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Appendix K – Marine Ecological Assessment

Boffa Miskell

Memorandum

☐ **Auckland**
PO Box 91250, 1142
+64 9 358 2526

☐ **Hamilton**
PO Box 1094, 3240
+64 7 960 0006

☑ **Tauranga**
Level 5
35 Grey Street
PO Box 13373, 3141
+64 7 571 5511

☐ **Wellington**
PO Box 11340, 6142
+64 4 385 9315

☐ **Christchurch**
PO Box 110, 8140
+64 3 366 8891

☐ **Queenstown**
PO Box 1028, 9348
+64 3 441 1670

☐ **Dunedin**
PO Box 657, 9054
+64 3 470 0460

Attention:	Ying Yang
Company:	GHD
Date:	12 February 2019
From:	Katrina McDermott, Dr Sharon De Luca
Message Ref:	Marine Ecological Assessment – Moa Avenue Stormwater Upgrade
Project No:	T18179

Introduction

Background

Auckland Council have received multiple reports of flooding issues in the vicinity of Moa Avenue, Blackpool on Waiheke Island. A stormwater investigation was undertaken to develop and assess a range of options for stormwater upgrades to mitigate these issues.

Following community consultation and options evaluation, Auckland Council decided to proceed with a stormwater pipe upgrade to improve flow conveyance, and swales for local drainage of the lower Moa Avenue road carriageway.

Boffa Miskell have been engaged to undertake a qualitative marine ecological assessment of the proposed coastal outfall in Huruhi Bay. This letter presents our findings of the assessment.

Site Location

The existing stormwater outfall is located in the Coastal Marine Area (CMA) of Blackpool Beach, Huruhi Bay West, Waiheke Island. The Huruhi Bay coastline is south facing and opens out into the Tamaki Strait and the greater Hauraki Gulf Marine Park.

The outfall is located adjacent to the end of southern end of Moa Avenue and is positioned around Mean Sea Level (MSL). The proposed upgraded outfall will be located in the same area within the CMA (Figure 1).

Project Works

The project involves the construction of new inlets, stormwater pipe, swales and a coastal outfall to Huruhi Bay, Waiheke Island, as indicated in Figure 1. The project works outlined below include only those that are relevant to potential effects on marine ecological values. Further project works are outlined in *Report for Auckland Council – Moa Avenue Stormwater Upgrade Construction Methodology Plan, 51/37338/* (GHD 2019).

Specific to the marine ecological assessment, project works include:

- Installation of a new outfall structure (combining both existing and new stormwater pipes) including a concrete chamber, box culvert outfall, headwall, and piled foundations.
- Removal and disposal of existing stormwater manhole and 600 mm diameter outfall pipe.

Also see Attached *DRAFT Drawing: Proposed SWMH 1 and SWMH 1A Details and Outlet Details (Drawing No: 51-37338-W031 Rev. B).*

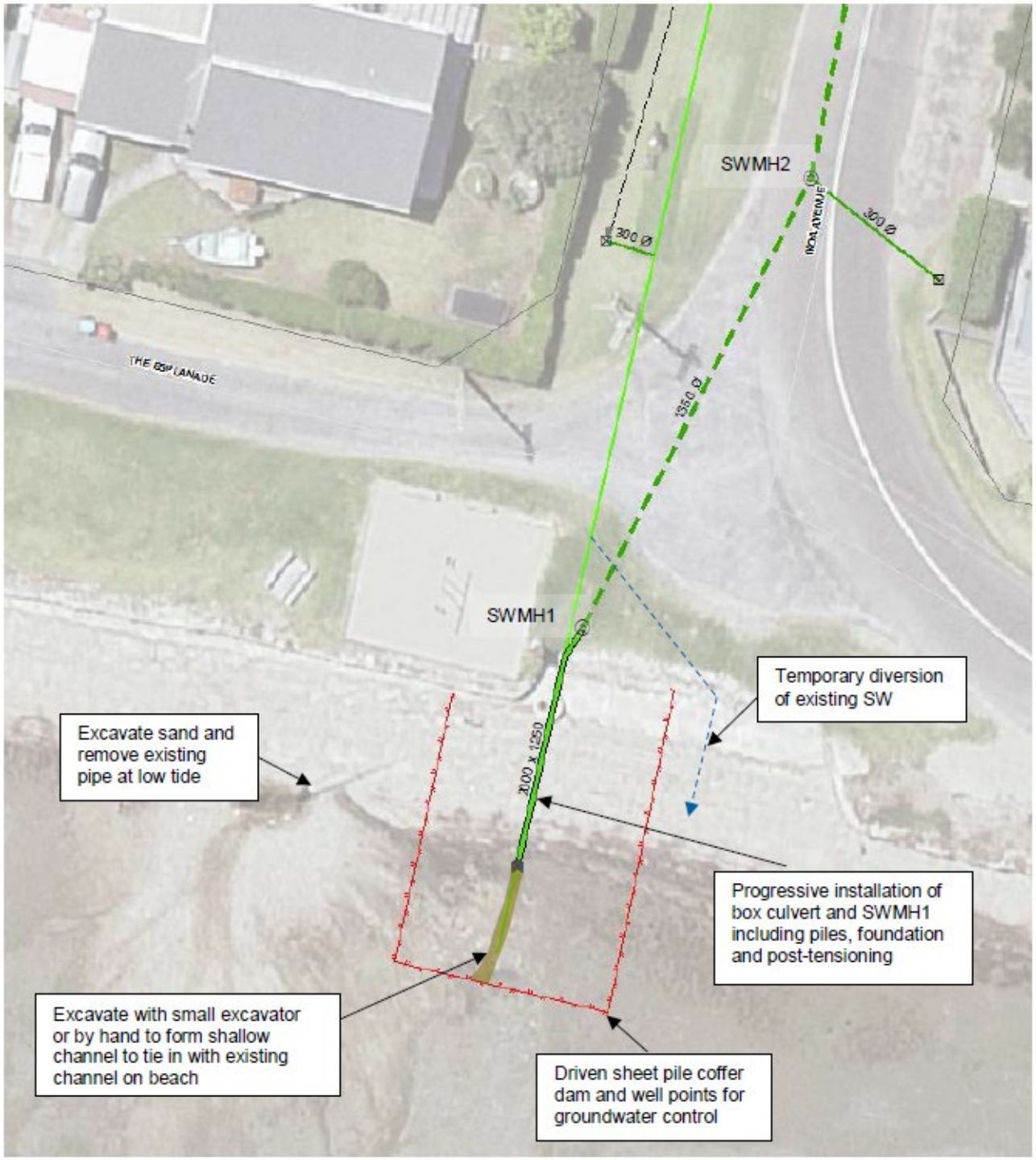


Figure 1: Site location map showing existing structures, proposed area of temporary disturbance and proposed permanent outfall structure[1].

[1] Note that the map is not to scale (schematic only).

Construction Methodology

This section is based on the GHD report dated 22 January 2019 which contains the full methodology for the entire Project. This memorandum should be read in conjunction with the GHD report.

Tidal outlet

The box culvert outfall structure will be located within the Coastal Marine Area and construction will be in the tidal zone. The estimated area of disturbance within the coastal marine area is 200 m^2 or less.

A sheet pile coffer dam will be required for construction to allow work to be carried out in dry conditions. A brief outline of the general construction sequence is given below:

1. A temporary diversion will be provided for the existing 600 mm diameter stormwater line (i.e. collection and pumped discharge to beach outside of work area).
2. The existing stormwater manhole and pipe will be removed and disposed of. The work area will be cleared of debris, rocks etc. so a suitable work site can be marked out.
3. Sheet piles will be driven down across the outlet end and along each side of the proposed box culvert outfall, leaving working room around the culvert.
4. Well points will be installed along the inside of the sheet piling to maintain a low ground water level and dry working conditions.
5. Sand will be excavated to at least 1 m below the outfall invert level.
6. The excavated sand will be replaced with compacted GAP65 wrapped in BIDIM geotextile, or approved equivalent, to form a stable foundation for the box culvert.
7. Piles beneath the headwall structure will be installed by driving steel tubes to the required depths, installing reinforcement and casting the concrete piles in-situ.
8. The pre-cast box culvert, headwall structure and concrete chamber SWMH1 will be laid progressively and bolted together as per the technical specifications. The trench will be backfilled with sand and compacted rock spawls of 100–300 mm diameter.
9. McAlloy stainless steel bars will be placed, tensioned and bolted together as the culvert is installed.
10. Following culvert installation and tensioning, the base slab for the outlet headwall will be cast to connect the culvert to the piles.
11. A small channel will be dug (by hand or small excavator) from the outlet to tie in approximately with the existing channel on the beach which has been eroded by overland flows.
12. Connections for the existing 600 mm and new 1350 mm diameter pipes will be provided in SWMH1. The outlet to the 1350 mm pipe should be plugged with timber boards until the pipe between SWMH1 and SWMH2 is laid and connected.
13. The outlet pipe will be commissioned, and the existing 600 mm pipe can be connected into SWMH1 to establish a ‘live’ stormwater system. The temporary stormwater diversion can then be removed.
14. Following completion of the outfall structure, a sand bag wall will be constructed on the inside of the coffer dam, to allow for the progressive removal of the sheet pile coffer dam.
15. The 1350 mm pipe between SWMH1 and SWMH 2 will be laid and connected to the stub at SWMH1. The temporary plug will then be removed so that the 1350 mm pipe becomes operational.
16. Following connection of the new stormwater pipe to SWMH1, the inlets to the new pipeline (Inlet 1, Inlet 2, the Megapit and Catch pit 7) will then be built and connected.

Works in the coastal marine area and floodplain

The proposed stormwater outfall will be located partly within the coastal marine area, and parts of the pipeline is located within a natural hazard overlay (Type A Flood Plain) identified in the Auckland Council District Plan: Hauraki Gulf Inner. The hazards are shown in Figure 2.

Works within flood prone land requires a resource consent. To minimise potential impacts during construction, it is proposed that the works will be constructed by trenched (open cut) excavation with a sheet pile coffer dam around the outfall and sheet piling along the pipeline trench up to at least chainage 100 m.

It is recommended that construction works in the coastal marine area and within flood prone areas are constructed during dry weather and appropriate erosion and sediment controls must be implemented prior to, and during construction.

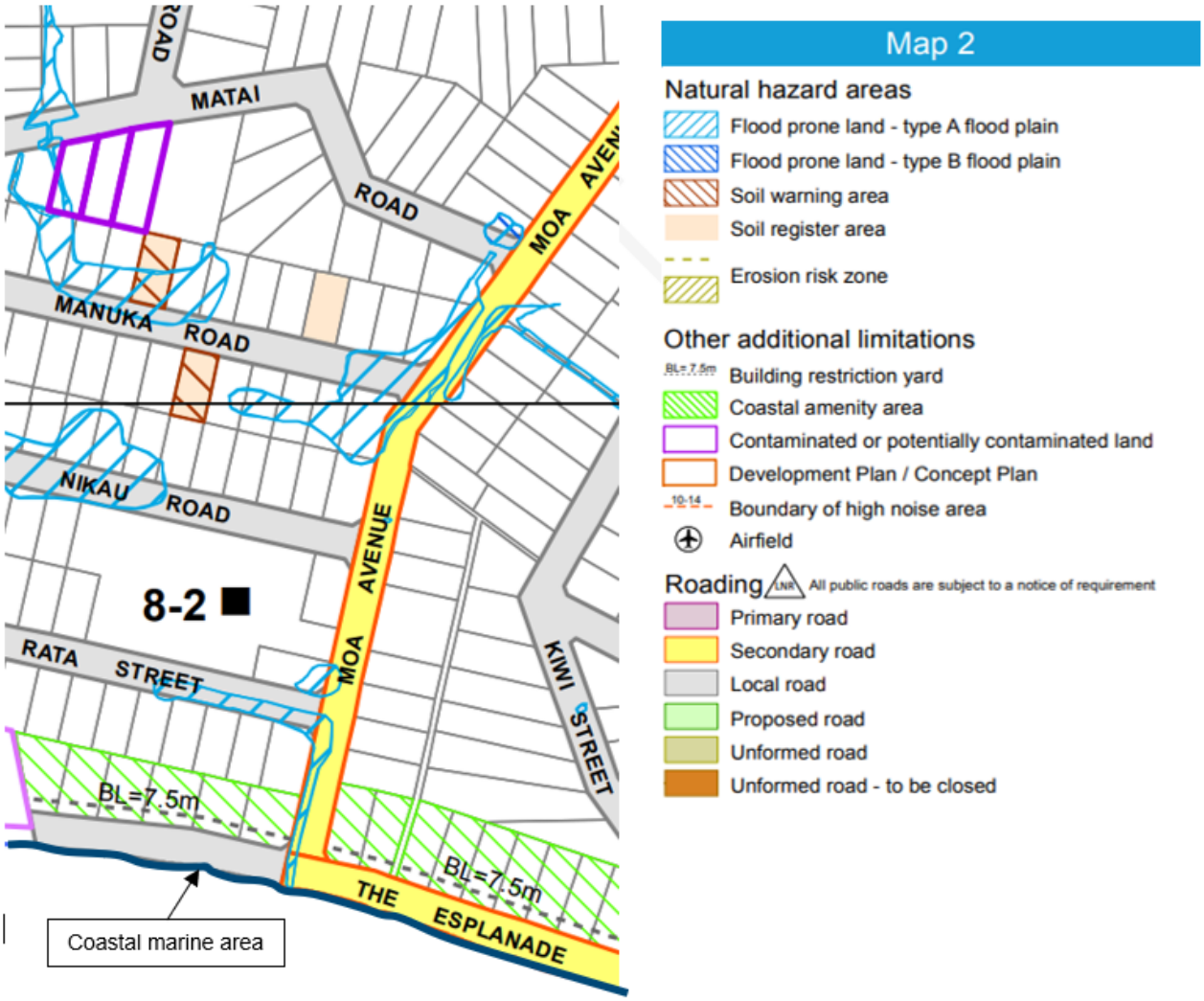


Figure 2: Coastal hazards present at the outfall location.

Erosion and Sediment Control

A Preliminary Erosion and Sediment Control Plan PECSP has been prepared in support of the resource consent application for the proposed works. The PESCP details the various erosion and sediment and control (ESC) measures to be implemented during the construction works to minimise the effect of the works on the receiving environment.

A summary of the proposed ESC measures and practices to be implemented for the duration of the works are given below. The complete PESCP will be provided as part of the resource consent.

Erosion Control Measures

The following general measures will be adopted to minimise erosion during the enabling and construction works:

- The Contractor shall construct diversion bunds in the form of “filter cloths” at the boundaries of the designated work area to prevent clean water entering the site, and sediment laden water leaving the site
- The Contractor shall minimise the extent of disturbed areas exposed to the elements and the Contractor shall ensure that works are carried out in a staged manner to ensure that any earth is not disturbed until works are due to commence in those areas, and
- The Contractor shall minimise the period during which bare earth is exposed to the elements. Where surfaces will be exposed for an extended period of time or when rain is forecast, these will be stabilised to reduce erosion potential appropriately.

Sediment Control Measures

The Contractor shall take all reasonable steps to minimise sediment wash off from the site and shall adopt the following general measures to minimise sediment discharge:

- Completing all works in the minimum time practicable.
- ‘Construction staging’ – the works will be staged appropriately to reduce the amount of exposed earth and spoil during construction.
- Ensure that all sediment-laden runoff from the site is treated by appropriate ESC measures.
- Arrange work practices to avoid the need for the unnecessary stockpiling of excavated waste/spoil on site. Where any temporary stockpiles are required, they will be located within the active work area, and will be appropriately stabilised as required.
- Pumping groundwater into a settlement tank or turkey’s nest prior to discharge into the existing stormwater network or to ground.
- Well pointing will discharge into a settlement tank or turkey’s nest prior to discharge to the sea.
- Settlement tanks and turkey’s nests are to be inspected and, if necessary to prevent the re-suspension of retained sediment, cleaned at the end of each working day.
- Implementing strict environmental control of temporary on-site chemical and fuel storage facilities using appropriate bunds and on-site pollutant traps and has in place appropriate spill response procedures.

Assessment Methodology

Ecological Assessment

A site visit was carried out on 9 January during low tide.

A visual survey of the existing outfall was undertaken on 9 January 2019 during low tide. Epifauna inhabiting the structure were identified. The soft sediment surrounding the structure, and within the proposed footprint of works, were also visually assessed with any fauna present noted. The ‘channel’ carrying water from the outfall was inspected for fauna.

Photographs of the habitats were taken (Figure 3; Figure 4; Figure 5).

Figure 3: The site showing existing outfall and manhole, the proposed area of works and adjacent children's playground and adjacent properties.

This assessment of ecological effects follows the method adapted from Regini (2002) and the Ecological Impact Assessment Guidelines (EIANZ, 2018). The method involves assessing the magnitude of the projects adverse effects on the site's ecological values, before using a matrix to assess the ecological significance of any effects. Table 1 describes the categories for the possible effect magnitudes, while Table 2 provides a matrix in which to determine the level of the effect on the ecological values.

Table 1:Magnitude of effects.

Magnitude	Description
Very High	Total loss of, or very major alteration to, key elements/ features of the baseline conditions, such that the post development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/ features of the baseline conditions such that post development character, composition and/or attributes will be fundamentally changed; AND/OR loss of a high proportion of the known population or range of the element/feature.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character, composition and/or attributes of the existing baseline will be partially changed; AND/OR loss of a moderate proportion of the known population or range of the element/feature

Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character, composition and/or attributes of existing baseline condition will be similar to predevelopment circumstances/patterns; AND/OR having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation; AND/OR having negligible effect on the known population or range of the element/feature.

Table 2: Criteria for describing level of effect.

		Ecological Value				
		Very high	**High**	**Medium**	**Low**	**Negligible**
Magnitude	**Very high**	Very high	Very high	High	Moderate	Low
	High	Very high	Very high	Moderate	Low	Very low
	Medium	High	High	Moderate	Low	Very low
	Low	Moderate	Low	Low	Very low	Very low
	Negligible	Low	Very low	Very low	Very low	Very low
	Positive	Net gain	Net gain	Net gain	Net gain	Net gain

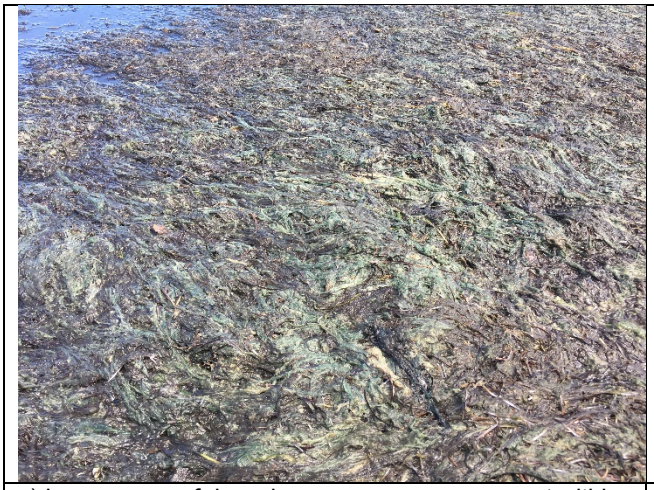
Existing Ecological Values

The existing marine environment is within the proposed area of works consists of sandy soft sediment intertidal habitat. The existing outfall and manhole structures provide some habitat for hard shore marine species (Figure 5).

At the time of the survey the upper intertidal area was almost completely covered in a thick (>30 cm deep in areas) of decaying seagrass *(Zostera muelleri)*. This layer was deepest surrounding the outfall pipe. Large areas of filamentous green algae were present within the seagrass. Sediment below this layer of decaying seagrass was anoxic, with anoxic sediment present within small channels (Figure 4).

a) Manhole and existing outfall looking West.

b) Manhole and existing outfall looking East.



c) Large areas of decaying seagrass were present within the high tide area.

d) Anoxic sediment present in small channels within the intertidal habitat.

Figure 4: Marine habitat present within the proposed area of works.

The existing structures are comprised of concrete and provide habitat for epifaunal species (Figure 5). A total of four species were identified inhabiting the structures; little black mussels (*Limnoperna pulex*), brown barnacles (*Octomeris brunnea*), dark top shells (*Diloma aethiops*), and an unidentified limpet.

a) Manhole and existing outfall.

b) Epifauna present on existing outfall pipe.

Figure 5: Hard shore epifauna present on existing structures.

The soft sediment habitat within the upper intertidal was comprised of sand with abundant shell hash, particularly cockles (*Austrovenus stutchburyi*). No epifauna were observed in any of the soft shore habitats.

A small channel is present within the intertidal habitat that conveys water from the stormwater outfall. Within this channel a single cockle was recorded. Two dead pipi (*Paphies australis*) were recorded adjacent to the existing outfall. A polychaete worm was observed within the channel, possibly discarded by a browsing southern black-backed gull that was disturbed while we were carrying out our survey.

Whilst a coastal bird survey was not carried out, we did not observe any important bird habitat within or adjacent to the Project area.

The existing ecological values of the proposed area of works is recorded as low-moderate due to the low number of benthic invertebrates observed and the highly anoxic areas of the upper intertidal.

Assessment of Effects on Marine Ecological Values

The proposed upgrade of the stormwater outfall involves both permanent occupation of the CMA and temporary disturbance during construction. The proposed area to be affected is approximately 25m^2 of permanent occupation and 170m^2 of temporary disturbance.

The permanent occupation of the CMA removes soft sediment habitat that could be inhabited by marine organisms. However, the structure may provide habitat for hard shore species. The temporary disturbance during construction has the potential to lead to mortality of any marine organisms within the footprint as it is likely to involve compaction and smothering of benthic invertebrates. However, the proposed footprint has a low density of inhabiting fauna, and the area is likely to be recolonised after the completion of construction.

The magnitude of effect of permanent occupation of the CMA (25m^2) and the temporary disturbance (170m^2) on marine ecological values is considered to be low, with no change to the underlying character of the habitat predicted (Table 1).

Combined with low-medium ecological values, the overall level of effect of the proposed outfall upgrade is assessed as low (Table 2). Therefore, no mitigation for occupation and disturbance of the marine environment is required.

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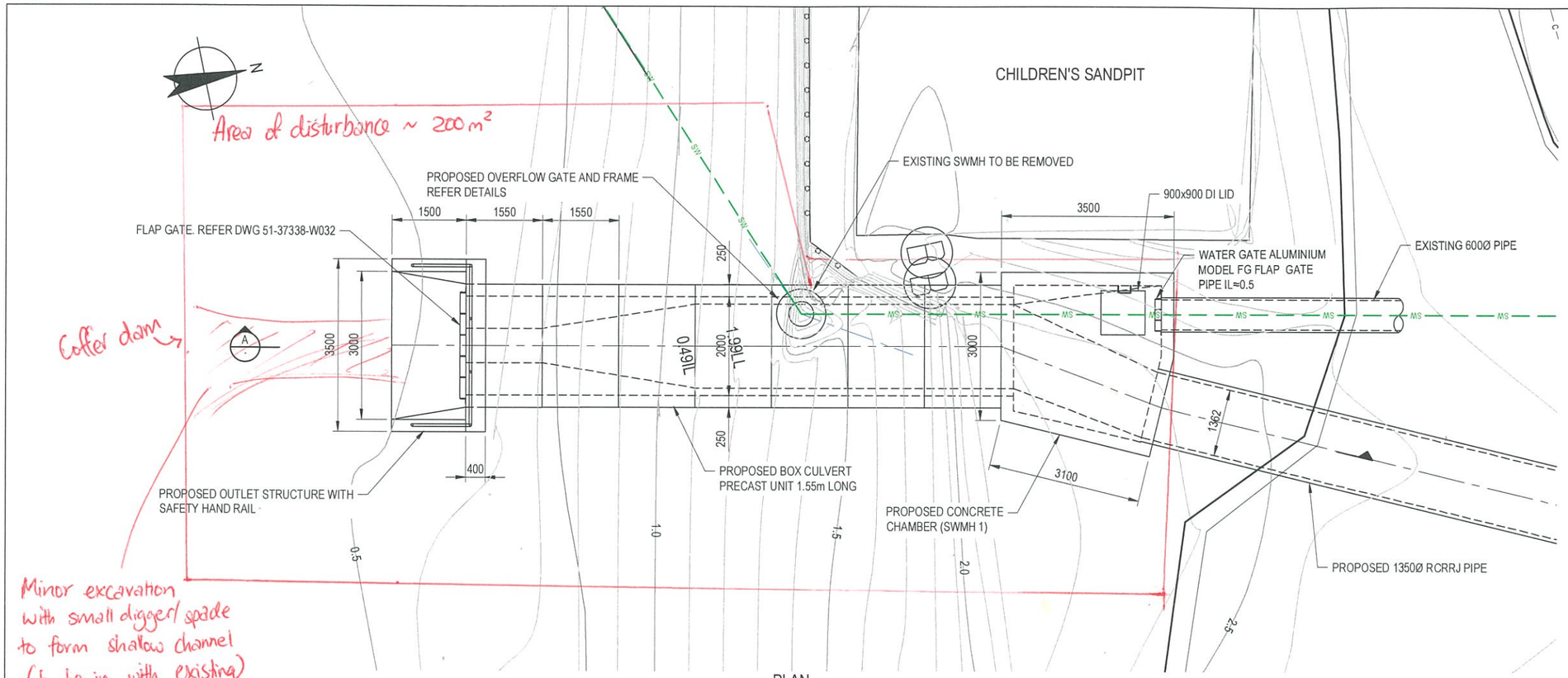

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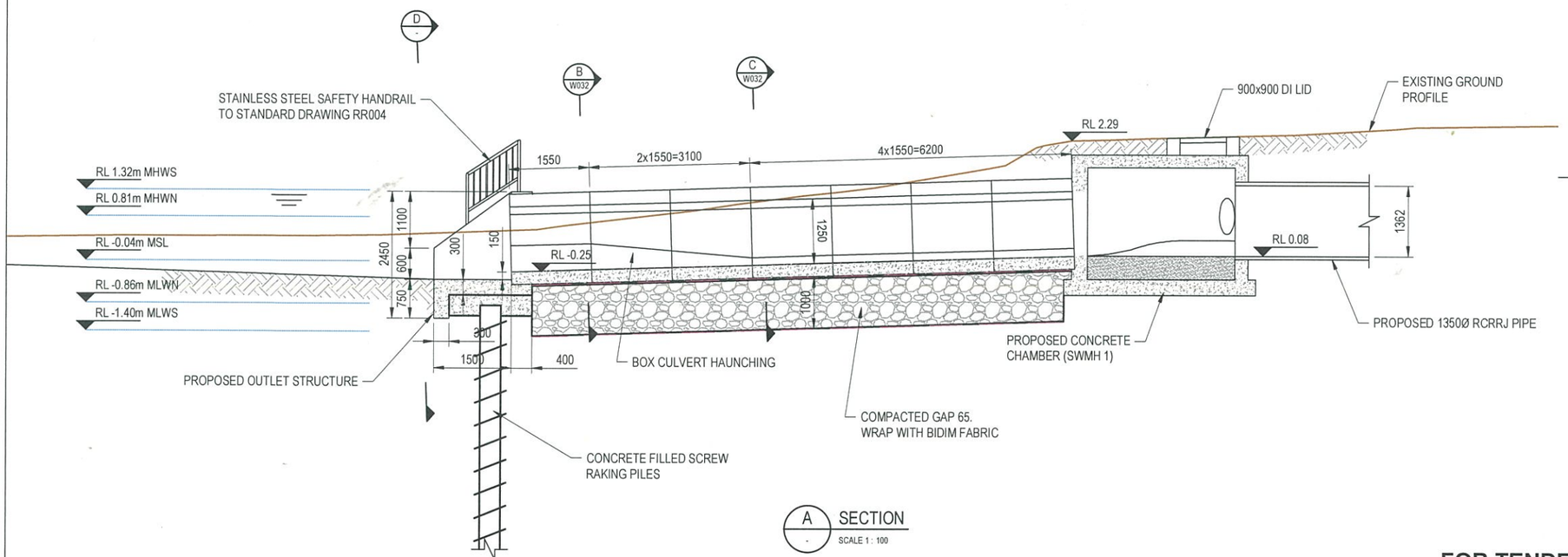

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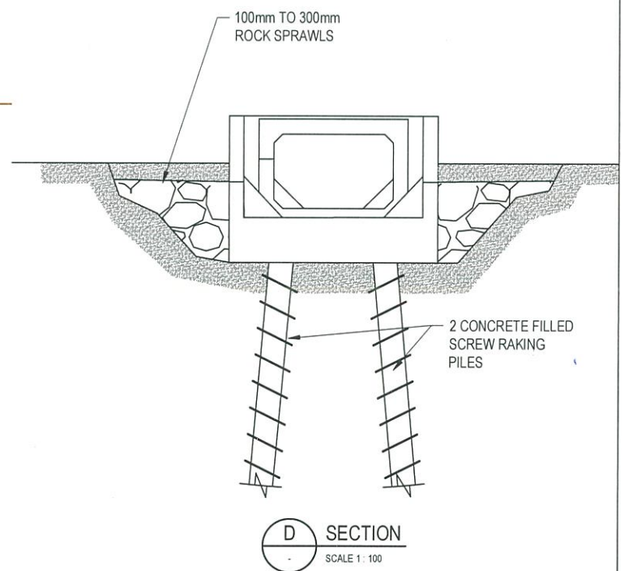

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NOTES:

THE BOX CULVERT AND ASSOCIATED CULVERT ARE A DESIGN AND BUILD COMPONENT TO THE DIMENSIONS DESCRIBED IN THE DRAWINGS AND SPECIFICATIONS. THEY ARE TO BE LAID IN TIDAL CONDITIONS AND CONVEY STORMWATER.

LOAD CAPACITY:

- DEAD LOAD -1.5 TO 1.5 M EARTH COVER
- TRAFFIC LOAD 0.85HN
- SUBMERGENCE UP TO 1.0 M TIDE NORMAL HIGH TIDE WITH 1.5 M EXTREME OVER THE ROOF PLUS ADDITIONAL 1.0 M SURGE.

SURFACE FINISH F4

JOINT

- SMALL SPIGOT AND SOCKET INCLUDING JOINT WITH HEADWALL
- EPOXY MORTAR JOINT SEAL
- BOXES AND HEADWALL UNITS ARE TO BE JOINED BY 6 NO 25 MM DIAMETER MACALLOY BARS IN GROUTED DUCTS

CONCRETE TO BE 50 MPA MICRO SILICA CONCRETE.

DESIGN AND DETAILED FOR USE IN TIDAL AND OR SPLASH ZONE INCLUDING CONCRETE AND COVER TO REINFORCING

FOR TENDER AND CONSENT (NOT FOR CONSTRUCTION)

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
B	UPDATED		DX			
A	PRELIMINARY		DX			

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SCALE 1:100 AT ORIGINAL SIZE

Auckland Council
Te Kaunihera o Tāmaki Makaurau

GHD
Level 3, GHD Centre
27 Napier Street, Freemans Bay, Auckland 1011 New Zealand
T 64 9 370 8000 F 64 9 370 8001
E auckland@ghd.com W www.ghd.com

Drawn	D XIE	Designer	P HOUGHTON
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client AUCKLAND COUNCIL
Project MOA AVENUE STORMWATER DETAILED DESIGN
Title PROPOSED SWMH 1 AND SWMH 1A DETAILS AND OUTLET DETAILS

Original Size A3
Drawing No: 51-37338-W031
Rev: B

Plot Date: 2 October 2018 - 11:40 a.m. Plotted By: Daniel Xie
Cad File No: \\ghdnet\ghd\NZ\Auckland\Projects\51\37338\CADD\Drawings\51-37338-W031-032.dwg