION
PLAN VIEW

Discipline

Drawing No. C63-01

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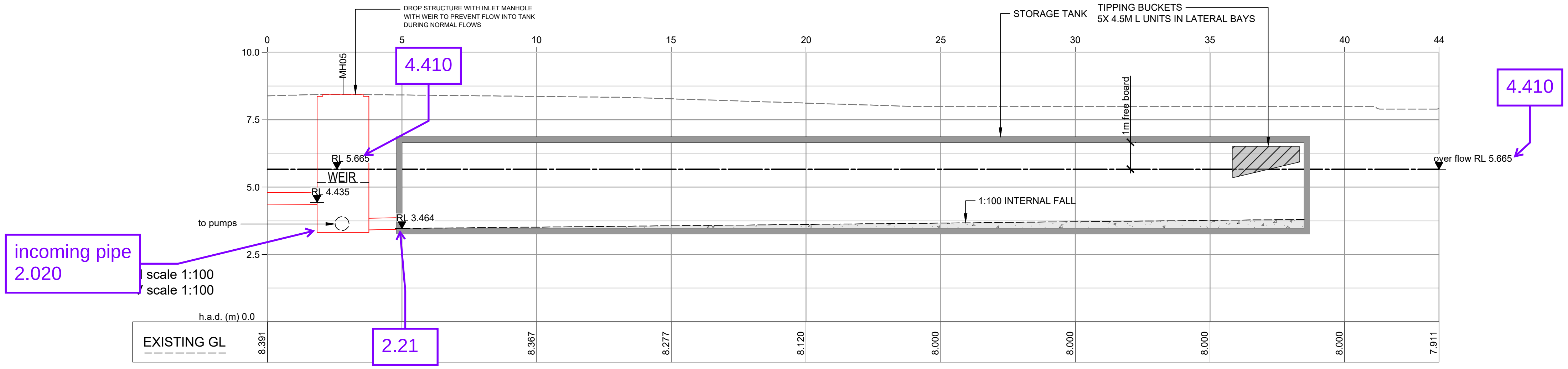
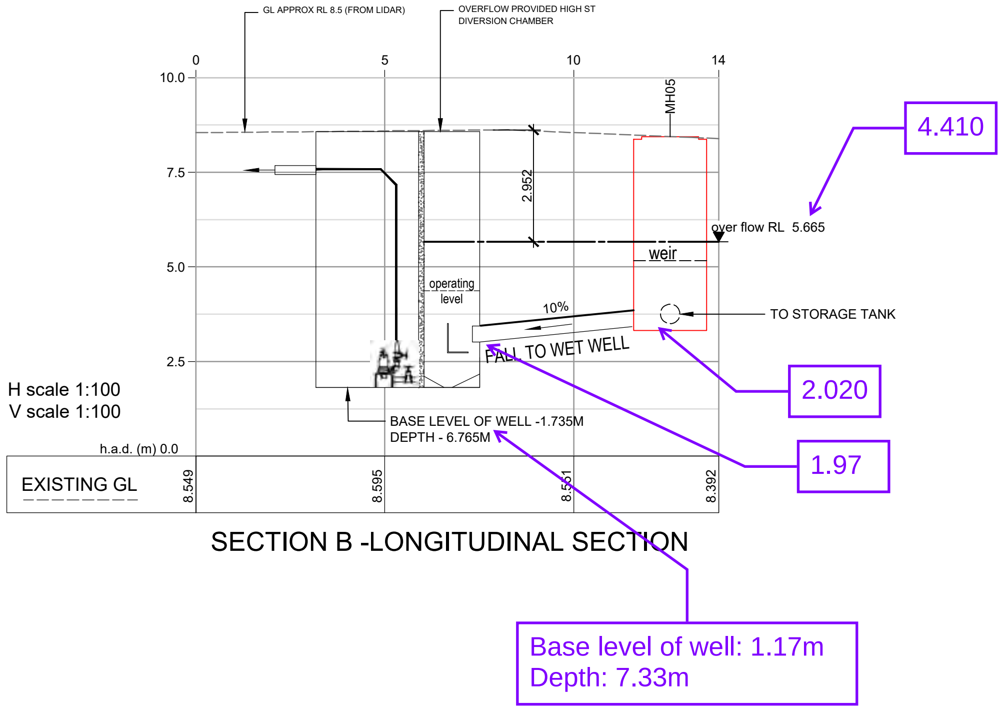


SECTION A -LONGITUDINAL SECTION



SECTION B -LONGITUDINAL SECTION

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

A3 REPRODUCTION SCALE
50
40
30
20
10
0mm

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

CHECK PRINT
DRG: 144418.50 M-P Pumpstation.dwg
DATE: 06 Mar 2023 9:54 AM
PROJECTNAME: ----

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Reduced Scale (A3)
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Design			*Approved
Drawn	JR	06-03-2022	
*Dsg Verifier	NOT APPROVED		
*Dwg Check			Date

*Name Produced through Projectwise Signoff

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Project:

UNDER REVISION

Title: PROPOSED PUMPSTATION LONGITUDINAL SECTIONS

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Drawing No. C63-02

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APPENDIX 02 – LEVEL 2 COST ESTIMATE

PROJECT ESTIMATE

Project Name:	Hutt CBD Sewer Bypass
Current Phase:	Level 2 Estimate
Base Date:	Mar-23

Phase	Description	Base Estimate	Contingency	Total
Investigations		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Project Development	[redacted]	[redacted]	[redacted]
Preliminary Design/Consenting		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Consenting Fees, Community Engagement	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Consenting	[redacted]	[redacted]	[redacted]
Detailed Design		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Site Investigations	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Detailed Design	[redacted]	[redacted]	[redacted]
Procurement		[redacted]	[redacted]	[redacted]
	Consultancy Fees	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Total Procurement	[redacted]	[redacted]	[redacted]
Construction		[redacted]	[redacted]	[redacted]
	Consultancy Fees (MSQA)	[redacted]	[redacted]	[redacted]
	Other Costs (Legal, Land, etc.)	[redacted]	[redacted]	[redacted]
	Physical Works	[redacted]	[redacted]	[redacted]
	Traffic Management	[redacted]	[redacted]	[redacted]
	Pipework - Open Cut	[redacted]	[redacted]	[redacted]
	Pipework - Tunnel	[redacted]	[redacted]	[redacted]
	Shafts	[redacted]	[redacted]	[redacted]
	Pipework - Rising Main	[redacted]	[redacted]	[redacted]
	Pipework - Bridge Crossing	[redacted]	[redacted]	[redacted]
	Pump Station	[redacted]	[redacted]	[redacted]
	Pump Station Storage	[redacted]	[redacted]	[redacted]
	Service Location works	[redacted]	[redacted]	[redacted]
	Service Relocation Works	[redacted]	[redacted]	[redacted]
	Contractors Risk	[redacted]	[redacted]	[redacted]
	SubTotal	[redacted]	[redacted]	[redacted]
	On Site Overheads	[redacted]	[redacted]	[redacted]
	Off Site O/H & Profit	[redacted]	[redacted]	[redacted]
	Total Physical Works	[redacted]	[redacted]	[redacted]
	Total Construction	[redacted]	[redacted]	[redacted]
Base Estimate		[redacted]	[redacted]	[redacted]
	Base Estimate	[redacted]	[redacted]	[redacted]
	Contingency	[redacted]	[redacted]	[redacted]
	Expected Estimate	[redacted]	[redacted]	[redacted]
95th Percentile Estimate		[redacted]	[redacted]	[redacted]
	Funding Risk	[redacted]	[redacted]	[redacted]
	95th Percentile Estimate	[redacted]	[redacted]	[redacted]

Notes: This estimate is exclusive of escalation and GST.

Approvals

	Name	Signature	Date
Prepared by:	[redacted]		
Reviewed by:	[redacted]		
Approved by:			

Appendix M – HAL Modelling Concept Design

From: [redacted]
Sent: Tuesday, 21 February 2023 11:10
To: [redacted]
Cc: [redacted]
Subject: RE: Hutt CEntral WW Bypass Option 2 concept design - modelling support

Hi [redacted]

Please see attached (***RVL_DWF_MPD.pdf***) for a summary of estimated flows in the vicinity of the proposed pump station at Pretoria Street. Link labels and surcharge status relates to Peak Dry Weather Flow (MPD scenario).

The summary table of flows is reproduced below. Locations A, B, C and D are annotated on the attached map.

Table 1: Summary of Dry and Wet Weather Flow Assessment

Location	**A. Kings Cres**		**B. High St**		**C. New Pump**		**D. WHMS**	
Node ID	**710017R00433**		**710096R00173**		**(A+B)**		**810007R00185**	
Scenario	**CUR**	**MPD**	**CUR**	**MPD**	**CUR**	**MPD**	**CUR**	**MPD**
Model Data								
Population	*1,546*	*2,559*	*2,245*	*4,215*	*3,791*	***6,774***	*62,039*	*105,369*
Total Area (Ha)		*42 Ha*		*94 Ha*		***136 Ha***		*3,383 Ha*
Non-residential flow (L/s)	0	1	8	14	9	**15**	42	65
ADWF L/s (Modelled)	5	9	15	23	20	**32**	203	365
PDWF L/s (Modelled)	9	21	22	29	31	**50**	394	446
PWWF L/s (Modelled 2yr)*	29	29	50	50	79	**79**	634	660
PWWF L/s (Modelled 2yr Option 2)*	51	52	53	69	104	**121**	655	706
Regional Standard Estimate								
ADWF L/s (Spec)		6		19		**25**		
PDWF L/s (Spec)		21		56		**70**		
PWWF L/s (Spec)		40		93		**126**		
Nominal Network Capacity								
Diameter mm	*225mm*		*225mm*				*975mm*	
Manning pipe-full capacity L/s (n=0.015, S=1/Dmm)	26		26		**52**		622	
Velocity pipe-full capacity L/s (v=2m/s)	80		80		**159**		1493	
Indicative Design Flows								
3x ADWF L/s	15	26	45	69	60	**95**		
4x ADWF L/s	20	35	60	92	80	**127**		
PWWF L/s (Modelled 2yr Option 2)	51	52	53	69	104	**121**		
PDWF WHMS limit (Manning capacity - PDWF_model)							228	176

*Note that modelled PWWF (2yr) is constrained by the existing network. The addition of the interceptor frees up capacity and results in higher PWWF (2yr Option 2).

Regional Standard Formula assumptions

The following table details the calculations according to the Wellington Water *Regional Standard for Water Services* (Dec 2021, Ver 3.0). The results are transposed to the relevant section of the summary table above (labelled "Spec").
Note that the network length was estimated based on the existing GIS layers for public, connection, and private pipes located in the estimated upstream catchment area.

Table 2: Regional Standard calculations based on MPD growth assumptions

Location	**A. Kings Cres**	**B. High St**	**C. New Pump**
Node ID	**710017R00433**	**710096R00173**	**(A+B)**
Catchment Data			
Population (PE)	2,559	4,215	6,774
Total Area (Ha)	41.9	94.4	136.3
Residential Area (Ha)	41.6	79.5	121.1
Non-Residential Area (Ha)	0.3	14.9	15.2
Residential Density (PE/Ha)	62	53	56
Adopted Density (PE/Ha) (min. 60 Pe/Ha)	62	60	60
Adopted Population (PE)	2,559	4,770	7,265
Network Length (km)	23.9	45.7	69.6
Flow Calculations (Regional Standard Section 5.3)			
Non-Residential ADWF (L/s) (adopt 0.52 L/Ha/s)	0.2	7.7	7.9
Non-Residential PDWF (L/s) (adopt 1.56 L/Ha/s)	0.5	23.2	23.7
Residential ADWF (L/s) (adopt 0.0023 L/s/PE)	5.9	11.0	16.7
Residential Peaking Factor (7.23 x $A^{-0.2}$)	3.4	3.0	2.8
Residential PDWF (L/s)	20.2	33.1	46.3
Direct Inflow (L/s) (0.55 L/s/km)	13.1	25.1	38.3
Infiltration (L/s) (0.25 L/s/km)	6.0	11.4	17.4
ADWF L/s (Spec)	6.0	18.7	**24.6**
PDWF L/s (Spec)	20.7	56.3	**70.0**
PWWF L/s (Spec)	39.8	92.8	**125.6**

Note that this static calculation does not account for the multiple upstream wet-weather bifurcations or network throttle points, which could either increase or decrease the flow that reaches the point being considered.
Also note that the calculation does not relate to calibrated parameters for inflow and infiltration, but apply assumed generic rates per pipe length.

Nominal Network Capacity

Network capacity is difficult to assess due to the varying pipe slopes and surcharge potential upstream. For the purposes of this exercise, two calculations were carried out to find estimate network capacity.

- Manning pipe-full capacity, which adopts a HGL slope as 1/diameter(mm), and Manning’s n = 0.015.
- Velocity-based pipe-full capacity, assuming 2m/s flow velocity.

Note for upstream network capacity:

- These figures indicate the maximum flow that the upstream network can deliver to the pump station, i.e. 52 – 159 L/s. Note that modelled PWWF reaching the pump station with the interceptor in place is estimated as 121 L/s.
- The emergency EOP capacity should exceed the capacity of the upstream network (say 160 L/s), to ensure that if required the EOP does not form a throttle and contribute to spilling at upstream locations.

Note for downstream network capacity:

- This indicates the nominal available capacity in the downstream network (WHMS), and therefore the available capacity to receive additional flow.
- The rate of single pump discharge should not exceed the capacity available in the receiving pipe above “No Pump” PDWF rates – i.e. the new pump should not cause dry-weather spilling in the downstream network. For MPD there is 176 L/s estimated available capacity in the WHMS (622 (Manning Capacity) – 446 (modelled PDWF)).

Indicative pump design flows

- There is a range of flow estimates that can be considered to determine the adopted design flow for the pump station. Designing for adaptability will be a key advantage in a successful design – for example facility for additional pumps, or modular storage, to adjust with future population growth.
- Modelled Option 2 has adopted a single pump / dual pump capacity of 60 / 100 L/s.

Effect of Interceptor Arrangement

The modelled option assumes the new interceptor directs primary flow to the new pump station, with connections to the existing downstream network operating only as wet-weather bifurcations 1.0m above the interceptor invert level.

Alternative arrangements were simulated, in which the existing network operated as primary flow-path, and interceptor only operating as wet-weather bifurcation, set at either soffit level or at half-barrel height. However these showed reduced benefits in the Southern Riverlink area compared with the initial arrangement.

The following table summarises the results of this exercise, with the results of note highlighted in bold.

Table 3: Spill Volumes for Modelled Options at selected locations

Upgrade Option	Description	~2yr ARI Event (14-16 November 2016)															
		Simulated Uncontrolled Spilling (m^3)								Simulated EOP Spilling (m^3)							Total Spilling (m^3)
		Northern Riverlink*	Southern Riverlink*	Boulcott*	WHMS	Alicetown *	Woburn*	Elsewhere	Total Unc.d	Riverlink	Barber Gr	Melling Station	62 Wakefield St	Silverstream	Seaview WWTP	Total EOP	
BAA	Do nothing, 2070 scenario, Baseline with Melling EOP sealed	*1,660*	*1,630*	*450*	*120*	*1,950*	*5,160*	*12,940*	*23,910*	*0*	*10,740*	*0*	*0*	*44,100*	*101,530*	*160,500*	*184,410*
BAE	(Option 2) New 375mm dia sewer on Pretoria St to new 100 L/s +2000 m3 PS on Pretoria St to Melling, with RTC, Melling EOP sealed.	480	330	430	0	2,090	4,960	12,930	21,230	0	11,360	0	0	44,040	103,640	163,150	184,370
BEB	(Option 2) New 375mm dia sewer **intercepting at soffits** on Pretoria St to new 100 L/s +2000 m3 PS on Pretoria St to Melling, with RTC, Melling EOP sealed.	510	**900**	430	0	2,040	5,110	12,910	21,890	0	10,910	0	0	43,960	103,600	162,590	184,480
BEC	(Option 2) New 375mm dia sewer **intercepting at half-barrel height** on Pretoria St to new 100 L/s +2000 m3 PS on Pretoria St to Melling, with RTC, Melling EOP sealed.	460	**830**	420	0	2,040	5,100	12,930	21,780	0	10,930	0	0	43,990	103,910	162,950	184,730

This exercise confirmed that redirecting the primary flow path to the new interceptor is likely to provide better relief than installing the new interceptor for wet-weather events only.

Long-time series (LTS) simulation

The option was modelled with a long-time series of 10-years (2008-2017) to confirm that the option provides the expected benefits to average spill frequency (as opposed to a single rainfall event).

The results are summarised in the attached maps for the Lower Hutt valley floor (***RVL_LTS_MPD_Option2.pdf***).

Note that the modelled option is labelled here as “BED”, which differs from “BAE” in that it includes an emergency EOP assumed just below ground level (and 2.5m above the 2 ML storage tank roof).

The EOP configuration as modelled is not predicted to operate in the 10yr LTS.

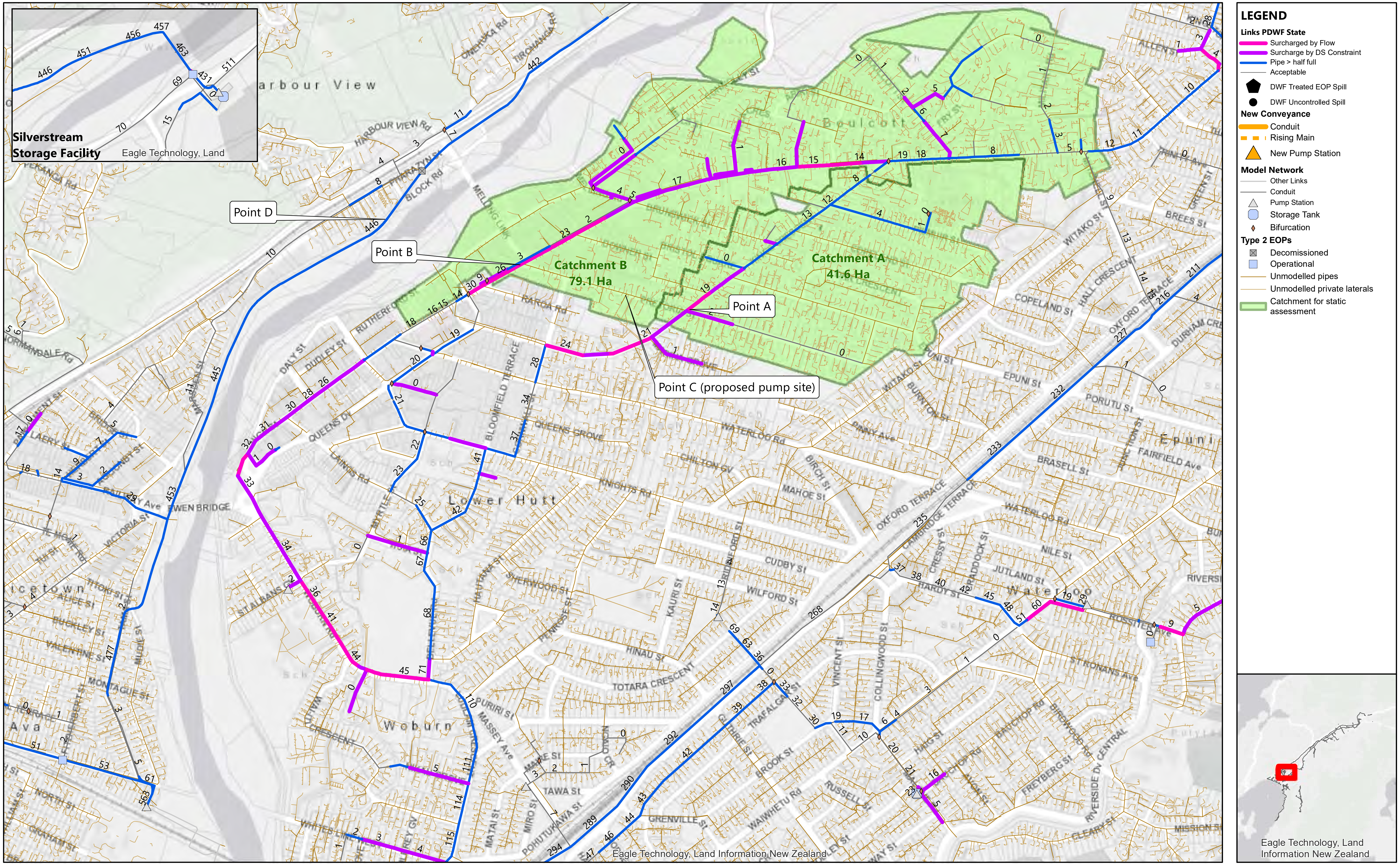
(Finally, for modelling Riverlink options, the flows from Upper Hutt have been conservatively adopted from the “MPD_Spec” scenario, which assumes Upper Hutt population contributes 200 L/Pe/day, higher than the average Upper Hutt calibrated rate of 143 L/Pe/day. This is expected to have little impact at WHMS, as it is protected by the Silverstream throttle, but may result in conservatively high spill estimates at Silverstream storage tank. All flows in Lower Hutt have adopted the calibrated loading rate as per usual MPD assumptions).

Let me know if you need any further details on any of the above.

Perhaps we should arrange to chat this week to discuss these outputs?

Best regards

[redacted]



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	BY	DATE
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DRAWN	[redacted]	FEB 2023
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:10,000

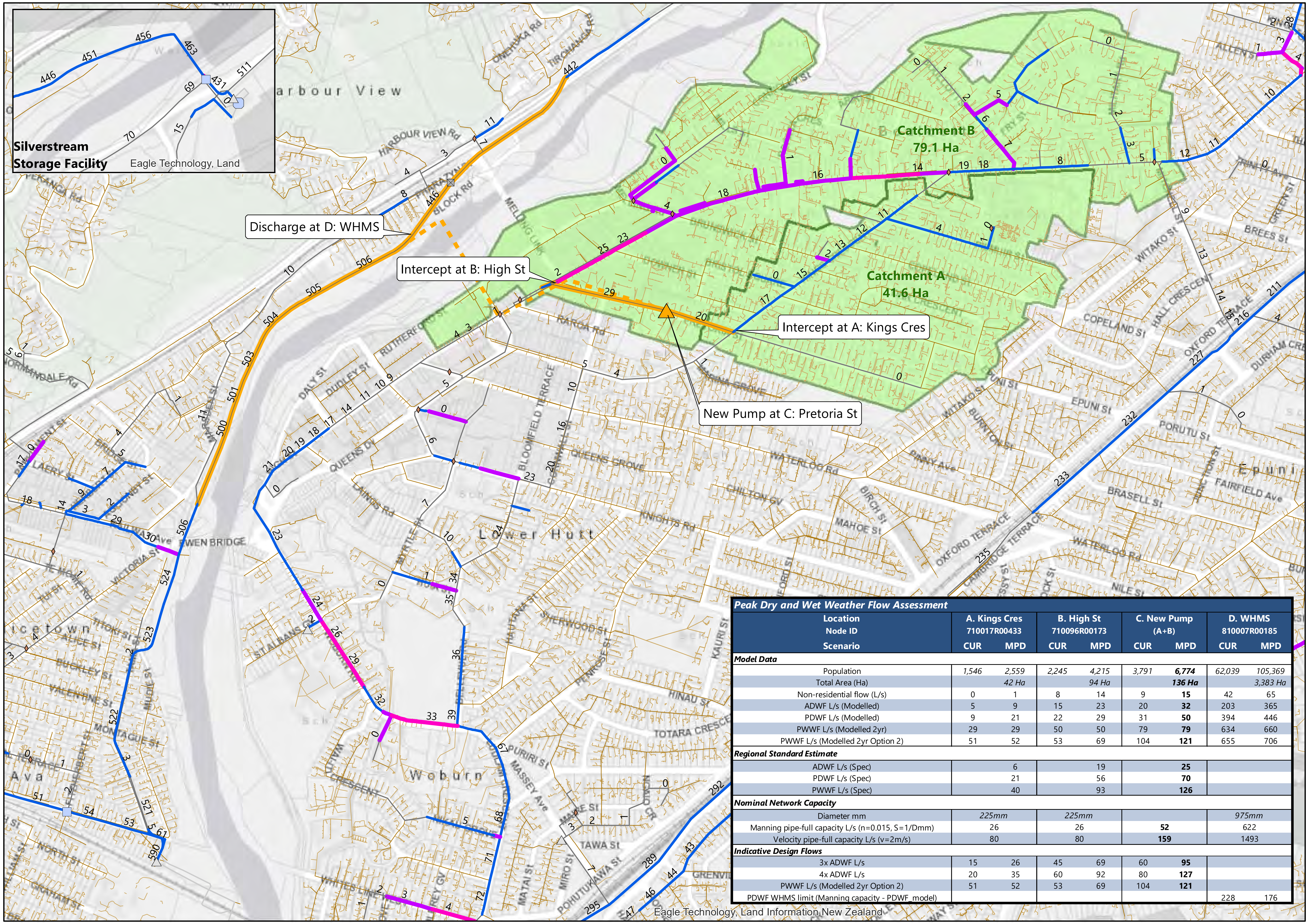
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0414

ISSUE
DRAFT A

DRAWING TITLE:
Peak DWF Performance Assessment
BAA Scenario - MPD (2070)

DRAWING No:



Peak Dry and Wet Weather Flow Assessment

Location	A. Kings Cres		B. High St		C. New Pump		D. WHMS	
Node ID	710017R00433		710096R00173		(A+B)		810007R00185	
Scenario	CUR	MPD	CUR	MPD	CUR	MPD	CUR	MPD
Model Data								
Population	*1,546*	*2,559*	*2,245*	*4,215*	*3,791*	***6,774***	*62,039*	*105,369*
Total Area (Ha)		*42 Ha*		*94 Ha*		***136 Ha***		*3,383 Ha*
Non-residential flow (L/s)	0	1	8	14	9	**15**	42	65
ADWF L/s (Modelled)	5	9	15	23	20	**32**	203	365
PDWF L/s (Modelled)	9	21	22	29	31	**50**	394	446
PWWF L/s (Modelled 2yr)	29	29	50	50	79	**79**	634	660
PWWF L/s (Modelled 2yr Option 2)	51	52	53	69	104	**121**	655	706
Regional Standard Estimate								
ADWF L/s (Spec)		6		19		**25**		
PDWF L/s (Spec)		21		56		**70**		
PWWF L/s (Spec)		40		93		**126**		
Nominal Network Capacity								
Diameter mm	*225mm*		*225mm*				*975mm*	
Manning pipe-full capacity L/s (n=0.015, S=1/Dmm)	26		26		**52**		622	
Velocity pipe-full capacity L/s (v=2m/s)	80		80		**159**		1493	
Indicative Design Flows								
3x ADWF L/s	15	26	45	69	60	**95**		
4x ADWF L/s	20	35	60	92	80	**127**		
PWWF L/s (Modelled 2yr Option 2)	51	52	53	69	104	**121**		
PDWF WHMS limit (Manning capacity - PDWF_model)							228	176

LEGEND

Links PDWF State
- Surcharged by Flow
- Surcharge by DS Constraint
- Pipe > half full
- Acceptable

- ⬟ DWF Treated EOP Spill
- ● DWF Uncontrolled Spill

New Conveyance
- Conduit
- Rising Main
- ▲ New Pump Station

Model Network
- Other Links
- Conduit
- △ Pump Station
- ○ Storage Tank
- ♦ Bifurcation

Type 2 EOPs
- ☒ Decomissioned
- ☐ Operational
- Unmodelled pipes
- Unmodelled private laterals
- 🟩 Catchment for static assessment

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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:10,000

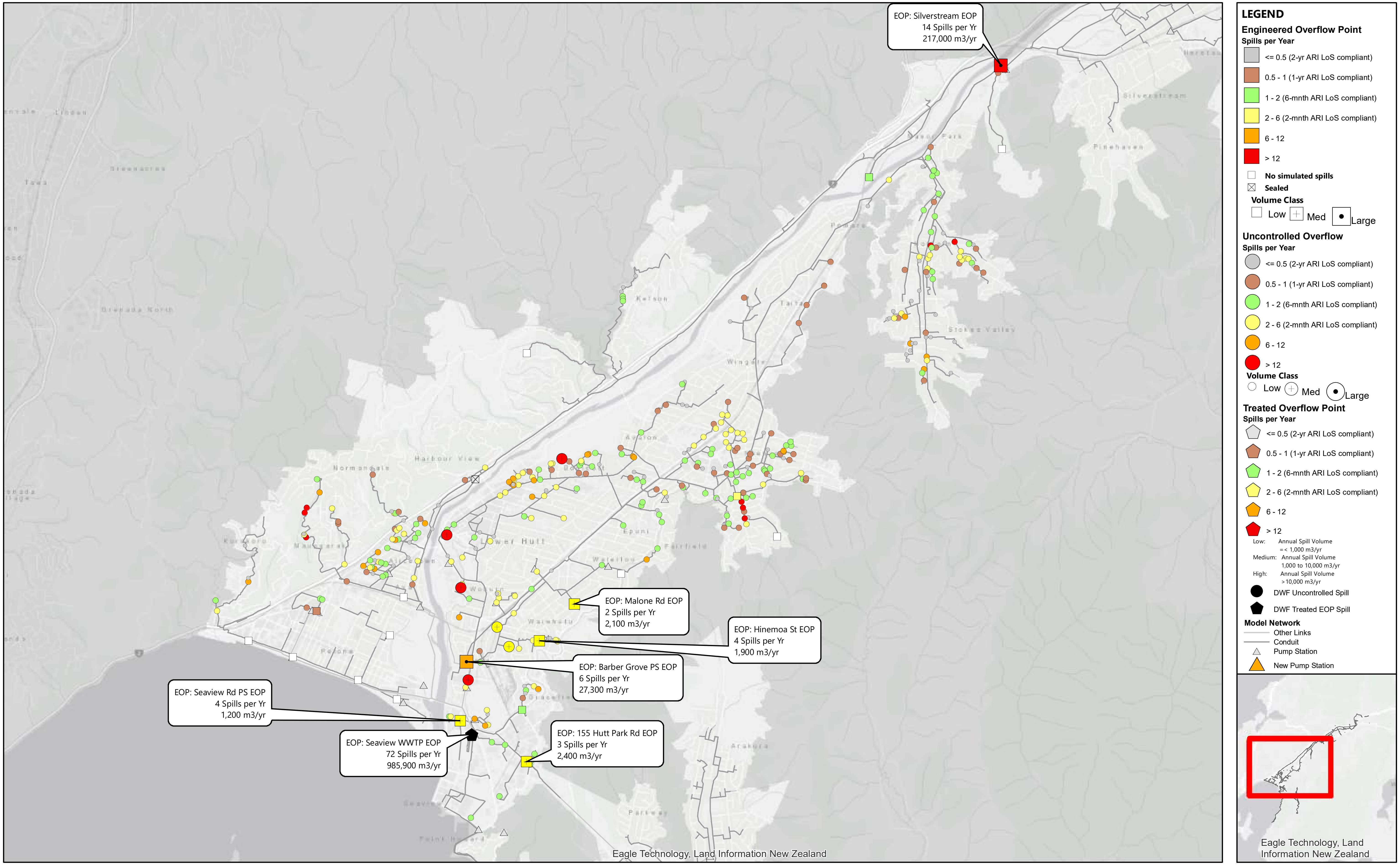
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

DRAWING TITLE:
Peak DWF Performance Assessment
BAE Scenario - MPD (2070)

PROJECT NO: J0414

ISSUE DRAFT A

DRAWING No:



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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:50,000

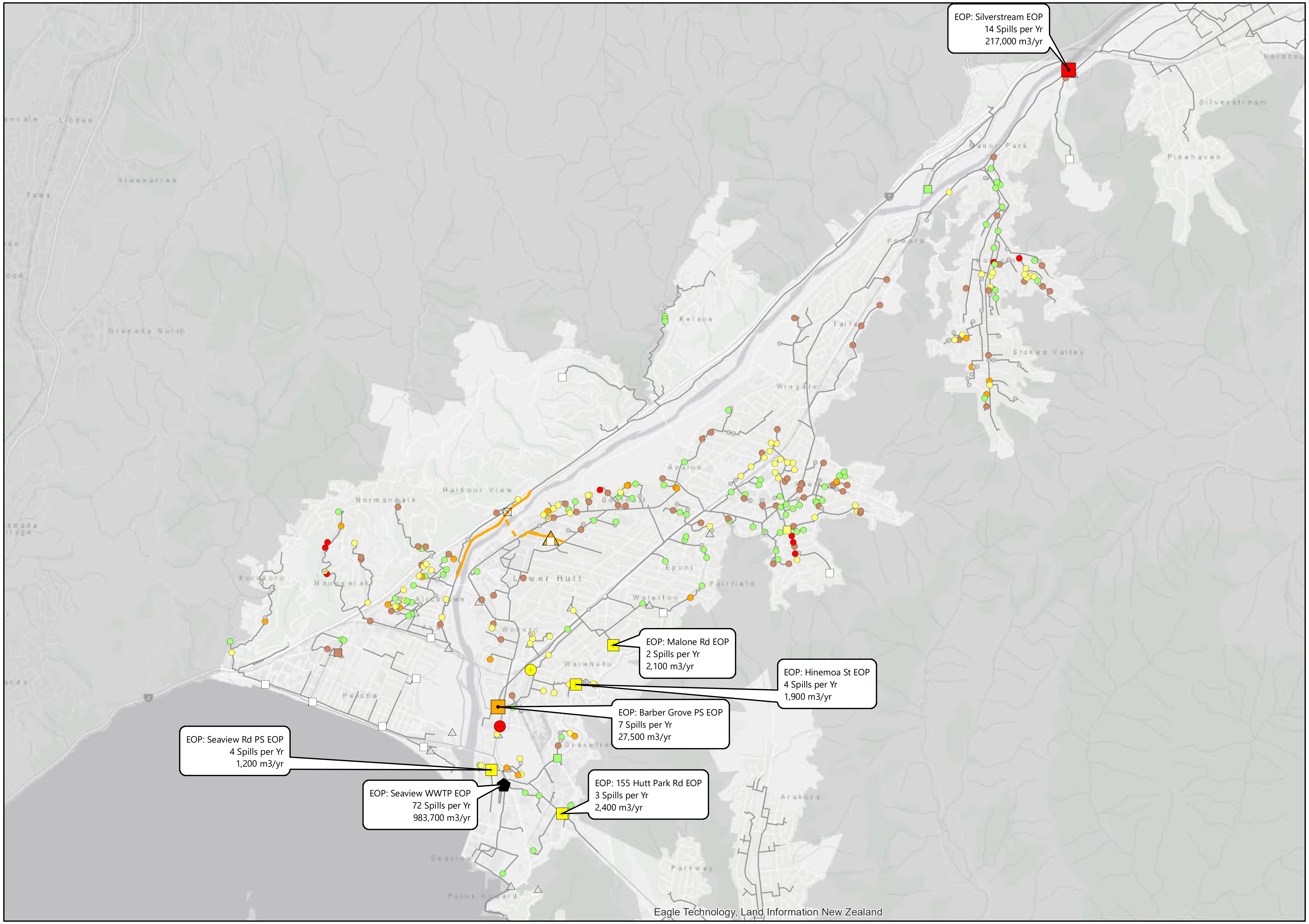
PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0363

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
BAA (2070) "Do Nothing" - 10-year LTS (2008-2017)

DRAWING No:



Eagle Technology, Land Information New Zealand

LEGEND

Engineered Overflow Point
Spills per Year
- ⬜ <= 0.5 (2-yr ARI LoS compliant)
- 🟫 0.5 - 1 (1-yr ARI LoS compliant)
- 🟩 1 - 2 (6-mnth ARI LoS compliant)
- 🟨 2 - 6 (2-mnth ARI LoS compliant)
- 🟧 6 - 12
- 🟥 > 12
- ☐ **No simulated spills**
- ☒ **Sealed**

Volume Class
☐ Low ⊞ Med ⊡ Large

Uncontrolled Overflow
Spills per Year
- ○ <= 0.5 (2-yr ARI LoS compliant)
- 🟤 0.5 - 1 (1-yr ARI LoS compliant)
- 🟢 1 - 2 (6-mnth ARI LoS compliant)
- 🟡 2 - 6 (2-mnth ARI LoS compliant)
- 🟠 6 - 12
- 🔴 > 12

Volume Class
○ Low ⊕ Med ⊙ Large

Treated Overflow Point
Spills per Year
- ⬠ <= 0.5 (2-yr ARI LoS compliant)
- ⬟ 0.5 - 1 (1-yr ARI LoS compliant)
- ⬟ 1 - 2 (6-mnth ARI LoS compliant)
- ⬟ 2 - 6 (2-mnth ARI LoS compliant)
- ⬟ 6 - 12
- ⬟ > 12

Low: Annual Spill Volume =< 1,000 m3/yr
Medium: Annual Spill Volume 1,000 to 10,000 m3/yr
High: Annual Spill Volume >10,000 m3/yr

- ● DWF Uncontrolled Spill
- ⬟ DWF Treated EOP Spill

Model Network
- ― Other Links
- ― Conduit
- △ Pump Station
- ▲ New Pump Station


Eagle Technology, Land Information New Zealand

REV	AMENDMENTS	BY	DATE		BY	DATE
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Wellington Water

0 10,500 21,000 42,000 63,000 84,000 Meters

SCALE (at A3)
1:50,000

PROJECT:
STRATEGIC MODEL HUTT CITY INTERCEPTOR OPTIONS

PROJECT NO:
J0363

ISSUE
DRAFT A

DRAWING TITLE:
Overflow Performance Assessment
BED (2070) Option - 10-year LTS (2008-2017)

DRAWING No:

Appendix N – Opex Cost

	Name	Date
Prepared by:	[redacted]	14/03/2023
Checked by:	[redacted]	20/03/2023
Reviewed by:	[redacted]	20/03/2023

OPEX Cost Estimate Summary

Total Annual Opex Cost		[redacted]	/yr
Pump Station		[redacted]	
Asset life	t	[redacted]	years
Pump station efficiency	η	[redacted]	
Total pumping head	Ht	[redacted]	m
Pump running hours		[redacted]	hr/yr
		[redacted]	
Annual power cost		[redacted]	
Annual maintenance cost		[redacted]	
Annual operator cost		[redacted]	
Total Annual Opex Cost		[redacted]	
		[redacted]	
Storage Tank		[redacted]	
Asset life	t	[redacted]	years
Tank Capacity (m3)	=	[redacted]	m^3
Power Requirements	=	[redacted]	kWh
		[redacted]	
Annual power cost		[redacted]	
Annual maintenance cost		[redacted]	
Annual operator cost		[redacted]	
Total Annual Opex cost	=	[redacted]	
		[redacted]	
Gravity Pipe (Connection and EOP)		[redacted]	
Asset life	t	[redacted]	years
Pipe length	=	[redacted]	m
		[redacted]	
Pipe cleaning		[redacted]	
CCTV		[redacted]	
Root cutting		[redacted]	
Patch or repair cost		[redacted]	
Total Annual Opex Cost		[redacted]	
		[redacted]	
315mm Pressure Pipe (Rising Main)		[redacted]	
Asset life	t	[redacted]	years
Pipe length	=	[redacted]	m
		[redacted]	
Pipe cleaning		[redacted]	
CCTV		[redacted]	
Root cutting		[redacted]	
Patch or repair cost		[redacted]	
Total Annual Opex Cost		[redacted]	

Pump Station

Variables

Analysis Period		100	years
Discount rate	DR	5%	
Inflation rate	IR	4%	
Effective rate	ER	1.0%	
Pump station asset life	t	100	years
Equivalent annual replacement cost as %	EAR%	1.5%	$=(ER/(ER+1))/(1-(1+ER)^{-t})$
Energy Cost		0.021	$/kWh
Pump station efficiency	η	79%	
Total pumping head	Ht	26.90	m
Pump running hours (duty)		4,380	hr/yr
Pump running hours (assist)		1,095	hr/yr

Assumptions & References

Rate derived from Treasury

Rate provided by Council varies each year. Conservative average used as within level of uncertainty of estimates

=(1+DR)/(1+IR)-1 from Unit Rate Database

Noting that different parts of the pump station have different asset lives

=(ER/(ER+1))/(1-(1+ER)-t) from Unit Rate Database

Rate as per Wellington Electricity 2022/23 Disclosure of Prices Appendix 1, assuming a low voltage commercial usage of 25kVA)GLV69-24UC)

Holmes design, would vary depending on age of pumps

Holmes design, total head for PWWF

Holmes design = 8 cycles/hr, Assuming 50% uptime per cycle

Holmes design = 8 cycles/hr, Assuming 50% uptime per cycle operating 25% of the time

Formulae for new pump stations

Formula for pump kW	kW =	0.0098*Q*Ht/η
Formula for pump station cost ($)	$ =	$C1 * KW^{C2}$
where constants are:	C1 =	62471
	C2 =	0.8755
Formula for pumping power cost ($/yr)	=	0.0208*0.0098*Q*Ht*t/η
Formula for O&M cost ($/yr)	=	7295*Q^0.225

Assumes a power relationship between cost and kW taken from Unit Rates Database

Constant for relationship between cost and flow converted using formula for kW taken from Unit Rates Database

Derived from cost curves from actual pump station build costs based on collated build cost data, Scirt data, and Auckland data taken Unit Rates Database

Energy cost x pump power requirements taken from Unit Rates Database

Based on curve fit of O&M cost estimates taken from Unit Rates Database

Costs for new pump stations

Capacity (l/s)	PS KW	Pump station total capital cost	Pump station construction cost	Other (20% P&G, 20% On Costs)	Civil Costs (60%)	Mechanical Costs (15%)	Electrical Costs (25%)	Annual KWh	Annual power cost ($/yr)	Annual O&M cost without power ($/yr)
60	20.0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
40	13.3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Pump station construction cost taken from Level 2 Cost Estimate (Alta, 16 March 2023)

Standard pump station configurations

Capacity (l/s)	Type	Pump arrangement	Odour control	Buildings	Other items	Operator requirements	Operator Cost	Maintenance Cost	Total O&M
100	Wetwell / drywell	1 duty, 1 assist, 1 standby	Yes	Yes	Electrical cabinet	2 person crew, 1 hour visit, 2 visits per month plus 1 day per year	[redacted]	[redacted]	[redacted]

Maintenance cost = 5000(PS kW)^0.2 taken from Unit Rates Database*

Operator Requirements determined through discussion with Paul Winstanley

Operator hourly rate taken from Unit Rates Database

Storage Tank

Variables

				Assumptions & References
Analysis Period		100	years	
Discount rate	DR	5.0%		*Rate derived from Treasury*
Inflation rate	IR	4.0%		*Rate provided by Council varies each year. Conservative average used as within level of uncertainty of estimates*
Effective rate	ER	1.0%		*=(1+DR)/(1+IR)-1 from Unit Rate Database*
Storage tank asset life	t	100	years	*Noting that different parts of the pump station have different asset lives*
Equivalent annual replacement cost as %	EAR%	1.5%	$=(ER/(ER+1))/(1-(1+ER)^{-t})$	*=(ER/(ER+1))/(1-(1+ER)-t) from Unit Rate Database*
Energy Cost		0.0208	$/kWh	*Rate as per Wellington Electricity 2022/23 Disclosure of Prices Appendix 1, assuming a low voltage commercial usage of 25kVA)GLV69-24UC)*
Tank Capacity	=	2000	m^3	*Holmes design*
Power Requirements	=	0.00	kWh	*Power requirements / costs for storage tank not included as assumed minimal*
Capital cost (Storage)	=	[redacted]		

Standard pump station configurations

Capacity (m^3)	Operator requirements	Operator Cost	Maintenance Cost	Total O&M	Power Cost
2000	2 person crew, 20 minute visit, 1 visit per month plus 2 days per year	[redacted]	[redacted]	[redacted]	$0

Operator Requirements determined through discussion with Paul Winstanley

Operator hourly rate taken from Unit Rates Database

*Maintenance Cost = 50*capital cost*^0.4 taken from Unit Rates Database for Christchurch tanks*

Gravity Pipes

Variables

				Assumptions & References
Analysis Period	t	100	years	
Discount rate	DR	5%		*Rate derived from Treasury*
Inflation rate	IR	4%		*Rate provided by Council varies each year. Conservative average used as within level of uncertainty of estimates*
Effective interest rate	ER	1.0%		*=(1+DR)/(1+IR)-1 from Unit Rate Database*
Connection Pipe Length		500	m	*Holmes design, length rounded to nearest 10m*
Connection Pipe Diameter		375	mm	*Holmes design*
EOP Pipe Length		280	m	*Holmes design, length rounded to nearest 10m*
EOP Pipe Diameter		475	mm	*Holmes design*

Pipe Operation and Maintenance Costs

Pipes	**Rate ($/m)**	**Frequency (years)**	**Cost per year /m**	**Total Annual Cost**	
Pipe cleaning	[redacted]	[redacted]	[redacted]	[redacted]	*Assumes on average once every 5 years, frequency and rate taken from Unit Rates Database*
CCTV	[redacted]	[redacted]	[redacted]	[redacted]	*Assumes on average once every 10 years, frequency and rate taken from Unit Rates Database*
Root cutting	[redacted]	[redacted]	[redacted]	[redacted]	*Assumes on average once every 10 years, frequency and rate taken from Unit Rates Database*
Total	[redacted]	[redacted]	[redacted]	[redacted]	

Pipe repairs - gravity

Pipe	**Patch or repair cost ($/repair)**	**($/m/patch)**	**($/m/yr)**	**Total ($/yr)**	
Connection	6000	[redacted]	[redacted]	[redacted]	*Assumes one patch or repair per 100 m of pipe after 50 years, frequency and rate taken from Unit Rates Database*
EOP	7205	[redacted]	[redacted]	[redacted]	*Assumes one patch or repair per 100 m of pipe after 50 years, frequency and rate taken from Unit Rates Database*
Total		[redacted]	[redacted]	[redacted]	

Pressure Pipes (rising main)

Variables

				Assumptions
Analysis Period	t	100	years	
Discount rate	DR	5%		*Rate derived from Treasury*
Inflation rate	IR	4%		*Rate provided by Council varies each year. Conservative average used as within level of uncertainty of estimates*
Effective interest rate	ER	1.0%		*=(1+DR)/(1+IR)-1 from Unit Rate Database*
Pipe Length		1260	m	*Holmes design, length rounded to nearest 10m*
Pipe Diameter		315	mm	*Holmes design*

Pipe Operation and Maintenance Costs

Pipes	**Rate ($/m)**	**Frequency (years)**	**Cost per year /m**	**Total Annual Cost**	
Pipe cleaning	[redacted]	[redacted]	[redacted]	[redacted]	*Assumes on average once every 5 years, frequency and rate taken from Unit Rates Database*
CCTV	[redacted]	[redacted]	[redacted]	[redacted]	*Assumes on average once every 10 years, frequency and rate taken from Unit Rates Database*
Root cutting	[redacted]	[redacted]	[redacted]	[redacted]	*Assumes on average once every 10 years, frequency and rate taken from Unit Rates Database*
Total	[redacted]	[redacted]	[redacted]	[redacted]	

Pipe repairs - pressure

Diameter (mm)	**Patch or repair cost ($/repair)**	**($/m)**	**($/m/yr)**	**Total ($/yr)**	
315	[redacted]	[redacted]	[redacted]	[redacted]	*Assumes one patch or repair per 200 m of pipe after 50 years, frequency and rate taken from Unit Rates Database*

Appendix O – Planning Assessment

Memo

To:	[redacted] Holmes	From:	[redacted] Wellington
Project/File:	310103744 - Hutt Central Sewer Bypass	Date:	15 March 2023

Reference: Planning Assessment - Hutt Central Sewer Bypass

1 Executive Summary

It has been requested that a planning assessment be undertaken on the preferred option associated with the Hutt City Sewer Bypass Project, recently adopted by Wellington Water Ltd.

Having undertaken the planning assessment, it is recommended that a meeting be held with the relevant groups to discuss the proposal. A meeting should be held with Taranaki Whānui, as mana whenua for the area, as soon as possible to introduce the project prior to the design being finalised, to ensure their views are taken into account and are incorporated into the design of the works, noting that the discharge of untreated wastewater from the proposed Engineered Overflow Point (EOP) into Te Awa Kairangi will not be in accordance with mana whenua values.

Meetings should also be held with the GWRC and HCC planning departments. In particular, a meeting should be held with GWRC to discuss the proposal, due to there being policy direction under the Proposed Natural Resources Plan (PNRP) to **avoid new wastewater discharges to freshwater**. The activity would be considered a Non-Complying Activity under the PNRP due to the discharge of untreated wastewater into Te Awa Kairangi. It is considered that consent would be very difficult to obtain and would likely be publicly notified.

The planning assessment made the following conclusions under the relevant planning legislation:

National

National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011 (NES-CS)

An assessment of the GWRC Selected Land Use Register (SLUR) was undertaken. As identified in Figure 2 below, the site extends alongside several SLUR sites, which may result in contamination creep. As such, this aspect should be discussed with a contaminated land expert to determine whether the NES-CS is relevant to the construction of the proposed sewer bypass.

Resource Management (National Environmental Standards for Freshwater) Regulations 2020

An assessment was undertaken against the National Environmental Standards for Freshwater 2020, and it was determined that it is not relevant to the proposed works associated with the Hutt City Sewer Bypass.

Regional

Wellington Regional Policy Statement (RPS), including RPS Change 1

The relevant objectives and policies relating to the sewer bypass project relate to recognising the benefits of regionally significant infrastructure, as well as protecting and enhancing the health and wellbeing of freshwater ecosystems and habitats from adverse effects of earthworks and vegetation disturbance.

It is considered that a new Engineered Overflow Point (EOP) which discharges untreated wastewater into Te Awa Kairangi will not comply with the objectives and policies which seek to protect freshwater ecosystems and habitats from adverse effects and will not comply with mana whenua values.

Proposed Natural Resources Plan (PNRP)

The assessment under the PNRP has been broken down into two parts, in order to provide clarification. The first being the discharge of untreated wastewater into Te Awa Kairangi and the second the rest of the works (including the EOP structure).

Discharge of wastewater into Te Awa Kairangi

As stated in Section 1 above, there is policy direction under the PNRP to **avoid new wastewater discharges to freshwater**. As such, the discharge of untreated wastewater into Te Awa Kairangi will not comply with the objectives and policies of the PNRP.

Resource consent from Greater Wellington Regional Council for a Non-Complying Activity under Rule R66 will be required for discharges of wastewater to fresh water. It is likely an application would be publicly notified, as the gateway test under section 104D of the Resource Management Act 1991 (RMA) will not be met (this is discussed in detail in Table 1 below).

EOP structure and construction effects

The following aspects of the proposal may require resource consent as follows:

- The construction of the EOP may require resource consent under Rule R145 if the permitted activity standards under Rule R128 cannot be complied with.
- If any diversion of Te Awa Kairangi is required as result of the construction of the EOP, resource consent under Rule R147 may be required.
- Any discharge from contaminated land that cannot comply with the permitted activity standards under Rule R82, will require resource consent under Rule R82 as a discretionary activity.

It is anticipated that the attachment of the rising main to the new pedestrian bridge across Te Awa Kairangi will be permitted under Rule R128.

It is noted that dewatering from the works area during the construction phase will be covered under the Wellington Water Global Dewatering consent (WGN170366).

Air discharges

The discharge of odour from the pump station and storage tank has the potential to create objectionable odour. It is recommended that an air quality specialist prepare a report to determine compliance with Rule R35, and/or mitigation measures that could be implemented.

If objectionable odour is created, and written approvals of those affected cannot be obtained, any resource consent may be notified / limited notified.

District

City of Lower Hutt District Plan

The construction and installation of new underground network utilities are a Permitted Activity provided a number of standards are met.

Resource consent may be required for the following aspects:

- If earthworks are undertaken outside 2m of the utility and exceeds 1.2m in depth, or 50m^3 in volume, resource consent for a Restricted Discretionary Activity will be required under Rule 14I 2.2(a). As is the case with the regional consent, this is likely to include a requirement for an Erosion and Sediment Control Plan (ESCP).

- Resource consent will be required for the construction of the proposed storage which will exceed the permitted activity volume standard.
- Cabinets exceeding the permitted activity standards for height, size and setback requirements for the Activity Area in which they are located will require resource consent for a Restricted Discretionary Activity.
- In all Activity Areas, construction, demolition and maintenance works must comply with the permitted activity standards for noise. If compliance cannot be achieved, resource consent for a Discretionary Activity will be required under Rule 14C 2.2.

It is recommended that a meeting be held with HCC planning staff to discuss the proposal.

2 Project Background

Hutt City Council (HCC) have identified growth opportunities within Hutt Central associated with the Riverlink project. This is expected to significantly increase the population in Hutt Central, which will subsequently put additional pressure on the wastewater network.

The purpose of the Hutt City Sewer Bypass project was to assess the feasibility and select a preferred option for a new wastewater trunk main and/or pump station to provide for the regeneration and growth within Hutt Central associated with the Riverlink project.

Following the Multi Criteria Analysis workshop held in September 2022, which assessed five different options, a preferred option of the Hutt City Sewer Bypass was endorsed by Wellington Water (WWL) to develop as part of concept design. That option is the focus of this assessment.

3 Proposal

The location of the preferred option of the Hutt City Sewer Bypass is shown in Figure 1 below. This option (which is similar to that of Option 2 assessed as part of the MCA process), is a mix of open cut construction and tunnelled construction. The proposal will consist of the following elements:

- Cut into existing mains at High Street and Kings Crescent intersections with Pretoria Street
- New 450m long 375mm dia. sewer along Pretoria St.
- New 100 L/s pump station + 600m³ storage on Pretoria St, requiring the purchase of a private property(s)
- New 1.14km long rising main from the pump station along Rutherford St. and across the new pedestrian bridge to connect into the existing Western Hills Trunk Main.
- New EOP and associated discharge of untreated wastewater to Te Awa Kairangi.

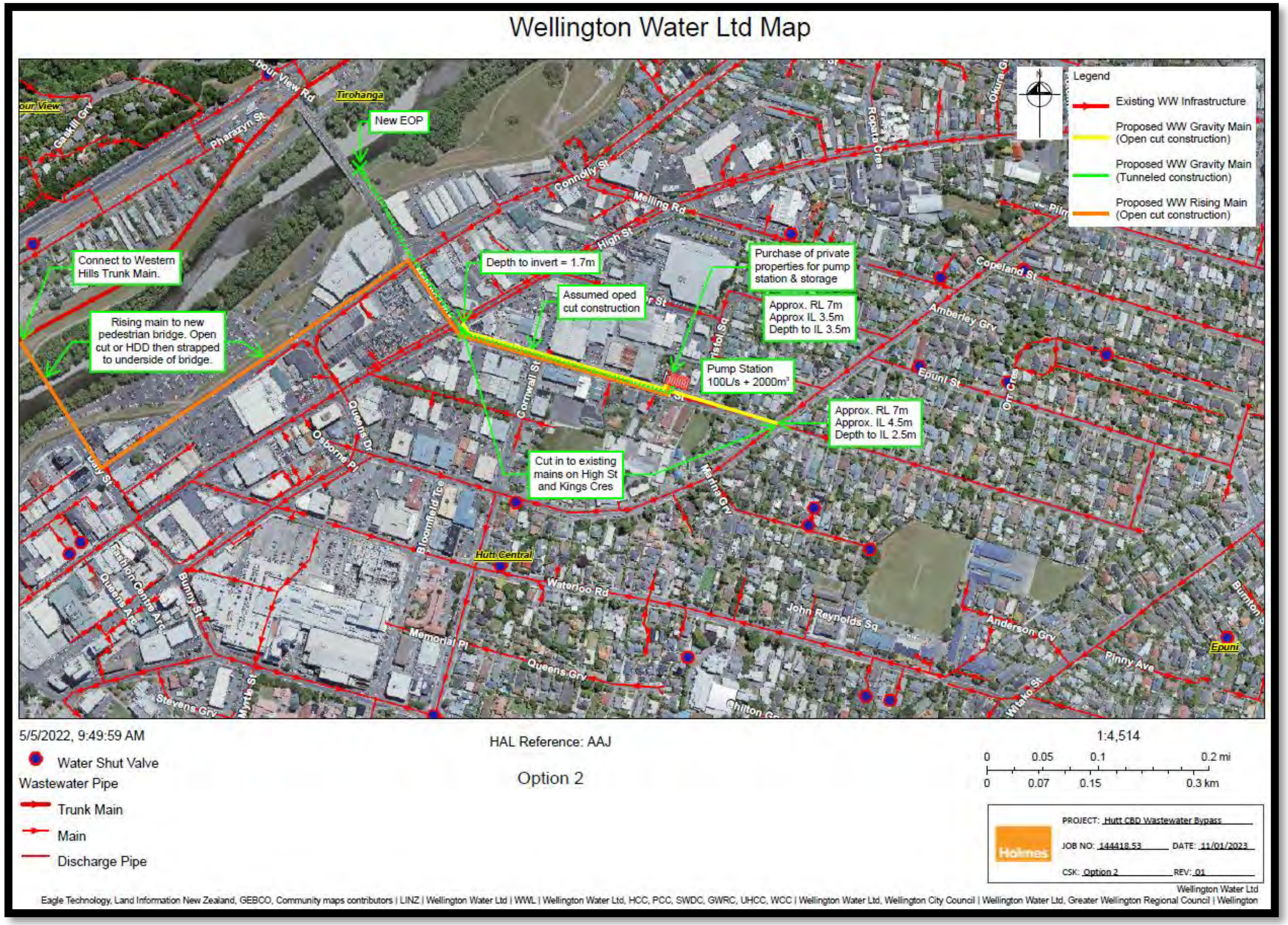


Figure 1: Extent of proposed HCSB works

bsi ISO 9001 Quality Management Systems CERTIFIED
bsi ISO 14001 Environmental Management CERTIFIED
bsi ISO 45001 Occupational Health and Safety Management CERTIFIED

4 Planning Assessment

4.1 Introduction

A planning assessment of the proposed Hutt City Sewer Bypass was undertaken against the following relevant planning documents, which are discussed further in the following sections:

National
- National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2011 (NES-CS)
- National Environmental Standards for Freshwater 2020

Regional
- Wellington Regional Policy Statement (RPS), including RPS Change 1
- Proposed Natural Resources Plan (PNRP)

District
- City of Lower Hutt District Plan (the District Plan)

Although it has since been indicated by Holmes that the discharge of wastewater into Te Awa Kairangi is not going to be assessed as part of this package, the activity is considered significant enough to note in this planning assessment.

4.2 National Planning Documents

4.2.1 NATIONAL ENVIRONMENTAL STANDARD FOR ASSESSING AND MANAGING CONTAMINANTS IN SOIL TO PROTECT HUMAN HEALTH 2011

An assessment of the GWRC Selected Land Use Register (SLUR) was undertaken. The SLUR is GWRC's database of sites that have, or may have, been used for activities and industries included in the Hazardous Activities and Industries List (HAIL) established by Ministry for the Environment (MfE).

As identified in Figure 2 below, the site extends alongside SLUR sites, which may result in contamination creep. As such, this aspect should be discussed with a contaminated land expert to determine whether the NES-CS is relevant to the construction of the proposed sewer bypass.

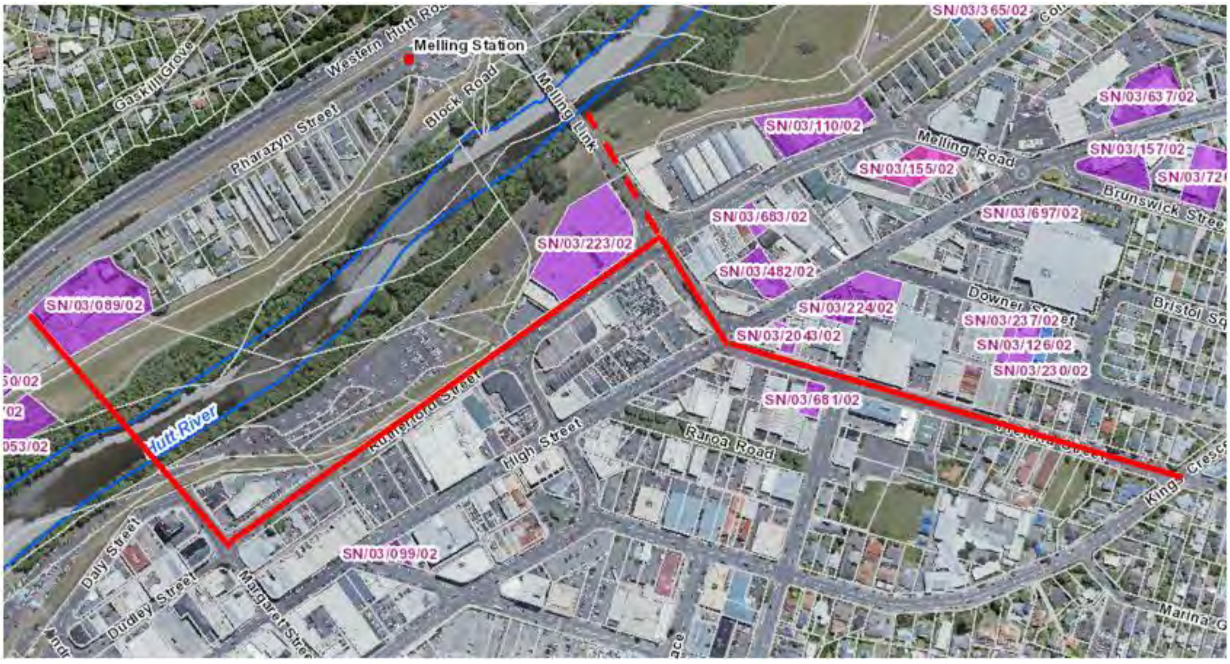


Figure 2: SLUR sites in close proximity to the proposed works site

4.2.2 RESOURCE MANAGEMENT (NATIONAL ENVIRONMENTAL STANDARDS FOR FRESHWATER) REGULATIONS 2020

An assessment was undertaken against the National Environmental Standards for Freshwater 2020, and it was determined that it is not relevant to the proposed works associated with the Hutt City Sewer Bypass.

4.3 Regional Planning Documents

4.3.1 WELLINGTON REGIONAL POLICY STATEMENT 2013

The Wellington Regional Policy Statement (RPS) identifies the regionally significant issues around the management of the regions natural and physical resources and sets out what needs to be achieved (objectives) and the way in which the objectives will be achieved (policies and methods).

Proposed Change 1 of the Regional Policy Statement (RPS Change 1) has also been assessed. RPS Change 1 makes changes to the Regional Policy Statement to account for new national direction and to address issues in the Wellington Region. The focus of Proposed RPS Change 1 is to implement and support the National Policy Statement on Urban Development 2020 (NPS-UD) and to start the implementation of the National Policy Statement for Freshwater Management 2020 (NPS-FM). Issues relating to climate change, indigenous biodiversity and high natural character are also addressed.

The relevant objectives and policies of the RPS relating to the Hutt City Sewer Bypass project are listed in Table 5, attached as Attachment 1 below.

In summary:

- It is considered that the majority of the proposed works will be in accordance with the objectives and policies of the RPS.
- The discharge of wastewater into Te Awa Kairangi will not be in accordance with the objectives and policies that seek to recognise tangata whenua values and protect indigenous ecosystems and habitats.

4.3.2 PROPOSED NATURAL RESOURCES PLAN – FINAL APPEALS VERSION 2022

The GWRC Proposed Natural Resources Plan (PNRP) final appeals version (2022) has been assessed.

It is noted that the Engineered Overflow Point (EOP) will fall within the following PNRP Schedules:

- **Schedule F1:** Rivers and lakes with significant indigenous ecosystems: habitat for indigenous threatened/ at risk fish species (Map 13b)
- **Schedule F1**: Rivers and lakes with significant indigenous ecosystems: habitat for six or more migratory indigenous fish species (Map 13c)
- **Schedule H1:** Significant primary contact recreation rivers and lakes (Map 20)
- **Schedule H2**: Priorities for improvement of fresh and coastal water quality for contact recreation and Māori customary use

4.3.2.1 PNRP objectives and policies

The relevant objectives and policies of the PNRP that will need to be taken into account, relate to the construction of the EOP and the subsequent discharge of untreated wastewater into Te Awa Kairangi. Please refer to Attachment 2, for the full set of relevant objectives and policies of the PNRP.

In summary:

- It is considered that the majority of the proposed works will be in accordance with the objectives and policies of the PNRP.
- The discharge of wastewater into Te Awa Kairangi will not be in accordance with the objectives and policies that seek to recognise tangata whenua values and protect indigenous ecosystems and habitats.
- Of particular note is Policy P94 which seeks to avoid new wastewater discharges to freshwater, which the proposal will not comply with.

4.3.2.2 Relevant PNRP Rules

The relevant rules of the PNRP that will need to be taken into account relate to the construction of the EOP, and the discharge of untreated wastewater into Te Awa Kairangi. Table 3 lists the relevant rules.

Table 1: Relevant PNRP Rules

Rule	**Comment**
Discharges to land and water	
5.2.6 Wastewater	
Rule R66: ~~New d~~Discharges of wastewater to fresh water – non-complying activity The discharge of wastewater into fresh water that is: (a) an existing wastewater discharge into fresh water that does not comply with Rule R65(b) or (c), or (b) a new wastewater discharge into fresh water is a non-complying activity.	The discharge of untreated wastewater from the EOP is a non-complying activity. It is noted that consent will have a high degree of difficulty, and the application may be publicly notified as the activity may not meet either of the gateway tests under section 104D of the RMA which has particular restrictions for non-complying activities. Section 104D states: ***104D Particular restrictions for non-complying activities*** *(1) Despite any decision made for the purpose of notification in relation to adverse effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either—* *(a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or* *(b) the application is for an activity that will not be contrary to the objectives and policies of—*

Rule	**Comment**
	(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or *(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or* *(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.* *(2) To avoid doubt, section 104(2) applies to the determination of an application for a non-complying activity.*
5.2.12 Contaminated land and hazardous substances	
Rule R82: Discharges from contaminated land – permitted activity The discharge of a contaminant from contaminated land where a contaminant may enter water is a permitted activity provided the following conditions are met: (a) a detailed site investigation has been undertaken, reported and provided to Wellington Regional Council in accordance with Rule R81, and (b) the results of the detailed site investigation ~~report concludes~~ indicate that the discharge does not pose unacceptable risks to human health or the environment – on-site or off-site ~~is highly unlikely to be a risk to human health or the environment at present or in the future~~, or (c) the discharge from SLUR Category III land or SLUR Category IV land does not, or is not likely to, result in: (i) ~~groundwater~~ quality exceeding the maximum acceptable value (MAV) in the Drinking-Water Standards New Zealand 2005 (Revised 2008) or	If works will be undertaken within contaminated land (noting the route of the sewer bypass will extend past identified SLUR sites), compliance with Rule R82 will be required. If compliance cannot be achieved, resource consent for a discretionary activity will be required under Rule R94 will be required.

Rule	**Comment**
50% of the MAV in a community drinking water supply protection area shown on Maps 26, 27a, 27b or 27c at the following locations: 1. at the property boundary, or within 50m from the source of the discharge, whichever is the lesser distance, or 2. in an existing bore within the property boundary or within 50m from the source of the discharge, whichever is the lesser distance, used to abstract water for any use other than water quality monitoring, (ii) water quality in a surface water body within the property boundary or within 50m from the source of the discharge, whichever is the lesser distance, exceeding a value in Schedule V ~~the Australian and New Zealand Environment and Conservation Council Guidelines for Fresh and Marine Water Quality (2000)~~ for the protection of 95% of species	
5.2.15 All other discharges	
Rule R94: All other discharges – discretionary activity The discharge of water or contaminants into water, or onto or into land where it may enter water, that is not: (a) in a site or habitat identified in Schedule A (outstanding water bodies), Schedule C (mana whenua), Schedule F1 (rivers/lakes), Schedule F3 (~~significant~~ identified natural wetlands), Schedule F4 (coastal sites) or Schedule H1 (contact recreation), and (b) a permitted, controlled, restricted discretionary, or non-complying activity under any other rule in the Plan, or a discretionary activity under Rules R55, R56, R58, R65, R83 or R90, is a discretionary activity.	
Wetlands and beds of lakes and rivers	
5.4.5 Uses of beds of lakes and rivers	
Rule R128: New structures – permitted activity The placement of a new structure, including sediment retention weirs, pipes, ducts, cables, hydrological and water quality monitoring equipment, fences, erosion protection	There are two aspects that need to be covered by this rule, as noted below;

Rule	Comment
structures, debris arrestor structures and structures associated with vegetative bank edge protection except a structure permitted by Rules R125, R126 and R127 and passive flap gates, that is fixed in, on, under, or over the bed of any river or lake, excluding activities regulated by the Resource Management (National Environmental Standards for Plantation Forestry) Regulations 2017 except general condition 5.4.4(n)), including any associated: (a) disturbance of the river or lake bed, and (b) deposition on the river or lake bed, and (c) diversion of water, and (d) discharge of sediment to water, and (e) temporary damming of water, and ~~(f) partial stream reclamation associated with the structure~~ is a permitted activity, provided the following conditions are met: (f) the activity shall comply with the beds of lakes and rivers general conditions specified above in Section 5.4.4, and (g) the activity does not occur within a site identified in Schedule C (mana whenua), excluding adding pipes or cables to an existing structure or providing for fish refuge, and (h) the activity does not occur in or on any part of the river bed identified as inanga spawning habitat in Schedule F1 (rivers/lakes), and (i) the structure does not occupy a bed area any greater than 10m², except for where the structure is associated with vegetative bank edge protection, or a pipe, duct, fence or cable which is located over or under the bed where no bed occupancy limits apply, and (j) the catchment upstream of any sediment retention weir is not greater than 200ha, and (k) the height of any sediment retention weir from the upstream base to the crest of the weir at the time of construction shall be no more than 0.5m., and	• The construction of the EOP will be required to comply with Rule R128. If construction of the EOP cannot comply, resource consent for a discretionary activity under Rule R145 will be required. It is noted that details of the EOP have not be provided, as such, an assessment cannot be made as to the likelihood of compliance at the time of writing. • It is anticipated that the attachment of the rising main to the new pedestrian bridge across Te Awa Kairangi will be permitted under Rule R128.

Rule	Comment
(l) the placement of a weir other than a customary weir, in, on over or under the bed of any river or connected area must also comply with the following: (i) the fall height of the weir must be no more than 0.5m, and (ii) the slope of the weir must be no steeper than 1:30, and (iii) the face of the weir must have roughness elements that are mixed grade rocks of 150 to 200mm diameter and irregularly spaced no more than 90mm apart to create a hydraulically diverse flow structure across the weir (including any wetted margins), and (iv) the weir's lateral profile must be V-shaped, sloping up at the banks, and with a low-flow channel in the centre, with the lateral cross-section slope between 5° and 10°, and (m) for all new weirs (except customary weirs), non-passive flap gates, aprons and ramps, placed in rivers or connected areas, the information requirements of Regulations 62, and 64,65, and 68 as relevant for the structure, of the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 shall be provided as set out in the regulations. Note The placement of a passive flap gate in, on, over or under the bed of any river or connected area is a non-complying activity regulated by the Resource Management (National Environment Standards for Freshwater) Regulations 2020.	
5.4.7 All other uses of the beds of rivers and lakes	
Rule R145: All other uses of ~~activities~~ in river and lake beds – discretionary activity All other uses ~~activities~~ that would otherwise contravene section 13(1) or 13(2) of the RMA and any associated activities under sections 14 or 15 of the RMA ~~except for damming and diverting of water,~~ in, on, under or over river and lake beds that is not permitted, controlled or restricted discretionary by Rule R122 to Rule R129 is a discretionary activity, except for reclamation, damming and diverting of water. ~~except for those activities that are non-complying or prohibited under Rule R126, Rule R127 or Rule R128.~~	

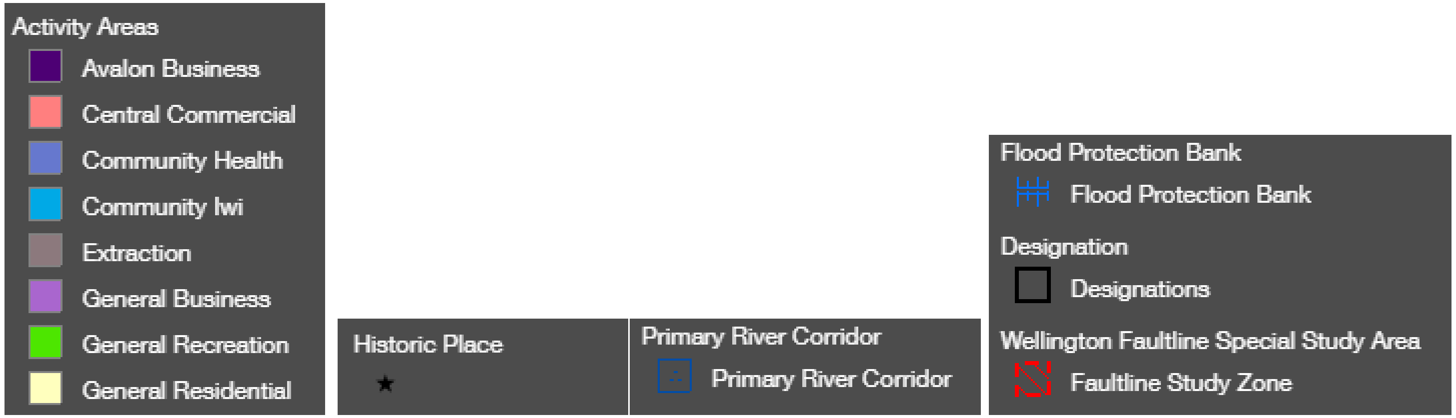
Rule	**Comment**
5.4.8 Damming and diverting of water	
Rule R147: Damming or diverting water within or from rivers – discretionary activity The damming or diverting of water within or from a river that does not meet Rules R122, R125, R126, R127, R128, R130, R131, R134, R137 and R138 and R159 is a discretionary activity, provided the following conditions are met: (a) the damming or diverting of water shall not result in river flows falling below minimum flows in chapters 7 to 11 of the Plan, and (b) the damming or diverting of water is not in any outstanding river identified in Schedule A1 (outstanding rivers)	If any diversion of Te Awa Kairangi is required as result of the construction of the EOP, resource consent under Rule R147 may be required.
5.1 Air quality	
5.1.11 Gas, water and wastewater processes	
Rule R35: Gas, water and wastewater processes – permitted activity The discharge of contaminants into air from the enclosed storage, conveyance and/or pumping of gas (including the flaring and venting of natural gas from gas distribution and transmission networks), water and wastewater processes is a permitted activity, provided the following conditions ~~is~~ are met: (a) the discharge shall not cause offensive or objectionable odour at the boundary of a sensitive activity;	The discharge of odour from the pump station and storage tank has the potential to create objectionable odour within the residential environs they will be located. It is recommended that an air quality specialist prepare a report to determine compliance with Rule R35, and/or mitigation measures that could be implemented. If objectionable odour is created, and written approvals of those affected cannot be obtained, any resource consent may be notified / limited notified.
Rule R42: All other discharges – discretionary activity The discharge of contaminants into air that are not permitted, controlled, discretionary, non-complying or prohibited is a discretionary activity.	

It is noted that dewatering from the works area during the construction phase will be covered under the Wellington Water Global Dewatering consent (WGN170366).

4.4 District Planning Documents

4.4.1 CITY OF LOWER HUTT DISTRICT PLAN

Under the City of Lower Hutt District Plan, there are a number of rules that must be complied with. Each relevant chapter and the associated rules are assessed below.



Activity Areas
🟪 Avalon Business
🟥 Central Commercial
🟦 Community Health
🟦 Community Iwi
🟫 Extraction
🟪 General Business
🟩 General Recreation
🟨 General Residential

Historic Place
★

Primary River Corridor
☐ Primary River Corridor

Flood Protection Bank
▦ Flood Protection Bank

Designation
☐ Designations

Wellington Faultline Special Study Area
▨ Faultline Study Zone

Figure 3: City of Lower Hutt District Plan Maps Legend

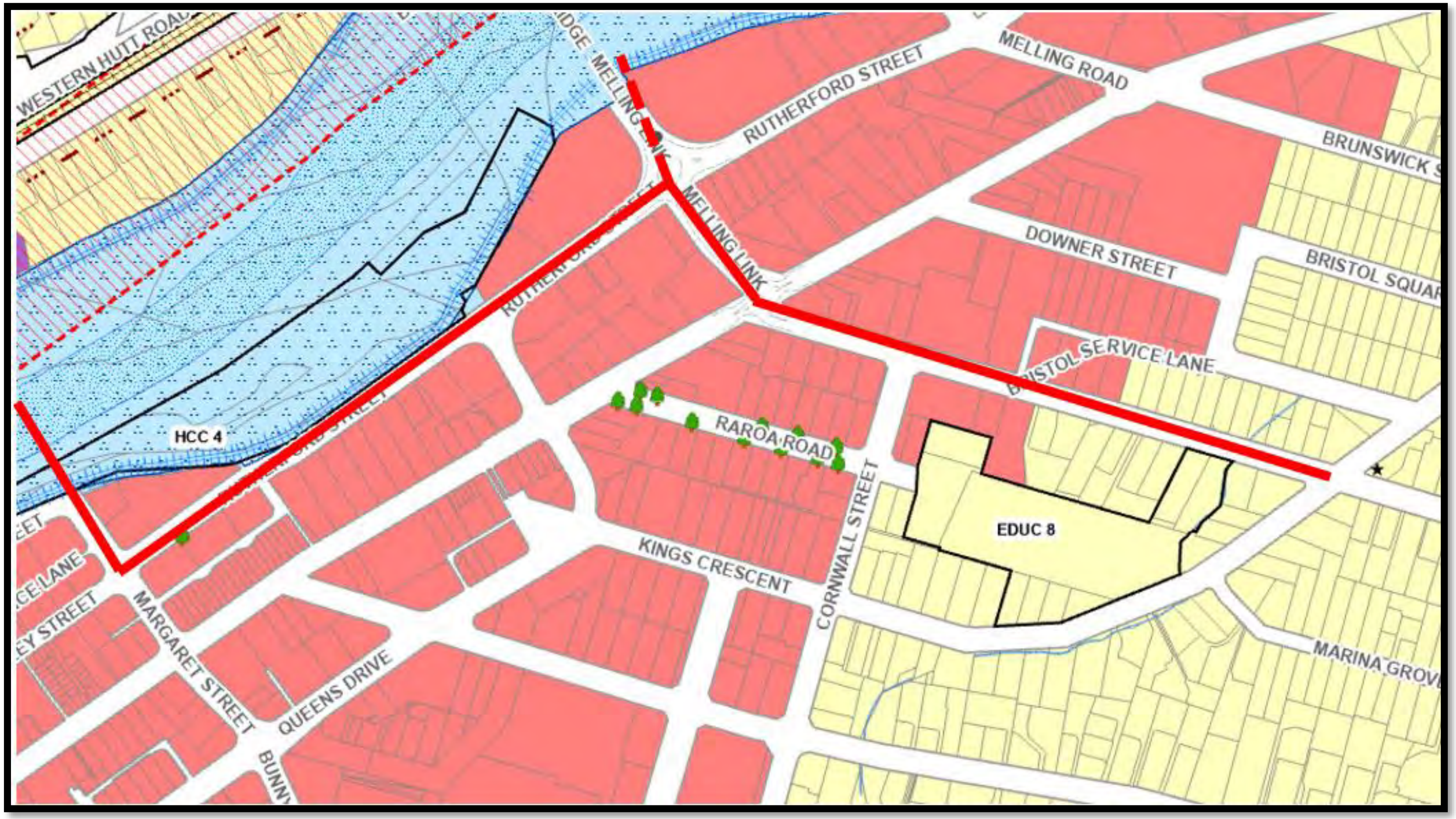


Figure 4:City of Lower Hutt District Plan Maps

4.4.1.1 Network Utilities Rules

Chapter 13 of the District Plan relates to Network Utilities. An assessment has been undertaken against each relevant rule in Tables 2 – 4 below.

As identified on the planning map in Figure 4 above, the pipe that extends along Daly Street which will then be attached to the new pedestrian bridge, will extend through:

- The Primary River Corridor
- A Designation identified as: HCC 4, HCC Riverbank Carpark.

Table 2: Relevant Network Utility Rules

Rule Number	**Rule**	**Activity Area**	**Status**	**Standards / Matters of Discretion**	**Comment**
Chapter 13: Network Utilities					
13.3 Rules – Network Utilities					
General					
13.3.1.9	***Cabinet and other network utility structures not otherwise listed in this table.***	*All, excluding Historic Residential and Landscape Protection Residential*	*Permitted*	Health and Safety: 13.3.2.1 (see below)	If compliance cannot be achieved with the permitted activity standards, resource consent as a Restricted Discretionary Activity will be required.
13.3.1.11	***Cabinets and other network utility structures not otherwise listed in this table that do not meet the permitted***	*All, excluding Historic Residential and Landscape*	*Restricted Discretionary*	Health and Safety: 13.3.2.1 ***Matters of Control or Discretion:*** 13.3.4 (a), 13.3.4 (b)	

	activity standards in Rule 13.3.1.9	*Protection Residential*		13.3.4 (e), 13.3.4 (f) 13.3.4 (g), 13.3.4 (h) 13.3.4 (j), 13.3.4 (k) 13.3.4 (l), 13.3.4 (m) 13.3.4 (r), 13.3.4(u), 13.3.4(v)	
Removal, Maintenance and Upgrading					

13.3.1.4	***The upgrading of existing network utilities***	*All*	*Permitted*	*Health and Safety: 13.3.2.1* *Earthworks: 13.3.2.5* *Vegetation: 13.3.2.6* *Noise: 13.3.2.7* (see below)	'Upgrading' as defined by the District Plan states: *As it applies to network utilities, upgrading means the improvement or physical works that result in an in carrying capacity, operational efficiency, security or safety of existing network utilities but excludes:* *(a) 'maintenance' (as it relates to network utilities);* *(b) 'minor upgrading'; and* *(c) any activity specifically provided for under Rules 13.3.1.9 to 13.3.1.41.* This rule is noted, as the proposed works associated with the pipe work, may meet the above definition of 'upgrading' under Rule 13.3.1.4. However, this should be clarified with HCC.
13.3.1.17	***The construction, installation and development, of new underground network utilities, except for:*** - ***Electricity transmission***	All	Permitted	Health and Safety: 13.3.2.1 Earthworks: 13.3.2.5 Vegetation: 13.3.2.6	The construction of new pipework would be a permitted activity

	lines above 110kV; and - ***Gas distribution and transmission pipelines at a pressure exceededing 2000 kilopascals.***				

Standard Number	**Standard**	**Standards**	**Comment**
13.3.2.1	***Health and Safety***	*Where specified as relevant, network utilities shall comply with the following standards:* a) *The maximum exposure levels shall not exceed the levels specified in NZS 2772:1999 'Radiofrequency Fields– Maximum exposure levels – 3kHz to 300 GHz'.* b) *Network utilities that emit electric and magnetic fields shall comply with the International Commission on Non-ionising Radiation Protection Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz – 100 Hz), Health Physics 99(6):818-836; 2010, and the recommendations from the World Health Organisation monograph Environmental Health Criteria (No 238, 2007).* *Note: The Resource Management (National Environmental Standards for Telecommunications Facilities) Regulations 2008, separate to this District Plan controls all radio-frequency emissions from telecommunication facilities through specific exposure standards.*	Complies It is anticipated that compliance with these standards will be achieved.
13.3.2.5	***Earthworks***		

13.3.2.5.1	*Sediment and Erosion Control*	*Erosion and sediment control measures shall be installed and maintained for all network utility activities, in accordance with the "Erosion and Sediment Control Guidelines for the Wellington Region – September 2002" – reprinted 2006.*	It is anticipated sediment and erosion control measures will be implemented.
13.3.2.5.2	*Slope, Height, Depth and Area of Earthworks*	*The following shall apply to all network utility activities, except to earthworks within 2.0 metres of the exterior walls of any network utility structure or the outer edge of a network utility structure without walls measured in plain view, trenching in the road reserve or rail corridor, and to piling associated with the installation of a network utility.* *(i) Slope - No earthworks shall be carried out on a slope greater than 45 degrees.* *(ii) Height, Depth - Earthworks shall not exceed 1.5 metres in height or depth.* *(iii) Recession Plane - Any earthworks that involve the raising of the height of land above existing ground level shall not exceed a height recession plane measured at an angle of 45 degrees from any neighbouring boundary.* *(iv) Area:* *Riparian Areas - 25m²* *All Recreation and Residential Activity Areas - 100m²* *All Rural Activity Areas - 1000m²* *All Other Activity Areas - 500m²* *Rail corridor and state highway - 1,000m²*	If earthworks are undertaken outside 2m of the utility and exceeds 1.2m in depth, or 50m^3 in volume, resource consent for a Restricted Discretionary Activity will be required under Rule 14I 2.2(a). It is noted that earthworks to construct the proposed storage tanks will result in approximately 6000m^3 of soil being displaced. As such, resource consent will be required for this aspect. If earthworks for the installation of the pipe across the new pedestrian bridge are outside 2m of the utility and exceeds 1.2m in depth and 50m^3 in volume, and are within 20m of a flood protection structure, resource consent for a Restricted Discretionary Activity under Rule 14I 2.2(a) will be required.
13.3.2.2	**Height**		

Standard		Commercial	Business	Community	Residential	Rural	Recreation
13.3.2.2.4	Cabinets and other network utility structures within the road reserve (not otherwise provided for).	2m			1.8m		2m

13.3.2.2.5	Cabinets and network utility structures that are not otherwise provided for and that are not located within the road reserve.	3.5m					
13.3.2.3	**Size and Diameter**						
Standard		Residential	Commercial	Business	Recreation	Rural	Community
13.3.2.3.6	Cabinets and other network utility structures located within the road reserve (not otherwise provided for).	1.4m^2	2m^2				
13.3.2.2.7	Cabinets and other network utility structures not otherwise provided for that are not located within the road reserve.	15m^2					

13.3.2.4 **Separation Distance and Setbacks**

With the exception of standard 13.3.2.4.1, which applies to all network utility structures, including lines, the following table applies to masts and antenna attached to masts and any cabinet or other network utility structure that is over 5m^2 in area with a height of more than 1.2 metres and **not located in the road reserve or rail corridor**

Standard	Residential	Commercial	Business	Recreation	Rural	Community
	General **Special** **Historic** **Hill** **Landsc. Prot.** **Medium Density**	**Central** **Petone** **Suburban** **Special** **Suburban** **Mixed Use**	**General** **Special** **Avalon** **Extraction**	**General** **Special** **River** **Passive**	**Residential** **General**	**Health** **Iwi**
13.3.2.4.1 Riparian setback	A minimum 20m setback shall be maintained					
13.3.2.4.2 Separation distance or setback for masts and antenna attached to masts	No less than 10m from a boundary in the Residential and Rural Activity Areas	No less than 10m from a boundary in the Residential Activity Areas.		No less than 10m from any boundary in the Residential or Rural Activity Areas.	No less than 10m from any property boundary. Under 15m in height – no less than 20m from the closest wall of a dwelling (excluding balconies and decks). Over 15m in height – no less than 50m from the closest wall	No less than 10m from a boundary in the Residential Activity Areas.

				of a dwelling (excluding balconies and decks).	
13.3.2.4.3 Separation distance or setback for cabinets and other network utility structures	No less than 2 metres to all boundaries.	No less than 2 metres to any boundary in a Rural, Residential and Recreation Activity Area and to a road or service lane boundary.	No less than 2 metres to all boundaries.		No less than 2 metres to any boundary in a Rural, Residential and Recreation Activity Area and to a road or service lane boundary.

13.3.2.5	**Earthworks**	
13.3.2.5.1	Sediment and Erosion Control	Erosion and sediment control measures shall be installed and maintained for all network utility activities, in accordance with the "Erosion and Sediment Control Guidelines for the Wellington Region – September 2002" – reprinted 2006.
13.3.2.5.2	Slope, Height, Depth and Area of Earthworks	The following shall apply to all network utility activities, except to earthworks within 2.0 metres of the exterior walls of any network utility structure or the outer edge of a network utility structure without walls measured in plain view, trenching in the road reserve or rail corridor, and to piling associated with the installation of a network utility. 1. Slope - No earthworks shall be carried out on a slope greater than 45 degrees. 2. Height, Depth - Earthworks shall not exceed 1.5 metres in height or depth. 3. Recession Plane - Any earthworks that involve the raising of the height of land above existing ground level shall not exceed a height recession plane measured at an angle of 45 degrees from any neighbouring boundary. 4. Area: Riparian Areas - 25m² All Recreation and Residential Activity Areas - 100m² All Rural Activity Areas - 1000m² All Other Activity Areas - 500m² Rail corridor and state highway - 1,000m²
13.3.2.7	**Noise**	
Noise associated with the activity shall not exceed the permitted activity noise standard(s) within the zone in which the activity is located.		

4.4.1.2 Noise Rules

Chapter 14C of the District Plan relates to Noise requirements.

Table 3: Relevant Noise Rules

Rule Number	Rule	Status	Comment
Chapter 14C Noise			
Rules			
14C 2.1	***In all Activity Areas*** *(a) These rules are without prejudice to the powers of Council pursuant to the Act.* *(b) These rules are without prejudice to the powers of any Medical Officer of Health pursuant to the Health Act 1956.* *(c) The noise levels shall be measured in accordance with NZS 6801:1991 "Measurement of Sound", and assessed in accordance with NZS 6802:1991 "Assessment of Environmental Sound". The noise level is the L10 descriptor, as defined in NZS 6801:1991.* *(d) The lower levels shall apply between the commencement of the lower level on a Saturday evening and Monday morning, and Public Holidays, unless otherwise specified.* *(e) The maximum sound level shall not exceed Lmax75dBA during the hours 10.00pm - 7.00am, measured anywhere within a residential activity area.*	*Permitted*	Complies I assume compliance, however it should be checked. If compliance cannot be met with this rule, resource consent under Rule R14C 2.2 for a Discretionary Activity must be obtained.
14C 2.2	*(a) Any activity no complying with the Permitted Activity – Conditions*	*Discretionary*	

4.4.1.3 Earthworks Rules

Chapter 14I of the District Plan relates to earthworks. These provisions do not apply to earthworks associated with the establishment of network utilities, if undertaken within 2m of the utility. However, for works that extend outside 2m of the utility, the rules below will apply.

Table 4: Relevant Earthworks Rules

Rule Number	Rule	Status	Standards	Comment
Chapter 14I: Earthworks				
Rules				
14I 2	***Rules*** ***These provisions shall not apply to the following:*** ***(i) Earthworks associated with the establishment of network utilities in accordance with Chapter 13 – Network Utilities.***			
14I 2.1	*(a) Earthworks in all activity areas except Special Recreation Activity Area, Passive Recreation Activity Area, Hill Residential Activity Area and Landscape Protection Residential Activity Area and in Maire Street, Eastbourne, Lot 4 DP 14002 as shown on Appendix Earthworks 1*	*Permitted*	*(a) Ground Level: The natural ground level may not be altered by more than 1.2m, measured vertically.* *(b) Quantity: Maximum volume of 50m³ (solid measure) per site.* *(c) N/A* *(d) In the Primary and Secondary River Corridors earthworks must be a minimum distance of 20m from a flood protection structure.*	If earthworks are undertaken outside 2m of the utility and exceeds 1.2m in depth, or 50m³ in volume, resource consent for a Restricted Discretionary Activity will be required under Rule 14I 2.2(a). With regards to (d), if earthworks for the installation of the pipe across the new pedestrian bridge is required, and are within 20m of a flood protection structure, resource consent for a Restricted Discretionary Activity will be required under Rule 14I 2.2(a).

14I 2.2	*(a) In all activity areas except Special Recreation Activity Area, Passive Recreation Activity Area, Hill Residential Activity Area, and the Landscape Protection Residential Activity Area, earthworks which fail to comply with any of the Permitted Activity Conditions.* *(b) In the Special Recreation, Passive Recreation, Hill Residential and Landscape Protection Residential Activity Areas and in Maire Street, Eastbourne, Lot 4 DP 14002 as shown on Appendix Earthworks 1, all earthworks.*	*Restricted Discretionary*		
14 2.2.1	***Matters in which Council has restricted its Discretion:*** *(a) In all activity areas except Special Recreation Activity Area, Passive Recreation Activity Area, Hill Residential Activity Area, and the Landscape Protection Residential Activity Area, earthworks which fail to comply with any of the Permitted Activity Conditions.* *(i) Amenity Values:* *The extent to which any earthworks proposal will affect adversely the visual amenity values of the area, and the extent to which the earthworks will result in unnecessary scarring and be visually prominent.* *The extent to which replanting or rehabilitation works are included as part of the proposal to mitigate adverse effects.* *Earthworks should not result in the permanent exposure of excavated areas.* *(ii) Existing Natural Features and Topography:* *The extent to which the proposed earthworks reflect natural landforms, and be sympathetic to the natural topography.* *(iii) Historical or Cultural Significance:* *The extent to which the proposed earthworks will affect adversely land and features which have historical and cultural significance.* *(iv) Natural Hazards:*			

	Consideration should be given to those areas prone to erosion, landslip and flooding. Excavation should not increase the vulnerability of people or their property to such natural hazards. In the Primary and Secondary River Corridors of the Hutt River, consideration should be given to the effects on the flood protection structures. *(b) In the Special Recreation, Passive Recreation, Hill Residential and Landscape Protection Residential Activity Areas and in Maire Street, Eastbourne, Lot 4 DP 14002 as shown on Appendix Earthworks 1, all earthworks.* *(i) Amenity Values:* *The extent to which any earthworks proposal will affect adversely the visual amenity values of the area, and the extent to which the earthworks will cause unnecessary scarring and be visually prominent. Consideration must be given to adverse effects on visual amenity values, and the value of the site as a visual backdrop to the city.* *The extent to which replanting or rehabilitation works are included as part of the proposal to mitigate adverse effects. Earthworks should not result in the permanent exposure of excavated areas.* *(ii) Existing Natural Features and Topography:* *The extent the proposed earthworks will alter the natural topography. Earthworks in these activity areas should be designed to retain the natural topography and protect natural features.* *(iii) Historical or Cultural Significance:* *The extent to which the proposed earthworks will affect adversely land and features which have historical and cultural significance.* *(iv) Natural Hazards:* *Consideration should be given to those areas prone to erosion, landslip and flooding. Excavation should not increase the vulnerability of people or their property to such natural hazards.*

It is noted that the relevant objectives and policies of the District Plan are very similar to the objectives and policies under the national and regional planning documents. As such, the extensive list has not been provided in this document, however, can be on request.

5 Conclusion

The planning assessment concludes that resource consent will be required from GWRC as a non-complying activity for the discharge of untreated wastewater into Te Awa Kairangi, which will be very difficult to obtain, as the proposal will not comply with the objectives and policies of the PNRP and will likely have more than minor effects on the environment. It is considered that the application will most likely be publicly notified.

It is considered that a pre-application meeting should be held with planning staff to introduce the proposal and discuss the planning aspects with the appropriate technical experts.

Resource consent will also be required to be submitted to the HCC, however it is anticipated that resource consent will be relatively straight forward to obtain, provided measures such as a Construction Management Plan and an Erosion and Sediment Control Plan are prepared and submitted with the application, detailing the measures to be implemented to avoid, remedy or mitigate potential effects on the environment. It is considered that a discussion should be held with planning staff to discuss the proposal before the application is submitted.

It is important that meetings should be held with mana whenua, in particular in relation to the discharge of untreated wastewater into Te Awa Kairangi, which goes against their values.

Please let me know if you require any clarification of the information contained within this planning assessment.

Ngā mihi,

Stantec New Zealand

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Attachment: [Attachment]

ATTACHMENT 1: WELLINGTON REGIONAL POLICY STATEMENT 2013

Proposed changes to the operative Regional Policy Statement (2013) are shown as ~~strikethrough~~ (proposed deletion) and underlined (proposed additional text).

Table 5: Relevant objectives and policies of the RPS

Objectives	**Policies**
3.1 Air quality	
Objective 1 Discharges of odour, smoke and dust to air do not adversely affect amenity values and people's wellbeing.	Policy 2: Reducing adverse effects of the discharge of odour, smoke, dust and fine particulate matter – regional plans
3.3 Energy, infrastructure and waste	
Objective 10 The social, economic, cultural and environmental, benefits of regionally significant infrastructure are recognised and protected	Policy 39: Recognising the benefits from renewable energy and regionally significant infrastructure – consideration
3.4 Freshwater	
Objective 12 Natural and physical resources of the region are managed in a way that prioritises: (a) first, the health and well-being of water bodies and freshwater ecosystems (b) second, the health needs of people (such as drinking water) (c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future; and Te Mana o te Wai encompasses six principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater, and these principles inform this RPS and its implementation. The six principles are: (a) Mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater (b) Kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations	Policy 40: ~~Maintaining~~ Protecting and enhancing the health and well-being of water bodies and freshwater ecosystems ~~aquatic ecosystem health in water bodies~~ – consideration Policy 41: ~~Minimising~~ Controlling the effects of earthworks and vegetation disturbance – consideration

Objectives	Policies
(c) Manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others (d) Governance: the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future (e) Stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations, and (f) Care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation. And the Statements of Kahungunu ki Wairarapa and Rangitāne o Wairarapa	
Objective 13 The region's rivers, lakes and wetlands support healthy functioning ecosystems.	~~Policy 43: Protecting aquatic ecological function of water bodies – consideration~~
3.6 Indigenous ecosystems	
Objective 16 Indigenous ecosystems and habitats with significant ecosystem functions and services and/or biodiversity values are ~~maintained~~ protected, enhanced, and restored to a healthy functioning state.	Policy 47: Managing effects on indigenous ecosystems and habitats with significant indigenous biodiversity values – consideration
Objective 16A The region's indigenous ecosystems are maintained, enhanced, and restored to a healthy functioning state, improving their resilience to increasing environmental pressures, particularly climate change, and giving effect to Te Rito o te Harakeke.	Policy IE.3: Maintaining, enhancing and restoring indigenous ecosystem health – non regulatory
Objective 16B Mana whenua / tangata whenua values relating to indigenous biodiversity, particularly taonga species, and the important relationship between indigenous ecosystem health and well-being, are given effect to in decisionmaking, and mana whenua / tangata whenua are supported to exercise their kaitiakitanga for indigenous biodiversity.	Policy IE.2: Giving effect to mana whenua / tangata whenua roles and values when managing indigenous biodiversity – consideration
3.7 Landscape	
Objective 17 The region's outstanding natural features and landscapes are identified and their landscape values protected from inappropriate subdivision, use and development.	Policy 50: Managing effects on outstanding natural features and landscapes – consideration
3.8 Natural hazards	

Objectives	Policies
Objective 19 The risks and consequences to people, communities, ~~their~~ business~~es~~, property, ~~and~~ infrastructure and the environment from natural hazards and the effects of climate change effects are ~~reduced~~ minimised.	Policy 51: Minimising the risks and consequences of natural hazards – consideration
3.9 Regional form, design and function	
Objective 22 Urban development, including housing and infrastructure, is enabled where it demonstrates the characteristics and qualities of well-functioning urban environments, which: (a) Are compact and well designed; and (b) Provide for sufficient development capacity to meet the needs of current and future generations; and (c) Improve the overall health, well-being and quality of life of the people of the region; and (d) Prioritise the protection and enhancement of the quality and quantity of freshwater; and (e) Achieve the objectives in this RPS relating to the management of air, land, freshwater, coast, and indigenous biodiversity; and (f) Support the transition to a low-emission and climate-resilient region; and (g) Provide for a variety of homes that meet the needs, in terms of type, price, and location, of different households; and (h) Enable Māori to express their cultural and traditional norms by providing for mana whenua / tangata whenua and their relationship with their culture, land, water, sites, wāhi tapu and other taonga; and (i) Support the competitive operation of land and development markets in ways that improve housing affordability, including enabling intensification; and (j) Provide for commercial and industrial development in appropriate locations, including employment close to where people live; and (k) Are well connected through multi-modal (private vehicles, public transport, walking, micro-mobility and cycling) transport networks that provide for good accessibility for	Policy UD.2: Enable Māori cultural and traditional norms – consideration Policy UD.3: Responsive planning to developments that provide for significant development capacity - consideration Policy 58: Co-ordinating land use with development and operation of infrastructure – consideration

Objectives	Policies
all people between housing, jobs, community services, natural spaces, and open space. ~~A compact well designed and sustainable regional form that has an integrated, safe and responsive transport network and:~~ ~~(a) a viable and vibrant regional central business district in Wellington city;~~ ~~(b) an increased range and diversity of activities in and around the regionally significant centres to maintain vibrancy and vitality ;~~ ~~(c) sufficient industrial based employment locations or capacity to meet the region's needs;~~ ~~(d) development and/or management of the Regional Focus Areas identified in the Wellington Regional Strategy;~~ ~~(e) urban development in existing urban areas, or when beyond urban areas, development that reinforces the region's existing urban form;~~ ~~(f) strategically planned rural development;~~ ~~(g) a range of housing (including affordable housing);~~ ~~(h) integrated public open spaces;~~ ~~(i) integrated land use and transportation;~~ ~~(j) improved eastwest transport linkages;~~ ~~(k) efficiently use existing infrastructure (including transport network infrastructure); and~~ (l) ~~essential social services to meet the region's needs.~~	
3.10 Resource management with tangata whenua	
Objective 25 The concept of kaitiakitanga is integrated into the sustainable management of the Wellington region's natural and physical resources.	Policy 49: Recognising and providing for matters of significance to tangata whenua – consideration
Objective 26 Mauri is sustained, particularly in relation to coastal and fresh waters	
Objective 28 The cultural relationship of Mäori with their ancestral lands, water, sites, wähi tapu and other taonga is maintained	

Objectives	Policies
3.11 Soils and minerals	
Objective 29 Land management practices do not accelerate soil erosion.	Policy 41: Minimising the effects of earthworks and vegetation disturbance – consideration

In summary:

- It is considered that the majority of the proposed works will be in accordance with the objectives and policies of the RPS.

The discharge of wastewater into Te Awa Kairangi will not be in accordance with the objectives and policies that seek to recognise tangata whenua values and protect indigenous ecosystems and habitats.

ATTACHMENT 2: PROPOSED NATURAL RESOURCES PLAN

Table 2 lists the relevant objectives and policies.

Table 6: Relevant PNRP objectives and policies

Objectives	**Policies**
3.1 Ki uta ki tai: mountains to the sea	
Objective O1 Air, land, fresh water bodies and the coastal marine area are managed as integrated and connected resources; ki uta ki tai – mountains to the sea.	**Policy P1: Ki uta ki tai and integrated catchment management** Air, land, fresh water bodies and the coastal marine area will be managed recognising ki uta ki tai by using the principles of integrated catchment management. These principles include: (a) decision-making using the catchment as the spatial unit, and (b) applying an adaptive management approach to take into account the dynamic nature and processes of catchments, and (c) coordinated management, with decisions based on best available information and improvements in technology and science, and (d) taking into account the connected nature of resources and natural processes within a catchment, and (e) recognising links between environmental, social, cultural and economic sustainability of the catchment.
Objective O2 The importance and contribution of air, land, ~~and~~ water and ecosystems to the social, economic and cultural well-being and health of people and ~~of~~ the community are recognised in the management ~~and, where applicable, allocation~~ of those resources.	
Objective O3 Mauri particularly the mauri of fresh and coastal waters is sustained and, where it has been depleted, natural resources and processes are enhanced to replenish mauri.	
Objective O4 The intrinsic values of fresh water and marine ecosystems are recognised and the life supporting capacity of air, water, soil and ecosystems is safeguarded	
3.2 Beneficial use and development	
Objective O7 The recreational values of the coastal marine area, rivers and lakes and their margins and natural	**Policy P6: Uses of land and water** The cultural, social and economic benefits of using land and water for: ~~(a) aquaculture, and~~

Objectives	Policies
wetlands are maintained and where appropriate for recreational purposes, is enhanced.	(a) treatment, dilution and disposal of wastewater and stormwater, and (b) industrial processes and commercial uses associated with the potable water supply network, and (c) community and domestic water supply, and ~~(e) electricity generation, and~~ (d) food production and harvesting (including aquaculture), and (e) gravel extraction from rivers for flood protection and control purposes, and (f) irrigation and stock water, and (g) firefighting (emergency or training purposes), and (h) contact recreation and Māori customary use, and (i) transportation, including along, across, and access to, water bodies, and (j) enabling urban development where it maintains the quality of the natural environment, (k) waste management facilities. shall be recognised
Objective O8 Public access to and along the coastal marine area and rivers and lakes is maintained and enhanced, other than in exceptional circumstances, in which case alternative access is provided where practicable.	**Policy P8: Public access to and along the coastal marine area and the beds of lakes and rivers** Maintain and enhance the extent or quality of public access to and along the coastal marine area and the beds of lakes and rivers except where it is necessary to: (a) protect the values of estuaries, sites with significant mana whenua values identified in Schedule C (mana whenua), sites with significant historic heritage value identified in Schedule E (historic heritage) and sites with significant indigenous biodiversity value identified in Schedule F (indigenous biodiversity), or ~~(b) provide access to significant surf breaks within the coastal marine area on a permanent or ongoing basis, or~~ (b) protect public health and safety, or protect Wellington International Airport and Commercial Port Area security, or (c) provide for a temporary activity such as construction, a recreation or cultural event or stock movement, and where the temporary restrictions shall be for no longer than reasonably necessary before access is fully reinstated, and

Objectives	Policies
	with respect to (a) and (b), where it is necessary to permanently restrict or remove existing public access, the loss of public access shall be mitigated or offset by providing enhanced public access at a similar or nearby location to the extent reasonably practicable.
Objective O9 The social, economic, cultural and environmental benefits of Regionally Significant Infrastructure, renewable energy generation activities and the utilisation of mineral resources are recognised.	**Policy P11: Benefits of Regionally Significant Infrastructure and renewable electricity generation facilities** ~~The benefits of Regionally Significant Infrastructure and renewable energy generation activities are recognised by having regard to:~~ ~~(a) the strategic integration of infrastructure and land use, and~~ ~~(b) the location of existing infrastructure and structures, and~~ ~~(c) the need for renewable energy generation activities to located where the renewable energy resources exist, and~~ ~~(d) operational requirements associated with developing, operating, maintaining and upgrading Regionally Significant Infrastructure and renewable energy generation activities.~~ When considering proposals that relate to the provision of Regionally Significant Infrastructure, or renewable energy generation activities, particular regard will be given to the benefits of those activities.
Objective O10 Regionally Significant Infrastructure and renewable energy generation activities that meets the needs of present and future generations are enabled in appropriate places and ways.	**Policy P9: Contact recreation and Māori customary use** Use and development shall avoid, remedy or mitigate any adverse effects on contact recreation and Māori customary use in fresh and coastal water, including by: (a) providing water quality and, in rivers, flows suitable for contact recreation and Māori customary use, and (b) managing activities to maintain or enhance contact recreation values in the beds of lakes and rivers, including by retaining existing swimming holes and maintaining access to existing contact recreation locations, (c) encouraging improved access to suitable swimming and surfing locations, and (d) providing for the passive recreation and amenity values of fresh water bodies and the coastal marine area.

Objectives	Policies
	Policy P13: Providing for Regionally Significant Infrastructure and renewable electricity generation activities The use, development, operation, maintenance, and upgrade of Regionally Significant Infrastructure and renewable energy generation activities are provided for, in appropriate places and ways. This includes by having particular regard to: (a) the strategic integration of infrastructure and land use, and (b) the location of existing infrastructure and structures, and (c) the need for renewable energy generation activities to locate where the renewable energy resources exist, and (d) the functional need and operational requirements associated with developing, operating, maintaining and upgrading Regionally Significant Infrastructure and renewable energy generation activities.
3.3 Māori relationships	
Objective O12 The relationships of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga are recognised and provided for, including: (l) maintaining and improving opportunities for Māori customary use of the coastal marine area, rivers, lakes and their margins and natural wetlands, and (m) maintaining and improving the availability of mahinga kai species, in terms of quantity, quality and diversity, to support Māori customary harvest, and (n) providing for the relationship of mana whenua with Ngā Taonga Nui a Kiwa, ~~and~~ including by maintaining or improving Ngā Taonga Nui a Kiwa so that the huanga identified in Schedule B are provided for, and	**Policy P18: Mauri** The mauri of fresh and coastal waters shall be recognised as being important to Māori and is sustained and enhanced, including by: (a) managing the individual and cumulative adverse effects of activities that may impact on mauri in the manner set out in the rest of the Plan, and (b) providing for those activities that sustain and enhance mauri, and (c) recognising and providing for the role of kaitiaki in sustaining mauri.

Objectives	Policies
(o) protecting sites with significant mana whenua values from use and development that will adversely affect their values and restoring those sites to a state where their characteristics and qualities sustain the identified values.	
Objective O13 Kaitiakitanga is recognised and mana whenua actively participate in planning and decision-making in relation to the use, development and protection of natural and physical resources.	**Policy P19: Mana whenua relationships with Ngā Taonga Nui a Kiwa** The relationships between mana whenua and Ngā Huanga o Ngā Taonga Nui a Kiwa identified in Schedule B (Ngā Taonga Nui a Kiwa) will be recognised and provided for by: (a) having particular regard to the values and Ngā Taonga Nui a Kiwa huanga identified in Schedule B (Ngā Taonga Nui a Kiwa) when applying for, and making decisions on resource consent applications, and developing Whaitua Implementation Programmes, and (b) informing iwi authorities of relevant resource consents relating to Ngā Taonga Nui a Kiwa, and (c) recognising the relevant iwi authority/ies as an affected party under RMA s95E where activities risk having a minor or more than minor adverse effect on Ngā Huanga o Ngā Taonga Nui a Kiwa or on the significant values of a Schedule C site which is located downstream, and (d) working with mana whenua, landowners, and other interested parties as appropriate, to develop and implement restoration initiatives within Ngā Taonga Nui a Kiwa, and (e) the Wellington Regional Council and iwi authorities implementing kaupapa Māori monitoring of Ngā Taonga Nui a Kiwa.
	Policy P20: Māori values The cultural relationship of Māori with air, land and water shall be recognised and the adverse effects on this relationship and their values shall be minimised
	Policy P21: Exercise of kaitiakitanga Kaitiakitanga shall be recognised and provided for by involving mana whenua in the assessment and decision-making processes associated with use and development of natural and physical resources including;

Objectives	**Policies**
	(a) managing activities in sites with significant mana whenua valueslisted in Schedule C (mana whenua) in accordance with tikanga and kaupapa Māori as exercised by mana whenua, and (b) the identification and inclusion of mana whenua attributes and values in the kaitiaki information and monitoring strategy in accordance with Method M2, and (c) identification of mana whenua values and attributes and their application through tikanga and kaupapa Māori in the maintenance and enhancement of mana whenua relationships with Ngā Taonga Nui a Kiwa.
3.4 Natural character, form and function	
Objective O14 The natural character of the coastal marine area, natural wetlands, and rivers, lakes and their margins is preserved and protected from inappropriate use and development.	**Policy P24: Preserving and protecting natural character from inappropriate use and development** To preserve natural character and protect it from inappropriate use and development by: (a) avoiding adverse effects of activities on the natural character of areas within the coastal environment that have outstanding natural character, and (b) avoiding significant adverse effects and avoid remedy and mitigate other adverse effects of activities on the natural character of areas within the coastal environment that do not have outstanding natural character, and (c) outside the coastal environment, avoiding and, where avoidance is not practicable, remedying or mitigating adverse effects of activities on the natural character of wetlands, rivers, lakes and their margins that have outstanding natural character, provided that the outstanding natural character of the area taken as a whole is retained, and (d) outside the coastal environment, avoiding and, where avoidance is not practicable, remedying or mitigating significant adverse effects of activities on the natural character of wetlands, rivers, lakes and their margins that have high natural character, provided that the high natural character of the area taken as a whole is retained, and (e) outside the coastal environment, avoiding, remedying or mitigating other adverse effects of activities on the natural character of wetlands, rivers, lakes and their margins that are not addressed under (c) or (d) of Policy P24.
3.5 Natural hazards	
Objective O15	

Objectives	**Policies**
The hazard risk and residual hazard risk, from natural hazards and adverse effects of climate change, on people, the community, the environment and infrastructure are acceptable.	
3.6 Water quality	
Objective O17 The quality of groundwater, water in surface water bodies, and the coastal marine area is maintained or improved.	
Objective O18 Rivers, lakes, natural wetlands and coastal water are suitable for contact recreation and Māori customary use, including by: (a) maintaining water quality, or (b) improving water quality in: (i) significant contact recreation fresh water bodies and sites with significant mana whenua values identified in Schedule C and Ngā Taonga Nui a Kiwa identified in Schedule B to meet, as a minimum and within reasonable timeframes, the primary contact recreation objectives in Table 3.1, and (ii) coastal water and sites with significant mana whenua values identified in Schedule C and Ngā Taonga Nui a Kiwa identified in Schedule B to meet, as a minimum and within reasonable timeframes, the primary contact recreation objectives in Table 3.3, and	

Objectives	Policies
(iii) all other rivers and lakes and natural wetlands to meet, as a minimum and within reasonable timeframes, the secondary contact recreation objectives in Table 3.2. Note For the purposes of this objective 'a reasonable timeframe' is a date for the applicable water body or coastal marine area inserted into this Plan through the plan change/s required by the RMA to implement the NPS-FM 2020, or 2050 if no other date is specified by 31 December 2026.	
3.7 Biodiversity, aquatic ecosystem health and mahinga kai	
Objective O19 Biodiversity, aquatic ecosystem health and mahinga kai in fresh water bodies and the coastal marine area are safeguarded such that: (a) water quality, flows, water levels and aquatic and coastal habitats are managed to maintain biodiversity aquatic ecosystem health and mahinga kai, and (b) where an objective in Tables 3.4, 3.5, 3.6, 3.7 or 3.8 is not met, a fresh water body or coastal marine area is meaningfully improved ~~over~~ so that the objective is met within a reasonable timeframe ~~to meet that objective~~, and (c) restoration of aquatic ecosystem health and mahinga kai is encouraged.	**Policy P30: Biodiversity, aquatic ecosystem health and mahinga kai** ~~Biodiversity, Aaquatic ecosystem health and mahinga kai shall be maintained or restored by managing the effects of use and development on physical, chemical and biological processes to:~~ Manage the adverse effects of use and development on biodiversity, aquatic ecosystem health and mahinga kai to: Hydrology (a) maintain or where practicable restore natural flow characteristics and hydrodynamic processes, and the natural pattern and range of water level fluctuations in rivers, lakes and natural wetlands, and Water quality (b) maintain or improve water quality including to assist with achieving ~~meet~~ the objectives in Tables 3.4, 3.5, 3.6, 3.7 and 3.8 of Objective O19, and Aquatic habitat diversity and quality

Objectives	Policies
Note For the purposes of this objective 'a reasonable timeframe' is a date for the applicable water body or coastal marine area inserted into this Plan through the plan change/s required by the RMA to implement the NPS-FM 2020, or 2050 if no other date is specified by 31 December 2026.	(c) maintain or where practicable restore aquatic habitat diversity and quality, including: (i) the form, frequency and pattern of pools, runs, and riffles in rivers, and (ii) the natural form of rivers, lakes, natural wetlands and the coastal marine area, and (d) where practicable restore the connections between fragmented aquatic habitats, and Critical habitat for indigenous aquatic species and indigenous birds (e) maintain or where practicable restore habitats that are important to the life cycle and survival of indigenous aquatic species and the habitats of indigenous birds in the coastal marine area, natural wetlands and the beds of lakes and rivers and their margins that are used for breeding, roosting, feeding, and migration, and Critical life cycle periods (f) ~~minimise~~ avoid, minimise or remedy adverse effects on aquatic species at times which will most affect the breeding, spawning, and dispersal or migration of those species, including timing the activity, or the adverse effects of the activity, to avoid times of the year when adverse effects may be more significant, and Riparian habitats (g) maintain or where practicable restore riparian habitats, and Pests (h) avoid the introduction, and restrict the spread, of aquatic pest plants and animals1.
	Policy P31: Adverse effects on biodiversity, aquatic ecosystem health, and mahinga kai Adverse effects on biodiversity, aquatic ecosystem health and mahinga kai shall be managed by:

Objectives	Policies
	(a) in the first instance, activities that risk causing adverse effects on the values of a Schedule F ecosystem or habitat, other than activities carried out in accordance with a wetland restoration management plan, shall avoid these ecosystems and habitats. If the ecosystem or habitat cannot be avoided, the adverse effects of activities shall be managed by (b) to (g) below. (b) avoiding ~~significant~~ adverse effects where practicable, and (c) where ~~significant~~ adverse effects cannot be avoided, minimising them where practicable, and (d) where ~~significant~~ adverse effects cannot be ~~avoided and/or~~ minimised, they are remedied, except as provided for in (a) to (g), and (e) where ~~significant~~ more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible ~~remain, it is appropriate to consider the use of biodiversity offsets.~~, and (f) if biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided, and (g) the activity itself is avoided if biodiversity compensation cannot be undertaken in a way that is appropriate as set out in Schedule G3, including Clause 2 of that Schedule. In relation to activities within the beds of lakes, rivers and natural wetlands, (e) to (g) only apply to activities which meet the exceptions in Policy P110. ~~Proposals for biodiversity mitigation under (a) to (c) above, and biodiversity offsetting, and biodiversity compensation will be assessed against the principles listed in Schedule G1 (biodiversity mitigation), and Schedule G2 (biodiversity offsetting).~~ A precautionary approach shall be used when assessing the potential for adverse effects on ecosystems and habitats with significant indigenous biodiversity values identified in Schedule F. Notes

Objectives	Policies
	Policy P38 applies to the management of adverse effects on indigenous biodiversity values within the coastal environment. Proposals for biodiversity mitigation under (b) to (d) above, and biodiversity offsetting, and biodiversity compensation will be assessed against the principles listed in Schedule G1 (biodiversity mitigation), and Schedule G2 (biodiversity offsetting), and Schedule G3 (biodiversity compensation).
Objective O21 Vegetated riparian margins are established, maintained or restored to enhance water quality, aquatic ecosystem health, mahinga kai and indigenous biodiversity of rivers, lakes, natural wetlands and the coastal marine area.	
Objective O23 The passage of fish and kōura is maintained, ~~and the passage of indigenous fish and kōura is restored~~ or is improved, by instream structures, except where it is desirable to prevent the passage of some fish species in order to protect desired fish species, their life stages or their habitats.	**Policy P32: Fish passage** The construction or creation of new barriers impeding the efficient and safe ~~to the~~ passage of fish and kōura species at all their life stages shall be avoided, except where this is required for the protection of indigenous fish and kōura populations. Note Advice can be sought from the statutory agencies responsible for the species. Sports fish, including trout, are managed by the Wellington Fish and Game Council and indigenous fish are managed by the Department of Conservation.
3.8 Sites with significant values	
Objective O28 Ecosystems and habitats with significant indigenous biodiversity values are protected from the adverse effects of use and development, and where appropriate restored to a healthy functioning state including as defined by Tables 3.4, 3.5, 3.6, 3.7 and 3.8.	**Policy P36: Restoring Te Awarua-o-Porirua Harbour, Wellington Harbour (Port Nicholson) and Wairarapa Moana** The ecological health and significant values of Te Awarua-o-Porirua Harbour, Wellington Harbour (Port Nicholson) and Wairarapa Moana will be restored including by: (a) (a) managing activities, erosion-prone land, and riparian margins to reduce sedimentation rates and pollutant inputs, to meet the water quality, aquatic ecosystem health and mahinga kai objectives set out in Tables 3.4 to 3.8, and (b) undertaking planting and pest management programmes in harbour and lake habitats and ecosystems.

Objectives	Policies
	Policy P42: Ecosystems and habitats with significant indigenous biodiversity values Protect in accordance with Policy P31 and Policies P38-P41 and, where appropriate, restore the following ecosystems and habitats with significant indigenous biodiversity values: (a) the rivers and lakes with significant indigenous ecosystems identified in Schedule F1 (rivers/lakes), and (b) the habitats for indigenous birds identified in Schedule F2 (bird habitats), and (c) ~~significant~~ natural wetlands, including the ~~significant~~ natural wetlands identified in Schedule F3 (identified ~~significant~~ natural wetlands), and (d) the ecosystems and habitat-types with significant indigenous biodiversity values in the coastal marine area identified in Schedule F4 (coastal sites) and Schedule F5 (coastal habitats). Notes All natural wetlands in the Wellington Region are considered to be ~~significant natural wetlands~~ ecosystems and habitats with significant indigenous biodiversity values as they meet at least two of the criteria listed in Policy 23 of the Regional Policy Statement 2013 for identifying indigenous ecosystems and habitats with significant indigenous biodiversity values; being representativeness and rarity
	Policy P43: Effects on the spawning and migration of indigenous fish species Avoid more than minor adverse effects of activities on indigenous fish species known to be present in any water body identified in Schedule F1 (rivers/lakes) as habitat for indigenous fish species or Schedule F1b (inanga spawning habitats), during known spawning and migration times identified in Schedule F1a (fish spawning/migration). These activities may include the following: (a) discharges of contaminants, including sediment, and (b) disturbance of the bed or banks that would affect spawning habitat at peak times of the year, and (c) damming, diversion or taking of water which leads to loss of flow or which makes the river impassable to migrating indigenous fish.

Objectives	Policies
	Policy P44: ~~Protecting and restoring~~ Managing effects on ecosystems and habitats with significant indigenous biodiversity values from activities outside these ecosystems and habitats In order to protect the ecosystems and habitats with significant indigenous biodiversity values ~~identified~~ in accordance with Policy P42, particular regard shall be given to managing the adverse effects of use and development in ~~surrounding~~ areas outside of these ecosystems and habitats ~~outside of~~ on physical, chemical and biological processes to: (a) maintain ecological connections within and between these habitats, or (b) provide for the enhancement of ecological connectivity between fragmented habitats through biodiversity offsets, and (c) provide adequate buffers around ecosystems and habitats with significant indigenous biodiversity values, and (d) avoid cumulative adverse effects on, and the incremental loss of ~~the values of these ecosystems and habitats~~ significant indigenous biodiversity values.
	Policy P47: Protection and restoration of sites with significant mana whenua values Sites with significant mana whenua values identified in Schedule C (mana whenua) shall be protected and restored by a mix of the following regulatory and non-regulatory methods: (a) managing use and development through rules in the plan, and (b) working in partnership with key stakeholders through: (i) increasing landowner and community understanding of significant values within Schedule C sites, and (ii) working with mana whenua, landowners, and other interested parties as appropriate, to develop and implement restoration programmes for Schedule C sites, and (iii) the Wellington Regional Council and iwi authorities implementing kaupapa Maori monitoring of Schedule C sites.
	Policy P48: Managing adverse effects on sites with significant mana whenua values

Objectives	Policies
	Sites with significant mana whenua values identified in Schedule C shall be protected and restored by managing use and development ~~both within and outside of these sites~~ in the following manner: (a) in the first instance, avoid locating activities within sites listed in Schedule C, (b) ~~where it is not practicable to avoid a site,~~ require ~~the~~ any more than minor adverse effects of activities on the significant mana whenua values of the site to be evaluated through a cultural impact assessment undertaken by the relevant ~~iwi authority or iwi authorities~~ mana whenua as identified in Schedule C, (c) significant adverse effects of an activity on the significant values of the site shall be avoided, (d) other adverse effects shall be managed in accordance with tikanga and kaupapa Maori responding to recommendations ~~as recommended~~ in the cultural impact assessment to: (i) avoid more than minor adverse effects on the significant values of the site, and (ii) where more than minor adverse effects cannot be avoided, minimising them, and (iii) where more than minor adverse effects cannot be avoided and/or minimised, they are remedied, and (e) where more than minor adverse effects on significant mana whenua values identified in Schedule C (mana whenua) cannot be avoided, minimised, or remedied, the activity is inappropriate. Offsetting of effects on sites with significant mana whenua values is inappropriate, except where provided for in Policy P49, and (f) the relevant mana whenua as identified in Schedule C ~~iwi authority/ies~~shall be considered to be an affected party under RMA s95E for all activities which require resource consent within a Schedule C site where the adverse effects are minor or more than minor, unless the application is publicly notified.
	Policy P49: Offsetting residual adverse effects on sites of significance to mana whenua

Objectives	Policies
	Residual adverse effects that are not otherwise avoided, minimised or remedied in accordance with the management hierarchy in Policy P48 may be offset where the relevant mana whenua as identified in Schedule C: (a) considers the offsetting of residual adverse effects is appropriate in the particular circumstances, and (b) have: (i) an offsetting policy in place that applies to the area and values to be affected by the proposed development, or (ii) prepared a cultural impact assessment that includes specific direction for the offsetting of effects of the proposed activity on the site of significance, and (iii) expressly confirms that the offset proposed is consistent with: 1. the offsetting policy in Policy P49(b)(i) (where applicable), and 2. the cultural impact assessment in Policy P49(b)(ii), and 3. the offsetting principles set out in Schedule G3. Where offsetting is proposed for a site of significance that is associated with multiple mana whenua, there must be an agreed position between all groups that offsetting is appropriate and that (b) has been met.
	Policy P52: Protecting natural features and landscapes from inappropriate use and development To protect natural features and landscapes (including seascapes) of the coastal environment, rivers, lakes and their margins and natural wetlands and their values, from inappropriate use and development by: (a) avoiding adverse effects of activities on the natural attributes and characteristics of outstanding natural features and landscapes in the coastal environment, and (b) avoiding significant adverse effects of activities on the natural attributes and characteristics of natural features and landscapes in the coastal environment and avoid, remedy and mitigate other adverse effects of activities on other natural features and natural landscapes in the coastal environment, and (c) outside the coastal environment, avoiding and, where avoidance is not practicable, remedying or mitigating adverse effects of activities on the natural

Objectives	Policies
	attributes and characteristics of outstanding natural features and landscapes, provided that the values of the natural features or landscapes that contribute to its outstanding status are retained.
3.9 Air quality	
Objective O32 The adverse effects of odour, smoke and dust on amenity values and people's well-being are minimised.	**Policy P58: Managing air amenity** Air quality amenity in urban, rural and the coastal marine areas shall be managed to minimise offensive or objectionable odour, smoke and dust, particulate matter, fumes, ash and visible emissions.
3.11 Land use	
Objective O34 The adverse effects on soil and water from land use activities are minimised, including to assist with achieving the outcomes and indicators of desired environmental states for water in Tables 3.1 to 3.8.	
3.12 Discharges to land and water	
Objective O39 Discharges of wastewater to land are promoted over discharges to fresh water and coastal water	**Policy P66: Minimising discharges to water or land** Discharges of contaminants to water or land will be minimised by adopting through the following hierarchy: (a) avoiding the production of the contaminant, (b) reducing the amount of contaminants, including by reusing, recovering or recycling contaminants, (c) minimising the volume or amount of the discharge, (d) discharging to land is promoted over discharging direct to water, including using land-based treatment, constructed wetlands or other systems to treat contaminants prior to discharge. Note In determining if it is appropriate to discharge to land as required by clause (d), consideration must be given to the requirements of Policy P68
Objective O40	**Policy P67: Human drinking water supplies**

Objectives	Policies
Discharges of wastewater to fresh water are progressively reduced	The adverse effects from discharges to land and water on the quality of community drinking water supplies and group drinking water supplies shall be avoided to the extent necessary to implement regulations for human drinking water. ~~the National Environmental Standards for Sources of Human Drinking Water 2007, in consultation with the~~ The drinking water supply operator will be consulted with as appropriate, taking into consideration emerging contaminants and industry best practice.
	Policy P69: Promoting discharges to land The discharge of contaminants to land is promoted over direct discharges to water, particularly where there are adverse effects on: (a) aquatic ecosystem health, or and (b) mahinga kai, or (c) contact recreation, or and (d) Māori customary use.
	Policy P77: Improving water quality for contact recreation and Māori customary use The quality of fresh water bodies and coastal water shall be improved to meet, over time and as a minimum, the objectives in Table 3.1, 3.2 and 3.3, including by: (a) improving water quality in all first priority for improvement water bodies for secondary contact with water listed in Schedule H2 (priority water bodies) in accordance with Method M34, and (b) having particular regard to improving water quality in fresh water bodies and coastal water where contact recreation and/or Māori customary use are adversely affected by discharges from stormwater networks, stormwater from a port, or airport ~~or state highway~~, wastewater networks and wastewater treatment plants.
	Policy P78: Managing point source discharges for aquatic ecosystem health and mahinga kai Where an objective in Table 3.4, Table 3.5, Table 3.6, Table 3.7 or Table 3.8 of Objective O19 is not met, point source discharges to water shall be managed in the following way: (a) for an existing discharge that contributes to the objective(s) not being met, the discharge is only appropriate if:

Objectives	Policies
	(i) at a minimum an application for a resource consent includes a defined programme of work for upgrading the discharge, in accordance with good management practice, within the term of the resource consent, and (ii) conditions on the resource consent require ~~reduction of~~ the adverse effects of the discharge to be minimised in order to improve water quality in relation to the objective(s) not met, and (iii) In determining the improvement to water quality required in (ii), and the timeframe in which it is to be achieved, consideration will be given to the discharge's contribution to the objective(s) not being met, (b) for a new discharge, ~~other than a wastewater discharge~~, the discharge is inappropriate if the discharge would cause the affected fresh water body or area of coastal water to decline in relation to the objective(s), except that a new temporary discharge to coastal water from a wastewater network or wastewater treatment plant to facilitate maintenance, repair, replacement or upgrade work that has temporary adverse effects may not be inappropriate. ~~In assessing the appropriateness of a new discharge or existing discharge, the ability to offset residual adverse effects may be considered.~~
	Policy P82: Avoiding inappropriate discharges to water Discharges to fresh and coastal water of: (a) untreated wastewater, except as a result of heavy rainfall event overflows, and (b) animal effluent from an animal effluent storage facility or from an area where animals are confined, and (c) untreated industrial or trade waste, and untreated organic waste or leachate from storage of organic material, shall be avoided.
	Policy P87: Minimising wastewater and stormwater interactions The adverse effects of wastewater and stormwater interactions on fresh and coastal water shall be minimised by: (a) avoiding wastewater contamination of stormwater from new wastewater networks or connections authorised after the date of 31 July 2015, and

Objectives	Policies
	(b) ~~progressive elimination~~ removal of existing wastewater contamination of stormwater progressively, and as soon as reasonably practicable ~~from the existing wastewater network,~~ and (c) progressively reducing stormwater and groundwater infiltration and inflow into the wastewater network.
	Policy P91: Mana whenua values and wastewater discharges Mana whenua values and interests shall be reflected in the management of wastewater discharges to fresh and coastal water including adverse effects on Māori customary use, Ngā Taonga Nui a Kiwa, outstanding water bodies and mahinga kai.
	Policy P92: Minimising and improving wastewater discharges The adverse effects of existing wastewater discharges ~~of wastewater~~ to fresh water and coastal water shall be minimised, and: (a) in the case of existing wastewater discharges to fresh water ~~or coastal water~~ from wastewater treatment plants, the quality of discharges shall be progressively improved and the quantity of discharges shall be progressively reduced, (b) and in the case of existing wastewater discharges to coastal water from wastewater treatment plants, the quality of discharges shall be progressively improved where the discharge contributes to an objective in Table 3.3 of Objective O18 or Table 3.8 of Objective O19 not being met, and (c) in the case of existing wastewater discharges to fresh water or coastal water from wastewater networks overflows during or following rainfall events, the frequency and/or volume of discharges shall be progressively reduced. Where improvements are required, these are undertaken within timeframes appropriate to the degree of improvement required and the level of effects of the discharge on the environment.
	Policy P93: Quality of existing wastewater discharges to rivers The quality of existing wastewater discharges to rivers shall be assessed in relation to the following water quality guidelines in the receiving water after the zone of reasonable mixing:

Objectives	Policies
	(a) when measured below the discharge point compared to above the discharge point: (i) a decrease in the Quantitative Macroinvertebrate Community Index of no more than 20%, and (ii) a decrease in water clarity of no more than: 1. 20% in River class 1 and in any river identified as having high macroinvertebrate community health in Schedule F1 (rivers/lakes), or 2. 30% in any other river, and (iii) a change in temperature of no more than: 1. 2˚C in any river identified as having high macroinvertebrate community health in Schedule F1 (rivers/lakes), or 2. 3˚C in any other river, and (b) consider the extent to which the discharge causes the following to be exceeded: (i) the 7-day mean minimum dissolved oxygen concentration of no more than 5 mg/L, and (ii) the daily minimum dissolved oxygen concentration of no lower than 4mg/L, and (iii) soluble carbonaceous biochemical oxygen demand (BOD5) of no more than 2mg/L at flows less than flood flows, and (iv) particulate organic matter (POM) no more than 5 mg/L at flows less than median, and (v) nitrate toxicity of no more than: 1. 1mg/L (annual median) and 1.5mg/L (annual 95th percentile from monthly samples) in outstanding waterbodies (Schedule A1), River class 1 and in any river identified as having high macroinvertebrate community health in Schedule F1 (rivers/lakes), or 2. 2.4mg/L (annual median) and 3.5mg/L (annual 95th percentile from monthly samples) in any other river, and (vi) ammonia toxicity (at pH 8 and 20˚C) of no more than: 1. 0.03mg/L (annual median) and 0.05mg/L (annual maximum from monthly samples) in outstanding waterbodies (Schedule A1), River class

Objectives	Policies
	1 and in any river identified as having high macroinvertebrate community health in Schedule F1 (rivers/lakes), or 2. 0.24mg/L (annual median) and 0.4mg/L (annual maximum from monthly samples) in any other river.
	Policy P94: Avoiding new wastewater discharges to fresh water New wastewater discharges ~~of wastewater~~ to fresh water are avoided.
	Policy P110: ~~Reclamation or drainage~~ Loss of extent and values of the beds of lakes and rivers, and natural wetlands The loss of extent and values ~~reclamation or drainage~~ of the beds of lakes and rivers and natural wetlands, including as a result of reclamation and drainage, ~~shall be~~ is avoided, ~~in particular those identified in Schedules A (outstanding water bodies) and C (mana whenua)~~ except where ~~the reclamation or drainage is~~: (a) in a natural inland wetland: (i) the loss of extent or values arises from any of the following: 1. the customary harvest of food or resources undertaken in accordance with tikanga Māori, or 2. restoration activities, or 3. scientific research, or 4. the sustainable harvest of sphagnum moss, or 5. the construction or maintenance of wetland utility structures, or 6. the maintenance or operation of specified infrastructure, or other infrastructure, or 7. natural hazard works, and 8. where the activity involves reclamation or drainage there are no other practicable alternative in a methods of providing for the activity, or (ii) for specified infrastructure: 1. the activity, including any reclamation and drainage, is necessary for the construction or upgrade of specified infrastructure, and 2. the specified infrastructure will provide significant national or regional benefits, and

Objectives	Policies
	3. there is a functional need for the specified infrastructure in that location, (b) in a river: (i) there is a functional need for the activity in that location; and (ii) any reclamation or drainage is: 1. partial reclamation of a river bank for the purposes of flood protection or erosion control, or 2. for the purposes of ~~necessary to enable~~ the development, operation, maintenance and upgrade of Regionally Significant Infrastructure, or 3. associated with the creation of a new river bed and does not involve piping of the river, or 4. for the purpose of forming a reasonable crossing point, or 5. associated with the extraction of significant mineral resources from existing quarries, or 6. partial reclamation of a river bank for the purposes of local roads, and 7. in respect of (1) to (6) there are no other practicable alternative methods of providing for the activity, or Note The effects of any activity that requires a resource consent under this policy will be managed through applying the effects management hierarchy as set out in Policies P31, P37, P38, or P48

Appendix P – Communication and Engagement Plan

Communications and Engagement Plan – RiverLink Hutt CBD Sewer Bypass

[March 2023]

Background

The RiverLink project is a partnership between Hutt City Council, Greater Wellington Regional Council, Waka Kotahi NZ Transport Agency, Taranaki Whānui ki te Upoko o te Ika and Ngāti Toa Rangatira, which aims to transform Lower Hutt by providing better flood protection, enabling urban growth, and improving transport safety and connections in Hutt City CBD.

This initiative to manage urban growth has implications for the current wastewater network which is ageing and vulnerable to damage from adverse events.

Following investigations into the existing Hutt CBD wastewater network, options for upgrades have been identified and recommended. This proposal would help tackle growth and is key driver for addressing existing network constraints to meet targeted Level of Service.

The intention of this plan is to promote the proposed wastewater network upgrade, the social, economic, and environmental values it provides to the wider community and to ensure Hutt City Council residents and businesses are regularly informed during the construction phase. It is also important to identify potential issues with stakeholders and engagement and to outline tasks to minimise the risks.

At present the project is undertaking optioneering and concept design, with timeline for construction yet to be determined.

It is important to note that this project has significant interdependencies with the wider RiverLink programme. Therefore, it is currently proposed for this to be delivered as part of the RiverLink alliance. If this occurs, the intention is for this Communications and Engagement Plan to be adopted by the RiverLink communications team.

Objectives

Objective	Measure
Ensure that Hutt City Council is well informed of the project, it's intentions and stages.	• Hutt City Council communications team are not surprised or unprepared for media and public enquiries
Ensure Greater Wellington Regional Council (GWRC) is well informed of the project, it's intentions and stages.	• GWRC communications team are not surprised or unprepared for media and public enquiries
Keep local businesses and organisations aware of construction works and impacts	• All businesses and organisations are supportive and engaged with the project and possible impacts

Engage with key affected parties to ensure work is managed to prevent disruption to events/activities	- Affected parties receive regular updates and acknowledge our communications and engagement as being transparent and helpful
Ensure Hutt City residents understand the need for construction, impacts of work and what to expect	- Hutt City residents do not complain about lack of information - Local media and Hutt City Council comms provide timely and accurate information to residents - Social media commentary and feedback
Build trust and confidence with stakeholders ensure they are aware of project milestones	- Stakeholder updates are well received, and recipients can articulate the project's progress
Ensure comms and messaging is consistent across the RiverLink programme	- Stakeholders understand updates and aren't confused about progress or different elements of the programme

Audiences

Audience	**What do we want them to know / do / understand**	**Channels to reach them**
	Internal	
Wellington Water SLT/Board	- Understand the scope and risks involved with project - Stay consistent with messaging during interactions with key stakeholders - Provide updates on developments and briefings	- Meetings - Briefings - HCC client council manager
WWL staff, contractors, and suppliers	- Provide updates on developments and media enquiries - Be advocates for Wellington Water	- Woogle - SLT connect - On Tap - All staff emails - Our social media channels - Our website
Wellington Water Customer Operations Group	- Provide updates on developments - Be advocates for Wellington Water - Be ready to support comms and engagement - Use key messages	- Email - Reso meetings
	External	
Wellington Water Committee	- Understand the scope and risks involved with project - Stay consistent with messaging during	- Meetings - Briefings

	interactions with key stakeholders	
Greater Wellington Regional Council	• Provide updates on developments and media enquiries • Support our external comms • Support our communications approach and help us to reach the right audiences with our messaging • Be trusted engagement partners	• Stakeholder updates
Hutt City Council	• Provide updates on developments and media enquiries • Support our communications approach and help us to reach the right audiences with our messaging • Support our external comms • Be trusted engagement partners	• Monthly meetings • HCC client council manager
RiverLink Communications Team	• Be trusted engagement partners • Support our external comms • Stay consistent with messaging during interactions with key stakeholders	• Stakeholder updates
RiverLink Project Management Office (PMO)	• Be trusted engagement partners • Support our external comms	• Stakeholder updates • WWL website
RiverLink funding partners - Waka Kotahi, GWRC, HCC	• Be trusted engagement partners • Support our external comms	• Stakeholder updates • WWL website
RiverLink partners – Ngati Toa Rangatira/ Taranaki Whaui ki te Upoko o te ika	• Provide updates on developments • Be trusted engagement partners • Support our communications approach and help us to reach the mana whenua audiences	• Stakeholder updates • WWL website

Kainga Ora (managers of infrastructure acceleration fund)	• Understand progress of project and how money is being spent • Advocate project to central government	• Stakeholder updates • WWL website • Quarterly reporting
Lower Hutt residents/businesses	• Provide regular updates on developments • To be supportive of the work and be aware of the benefits • Provided traffic management updates as required	• Social media • WWL website • HCC channels • Stakeholder updates

Key messages

Overarching narrative/primary key messages:

- The Hutt City sewer upgrade will support the wider Riverlink project and enable Hutt City CBD to manage future development and growth.
- Wellington Water is undertaking a wastewater renewal project that will improve the existing Hutt City wastewater network now and into the future
- While our water services are generally very reliable, this can no longer be taken for granted, as our assets are vulnerable to damage from natural events and prone to failure when reaching the end of their lives
- The proposed Hutt City sewer upgrade will help improve water quality, safeguard public health, and reduce the risk of wastewater entering the environment

Secondary key messages

- Wellington Water is working closely with the RiverLink programme to ensure any disruption to residents and businesses is minimised during the works.

Strategic approach

In line with the Hutt City pipe renewals communications strategy, this project is assessed at level three. This means it has a high level of real or perceived impact on a specific suburb, local areas, community, or user group. Due to proposed delivery by RiverLink alliance, the following mitigation strategies are suggestions only and will be developed alongside the RiverLink Communications Team.

- Use signage, letters, face-to-face and drop-in events to give advance notice of construction
- Develop specific mitigation strategies for most affected businesses (e.g. coffee shop vouchers)
- Continuously update project signage and communications (website, social media, local boards) to ensure up-to-date information and changes to timeline or milestones
- Use staged construction approach to continuously update public and key stakeholders of ongoing works

- Ensure contractor notifies residents/businesses and key stakeholders of any outages or vehicle access issues.
- Proactive media engagement at the beginning, throughout, and end of the project.
- Proactive PR opportunities for WWL and Hutt City and Greater Wellington Regional Councils. For example, site blessings, site visits, key milestones.
- Existing channels like Wellington Water's Facebook and website, Hutt City Council's updates and social channels, Waka Kotahi Twitter (@wakakotahiwgtn) will also be used to deliver information to both local and wider audiences.
- Website content and updates.
- Iwi / mana whenua engagement as required

Risks and mitigation

Risks	Mitigation
Hutt City Council or Wellington Water's reputation is damaged	• Engage with media early and have clear and authentic information released to our key stakeholders, affected parties and the public.
CBD business/tenants/public expressing concerns about noise, disruption and/or expectations impacted by disruption	• Kept well informed and clear expectations set about the likely impacts • Traffic management teams on site for duration of project • Sub-contractors understand importance of courteous engagement • Issues escalated to communications team where appropriate • Ensure HCC kept informed about any issues and how they're being managed
Frustrated business/tenants/property owners/public complain to media	• Early engagement with local media to enable contact channels to be established
Affected property owners are unaware of changes affecting access to or possible damage to their properties.	• Engage with affected property owners and tenants to explain the risks and how they are managed. • Involve council officers to explain policy regarding compensation, and support mitigation measures. • Ensure communications have been received and understood.

Concern about traffic impacts and parking	- Engage with key local stakeholders to help plan access points and timing of activity to anticipate busy times and potential congestion. - Keep in touch about key events – e.g. tangi, weddings, festivals and possible changes to traffic routines. - Early notification of the impacts and alternatives. Clear direction to website / further information sites. All complaints / queries to be handled centrally so learning is shared, and customers can self-direct / answer. Use full suite of notification tools – Signs, fence mesh with contact/ info site details, VMS boards, newspaper advertising, local networks
Loss of co-ordination with wider Riverlink projects	- Partner with RiverLink Communications Team to develop and implement a joint strategy

Measurement

- Stakeholder feedback
- Community feedback
- Social media metrics
- Media interest
- Customer satisfaction

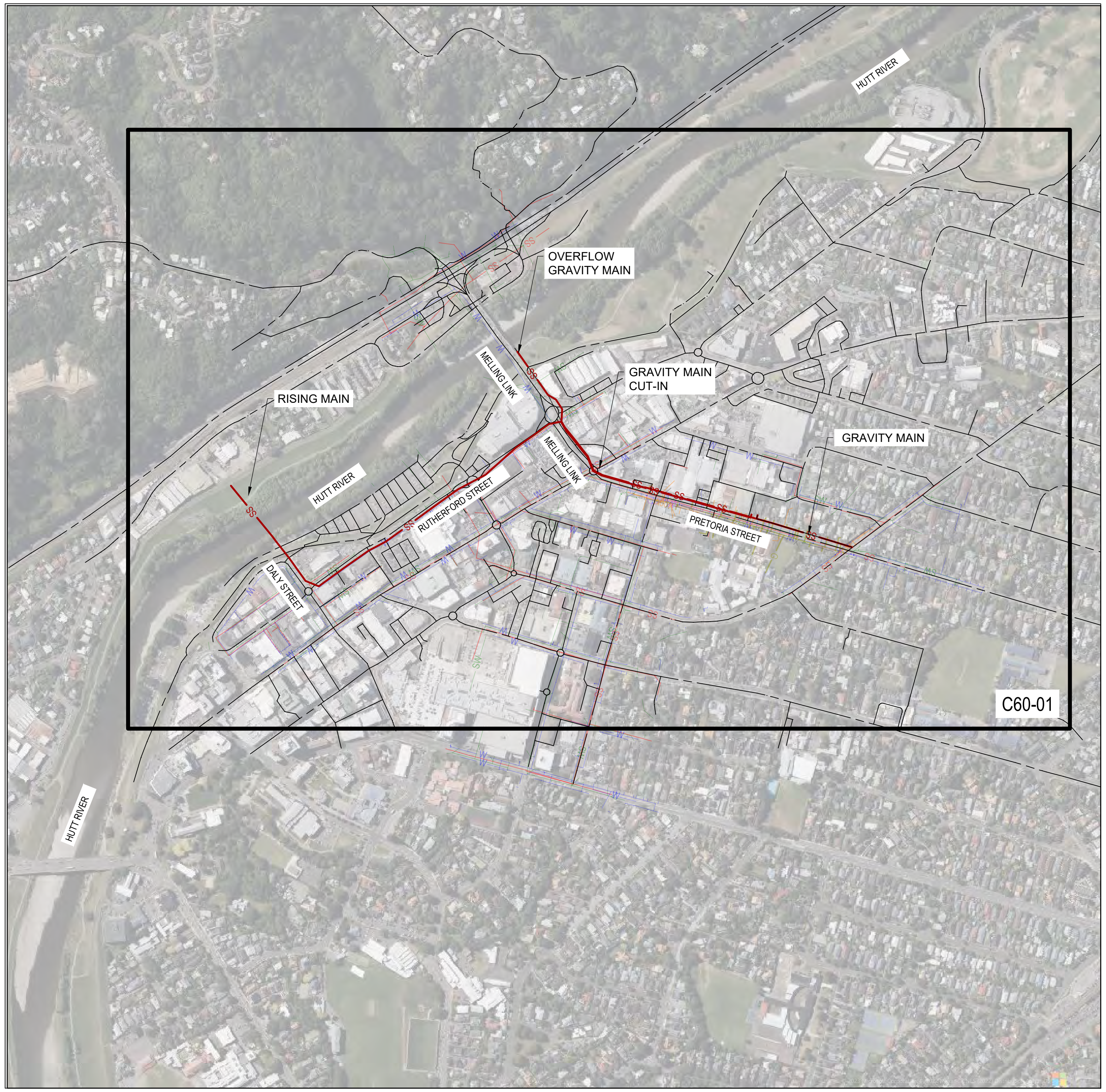
Tactics and timing

TBC once delivery strategy has been confirmed

Timing	Activity	Responsible

Appendix Q – Concept Design Drawings

RIVERLINK WASTEWATER TRUNK
CBD BYPASS



LOCALITY PLAN
1:5000

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

A1 REPRODUCTION SCALE 100 80 60 40 20 0mm

A3 REPRODUCTION SCALE 50 40 30 20 10 0mm

DRAWING REGISTER, DISTRIBUTION AND TRANSMITTAL

CLIENT	WELLINGTON WATER LTD									
CONTRACTOR										
	DRAWING ISSUE STATUS OPTIONS FOR INFORMATION ONLY FOR APPROVAL FOR TENDER ONLY NOT FOR CONSTRUTION ISSUED FOT CONSTRUCTION AS BUILT (CONSTRUCTION RECORD)	ISSUE STATUS		FOR INFORMATION ONLY	CLIENT REVIEW	-	-	-	-	-
	DRAWING PRINT SIZE			A3	A3					
			DD	6	14					
CAD FILE REFERENCE	144418.50 M-P Cover page and Location 144418.50 M-P-Gravity Main 144418.50 M-P-Rising Main 144418.50 M-P-Gravity Main Cut-In 144418.50 M-P-Overflow Gravity Main		MM	3	4					
			YY	23	23					
DRAWING NUMBER	DRAWING TITLE			1	A					
C00-00	COVER SHEET AND DRAWING INDEX			1	A					
C00-01	PROJECT INFORMATION			1	A					
C60-01	PROPOSED WASTEWATER KEY PLAN			1	A					
C61-01	PROPOSED WASTEWATER GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-02	PROPOSED WASTEWATER GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-03	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-04	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-05	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-06	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-07	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-08	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-09	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-10	PROPOSED WASTEWATER RISING MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-11	PROPOSED WASTEWATER GRAVITY MAIN CUT-IN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-12	PROPOSED WASTEWATER GRAVITY MAIN CUT-IN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-13	PROPOSED WASTEWATER OVERFLOW GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C61-14	PROPOSED WASTEWATER OVERFLOW GRAVITY MAIN PLAN AND LONGITUDINAL SECTIONS			1	A					
C63-01	PROPOSED PUMPSTATION PLAN VIEW			1	A					
C63-02	PROPOSED PUMSTATION LONGITUDINAL SECTIONS			1	A					

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023
No.	Revision	By	Chk	Appd	Date

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Original Scale (A1)	Design	EG	06-03-2023	*Approved
	Drawn	JR	06-03-2023	
Reduced Scale (A3)	*Dsg Verifier	PB	14-04-2023	
AS SHOWN	*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: COVER SHEET
AND DRAWING INDEX

Discipline: CIVIL

Drawing No.: C00-00

Rev.: A

Plotted By Johan Rosendo

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Document No. 144418.50 M-P COVER PAGE AND LOCATION.DWG

GENERAL NOTES

1. SURVEY MARKS SHOWN ARE FROM LINZ DATA SERVICES AND ARE APPROXIMATE ONLY.

SURVEY NOTES

1. COORDINATES ARE IN TERMS OF NZTM 2000.
2. HEIGHT SHALL BE IN TERMS OF NZVD 2016.

Structure Schedule: GRAVITY MAIN

Name	Levels	Coordinates	Type	Comments
MH01	LL: 7.579 D: 4.526 IL out = 3.053	E: 1760529.347 N: 5436443.792	1,050 dia Concrete Manhole Sump Depth 0.000	
MH02	LL: 7.444 D: 4.787 IL in = 2.657 IL out = 2.657	E: 1760445.525 N: 5436466.930	1,050 dia Concrete Manhole Sump Depth 0.000	
MH03	LL: 7.828 D: 5.458 IL in = 2.370 IL out = 2.370	E: 1760383.192 N: 5436485.807	1,050 dia Concrete Manhole Sump Depth 0.000	
MH04	LL: 8.255 D: 5.985 IL in = 2.270 IL out = 2.270	E: 1760365.558 N: 5436490.594	1,050 dia Concrete Manhole Sump Depth 0.000	
MH05	LL: 8.445 D: 7.245 IL in = 2.210 IL out = 1.200	E: 1760368.486 N: 5436500.999	1,800 dia Concrete Manhole Sump Depth 1.010	

Structure Schedule: PROPOSED GRAVITY MAIN CUT IN

Name	Levels	Coordinates	Type	Comments
MH06	LL: 7.318 D: 3.683 IL out = 3.666 IL out = 3.666	E: 1760064.865 N: 5436586.168	1,050 dia Concrete Manhole Sump Depth 0.031	
MH07	LL: 7.536 D: 3.987 IL in = 3.580 IL out = 3.580	E: 1760079.911 N: 5436573.834	1,050 dia Concrete Manhole Sump Depth 1.921	
MH08	LL: 6.935 D: 3.782 IL in = 3.184 IL out = 3.184	E: 1760166.216 N: 5436549.206	1,050 dia Concrete Manhole Sump Depth 1.921	
MH09	LL: 7.037 D: 4.258 IL in = 2.810 IL out = 2.810	E: 1760247.785 N: 5436525.630	1,050 dia Concrete Manhole Sump Depth 1.921	
MH10	LL: 7.944 D: 5.547 IL in = 2.427 IL out = 2.427	E: 1760331.663 N: 5436502.435	1,050 dia Concrete Manhole Sump Depth 1.921	
MH11	LL: 7.092 D: 3.353 IL in = 3.800	E: 1760072.227 N: 5436598.074	1,050 dia Concrete Manhole Sump Depth 0.000	

Structure Schedule: PROPOSED OVERFLOW GRAVITY MAIN

Name	Levels	Coordinates	Type	Comments
MH12	LL: 6.456 D: 2.503 IL in = 3.953 IL out = 3.956	E: 1760054.606 N: 5436611.524	1,050 dia Concrete Manhole Sump Depth 0.000	
MH13	LL: 5.988 D: 2.303 IL in = 3.686 IL out = 3.685	E: 1760017.301 N: 5436658.176	1,050 dia Concrete Manhole Sump Depth 0.000	
MH14	LL: 5.702 D: 2.140 IL in = 3.562 IL out = 3.562	E: 1760006.952 N: 5436674.709	1,050 dia Concrete Manhole Sump Depth 0.000	
MH15	LL: 5.271 D: 2.011 IL in = 3.260 IL out = 3.262	E: 1759982.322 N: 5436722.942	1,050 dia Concrete Manhole Sump Depth 0.000	
MH16	LL: 5.590 D: 2.662 IL in = 2.927 IL out = 2.927	E: 1759943.527 N: 5436777.476	1,050 dia Concrete Manhole Sump Depth 0.000	

PIPE MATERIAL

CODE	DESCRIPTION	SUPERSEDED CODE
ABS	ACRYLONITRITE BUTADIENE STYRENE	
AC	ASBESTOS CEMENT	
AC-E	ASBESTOS CEMENT EVERITE	
AC-I	ASBESTOS CEMENT ITALITE	
AL	ALUMINIUM	
CI	CAST IRON	
CU	COPPER	
DI	DUCTILE IRON	
EW	EARTHEN WARE	
GI	GALVANISED IRON	
LBST	LOCKBAR STEEL	
MPVC	MODIFIED POLYVINYL CHLORIDE	
PE100	POLYETHYLENE HDPE	
PE80	POLYETHYLENE MDPE	
PVC	POLYVINYL CHLORIDE	
RC	REINFORCED CONCRETE	CC
SS	STAINLESS STEEL	
ST	MILD STEEL	
UNK	UNKNOWN	
UPVC	UNPLASTICISED POLYVINYL CHLORIDE	

PIPE LINING

CODE	DESCRIPTION	SUPERSEDED CODE
BL	BITUMEN	
CL	CONCRETE	
CML	CEMENT MORTAR	
CTL	COAL TAR ENAMEL	EL, CTE
EL	EPOXY	PL
NL	NO LINING	
TEL	COAL TAR EPOXY	CTE
UL	UNKNOWN LINING (use UL when not specified)	

PIPE COATING

CODE	DESCRIPTION	SUPERSEDED CODE
BC	BITUMEN	
CTE	COAL TAR ENAMEL, PITCH ENAMEL, ENAMEL	MC, EC
DC	DIMET (EPOXY)	
EC	EPOXY	
GC	GUNITE	
NC	NO COATING	
PC	POLYETHYLENE, POLYKEN TAPE	TC
PW	POLYETHYLENE WRAP (polyethylene sleeve on DI pipe)	
UC	UNKNOWN COATING (use UC when not specified)	KC

SERVICES LEGEND

NEW WATER MAIN	━━ W ━━
EXISTING WATER MAIN	—— W ——
NEW STORMWATER	━━ SW ━━
EXISTING STORMWATER	—— SW ——
NEW WASTEWATER	━━ SS ━━
NEW WASTEWATER RISING MAIN	━━ WWR ━━
EXISTING WASTEWATER	—— SS ——
ABANDONED SERVICE	— X — X — X —
PRIVATE WATER	– – – – – –
PRIVATE STORMWATER	– – – – – –
PRIVATE WASTEWATER	– – – – – –
KERBS	——
CONTOURS MAJOR	——
CONTOURS MINOR	——
PARCEL BOUNDARY	——
VALVE NEW OR EX. / REDUNDANT	Ⓥ Ⓥ
BOUNDARY VALVE	Ⓥ
HYDRANT NEW OR EX. / REDUNDANT	FH FH
MANIFOLD NEW / EXISTING	■ ⊠
EXISTING TOBY	⊗
PUMP	▷
NEW SS/SW MANHOLE	◉ ◉
EXISTING SS/SW MANHOLE	◎ ◎
EXISTING SS/SW LHCE	▣ ▣
EXISTING SW SUMP	▥
PROPERTY NUMBER	1

UTILITIES LEGEND

GAS - POWERCO	—— G ——
GAS - NOVA	—— NG ——
U/G POWER	—— UP ——
400V U/G POWER	—— 400V ——
11kV U/G POWER	—— 11kV ——
33kV U/G POWER	—— 33kV ——
O/H POWER / TROLLEY WIRE	—— OH ——
TELECOMMS / CHORUS	—— T ——
OVERHEAD TELECOMMS	—— OH ——
VODAFONE	—— V ——
FIBRE OPTIC	—— FO ——
CITYLINK BROADBAND	—— B ——
VECTOR COMMS	—— VC ——
OIL	—— OIL ——
LINZ SURVEY MARK	◉ SM
POLE	●

MISCELLANEOUS

FENCE LINE	— // ——
EXISTING FENCE	— // ——
SECURITY FENCE	—○——

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

ORIGINAL DRAWING IN COLOUR

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Drawn	JR	06-03-2023	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROJECT INFORMATION

Discipline: CIVIL

Drawing No.: C00-01

Rev.: A

Plotted By:Johan Rosendo

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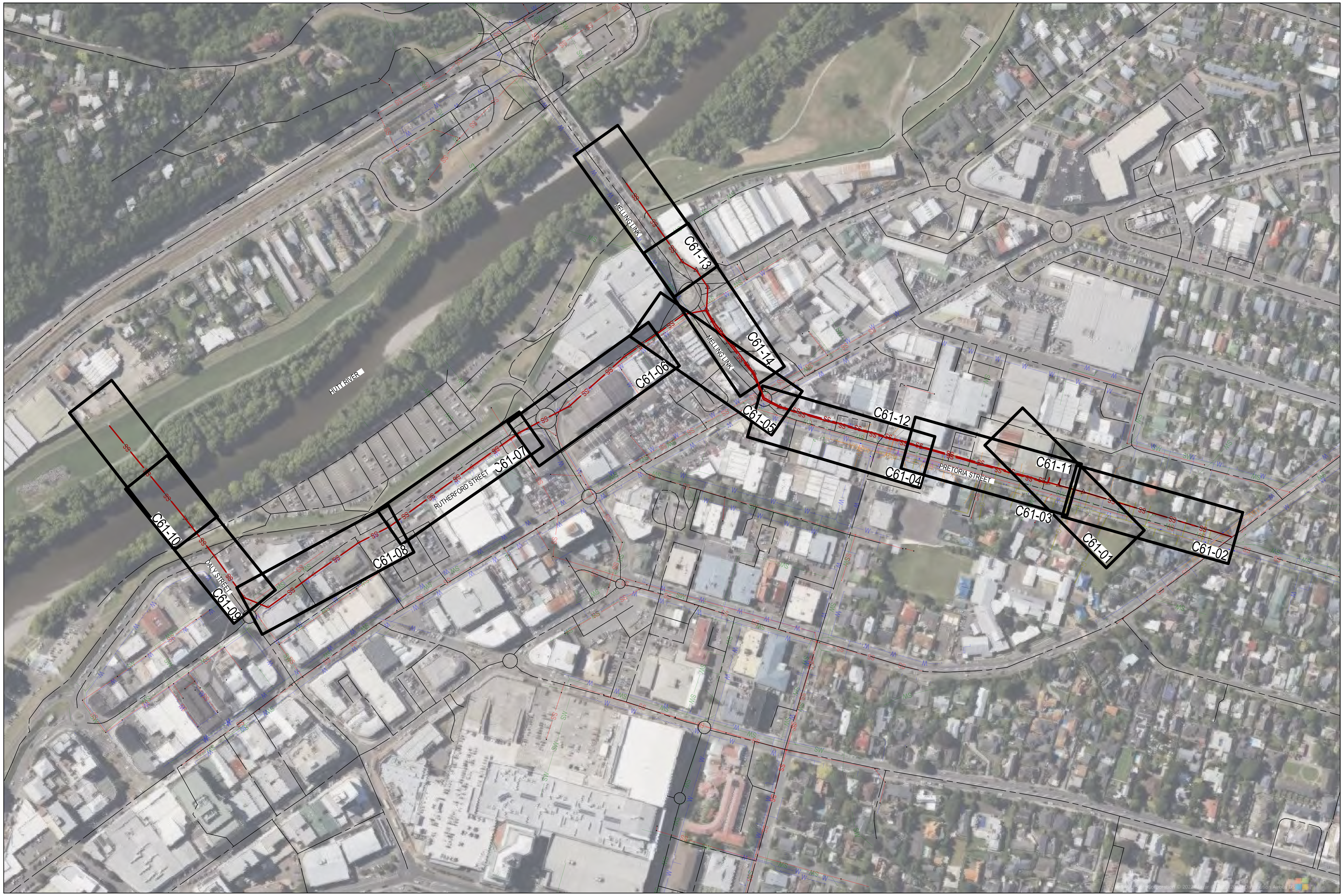

A1 REPRODUCTION SCALE

0mm 20 40 60 80 100

A3 REPRODUCTION SCALE

0mm 10 20 30 40 50

PROPOSED WASTEWATER KEY PLAN

1:2000

0 20 40 60 80 100m

SCALE 1:2000 AT ORIGINAL SIZE

ORIGINAL DRAWING IN COLOUR

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*Dwg Check			Date
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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED WASTEWATER
KEY PLAN

Discipline: CIVIL

Drawing No.: C60-01

Rev.: A

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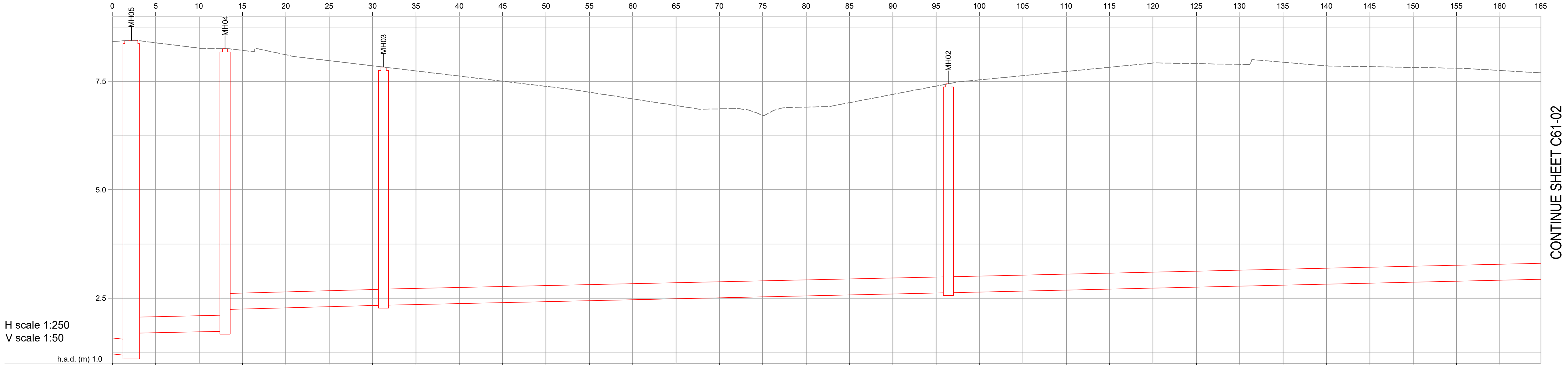
PLAN VIEW - PROPOSED WW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	8.421 8.390 8.266 8.214 8.112 7.977 7.858 7.740 7.621 7.503 7.385 7.250 7.095 6.941 6.865 6.710 6.906 7.008 7.199 7.391 7.534 7.631 7.728 7.825 7.921 7.909 7.891 7.941 7.857 7.838 7.821 7.804 7.750 7.694
LID LEVEL	8.445 8.255 7.828 7.444
COVER TO PIPE	6.84 6.39 5.65 5.12 4.45
PIPE DATA	300 NB RCRRJ CLASS 4 -1:50 (-2.00%) 300 NB RCRRJ CLASS 4 1:227 (0.44%) 300 NB RCRRJ CLASS 4 1:183 (0.55%) 300 NB RCRRJ CLASS 4 1:227 (0.44%) 300 NB RCRRJ CLASS 4 1:220 (0.46%)
INVERT LEVEL	1.244 1.200 1.722 1.770 2.270 2.370 2.370 2.657 2.657 3.053
MH CHAINAGE	2.191 13.000 31.272 96.400

LONGITUDINAL SECTION GRAVITY MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250
AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING IN COLOUR

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*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED GRAVITY MAIN
PLAN AND PROFILE SECTION

Discipline CIVIL
Drawing No. C61-01
Rev. A

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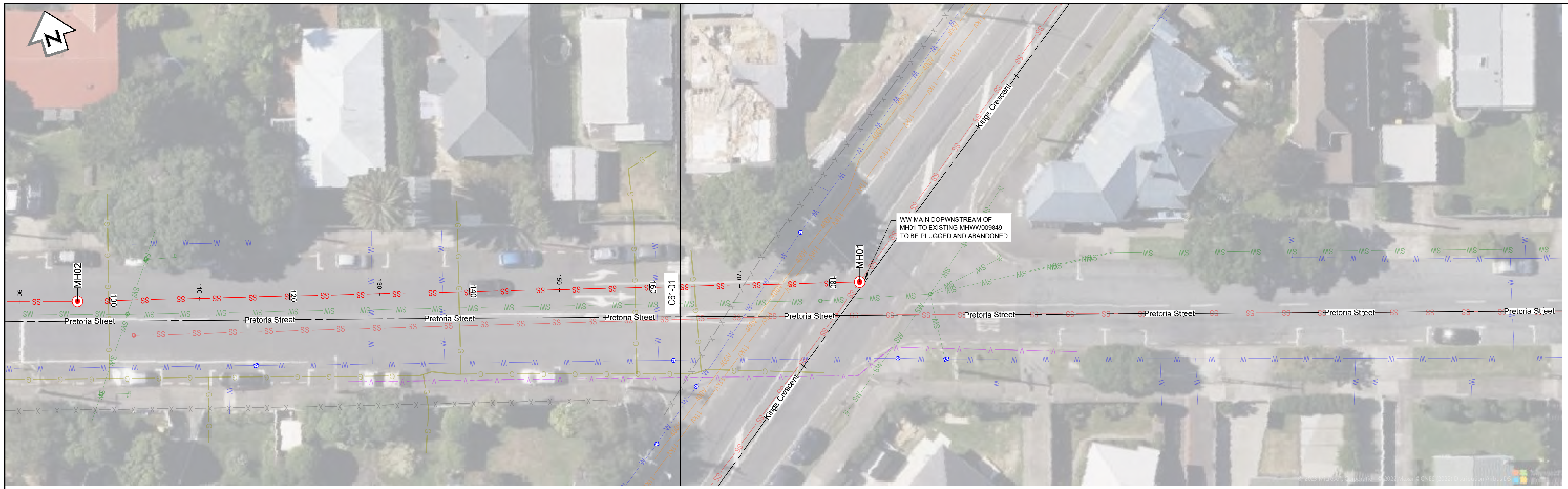
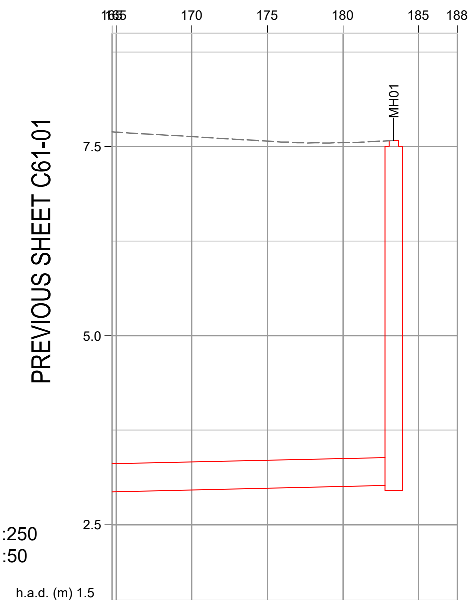


PLAN VIEW - PROPOSED WW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



H scale 1:250
V scale 1:50

h.a.d. (m) 1.5

EXISTING GL	7.694 7.692	7.632	7.573	7.554		
LID LEVEL					7.579	
COVER TO PIPE	4.45					
PIPE DATA	300 NB RCRRJ CLASS 4 1:220 (0.46%)					
INVERT LEVEL	2.657				3.053	
MH CHAINAGE					183.357	

LONGITUDINAL SECTION GRAVITY MAIN ALIGNMENT

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
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A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

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Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED GRAVITY MAIN
PLAN AND PROFILE SECTION

Discipline: CIVIL

Drawing No. C61-02

Rev. A

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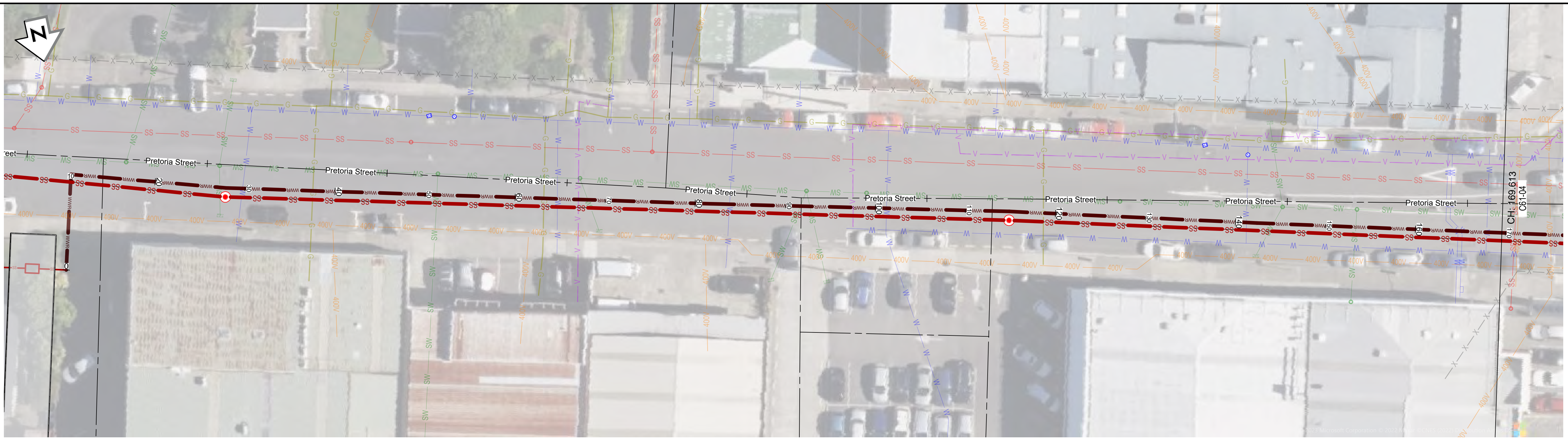
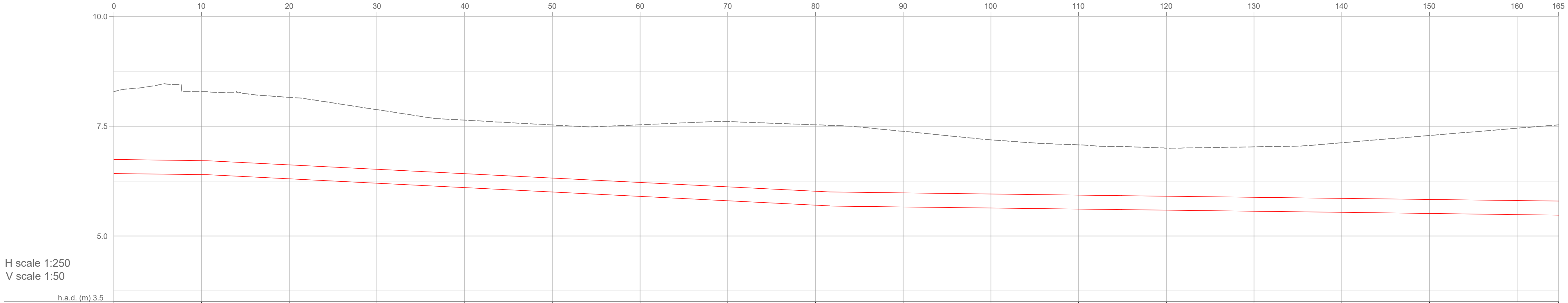


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



CONTINUES SHEET C61-04

EXISTING GL: 8.295, 8.288, 8.159, 7.879, 7.640, 7.529, 7.534, 7.607, 7.533, 7.385, 7.191, 7.077, 7.003, 7.031, 7.125, 7.290, 7.455, 7.533

LID LEVEL: 7.204, 6.731, 6.558, 6.019, 5.936, 5.867

COVER TO PIPE: 1.55, 1.57, 1.40, 1.52, 1.12, 1.31

PIPE DATA: 315 NB PE100 PN16 1:378 (0.26%); 315 NB PE100 PN16 1:100 (1.00%); 315 NB PE100 PN16 1:100 (1.00%); 315 NB PE100 PN16 1:400 (0.25%); 315 NB PE100 PN16 1:400 (0.25%); 315 NB PE100 PN16 1:400 (0.25%)

INVERT LEVEL: 6.455, 6.427 6.427, 6.254 6.254, 5.715 5.715, 5.632 5.632, 5.563 5.563, 5.312

CHAINAGE: 0.000, 10.618, 27.885, 81.639, 114.879, 142.399

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100 50

A3 REPRODUCTION SCALE 0mm 10 20 30 40

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING IN COLOUR

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Reduced Scale (A3)
1/2 SHOWN

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*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK CBD BYPASS

Title: PROPOSED RISING MAIN PLAN AND PROFILE SECTION

Discipline: CIVIL

Drawing No.: C61-03

Rev.: A

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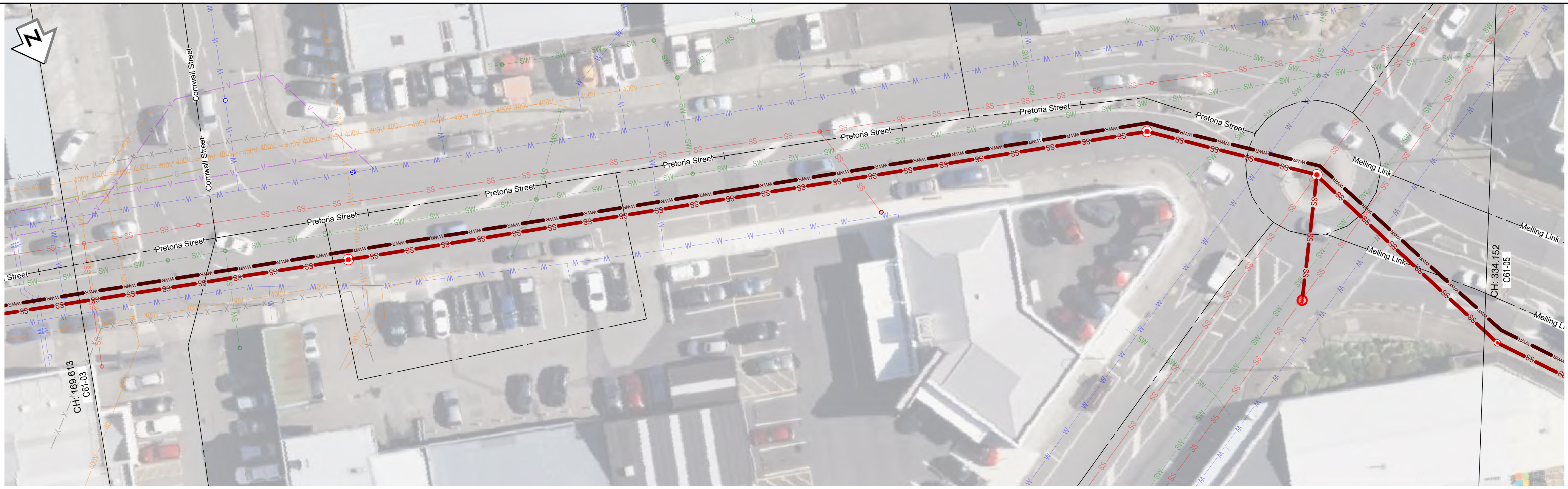
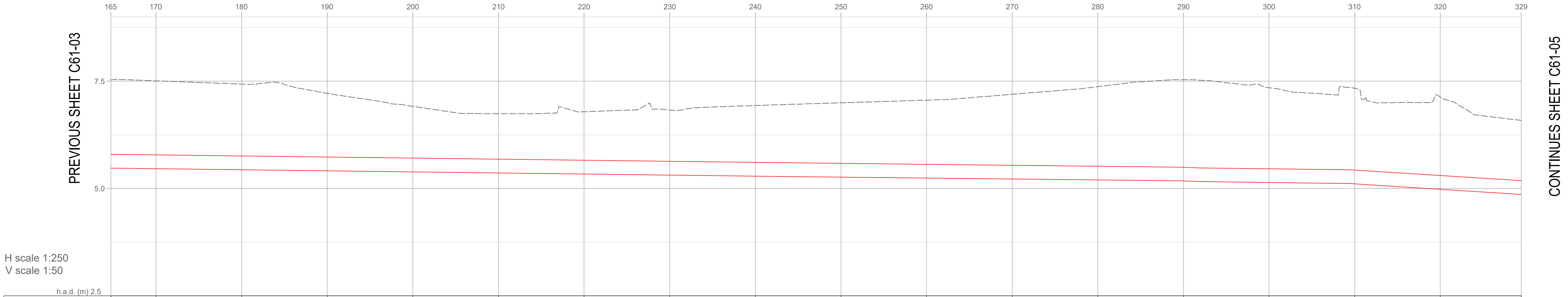


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	7.533 7.509 7.434 7.218 6.916 6.745 6.788 6.829 6.934 6.997 7.060 7.196 7.375 7.536 7.349 7.339 7.132 6.590
LID LEVEL	5.616 5.512 5.497 5.452
COVER TO PIPE	1.31 1.35 2.04 2.04 1.92
PIPE DATA	315 NB PE100 PN16 1:400 (0.25%) 315 NB PE100 PN16 1:452 (0.22%) 315 NB PE100 PN16 1:142 (0.71%) 315 NB PE100 PN16 1:392 (0.25%) 315 NB PE100 PN16 1:79 (1.27%)
INVERT LEVEL	5.563 5.312 5.312 5.208 5.208 5.193 5.193 5.148 5.148 4.804
CHAINAGE	242.895 289.732 291.898 309.438

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

NOTES:

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3. PIPE SIZE TO BE CONFIRMED

PROPOSED SERVICES LEGEND

NEW WASTEWATER	—SS—
NEW WASTEWATER RISING MAIN	—WWR—

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm
50
40
30
20
10
0mm
A3 REPRODUCTION SCALE

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

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*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

Discipline: CIVIL

Drawing No.: C61-04

Rev.: A

Plotted By Johan Rosendo

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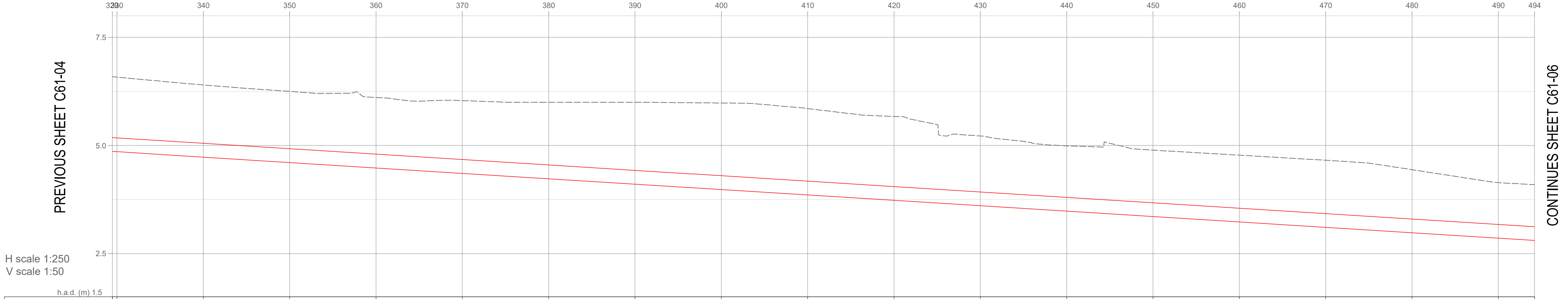
PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	6.590 6.580 6.400 6.250 6.110 6.037 6.000 6.000 5.983 5.854 5.672 5.221 4.989 4.893 4.775 4.658 4.440 4.140 4.094
LID LEVEL	5.585 4.871 4.772 4.475 4.028 3.704
COVER TO PIPE	1.92 1.37 1.41 1.65 1.61 1.19 1.24
PIPE DATA	315 NB PE100 PN16 1:79 (1.27%) 315 NB PE100 PN16 1:80 (1.25%) 315 NB PE100 PN16 1:80 (1.25%) 315 NB PE100 PN16 1:80 (1.25%) 315 NB PE100 PN16 1:80 (1.25%) 315 NB PE100 PN16 1:80 (1.25%) 315 NB PE100 PN16 1:80 (1.25%)
INVERT LEVEL	5.148 4.804 4.804 4.301 4.301 4.054 4.054 3.807 3.807 3.528 3.528 3.118 3.118 2.618
CHAINAGE	336.595 376.829 396.594 416.362 438.714 471.477

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3) 1/2 SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2022	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

Discipline: CIVIL

Drawing No.: C61-05

Rev.: A

Plotted By:Johan Rosendo

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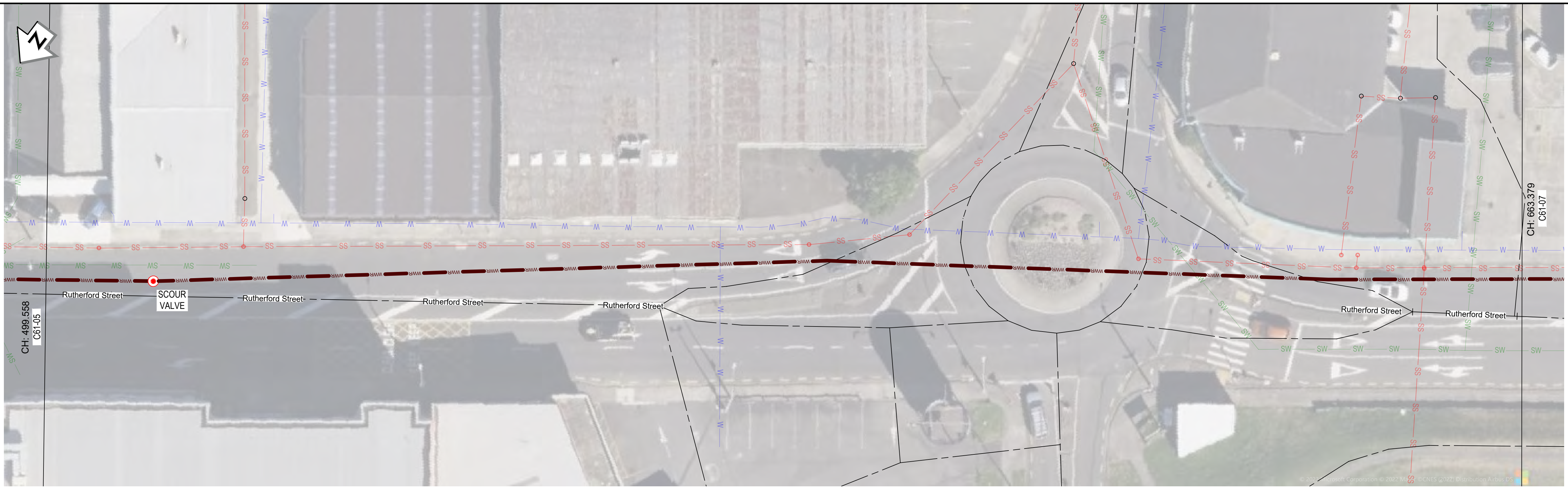
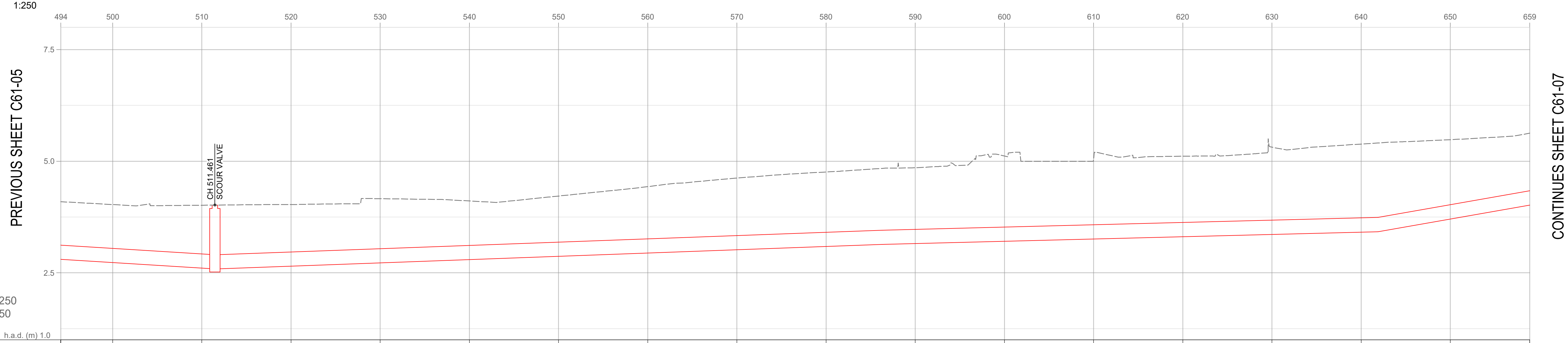


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



H scale 1:250
V scale 1:50

EXISTING GL	4.094	4.029	4.015		4.028	4.161	4.110	4.220	4.431	4.622	4.759		4.854	5.116	5.047	5.112	5.315	5.385		5.482	5.629
LID LEVEL				4.018								3.472							3.757		
COVER TO PIPE	1.24			1.11								1.38							1.67		
PIPE DATA	315 NB PE100 PN16 1:80 (1.25%)			315 NB PE100 PN16 -1:136 (-0.73%)								315 NB PE100 PN16 -1:195 (-0.51%)							315 NB PE100 PN16 -1:29 (-3.50%)		
INVERT LEVEL	3.118			2.618 2.618								3.168 3.168							3.453 3.453		6.930
CHAINAGE				511.461								586.270							641.901		

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

50
40
30
20
10
A3 REPRODUCTION SCALE
0mm

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING
IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250
AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023
No.	Revision	By	Chk	Appd	Date

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Holmesgroup.com
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Original Scale (A1)
Reduced Scale (A3)
1/2 SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2022	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

Discipline: CIVIL
Drawing No. C61-06
Rev. A

Plotted By:Johan Rosendo

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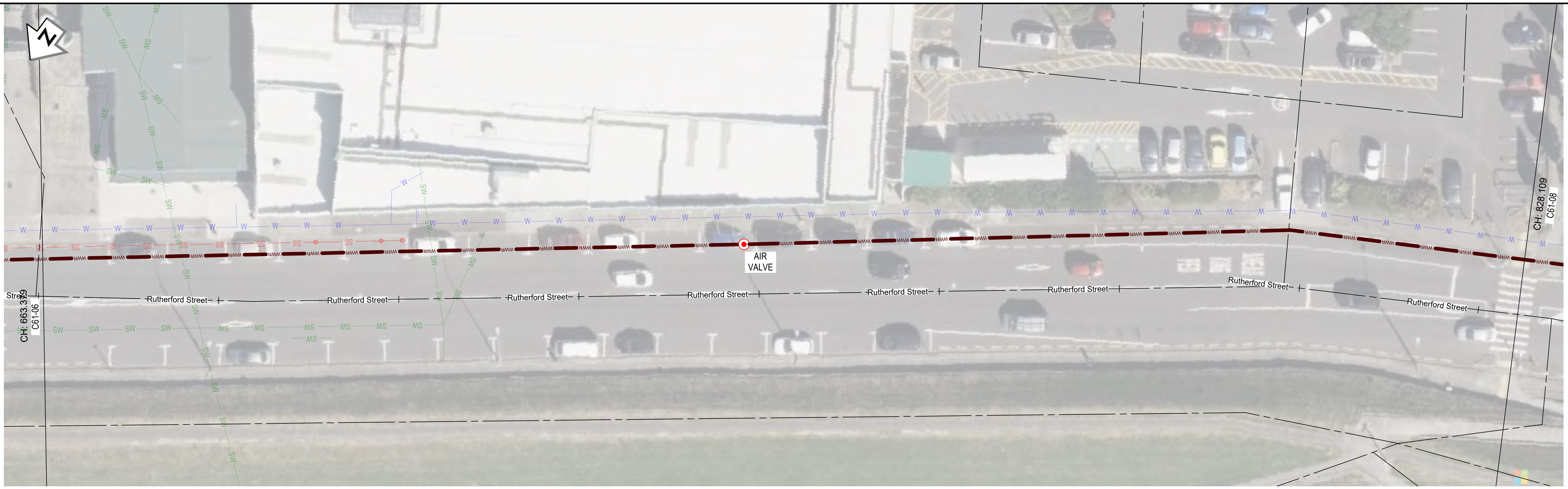
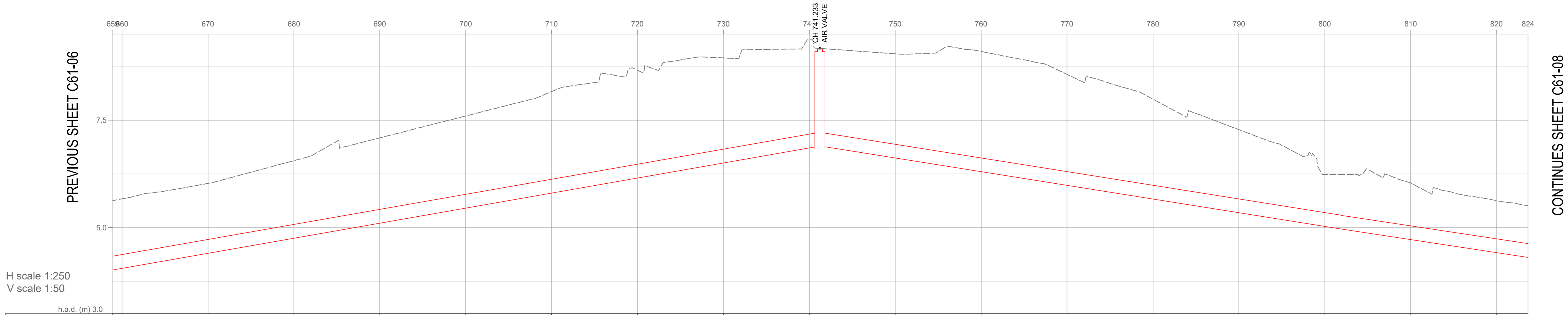
Document No. 144418.50 M-P-RISING MAIN-3.DWG



PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	5.629	5.669	6.029	6.558	7.088	7.597	8.163	8.660	8.947	9.369	9.043	9.095	8.565	7.987	7.278	6.232	6.039	5.629	5.508

LID LEVEL	9.168	5.304	
COVER TO PIPE	1.67	1.95	0.94
PIPE DATA	315 NB PE100 PN16 -1:29 (-3.50%)	315 NB PE100 PN16 1:31 (3.18%)	315 NB PE100 PN16 1:33 (3.03%)
INVERT LEVEL	3.453 – 6.930	6.930 – 4.999	4.999 – 3.926
CHAINAGE	741.232	801.902	

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	▬ SS ▬
NEW WASTEWATER RISING MAIN	▬ WWR ▬

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
AS SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2022	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

Discipline: CIVIL
Drawing No.: C61-07
Rev.: A

Plotted By:Johan Rosendo

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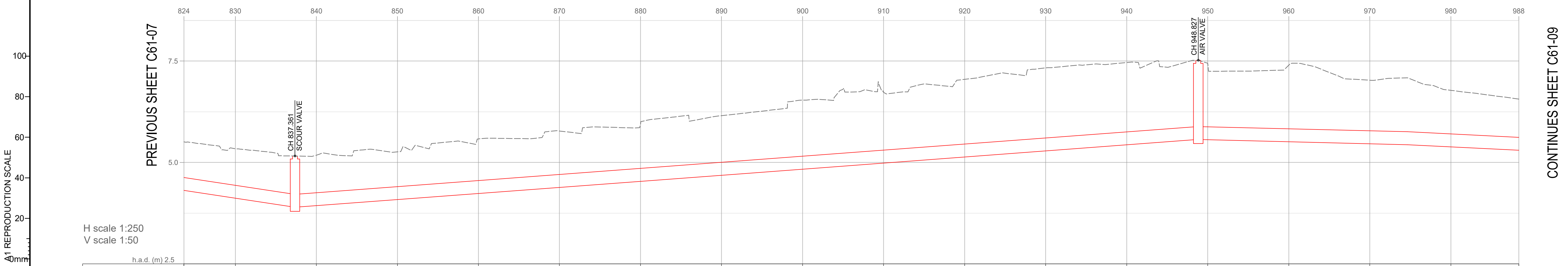
PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



H scale 1:250
V scale 1:50

h.a.d. (m) 2.5

EXISTING GL	5.508	5.339		5.180	5.261	5.579	5.776	5.955	6.155		6.536	6.729	7.049	7.332	7.463		7.441	7.399	7.028		6.779	6.564
LID LEVEL			5.159							5.058						7.517				5.773		
COVER TO PIPE	0.94		0.94							1.17						1.63				1.33		
PIPE DATA	315 NB PE100 PN16 1:33 (3.03%)		315 NB PE100 PN16 -1:67 (-1.50%)							315 NB PE100 PN16 -1:67 (-1.50%)						315 NB PE100 PN16 1:200 (0.50%)				315 NB PE100 PN16 1:100 (1.00%)		
INVERT LEVEL	4.999		3.926 3.926							4.754 4.754						5.598 5.598				5.469 5.469		4.961
CHAINAGE			837.361							892.564						948.827				974.658		

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

50
40
30
20
10
0mm
A3 REPRODUCTION SCALE

CHECK PRINT
DRG: 144418.50 M-P-Rising Main-3.dwg
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ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250
AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
AS SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2022	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

Discipline: CIVIL
Drawing No.: C61-08
Rev.: A

Plotted By Johan Rosendo

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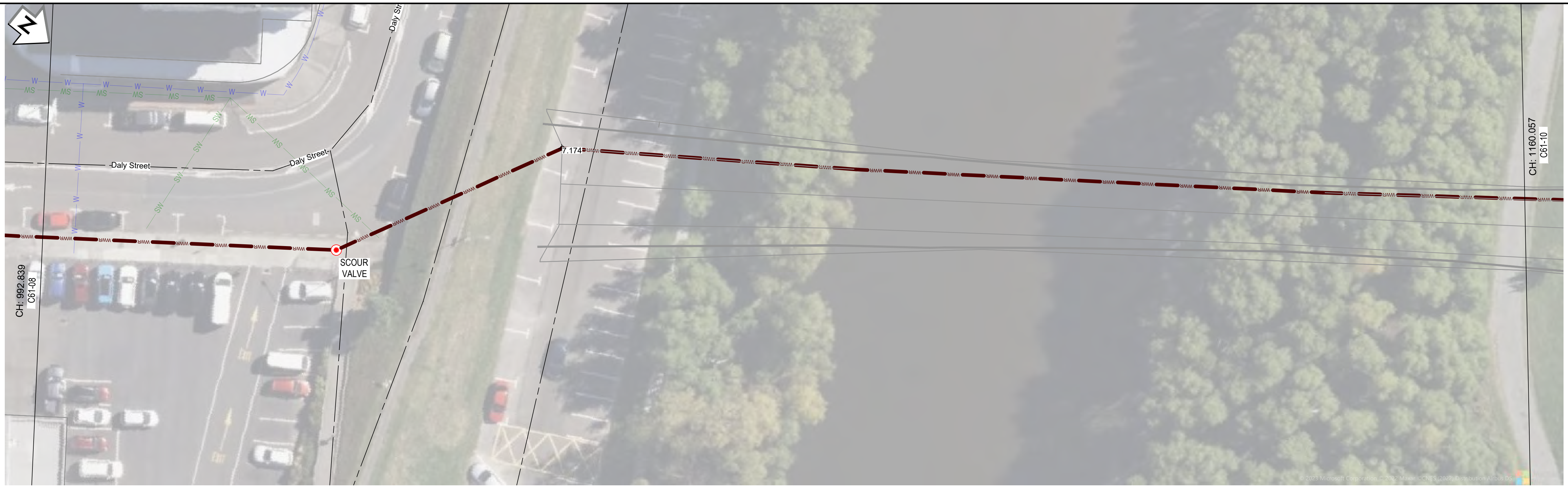
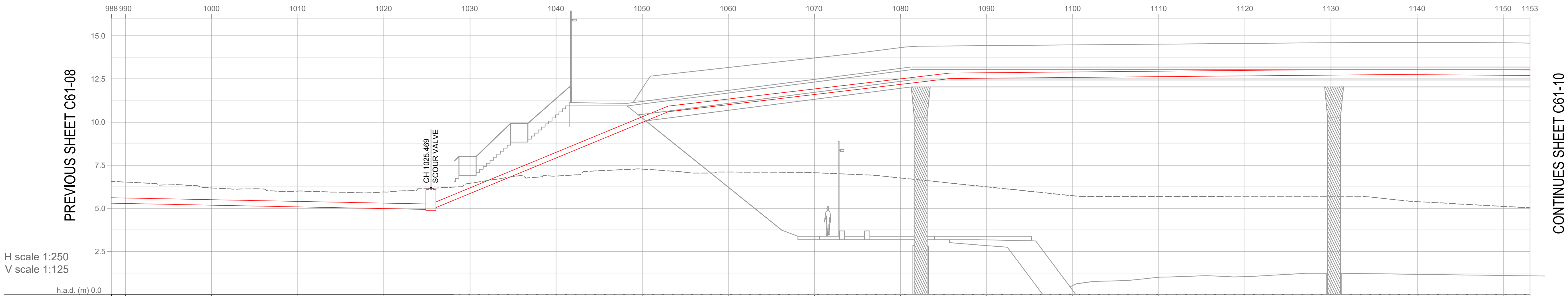


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	6.564 6.525 6.185 6.000 5.950 6.455 6.876 7.280 7.107 7.064 6.763 6.249 5.733 5.693 5.698 5.702 5.390 5.116 5.031
LID LEVEL	6.161 10.940 12.864 13.091
COVER TO PIPE	1.33 0.91 -3.75 -6.38 -7.58
PIPE DATA	315 NB PE100 PN16 1:100 (1.00%) 315 NB PE100 PN16 -1:5 (-20.61%) 315 NB PE100 PN16 -1:17 (-5.88%) 315 NB PE100 PN16 -1:228 (-0.44%) 315 NB PE100 PN16 1:299 (0.33%)
INVERT LEVEL	5.469 4.961 4.961 10.636 10.636 12.560 12.560 12.788 12.788 12.652
CHAINAGE	1025.469 1053.007 1085.730 1137.643

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

NOTES:

1. DO NOT SCALE OFF DRAWINGS.

2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED
4. BRIDGE AND ALIGNMENT IS INDICATIVE ONLY AND SUBJECT TO CHANGE

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3) AS SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2022	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK CBD BYPASS

Title: PROPOSED RISING MAIN PLAN AND PROFILE SECTION

Discipline: CIVIL

Drawing No. C61-09

Rev. A

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Document No. 144418.50 M-P-RISING MAIN-3.DWG

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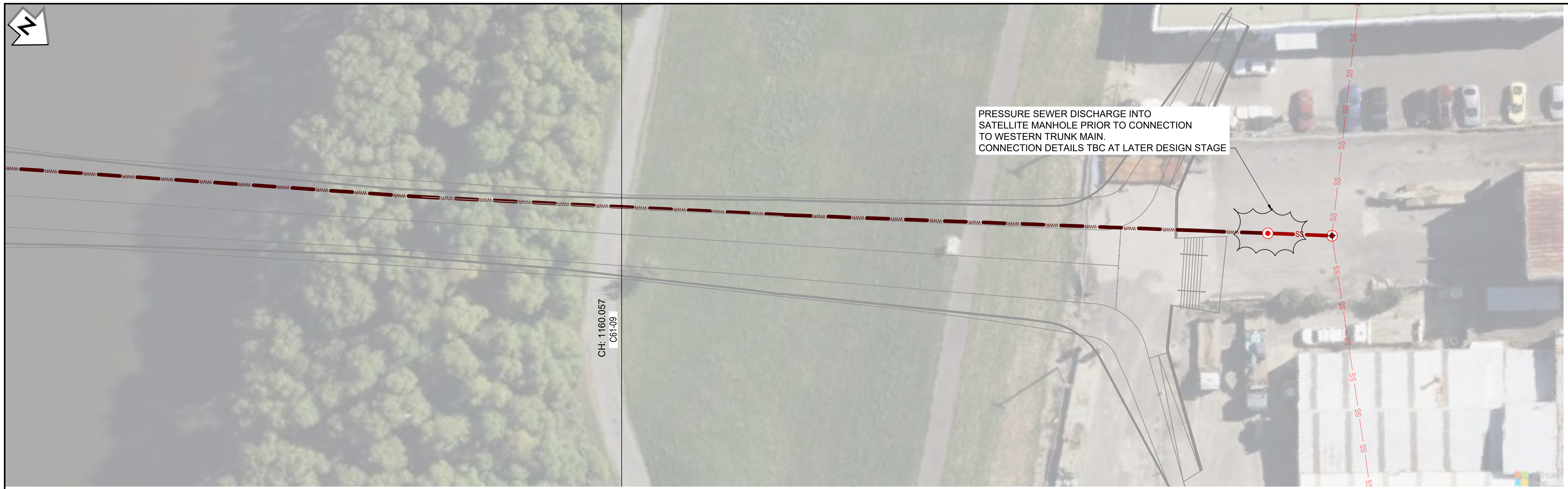
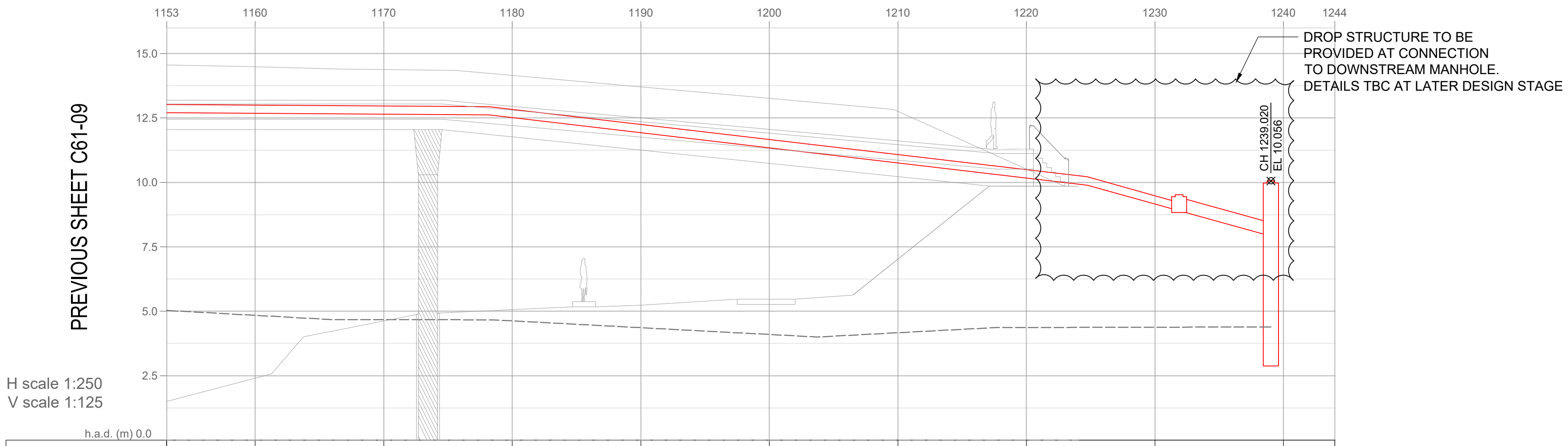


PLAN VIEW - PROPOSED WW RISING MAIN (OPEN CUT CONSTRUTION)

1:250



EXISTING GL	5.031	4.842	4.676		4.627	4.363	4.098	4.166	4.371		4.381	
LID LEVEL				12.956						10.230	9.522	10.056
COVER TO PIPE	-7.58			-8.26						-5.84	-5.04	
PIPE DATA	315 NB PE100 PN16 1:299 (0.33%)			315 NB PE100 PN16 1:17 (5.86%)						315 NB PE100 PN16 1:7 (13.90%)	475 NB UPVC SN16 1:7 (13.90%)	
INVERT LEVEL	12.788			12.652 12.652						9.926 9.926	8.934 8.934	7.942
CHAINAGE				1178.203						1224.740	1231.880	1239.020

LONGITUDINAL SECTION RISING MAIN ALIGNMENT

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED
4. BRIDGE AND ALIGNMENT IS INDICATIVE ONLY AND SUBJECT TO CHANGE

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

A3 REPRODUCTION SCALE
50
40
30
20
10
0mm

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE
0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250
AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

ORIGINAL DRAWING
IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
AS SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2022	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client:
Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED RISING MAIN
PLAN AND PROFILE
SECTION

Discipline
CIVIL

Drawing No.
C61-10

Rev.
A

Plotted By:Johan Rosendo

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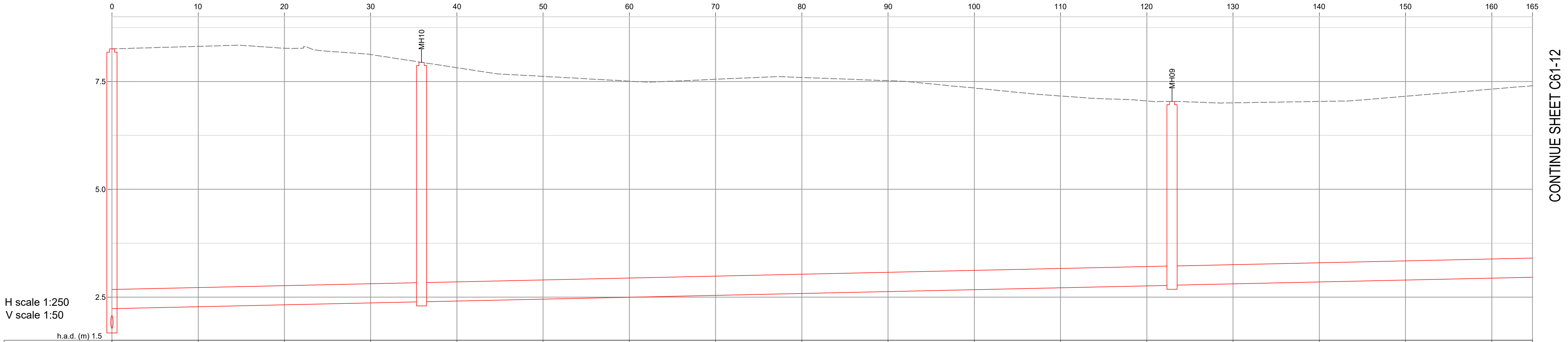
PLAN VIEW - PROPOSED WW GRAVITY MAIN CUT-IN (OPEN CUT CONSTRUTION)

1:250



	0	10	20	30	35.904	40	50	60	70	80	90	100	110	120	122.930	130	140	150	160	165
EXISTING GL	8.255	8.314	8.271	8.124		7.819	7.618	7.508	7.551	7.593	7.518	7.350	7.163	7.050		7.005	7.037	7.157	7.322	7.400
LID LEVEL					7.944										7.037					
COVER TO PIPE	5.58				5.11										3.82					
PIPE DATA	375 NB RCRRJ CLASS 4 1:227 (0.44%)				375 NB RCRRJ CLASS 4 1:227 (0.44%)										375 NB RCRRJ CLASS 4 1:227 (0.44%)					
INVERT LEVEL	2.269				2.427 2.427										2.810 2.810					3.184
MH CHAINAGE					35.904										122.930					

LONGITUDINAL SECTION PROPOSED GRAVITY MAIN CUT-IN ALIGNMENT

A1 REPRODUCTION SCALE
100
80
60
40
20
0mm

A3 REPRODUCTION SCALE
50
40
30
20
10
0mm

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50
AT ORIGINAL SIZE
0 0.5 1 1.5 2 2.5m

HORIZONTAL 1:250
AT ORIGINAL SIZE
0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING
IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Auckland 1010
New Zealand
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Original Scale (A1)
Reduced Scale (A3)
AS SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2023	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client:
Wellington Water

Project:
RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title:
PROPOSED GRAVITY MAIN CUT IN
PLAN AND PROFILE SECTION

Discipline
CIVIL

Drawing No.
C61-11

Rev.
A

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Document No. 144418.50 M-P-GRAVITY MAIN CUT-IN-3.DWG

Plotted By:Johan Rosendo

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WW MAIN DOWNSTREAM OF MH06 TO EXISTING MH WW009623 TO BE PLUGGED AND ABANDONED

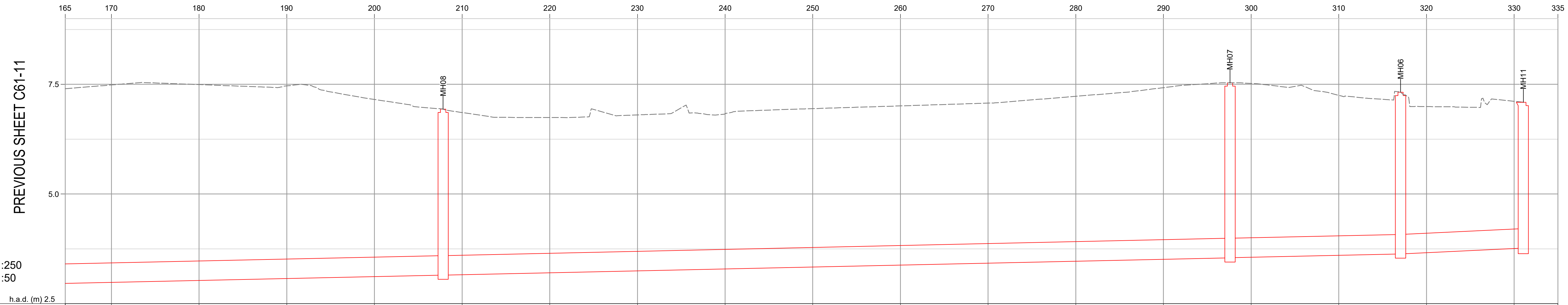
WW MAIN DOWNSTREAM OF MH11 TO EXISTING MH WW10063 TO BE PLUGGED AND ABANDONED

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

PLAN VIEW - PROPOSED WW GRAVITY MAIN CUT IN (OPEN CUT CONSTRUTION)

1:250



H scale 1:250
V scale 1:50

h.a.d. (m) 2.5

EXISTING GL	7.400	7.487	7.495	7.464	7.156	6.858	6.743	6.803	6.829	6.946	7.009	7.072	7.228	7.424	7.521	7.250	6.993	7.114

LID LEVEL		6.935		7.536		7.318		7.092
COVER TO PIPE	3.82		3.34		3.55		3.24	
PIPE DATA	375 NB RCRRJ CLASS 4 1:227 (0.44%)		375 NB RCRRJ CLASS 4 1:227 (0.44%)		375 NB RCRRJ CLASS 4 1:227 (0.44%)		375 NB RCRRJ CLASS 4 -1:104 (-0.96%)	
INVERT LEVEL	2.810	3.184	3.184	3.580	3.580	3.666	3.666	3.800
MH CHAINAGE		207.838		297.587		317.043		331.044

LONGITUDINAL SECTION PROPOSED GRAVITY MAIN CUT-IN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

PROPOSED SERVICES LEGEND

NEW WASTEWATER — SS —
NEW WASTEWATER RISING MAIN — WWR —

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
AS SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2023	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK CBD BYPASS

Title: PROPOSED GRAVITY MAIN CUT IN PLAN AND PROFILE SECTION

Discipline: CIVIL

Drawing No.: C61-12

Rev.: A

Plotted By:Johan Rosendo

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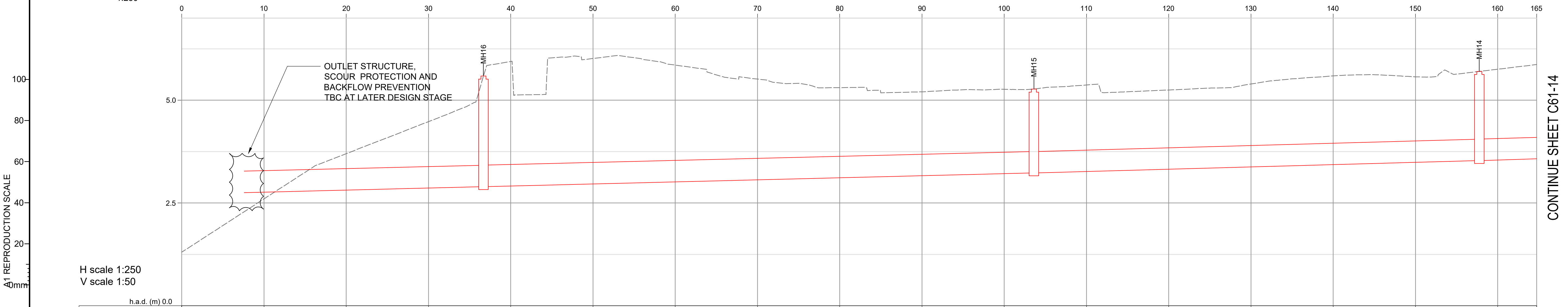
Document No. 144418.50 M-P-GRAVITY MAIN CUT-IN-3.DWG

PLAN VIEW - PROPOSED WW OVERFLOW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



H scale 1:250
V scale 1:50

h.a.d. (m) 0.0

EXISTING GL	1.303		2.600	3.700	4.480		5.945	6.017	5.855	5.515	5.307	5.205	5.268		5.372	5.250	5.394	5.592	5.570		5.755	5.869
LID LEVEL						5.590								5.271						5.702		
COVER TO PIPE		-0.99				2.17								1.52						1.65		
PIPE DATA		475 NB UPVC SN16 1:200 (0.50%)				475 NB UPVC SN16 1:200 (0.50%)								475 NB UPVC SN16 1:179 (0.56%)						475 NB U 1:158 (C		
INVERT LEVEL		2.782				2.927 2.927								3.262 3.260						3.562 3.562		3.685
MH CHAINAGE						36.680								103.605						157.764		

LONGITUDINAL SECTION PROPOSED OVERFLOW GRAVITY MAIN ALIGNMENT

50
40
30
20
10
0mm
A3 REPRODUCTION SCALE

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
AS SHOWN

Design	EG	06-03-2023	*Approved
Drawn	JR	06-03-2023	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED OVERFLOW
GRAVITY MAIN PLAN AND PROFILE
SECTION

Discipline: CIVIL

Drawing No. C61-13

Rev. A

Plotted By:Johan Rosendo

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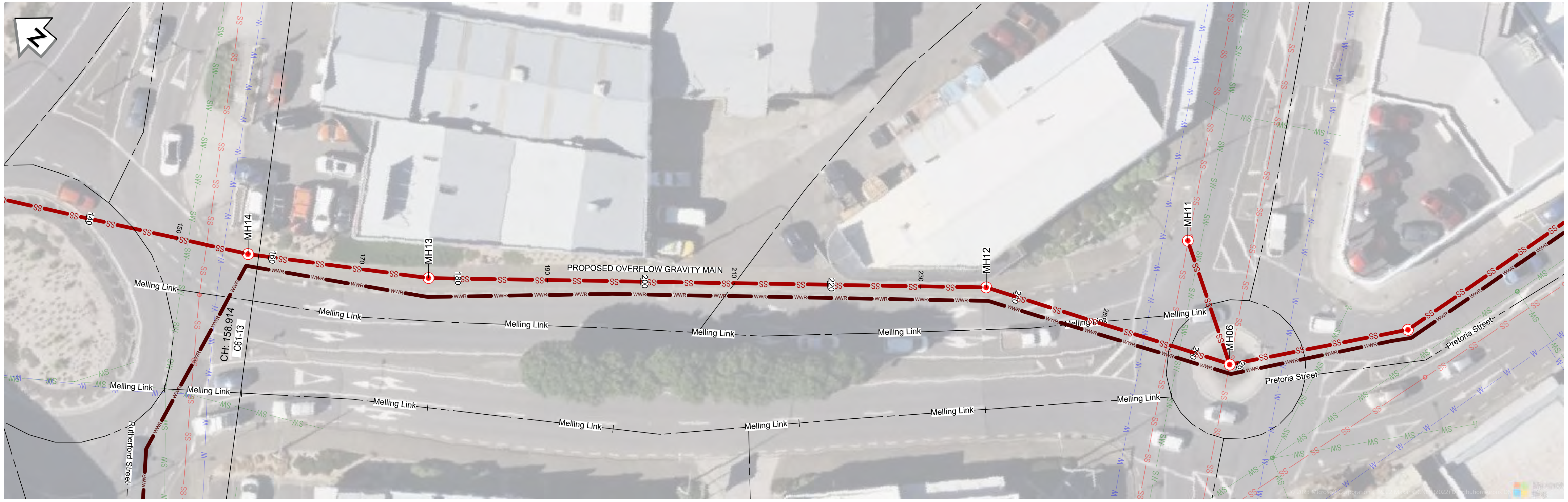
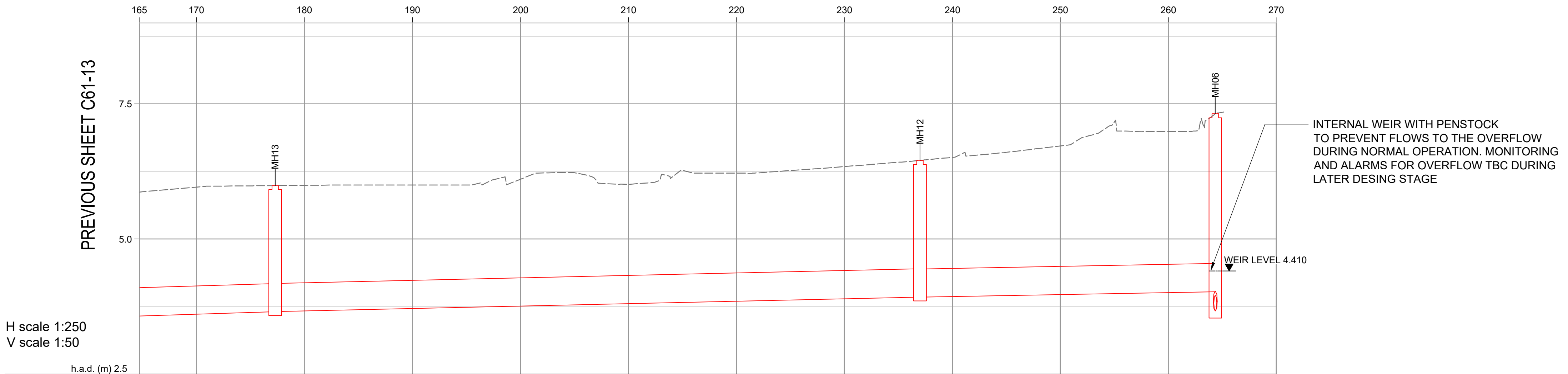


PLAN VIEW - PROPOSED WW OVERFLOW GRAVITY MAIN (OPEN CUT CONSTRUTION)

1:250



INTERNAL WEIR WITH PENSTOCK
TO PREVENT FLOWS TO THE OVERFLOW
DURING NORMAL OPERATION. MONITORING
AND ALARMS FOR OVERFLOW TBC DURING
LATER DESING STAGE

EXISTING GL	5.869 5.962 5.994 6.000 6.107 6.013 6.218 6.340 6.511 6.723 6.989
LID LEVEL	5.988 6.456
COVER TO PIPE	1.65 1.81 2.01
PIPE DATA	475 NB UPVC SN16 1:158 (0.63%) 475 NB UPVC SN16 1:221 (0.45%) 475 NB UPVC SN16 1:270 (0.37%)
INVERT LEVEL	3.562 3.685 3.686 3.956 3.953 4.054
MH CHAINAGE	177.268 237.002

LONGITUDINAL SECTION PROPOSED OVERFLOW GRAVITY MAIN ALIGNMENT

A1 REPRODUCTION SCALE 0mm 20 40 60 80 100

A3 REPRODUCTION SCALE 0mm 10 20 30 40 50

PROPOSED SERVICES LEGEND

NEW WASTEWATER	SS
NEW WASTEWATER RISING MAIN	WWR

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. PIPE SIZE TO BE CONFIRMED

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

0 2.5 5 7.5 10 12.5m
SCALE 1:250 AT ORIGINAL SIZE

VERTICAL 1:50 AT ORIGINAL SIZE 0 0.5 1 1.5 2 2.5m
HORIZONTAL 1:250 AT ORIGINAL SIZE 0 2.5 5 7.5 10 12.5m

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
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*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK CBD BYPASS

Title: PROPOSED OVERFLOW GRAVITY MAIN PLAN AND PROFILE SECTION

Discipline: CIVIL

Drawing No.: C61-14

Rev.: A

Plotted By:Johan Rosendo

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Document No. 144418.50 M-P-OVERFLOW GRAVITY MAIN-2.DWG

[redacted]

NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01.
3. FENCING OF PUMP STATION AND ACCESS HATCHES REQUIRED
   --- EXTENT ON FENCING DEPENDANT ON LONG TERM USE OF SITE
   --- TBC DURING LATER STAGES OF DESIGN WITH HCC
4. SECURITY AND MAINTENANCE LIGHTING TBC WITH HCC DURING LATER DESIGN STAGES
5. WASH DOWN FACILITIES REQUIRED - DETAILS TBC DURING LATER DESIGN STAGES
6. CONNECTION FOR EMERGENCY GENERATOR TO BE INCLUDE

	PROPERTY BOUNDARIES
	PUMPSTATION BOUNDARIES
SS	PROPOSED GRAVITY MAIN
WWR	PROPOSED RISING MAIN

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

A1 REPRODUCTION SCALE

A3 REPRODUCTION SCALE
10
0mm

0 4.5 9
Meters

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
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*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED PUMPSTATION
PLAN VIEW

Discipline: CIVIL

Drawing No.: C63-01

Rev.: A

Plotted By: Johan Rosendo

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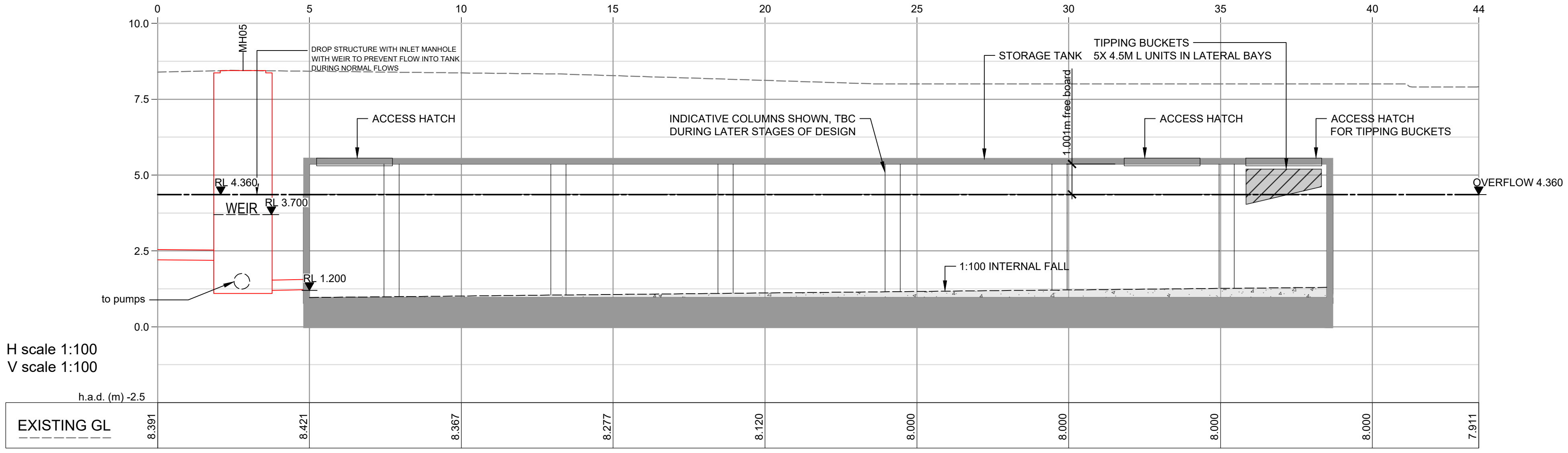
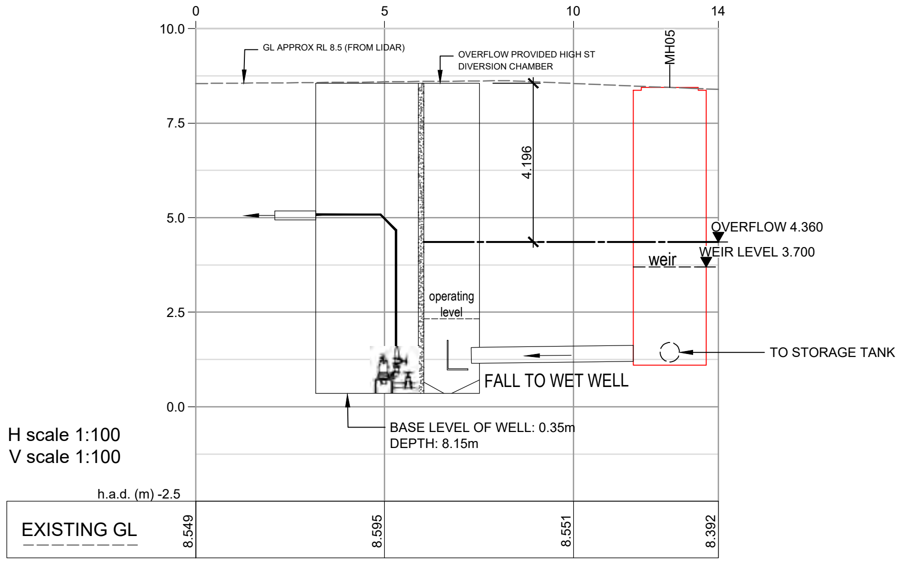
NOTES:

1. DO NOT SCALE OFF DRAWINGS.
2. REFER TO GENERAL AND STANDARD NOTES AND LEGENDS ON DRAWING C00-01



SECTION A -LONGITUDINAL SECTION



SECTION B -LONGITUDINAL SECTION

A1 REPRODUCTION SCALE 100 80 60 40 20 0mm

A3 REPRODUCTION SCALE 50 40 30 20 10 0mm

0 1 2 3 4 5m
SCALE 1:100 AT ORIGINAL SIZE

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	FOR CLIENT REVIEW	JR	EG	PB	14-04-2023

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Original Scale (A1)
Reduced Scale (A3)
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Drawn	JR	06-03-2023	
*Dsg Verifier	PB	14-04-2023	
*Dwg Check			Date

*Name Produced through Projectwise Signoff

Client: Wellington Water

Project: RIVERLINK WASTEWATER TRUNK
CBD BYPASS

Title: PROPOSED PUMPSTATION
LONGITUDINAL SECTIONS

Discipline: CIVIL

Drawing No.: C63-02

Rev.: A

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