TC24/20 Awaiti Place and Ohauiti Stormwater Upgrades ECI

Construction Management Plan

Revision Details

Revision	Date	Details	By	Checked	Approved
A	17 August 2020	For Resource Consent	G Cooper	M Allott	
A1	9 April 2021	For Resource Consent	A Hollins		
A2	20 May 2021	For Resource Consent	A Hollins		
0	tbc	Construction Phase – Following Issue of RMA Consent	-	-	-
1					
2					
3					
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5					

1. Governance

MAP Projects Ltd (MAP) has been contracted by Tauranga City Council (TCC) to construct the Contract TC24/20 Awaiti Place and Ohauiti Reserve Stormwater Upgrades. The works include;

Construction of a new stormwater retaining earth dam at Pukepoto Place
Modifications to the Awaiti Place stormwater retention pond
Construction of stormwater reticulation

MAP undertakes all of its projects using the MAP Management System. This plan constitutes a MAP document, and outlines how MAP, and its subcontractor, will meet its requirements under the Project Agreement.

2. Commencement

The proposed start date for the Construction Phase of Contract TC24/20 Awaiti Place and Ohauiti Reserve Stormwater Upgrades project is **22 November 21**.

MAP will provide high level summary of the programme, including expected timing and duration of works.

3. Key Contacts

The key project contacts are:

MAP Contractor's Representative:	Andy Hollins
Phone:	+64 27 244 7368
Email:	andy@mappro.co.nz
MAP Project Manager:	Bruce Watson
Email:	bruce@mappro.co.nz
Phone:	+64 21 266 6327
Calibre Group (Design Lead):	John Sternberg
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Tauranga City Council:	Gareth John
Email:	Gareth.John@tauranga.govt.nz
Phone:	+64 27 537 3602

4. Purpose

This Construction Management Plan is drafted in support of Resource Management Act Consent application for the project and details the overarching management methodology in relation to construction methodology & environmental controls for the construction phase of the Contract TC24/20 Awaiti Place and Ohauiti Reserve Stormwater Upgrades Project (the Project). This document is supported by a suite of supplementary management plans that further detail the management methodologies to be employed by the project to ensure compliance with the designation conditions, these include:

- Construction Noise and Vibration Management Plan
- Erosion and Sediment Control Plan
- Dust Management Plan

4.1 Compliance

The following protocols and policies will be amended and implemented throughout the site for compliance with specific consent and designation conditions once issued by the controlling authorities.

4.2 Specific Designation Conditions

To be completed once received and before construction commences.

4.3 Roles and Responsibilities

The MAP Contractor's Representative has responsibility for supporting the implementation of all required earthworks and leading the communication of issues to the Project Management Team.

All personnel working on the Project, including all MAP employees and subcontractors, have responsibility for following the requirements of the consent and designation conditions, approvals and the CMP.

4.3.1 Project Representative

The Contractor's Representative or principle contact person nominated for the project is:

MAP Contractor's Representative:	Andy Hollins
Phone:	+64 27 244 7368
Email:	andy@mappro.co.nz

5. Construction

5.1 Scope

The scope of the Works is located on two distinct sites as follows:

Pukepoto Dam

- Site establishment and access
- Location, removal, and relocation of existing services
- Implementation of erosion and sediment controls
- Muck-out of watercourse
- Ground improvements (deep-soil mixing)
- Stockpiling to topsoil and unsuitable materials
- Stockpiling of imported cohesive materials
- Construction of earth dam (bulk cut & fill)
- Constructiuon of spillway
- Pipe crossing of McFetridge Lane, incl. inlet & outlet structures
- Landscaping

Awaiti Place

- Site establishment and access
- Location, removal, and relocation of existing services
- Implementation of erosion and sediment controls
- Awaiti pond modifications (removal of unsuitable material and modifications to inlet and outlet structure and raising of dam crest)
- Construct new stormwater pipeline, incl. crossing of Poike Road and outlet structures and dedicated fish passage
- Construction of in stream scour protection

Works will be staged between Pukepoto and Awaiti Place with provisional timings of Pukepoto late 2021 – late 2022 and Awaiti starting late 2023. Final dates to be confirmed depending on consent and funding approvals.

5.2 Methodology

5.2.1 General

Construction will involve the establishment of site facilities, installation of erosion and sediment controls, bulk earthworks, and general site preparation activities.

Catchment areas will be established progressively to facilitate construction activities during the duration of the earthworks period; each catchment will consist of a clean/dirty water diversion network to provide for expected surface water flows during the earthworks and associated activities.

Staged ESCPs will be developed in collaboration with a specialist consultant and submitted to the Bay of Plenty (BoPRC) for certification, these plans will generally describe individual catchments or parts thereof, and the specific activities required for the Works.

Upon completion of each catchment area the associated controls will be commissioned and signed off by a suitably qualified erosion and sediment control professional prior to commencement of any sediment creating activities within that area.

Materials used in the construction of the earth dam will be a mix of site-won, and imported materials to enable the efficient implementation of the construction programme, and provide for material imbalances within the cut-fill earthworks operation. Local borrow-pits are being investigated to minimize the quarying and haulge of materials. Pipe surround will be imported aggregate.

The actively worked un-stabilised catchment area will be limited to 10ha unless approved in writing by the Bay of Plenty Regional Council.

5.2.2 Geotechnical investigations

The proposed design, management and control of earthworks operations has been informed by the geotechnical information provided by TCC. Supplementary geotechnical investigations and laboratory testing will be undertaken as part of the design process for interpretation of underlying ground conditions and subsequent input into the final design and construction phase environmental controls.

1. Pukepoto Dam

The Preliminary geotechnical and Dam Concept Assessment states;

2015 McFetridge Lane Subdivision Investigation by Tonkin & Taylor Ltd

Geotechnical investigation for the McFetridge Lane Subdivision, immediately west of the Ohauiti Stormwater Reserve, was undertaken by Tonkin and Taylor Ltd (T&T) in 2015. TCC has provided the geotechnical suitability for subdivision report (ref: 851902), prepared by T&T and dated March 2015. In June 2015, T&T carried out additional deep investigation, which was not included with the report. This data has been accessed via the New Zealand Geotechnical Database (NZGD). T&T tests relevant to the site have borehole logs attached and locations presented on RILEY Dwg: 190474-1, appended.

The T&T investigation included boreholes to up to between 5m and 20m depth within the terrace west of the dam site gully. The Waitearikiignimbrite was not encountered at any of the T&T borehole locations. The investigation indicated that the terrace comprises in excess of 20m thickness of Mautua deposits, blanketed by between 3m and 6m of ash deposits.

***Mautua** alluvial deposits were logged by T&T as bedded CLAY, SILT and SAND, orange brown to light grey, non-plastic to high plasticity, loose to medium dense. Deposits are locally clayey, organic, pumicious or gravelly.*

The ash deposits blanketing the terrace were logged by T&T as:

Hamilton Ash *of between 0.2m and 3m (typically 1m) thickness, which was described as SILT with some sand, orange brown (dark brown paleosols at top), stiff.*

Rotoehu Ash *of between 0.2m and 1.7m (typically 0.7m) thickness, which was described as SILT and fine to coarse pumicious SAND, orange brown to light grey, medium dense.*

Post-Rotoehu Ash *(younger ash) of between 1.9m and 3.8m (typically 2.9m) thickness, which was described as SILT with some sand, orange brown to light brown, stiff.*

Preliminary Field Investigation (RILEY 2019)

A site walkover was undertaken by a RILEY Chartered Professional Geotechnical Engineer (Scott Vaughan) on 18 October 2019. This included observation of geomorphology as well as test location selection.

Intrusive ground testing was undertaken on 6 November 2019 by RILEY technicians. This included five hand auger boreholes (HAs), undertaken along the proposed crest line on a section through the gully. A sixth hand auger borehole and a hand excavated test pit (for the collection of a bulk sample) were undertaken at the location of a prospective fill source area. Borehole logs are attached and the locations are indicated on RILEY Dwg: 190474-2.

Preliminary Laboratory Testing (RILEY 2019)

Geotechnical laboratory testing was undertaken on a bulk sample of silty sand collected at a depth of 0.5m from a hand excavated test pit (TP1) at a possible fill source area. The test pit location is presented on RILEY Dwg: 190474-2 and is on the gentle slope south of the eastern dam abutment. Testing included hydrometer particle size distribution (PSD), Atterberg limits and linear shrinkage, and standard compaction and solid density tests, all undertaken by Babbage Geotechnical Laboratory in accordance with NZS 4402: 1986.

The PSD test indicated the sample was 56% sand and 44% fines (including 38% silt and 6% clay). Despite the sand content being predominant by weight, the Atterberg limits indicated the sample behaved with moderate plasticity index (27%) and a relatively high liquid limit (83%). Moderate linear shrinkage of 11% was reported. These are similar properties to typical volcanic soils of the region.

Solid density test was indicated to be 2.44t/m³, which is relatively low. Maximum dry density (MDD) of 1.02t/m³ was indicated, which is also relatively low but typical of volcanic soils of the region. Optimum moisture content (OMC) was indicated to be 48%, which was close to, but slightly wet of, the natural water content (46%).

Site Conditions and Ground Model

It is considered that the geological units present at the site are generally similar to those described at the neighbouring McFetridge Lane Subdivision. It is interpreted that the gully has been eroded into a thick deposit of Matua Subgroup alluvium. A series of ash deposits between 3m and 6m thick is assessed to blanket the terraces on both sides of the gully, overlying the Matua Subgroup deposits.

Matua Subgroup soils are exposed in the sides of the gully. The base of the gully is covered by in the order of 0.2m to 0.7m thickness of Anthropocene/Holocene-aged organic alluvium. Soils generally appear to be softened to between 1.8m and 2.6m below the base of the gully, by weathering and/or inclusion of soft materials.

Waitearikí Formation ignimbrite is likely to be present in the order of 10m to 100m below the base of the gully, but to date it has not been confirmed by ground investigation in the area. Two cone penetrometer

tests (CPTs), undertaken by T&T either side of the McFetridge Lane embankment, encountered refusal on what appears to be very hard material at approximately RL 22.0m. The Scala penetrometer testing from the base of HA1 encountered very dense material at approximately RL 22.6m, which is similar to the refusal depth of the T&T CPTs. At this stage it is unknown whether this could reflect the upper surface of the ignimbrite or very stiff to hard Matua group soils, however, we consider it is more likely to represent Matua subgroup materials. T&T also reported observing an outcrop of ignimbrite downstream of the McFetridge Lane embankment. It has not been confirmed whether the observed ignimbrite represented an outcrop of intact Waitewariki Formation, or if it was an inclusion within the Matua deposits. We have not observed the outcrop T&T described, however, assuming it was at RL 25.0m or higher, the latter would be considered more likely.

Groundwater was not encountered in the hand auger boreholes drilled in the abutments, however with HA5 and HA6, soils at depth were noted to be wet. Initial review of the T&T borehole logs for the site to the west indicate standing groundwater was measured at between 5m to 8m depth, for investigations in the slopes above the gully features. These combined observations may indicate the permanent groundwater level, in the abutments of the possible dam site, is present at a similar depth (i.e. 5 to 8m). Hand auger boreholes HA1 and HA2, drilled at the edge of the wetland/stream, encountered the wetland water level, however, as the boreholes were extended to depth within a temporary PVC casing, it was possible to gauge approximate permeability of the soils and groundwater inflows. Both boreholes were able to be extended to depth without groundwater inflow and soils toward the base of the holes were logged as moist rather than saturated. These observations indicate relatively low permeability soils and/or a low permanent groundwater level and may indicate that the water within the swamp feature is perched on the lower permeability soils.

RILEY Dwgs: 190474-3 and -4 present interpreted geological cross sections through the proposed dam site, based on preliminary ground investigation data.

When necessary, we will undertake additional investigation of the cut and borrow areas prior to commencing excavation to provide a better understanding of the types and locations of materials that need to be excavated. This will focus on materials that are suitable for structural fill that require little or no drying.

Initial investigations carried out within the wetland areas have provided a greater understanding of the ground conditions, and provided greater certainty with regard to the material volumes requiring disposal as part of the Works.

2. Awaiti Place Pond & Pipeline

The vertical alignment of the pipeline has been raised as the design progresses resulting in shallower excavations than expected at the time of Geotech investigations. The CMW Geosciences geotechnical investigation report states;

1. FIELD WORK

The initial field work was undertaken on the 6th and 7th of March 2018 and comprised:

- A site walkover by a CMW Engineering Geologist to assess the general landform, site conditions and any adjacent structures.
- On-site services search was carried out by a specialist contractor to identify the presence of any underground obstructions or hazards prior to the field investigation program commencing.
- Eight hand auger boreholes, denoted HA01 to HA08, drilled using a 50mm diameter auger to target depths of 3.0 metres below existing ground level or refusal. In-situ soil shear strengths measurements were carried out at regular intervals using handheld shear vane apparatus to help assess soil strengths. Dynamic cone penetrometer (DCP) testing was carried out where sands where encountered to determine the relative density of the materials encountered.

- Investigations undertaken during the initial phase of work were not able to penetrate the ignimbrite present throughout the service alignment within the proposed invert of the pipe.

The second phase of field work was undertaken between the 28th and 31st January 2020 and comprised:

- On-site services search was carried out by a specialist contractor to identify the presence of any underground obstructions or hazards prior to the field investigation program commencing.
- Six machine boreholes, denoted BH01 to BH07, were drilled using HG PQ Triple Tube Coring techniques to depths of up to 12.5m below existing ground level to determine the ground conditions and ensure we were able to investigate the deeper geology.
- One hand auger borehole, HA09, was drilled using a 50mm diameter auger to a target depth of 3.0 metres below existing ground level. In-situ soil shear strengths measurements were carried out at regular intervals using handheld shear vane apparatus to help assess soil strengths. Dynamic cone penetrometer (DCP) testing was carried out where sands where encountered to determine the relative density of the materials encountered.

2. GEOLOGICAL MODEL

1. Local Geology

The published geological map1 of the area indicates the area to be primarily underlain by fluvially reworked volcanic sediments comprising sands, silts and clays of the Pleistocene aged (2.18 – 0.35 Ma) Matua Subgroup.

1 Briggs, R.M. et al, 1996, Geology of the Tauranga Area, Institute of Geological and Nuclear Sciences Limited, Sheet U14, 1:50,000 Scale

The Matua Subgroup is underlain by the Pliocene aged (~2.18 Ma) Waitearikí Ignimbrite which is described as grey to dark brown, non-welded to densely welded and lenticulitic, crystal-rich ignimbrite with grey lenticular pumice and lithics of rhyolite and andesite.

Historical aerial photography indicates the site encompasses an old gully system that was infilled sometime after late the 1970s as part of the Awaiti Place road construction and residential development. The presence of recent (Holocene aged) alluvial stream deposits are therefore likely.

Based on the known history of the site and the surrounding land, superficial depths of fill are anticipated as a result of road construction and previous subdivision development.

2. Soil Stratigraphy

The ground conditions encountered and inferred from the investigation differ slightly from the published geology for the area and are summarised below:

- Topsoil was encountered at ground level at all test locations with thicknesses ranging from 100mm to 500mm. Thick topsoil was observed within the drainage reserve south of Poike Road.

- Beneath the topsoil, fill was encountered within all test locations except BH07 at the southern end of the site. The fill comprises stiff to hard clayey silts and loose to medium dense sands to depths ranging from 0.5 metres near the southern end of the alignment to 5.0 metres depth at the northern end towards Poike Road. Undrained shear strengths obtained in the clayey silts range from 118kPa to greater than 195kPa (being the upper limit on the shear vane). SPT N values in the silt obtained from the machine boreholes range from 0 to 7.

- Underlying the fill and topsoil within BH01, BH07, HA01 and HA06, recent alluvium comprising stiff silt was encountered.

- Matua Subgroup soils comprising interbedded silts and sands were encountered in BH07 with SPT N values ranging from 11 to 37.

- The lower strata beneath the soils described above comprised very dense sandy silt to extremely weak ignimbrite, of Waitearikí Ignimbrite. This was encountered in all test locations except .BH07. The

weathered Ignimbrite was encountered at depths ranging from 0.5 metres (BH06) to 6.05 metres (BH01). SPT N values within this strata ranges from 4 to in excess of 50.

- Hand auger boreholes together with DCP tests refused early within the weathered ignimbrite strata due to the density and strength of this unit.
- The transition of weathering profiles from completely weathered to highly weathered within the ignimbrite typically occurs from 2.6 to 9.8 metres below ground level, with the transition thickening towards the southern end of the alignment.

3. GROUNDWATER

Groundwater was encountered during boring within HA02, HA06, HA09, BH01, BH02, BH05 and BH06 at depths ranging from 1m to 4.5m below ground level.

Two piezometers were installed during the second phase of investigation in BH02 and BH06. When dipped during the summer months groundwater was measured between 2.05m and 2.21m below ground level, equating to approximately RL 13 and 17m respectively.

4. ENGINEERING EVALUATION AND COMMENTRY

1. Pipeline Construction Works

We understand that construction methodology of the pipeline and associated manholes and outlets is yet to be confirmed. It is possible that a combination of techniques may be adopted.
The comments provided below are based on ground and groundwater conditions observed within the pipeline route (revision B). **.**

2. Trenching for Pipe Installation

If trenching the pipeline is proposed, the following will need to be considered:

- The majority of the pipe alignment invert is proposed within the completely to highly weathered ignimbrite, which is predominantly comprised of dense silty sand or highly weathered volcanic rock, however from chainage 0m to 60m within the drainage reserve the pipe invert is within recent alluvium and from chainage 390m to 410m, near the outfall the pipe invert is within recent alluvium and uncontrolled fill.
- Construction of pipelines within the recent alluvium and uncontrolled fill will likely require construction of safe berm/batters and/or use of trenching shields to protect workers during installation of bedding and pipework. Temporary safe batter angles within these soils are typically 1(v) in 2(h) on average assuming dry conditions.
- The use of safe berm and batter construction should be continued through transition zones into the ignimbrite layers.
- The weathered ignimbrite strata ranges from a medium dense silty sand to a highly weathered volcanic rock which are likely to require a rock bucket and a minimum 20 tonne excavator to trench through.
- Temporary trenches within the ignimbrite will likely remain near vertical (if dry) during pipe construction, with the use of trenching shields required to protect workers installing the pipeline in accordance with health and safety requirements and drainage construction best practice.
- Groundwater was encountered at 1m to 4.5m below ground level, therefore sections of the pipe invert will be below the groundwater level. Temporary dewatering should be considered during construction. If dewatering of trench works is undertaken it is recommended to be undertaken as a

staged approach within the area of work rather than installing dewatering spears across the alignment prior to excavation works. Widespread dewatering should not be considered due to the potential for settlement of the adjacent land.

- The use of sheet piles installed in a temporary measure as the pipeline is excavated can help with prevention of trench collapse due to groundwater flows. However, installation of sheet piles need to consider any vibration effects during installation on neighbouring houses and street infrastructure.
- Several services are located close to the proposed alignment of the pipeline. Prior to construction the contractor must confirm location and depths of existing services with respect to the proposed pipeline to ensure that construction does not induce unacceptable displacement and settlement of existing services.

3. Trenchless Pipe Installation

Trenchless technologies including directional drilling and micro-tunnelling may be considered for construction of the pipeline.

The pipeline invert through the majority of the alignment is transitioning through weathered ignimbrite which is predominantly residually weathered and will act like a soil when drilled.

The current design invert between chainage 160m and 340m is likely to be partially in less weathered ignimbrite which will act like rock when drilled. Therefore, trenchless technologies may have difficulty maintaining pipe gradients when the drill head is traversing between soil and rock conditions or has mixed face conditions.

As discussed above, the northern and southern ends of the pipeline's current invert will be within uncontrolled fill or recent alluvium generally, the strengths of these soils are typically lower than the weathered ignimbrite soils.

Drilling will likely be beneath the groundwater for the majority of the line.

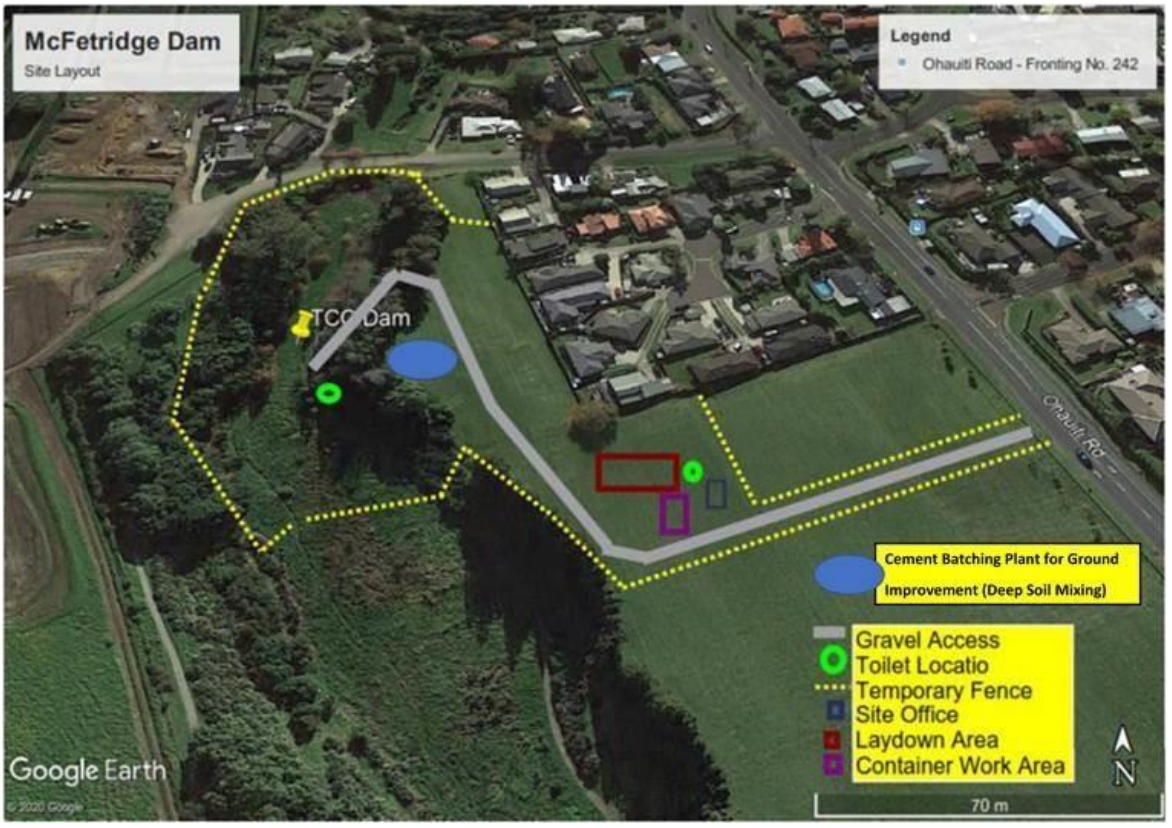
5.2.3 Site establishment and access

Following the establishment of provisions for site access and staging areas, initial site establishment will include the installation of a temporary perimeter fence encompassing the active construction site and restricting site access to the controlled entry/exit points. The fence will act as a physical and/or visual deterrent to the public and site personnel operating within the area.

Controlled site access points will be developed in conjunction with the ESCP to ensure the condition of the surrounding roads is maintained and kept free of excess dust and dirt caused by site traffic.

Implementation of the approved ESCP will ensure the construction area is secured - protecting waterways and external site ecology.

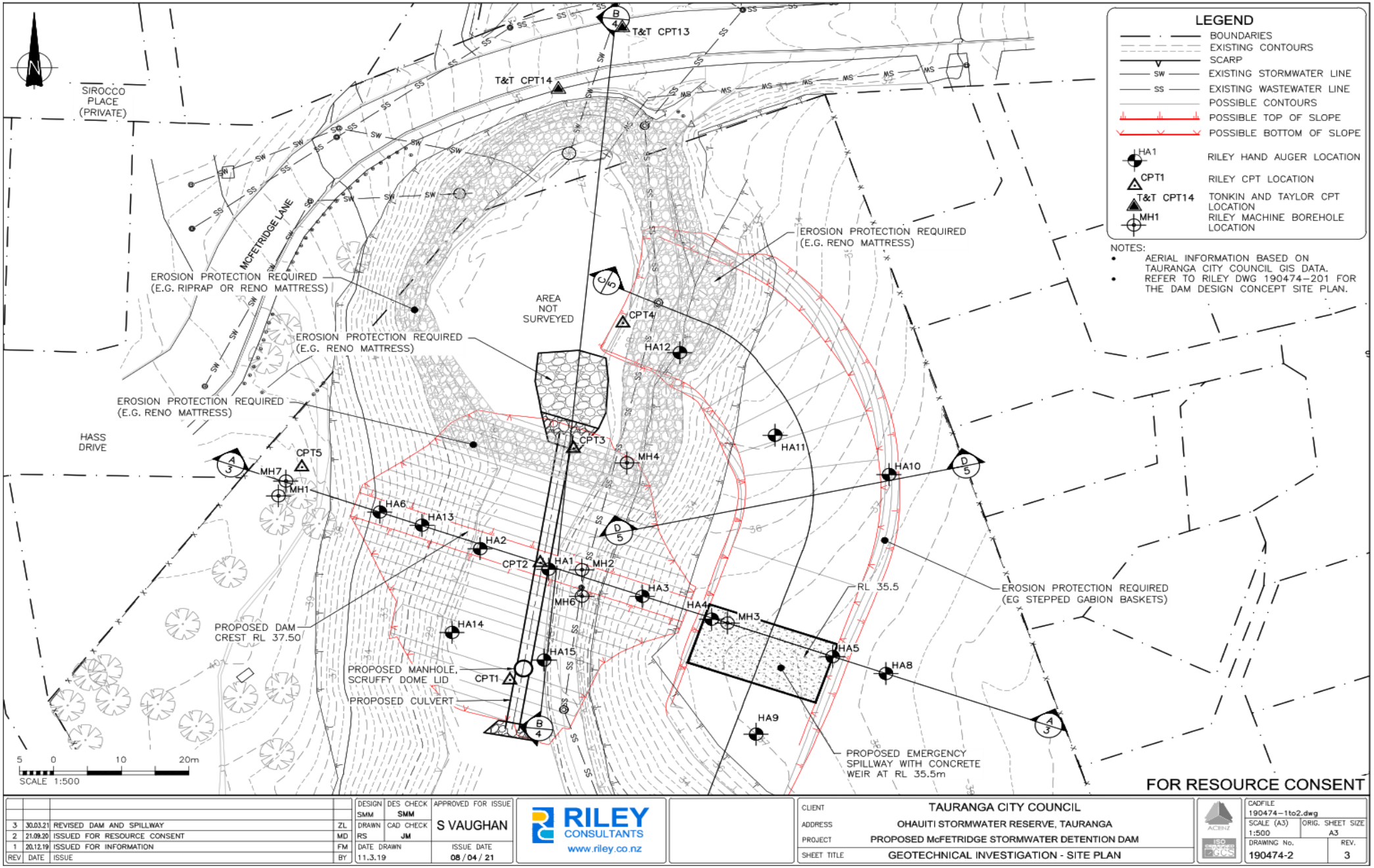
A stabilised construction entrance at the site entrance point shall be constructed to manage all traffic leaving the site and prevent the tracking of sediment onto the public road surface.



5.2.4 Installation of controls

Following approval of each ESC Sub-Plan; sediment control measures will be progressively implemented to enable work areas as per a staged construction programme.

Clean water diversions and exterior site bunding will be carried out in conjunction with the topsoil strip and stabilisation of the temporary site haul roads and working platforms.



REV	DATE	ISSUE	
3	30.03.21	REVISED DAM AND SPILLWAY	ZL
2	21.09.20	ISSUED FOR RESOURCE CONSENT	MD
1	20.12.19	ISSUED FOR INFORMATION	FM

DESIGN	DES CHECK	APPROVED FOR ISSUE
SMM	SMM	S VAUGHAN
DRAWN	CAD CHECK	
RS	JM	
DATE DRAWN		ISSUE DATE
11.3.19		08 / 04 / 21

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CLIENT	TAURANGA CITY COUNCIL
ADDRESS	OHAUITI STORMWATER RESERVE, TAURANGA
PROJECT	PROPOSED McFETRIDGE STORMWATER DETENTION DAM
SHEET TITLE	GEOTECHNICAL INVESTIGATION - SITE PLAN

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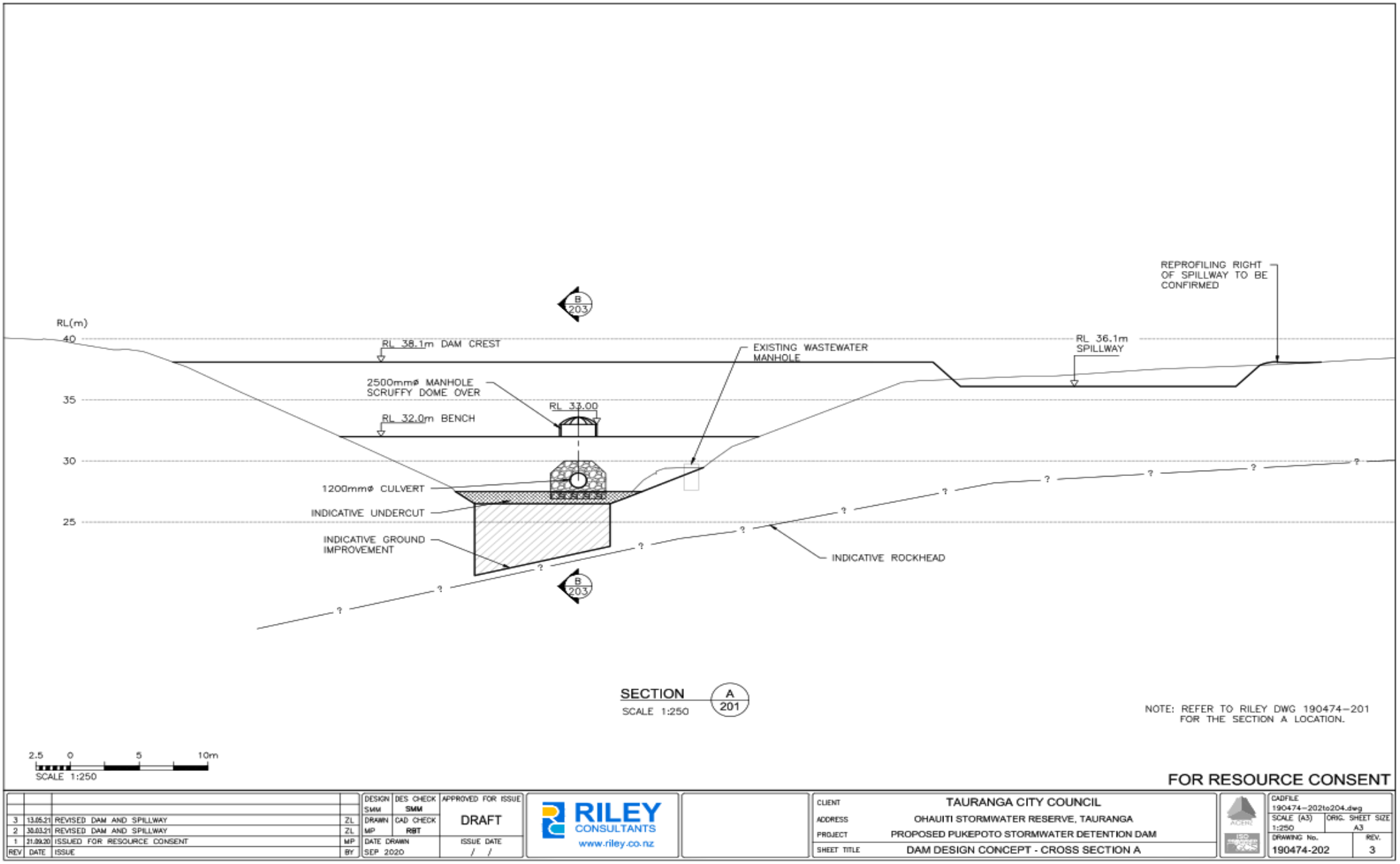
ORIG. SHEET SIZE	A3
DRAWING No.	190474-2
REV.	3


RL(m)
40
35
30
25
RL 38.1m DAM CREST
2500mmø MANHOLE
SCRUFFY DOME OVER
RL 32.0m BENCH
RL 33.00
EXISTING WASTEWATER
MANHOLE
RL 36.1m
SPILLWAY
REPROFILING RIGHT
OF SPILLWAY TO BE
CONFIRMED
1200mmø CULVERT
INDICATIVE UNDERCUT
INDICATIVE GROUND
IMPROVEMENT
INDICATIVE ROCKHEAD
B
203
B
203
SECTION A
201
SCALE 1:250
NOTE: REFER TO RILEY DWG 190474-201
FOR THE SECTION A LOCATION.
2.5 0 5 10m
SCALE 1:250
FOR RESOURCE CONSENT
3 13.05.21 REVISED DAM AND SPILLWAY ZL
2 30.03.21 REVISED DAM AND SPILLWAY ZL
1 21.09.20 ISSUED FOR RESOURCE CONSENT MP
REV DATE ISSUE BY
DESIGN SMM
DES CHECK SMM
DRAWN MP
CAD CHECK RBT
DATE DRAWN SEP 2020
APPROVED FOR ISSUE
DRAFT
ISSUE DATE / /
RILEY CONSULTANTS
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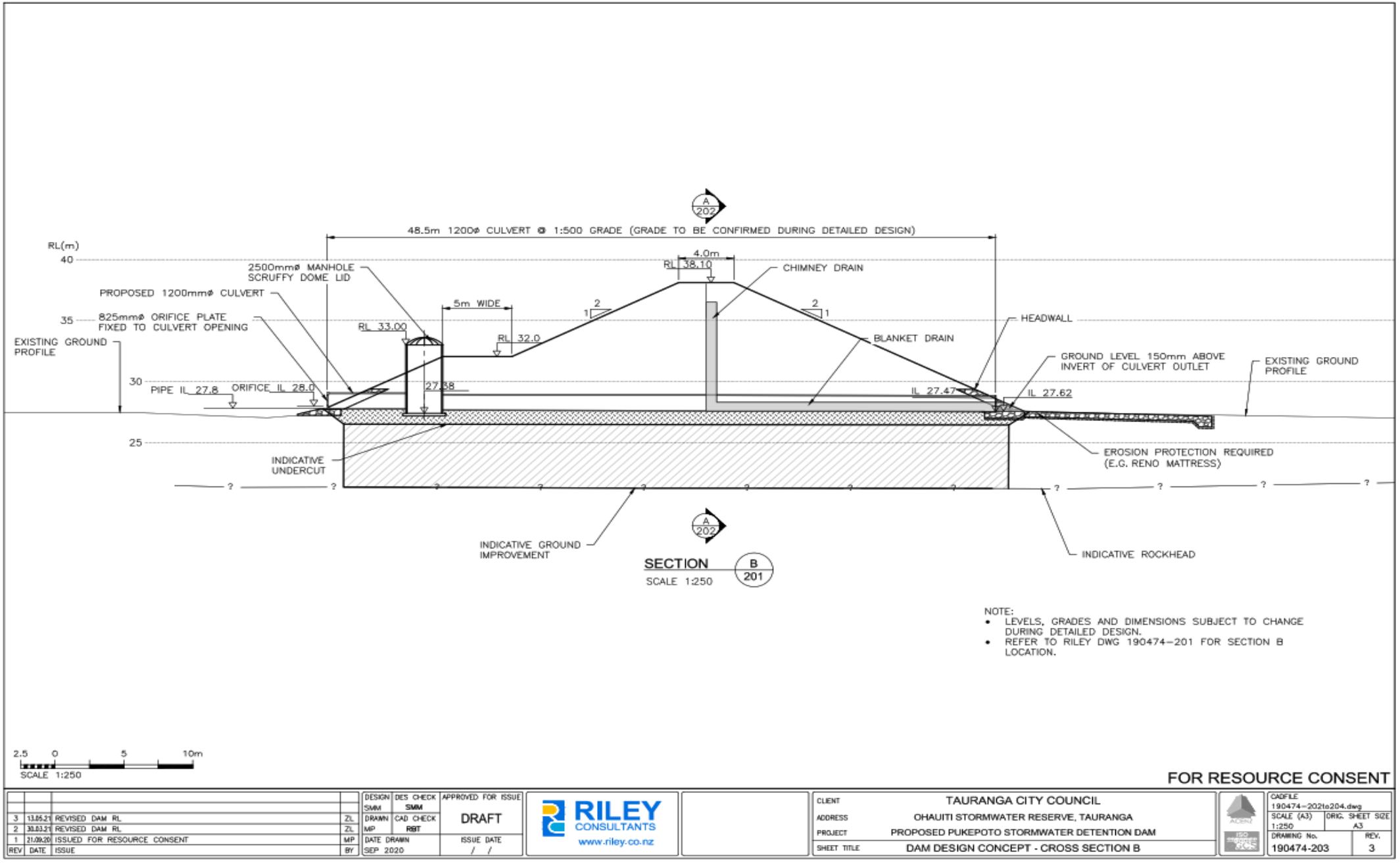
CLIENT TAURANGA CITY COUNCIL
ADDRESS OHAUITI STORMWATER RESERVE, TAURANGA
PROJECT PROPOSED PUKEPOTO STORMWATER DETENTION DAM
SHEET TITLE DAM DESIGN CONCEPT - CROSS SECTION A
CADFILE 190474-202to204.dwg
SCALE (A3) 1:250
ORIG. SHEET SIZE A3
DRAWING No. 190474-202
REV. 3


A 202
48.5m 1200ø CULVERT @ 1:500 GRADE (GRADE TO BE CONFIRMED DURING DETAILED DESIGN)
RL(m)
40
35
30
25
2500mmø MANHOLE SCRUFFY DOME LID
PROPOSED 1200mmø CULVERT
825mmø ORIFICE PLATE FIXED TO CULVERT OPENING
EXISTING GROUND PROFILE
PIPE IL 27.8
ORIFICE IL 28.0
RL 33.00
5m WIDE
RL 32.0
4.0m
RL 38.10
CHIMNEY DRAIN
BLANKET DRAIN
HEADWALL
GROUND LEVEL 150mm ABOVE INVERT OF CULVERT OUTLET
EXISTING GROUND PROFILE
IL 27.47
IL 27.62
27.38
INDICATIVE UNDERCUT
EROSION PROTECTION REQUIRED (E.G. RENO MATTRESS)
INDICATIVE GROUND IMPROVEMENT
INDICATIVE ROCKHEAD
A 202
SECTION B 201
SCALE 1:250
NOTE:
• LEVELS, GRADES AND DIMENSIONS SUBJECT TO CHANGE DURING DETAILED DESIGN.
• REFER TO RILEY DWG 190474-201 FOR SECTION B LOCATION.
2.5 0 5 10m
SCALE 1:250
FOR RESOURCE CONSENT
REV | DATE | ISSUE | BY
3 | 13.05.21 | REVISED DAM RL | ZL
2 | 30.03.21 | REVISED DAM RL | ZL
1 | 21.09.20 | ISSUED FOR RESOURCE CONSENT | MP
DESIGN SMM | DES CHECK SMM | APPROVED FOR ISSUE DRAFT
DRAWN ZL | CAD CHECK RBT
DATE DRAWN SEP 2020 | ISSUE DATE / /
RILEY CONSULTANTS www.riley.co.nz
CLIENT TAURANGA CITY COUNCIL
ADDRESS OHAUITI STORMWATER RESERVE, TAURANGA
PROJECT PROPOSED PUKEPOTO STORMWATER DETENTION DAM
SHEET TITLE DAM DESIGN CONCEPT - CROSS SECTION B
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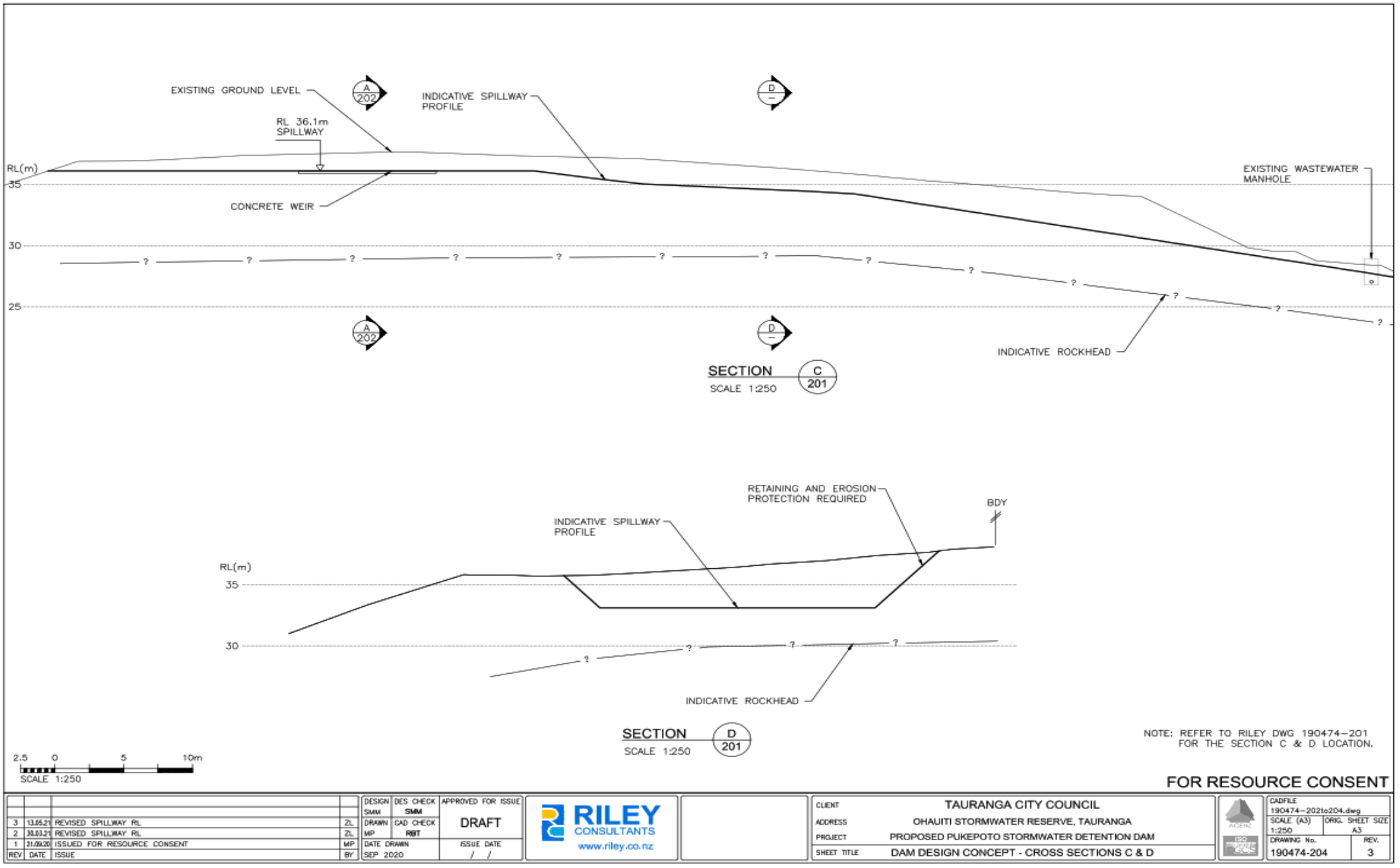
REV. 3



REV	DATE	ISSUE	BY
3	13.05.21	REVISED SPILLWAY RL	ZL
2	30.03.21	REVISED SPILLWAY RL	ZL
1	21.09.20	ISSUED FOR RESOURCE CONSENT	MP

DESIGN: SMM | DES CHECK: SMM | APPROVED FOR ISSUE: DRAFT
DRAWN: MP | CAD CHECK: RBT
DATE DRAWN: SEP 2020 | ISSUE DATE: / /

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CLIENT	TAURANGA CITY COUNCIL
ADDRESS	OHAUITI STORMWATER RESERVE, TAURANGA
PROJECT	PROPOSED PUKEPOTO STORMWATER DETENTION DAM
SHEET TITLE	DAM DESIGN CONCEPT - CROSS SECTIONS C & D

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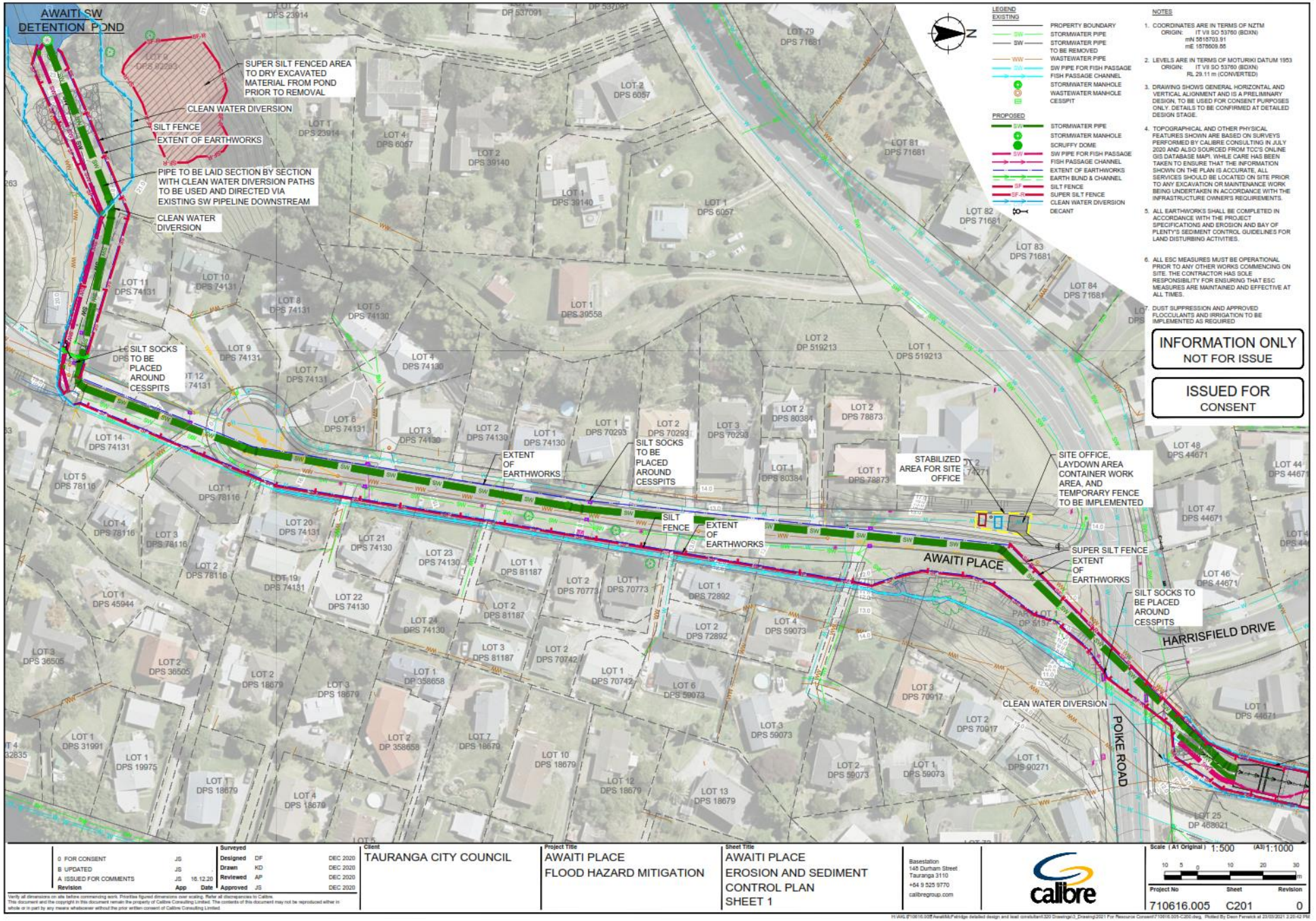
DRAWING No.: 190474-204 | REV.: 3


AWAITI SW DETENTION POND
SUPER SILT FENCED AREA TO DRY EXCAVATED MATERIAL FROM POND PRIOR TO REMOVAL
CLEAN WATER DIVERSION
SILT FENCE
EXTENT OF EARTHWORKS
PIPE TO BE LAID SECTION BY SECTION WITH CLEAN WATER DIVERSION PATHS TO BE USED AND DIRECTED VIA EXISTING SW PIPELINE DOWNSTREAM
CLEAN WATER DIVERSION
SILT SOCKS TO BE PLACED AROUND CESSPITS
EXTENT OF EARTHWORKS
SILT SOCKS TO BE PLACED AROUND CESSPITS
SILT FENCE
EXTENT OF EARTHWORKS
STABILIZED AREA FOR SITE OFFICE
SITE OFFICE, LAYDOWN AREA CONTAINER WORK AREA, AND TEMPORARY FENCE TO BE IMPLEMENTED
AWAITI PLACE
SUPER SILT FENCE EXTENT OF EARTHWORKS
SILT SOCKS TO BE PLACED AROUND CESSPITS
HARRISFIELD DRIVE
CLEAN WATER DIVERSION
POIKE ROAD
LEGEND
EXISTING
PROPERTY BOUNDARY
STORMWATER PIPE
STORMWATER PIPE TO BE REMOVED
WASTEWATER PIPE
SW PIPE FOR FISH PASSAGE
FISH PASSAGE CHANNEL
STORMWATER MANHOLE
WASTEWATER MANHOLE
CESSPIT
PROPOSED
STORMWATER PIPE
STORMWATER MANHOLE
SCRUFFY DOME
SW PIPE FOR FISH PASSAGE
FISH PASSAGE CHANNEL
EXTENT OF EARTHWORKS
EARTH BUND & CHANNEL
SILT FENCE
SUPER SILT FENCE
CLEAN WATER DIVERSION
DECANT
NOTES
1. COORDINATES ARE IN TERMS OF NZTM ORIGIN: IT V9 SO 53760 (BDXN) mN 5618703.91 mE 1575609.88
2. LEVELS ARE IN TERMS OF MOTURIKI DATUM 1953 ORIGIN: IT V9 SO 53760 (BDXN) RL 29.11 m (CONVERTED)
3. DRAWING SHOWS GENERAL HORIZONTAL AND VERTICAL ALIGNMENT AND IS A PRELIMINARY DESIGN. TO BE USED FOR CONSENT PURPOSES ONLY. DETAILS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
4. TOPOGRAPHICAL AND OTHER PHYSICAL FEATURES SHOWN ARE BASED ON SURVEYS PERFORMED BY CALIBRE CONSULTING IN JULY 2020 AND ALSO SOURCED FROM TCC'S ONLINE GIS DATABASE MAPI. WHILE CARE HAS BEEN TAKEN TO ENSURE THAT THE INFORMATION SHOWN ON THE PLAN IS ACCURATE, ALL SERVICES SHOULD BE LOCATED ON SITE PRIOR TO ANY EXCAVATION OR MAINTENANCE WORK BEING UNDERTAKEN IN ACCORDANCE WITH THE INFRASTRUCTURE OWNER'S REQUIREMENTS.
5. ALL EARTHWORKS SHALL BE COMPLETED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND EROSION AND BAY OF PLENTY'S SEDIMENT CONTROL GUIDELINES FOR LAND DISTURBING ACTIVITIES.
6. ALL ESC MEASURES MUST BE OPERATIONAL PRIOR TO ANY OTHER WORKS COMMENCING ON SITE. THE CONTRACTOR HAS SOLE RESPONSIBILITY FOR ENSURING THAT ESC MEASURES ARE MAINTAINED AND EFFECTIVE AT ALL TIMES.
7. DUST SUPPRESSION AND APPROVED FLOCCULANTS AND IRRIGATION TO BE IMPLEMENTED AS REQUIRED
INFORMATION ONLY NOT FOR ISSUE
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0 FOR CONSENT JS
B UPDATED JS
A ISSUED FOR COMMENTS JS 16.12.20
Revision App Date
Surveyed
Designed DF DEC 2020
Drawn KD DEC 2020
Reviewed AP DEC 2020
Approved JS DEC 2020
Client TAURANGA CITY COUNCIL
Project Title AWAITI PLACE FLOOD HAZARD MITIGATION
Sheet Title AWAITI PLACE EROSION AND SEDIMENT CONTROL PLAN SHEET 1
Basestation 146 Durham Street Tauranga 3110 +64 9 525 9770 calibregroup.com
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Scale (A1 Original) 1:500 (A3) 1:1000
Project No 710616.005
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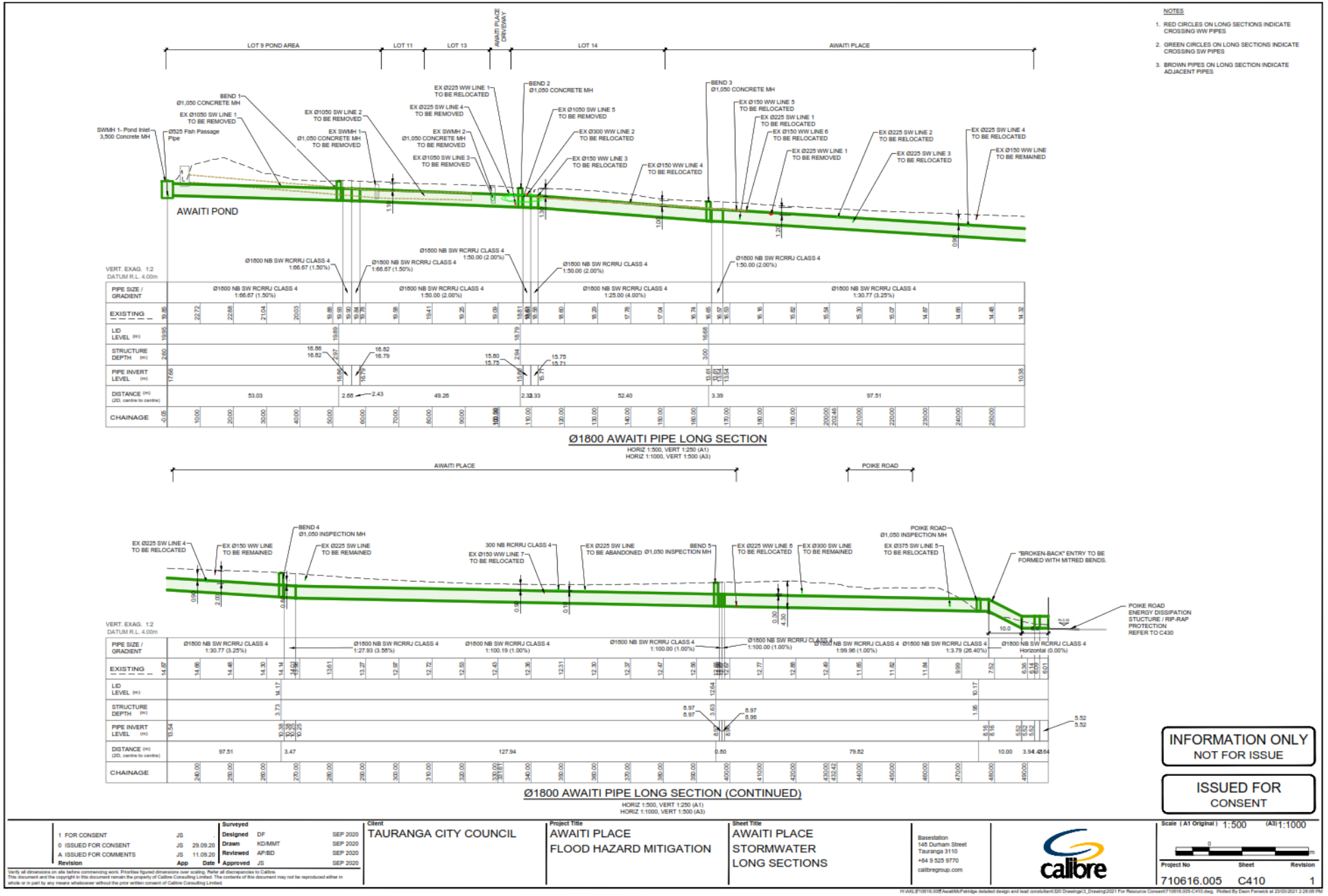
Revision 0


NOTES
1. RED CIRCLES ON LONG SECTIONS INDICATE CROSSING WW PIPES
2. GREEN CIRCLES ON LONG SECTIONS INDICATE CROSSING SW PIPES
3. BROWN PIPES ON LONG SECTION INDICATE ADJACENT PIPES
LOT 9 POND AREA
LOT 11
LOT 13
AWAITI PLACE DRIVEWAY
LOT 14
AWAITI PLACE
AWAITI POND
Ø1800 AWAITI PIPE LONG SECTION
HORIZ 1:500, VERT 1:250 (A1)
HORIZ 1:1000, VERT 1:500 (A3)
AWAITI PLACE
POIKE ROAD
Ø1800 AWAITI PIPE LONG SECTION (CONTINUED)
HORIZ 1:500, VERT 1:250 (A1)
HORIZ 1:1000, VERT 1:500 (A3)
INFORMATION ONLY
NOT FOR ISSUE
ISSUED FOR
CONSENT
TAURANGA CITY COUNCIL
AWAITI PLACE
FLOOD HAZARD MITIGATION
AWAITI PLACE
STORMWATER
LONG SECTIONS
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Site-won material will be used where required to construct stabilized soil bunds. The bund will facilitate the diversion of clean water from the construction site, and ensure that surface water is contained and managed by the site's erosion and sediment controls for the duration of the construction works.

All site access points will be stabilized and constructed to minimise material carried on public and/or facility roadways. External site erosion and sediment controls will be implemented in such a way as to limit any required
modification throughout the duration of the earthworks operation. To achieve this, internal temporary un-stabilised earth bunding will act to maintain sufficient surface water flows.

Sediment control measures will be developed in conjunction with a specialist consultant and the Bay of Plenty Regional Council to provide resilience over the duration of the earthworks operation, including high rainfall events, and winter working.

If debris is deposited onto public roads, it shall be cleaned up as soon as practicable by MAP.

The site will be monitored and maintained until vegetation is established or the site grassed to such an extent that it prevents erosion and prevents sediment from entering any watercourse.

5.1.1 Stockpiling of wet material before off-site disposal

Materials excavated from existing ponds and pipelines that needs to be disposed of off-site will be stockpiled inside a bunded area to dry out before carting off-site. Bunds will be constructed as per the details for diversion bunds in Environment Bay of Plenty Guideline 2010/01 “Erosion and Sediment Control Guidelines for Land Disturbing Activities”. Run-off water that does not naturally soak into the ground under the stockpile will be collected and passed through a sediment retention device before being allowed to enter a watercourse.

5.1.2 Fish Passage

At Pukepoto Dam the stream flow will be diverted to the west of the construction site via a steel pipe. Bunds will be formed at the upstream and downstream ends to train the flow into the pipe and ensure temporary fish passage around the construction area is maintained until the permanent low-flow culvert through the dam is constructed. Once the temporary fish passage is established the construction area will have a period of fish-relocation before construction commences. Once the permanent culvert is constructed the flow will be diverted through to its permanent route and the permanent fish passage will be established.

At Awaiti Pond the new permanent fish passage pipeline will be constructed between the pond and the junction box and the junction box and the open channel. During this construction the existing fish passage is unaffected. Once the new permanent fish passage is established the new stormwater pipeline can be constructed which will remove the current fish passage pipeline. At all times a fish passage will be maintained.

At the northern side of McFetridge Lane rip-rap rock will be installed a scour protection for the new culvert under McFetridge Lane. This scour protection will be constructed in two halves with the flow directed through the existing culvert and trained towards the east bank whilst the western rip-rap is installed, and the flow directed through the existing culvert and trained towards the west bank whilst the eastern rip-rap is installed. A small section immediately in front of the existing culvert will need the flow through the existing culvert to be stopped whilst the rip-rap is installed, this will be works of short duration lasting approximately half a day.

5.1.3 Topsoil stripping and replacement

Topsoil will, in general, be stripped and stockpiled at designated locations for later use on site or removal. The methodology for the topsoil removal/replacement and the management of stockpiles will be fully with the Designation and Consenting Conditions, once received.

5.1.4 Construction water

Construction water will be supplied from metered standpipes at an agreed and controlled rate into temporary tanks that does not overload the existing capacity of the network. The tanks will incorporate a valve operated shut-off system to enable continuous low volume filling – allowing water to be stored to supplement periods of high peak demand. A designated fill point for water carts will be established and trucks will fill from a pump connected to the temporary tanks.

During periods of reduced availability of supply through the standpipes; alternative sources shall be procured both on site and external including:

- Sedimentation ponds
- External consented water take sites (to be applied for)

5.1.5 Service protection/relocation

Existing services located within the site will be located, removed or protected or relocated as appropriate. Relocations/protections within these works include:

Sanitary sewer and stormwater main relocation (pending further investigation) MAP

will coordinate underground service relocation works with the owner of the utility.

Services at key areas will be protected to allow ongoing earthworks operation, construction access, and additional requirements of the permanent works.

If any suspected asbestos or asbestos containing material is encountered a specialist sub-contractor will be engaged to manage the handling and disposal of the suspected asbestos containing materials.

5.1.6 Bulk earthworks

The Pukepoto dam has been located to minimize the footprint f the new earth dam and also minimize the volume of ground improvements associated with the dam construction. Site- won material located near or below the water table is expected to be limited in its application due to moisture content being significantly above that required for optimal compaction.

The proposed earthworks design has sought to balance the cut to fill earthworks as much as possible. The earthworks design has taken into account the local geology. Earthworks activities will look to retain material on site.

5.1.6.1 Geotechnical hazards and site suitability

The Preliminary geotechnical and Dam Concept Assessment considers the geotechnical hazards and site suitability. Whilst a number of potential geotechnical hazards have been considered based on the investigations undertaken to date, we have not identified any specific natural geotechnical hazards that indicated the possible dam site is unsuitable. The existing wastewater pipeline located within the dam footprint does present some challenges. The following provides a summary of the primary geotechnical hazards that exist for the proposed dam.

Slope Stability

No obvious signs of recent or past slope instability have been observed in historic aerial imagery, during the site walkover at the dam site, or immediately adjacent to the reservoir extent that would be formed by the proposed dam. Notwithstanding this, any further investigations should include assessment of the ground conditions and

stability of the steeper slopes above the south-western extent of the potential reservoir, which extend into the adjacent property.

Generally, the dam concept does not involve any long-term slope toe excavations or slope surcharging. The soils strengths indicated from the in-situ shear strength testing, do not indicate any obvious slope instability hazard in the slopes adjacent to the gully. Notwithstanding this, further consideration of stability for any permanent cut slopes required to form the spillway would be necessary, as well as stability of temporary excavations required for undercutting of soft unsuitable soils in the dam footprint.

Settlement and Piping – Wastewater Pipeline

The existing wastewater pipeline beneath the dam footprint presents a risk of impounded water behind the dam initiating piping erosion of the trench backfill around the pipe. There would also be a risk of damage to the pipeline itself, due to load from the dam embankment and potential settlement. This will be mitigated by either diverting the pipeline to an alignment that will not affect the dam, or by replacing the existing section of pipeline beneath the dam footprint, including a specifically designed filter and concrete protection.

Excessive Seepage and Internal Erosion

The investigations in the true right abutment (HA4 and HA5) have identified a sand horizon that is 1.3m to 1.6m thick, inferred to be the Rotoehu Ash. This sand horizon was also encountered in HA7 and TP1, also located on the true right side of the stream approximately 160m upstream of the possible dam location. Based on the difference in ground levels between these locations, and the fact that these soils were subject to aerial deposition, the horizon will not be at a uniform level.

At the dam site the possible spillway level indicates the sand horizon would be below the full reservoir level and, as such, seepage through this layer would occur. Minimisation and/or management of seepage through the right abutment will need to be considered to manage the risk of internal erosion/piping, which could lead to uncontrolled release of impounded water. The horizon is fortunately relatively thin and the soils underlying it are of significantly lower permeability.

With the exception of the thin sand horizon in the right abutment, the investigations to date have not identified any other excessive seepage or internal erosion risk beneath the dam footprint or on the true left abutment. It should be noted that the investigations in the dam footprint at this stage have been limited to approximately 4m depth and, as such, the nature and composition of soils at depth is yet to be confirmed

5.1.6.2 Ground preparation

Foundation Settlement

The investigation has identified a 2m to 2.5m thick layer of soft compressible/low strength soil that could be subject to consolidation settlement beneath the dam fill and would need to be removed and replaced, or improved by deep soil mixing or other ground improvement technique.

5.1.6.3 Compaction control

All earthworks, including excavation, preparation of subgrade, and backfill will be performed in accordance with the design specifications. Earthworks will be observed by a qualified Geotechnical Engineer.

Compaction of fill material will be carried out to certifiable standards, with conventional plant under engineering control, and site observations undertaken to IPENZ Construction Monitoring Level 4 (CM4). Cohesive fill will be controlled largely in terms of minimum allowable shear strengths and maximum allowable air voids, but also including test results in terms of Maximum Dry Density (MDD) within appropriate moisture content ranges.

Gravel working platform material will be spread and compacted in uniform lifts not exceeding 200mm in uncompacted thickness.

Other test methods may be used at the Geotechnical Engineer's discretion.

5.1.7 Completion

Following the completion of earthworks activities within each of the staged catchment areas it is anticipated:

A "Statement of Professional Opinion as to Suitability of Completed Earthworks" is to be completed by the Geotechnical Engineer if required by the Resource Cosent.

Works will be completed in accordance with MAP quality procedures, inspection and test plans (ITP's) and conformance confirmed with respect to design drawings and specifications

5.2 Environmental

5.2.1 Erosion and Sediment Control

Prior to the commencement of any soil disturbing activities on site; the project team must ensure that an approved Erosion and Sediment Control Sub-Plan is in place and adequate to manage the proposed scope of activities to be carried out.

All erosion and sediment controls shall be carried out in accordance with the Bay of Plenty Regional Water and Land Plan 1 December 2008 (updated 2 March 2010). Where the Bay of Plenty Regional Water and Land Plan 1 December 2008 (updated 2 March 2010) is silent on the ,matter standard details will be drawn from the Waikato Regional Council Guidelines for Soil Disturbing Activities, January 2009 or as agreed with the BoPRC Environmental compliance Officer assigned to the project.

Prior to the commencement of bulk earthworks in any area; the installation and intent of the approved Erosion and Sediment Control Plan (ESCP) must be certified by an appropriately qualified and experienced erosion and sediment control practitioner nominated by MAP in collaboration with BoPRC.

Certification of all controls implemented on site must be carried out within five working days of the completed implementation.

All sediment laden run-off from the site shall be treated by an appropriate sediment control measure; to be fully operational prior to the commencement of bulk earthworks within the catchment area.

All runoff diversion systems shall be designed and maintained to ensure that they can sufficiently convey flows from contributing catchment areas up to a 20% AEP rainfall event without overtopping and have adequate protection against erosion.

Inspections of ESCP controls will be carried out weekly as a part of general site monitoring and maintenance. Immediately after a rain event; all erosion and sediment control devices are to be visually inspected and ensured to be in good working order.

Note that any approved erosion and sediment control device related to the isolation of a catchment area may not be disestablished without prior approval from the Bay of Plenty Regional Council.

Care must be taken to ensure that clean water diversions are in place to manage any alterations to the existing natural catchment areas.

All vehicles shall use the controlled access and egress points as designated within the approved ESCP; drivers will ensure that mud and debris are cleared to a suitable extent from their tyres via the control devices implemented for this purpose before leaving the designated site area onto public road surfaces.

Erosion and sediment controls shall be inspected during weekly site audits that are to be carried out by the site supervisor; any identified impairment or poor performance observed during these audits shall be notified to the engineer and promptly addressed. A full site audit of erosion and sediment controls is to be carried out within 24 hours of a rainstorm event likely to impair their function or performance. Auditing records will be maintained and made available at all times.

The approved ESCP is included as an appendix to this plan. Any resulting corrective measures will be implemented under the guidance of a suitably experienced erosion and sediment control professional.

5.2.2 Noise and Vibration

Before the commencement of any soil disturbing activities on site; the Construction Noise and Vibration Management Plan (CNVMP) must be consulted by the site team prior to the development of the Work Pack for each area. The CNVMP is included as an appendix to this plan.

Vibration levels at neighbouring properties to not damage the buildings or chattels, nor cause unacceptable effects on amenity

5.2.3 Dust

Before the commencement of any soil disturbing activities on site; the Dust Management Plan (DMP) must be consulted and incorporated within the development of the Work Pack for each area. The DMP is included as an appendix to this plan.

The soil moisture of exposed areas must be maintained at an appropriate level so as to prevent dust from being blown beyond the site boundary.

A means of dust suppression must be in place at all times while soil is exposed on site; and staff must be available on-call to operate those systems in the event that they are required.

All earthworks activities will be carried out so that all dust and particulate emissions are kept to a practical minimum to the extent that there are no dust discharges beyond the boundary of the site that cause an objectionable effect

5.3 Ecological

5.3.1 Fish Management

Prior to the disturbance of any wetland/stream areas within the site; the Fish Management Plan must first be submitted to council for certification to ensure that the capture and transfer of any and all fish have been removed and the area has been marked as clear.

5.4 Staging

All earthworks and soil disturbing activities shall be planned, programmed and implemented to occur in a staged manner and minimise the extent of exposed surfaces. A record of open catchments and key dates for excavation will be maintained by the civil supervisor for the development of future Work Packs and amendments to the programme.

All excavated area must be stabilised within 14 days of completion unless otherwise approved by the Bay of Plenty Regional Council.

5.5 Winter Works

Unless approval to undertake earthwork during the period 1st May to 30th September inclusive has been approved by Bay of Plenty Regional Council; the full project site shall be appropriately stabilised by 30 April each year.

MAP intends to carry out Winter Works each year; this will be made clear in the Resource Consent application, and it is anticipated a written application will need to be submitted in writing to the Bay of Plenty Regional Council prior to 1st April each year.

Accordingly, erosion and sediment controls have been designed to ensure their capacity is sufficient to manage winter surge events; refer to the Erosion and Sediment Control Plan for additional detail.

5.6 Accidental Discovery

In the event of any potential archaeological artefacts being discovered the works shall cease immediately in the vicinity of the discovery and the archaeologist shall be notified. Works may only re-commence once the

area has been assessed deemed clear by the Bay of Plenty Regional Council. The full Accidental Discovery Protocol (ADP) is included as Appendix F.

5.7 Traffic

All construction traffic associated with the construction of the Works will be managed under an approved Temporary Traffic Management Plans drafted by a Temporary Traffic Management specialist subcontractor to MAP Projects Ltd.

Specific items to be covered in the Temporary Traffic Management Plans include;

Construction site accesses for Pukepoto Dam Construction
Construction site accesses on and around Awaiti Place
Lane closures for Poike Road Crossing

6. Consent Monitoring

Consent condition requirements under resource consents will be written into the Projects operational management plans for the development of construction methodologies and formal auditing processes. The MAP Project Manager will oversee adherence to the consent requirements within their sign-off and approval of each Construction Area Plan and Work Packs associated with those areas.

Formal auditing will be carried out on a monthly basis by the Civil Supervisor or delegated authority to ensure compliance with the consent and designation conditions, and that effective controls are in place and operational.

Consent and designation conditions will be tabulated and assigned owners with the delivery team. Once the relevant activities have been completed, each condition will be closed out with agreement from the relevant local authority.

7. Complaints Management

All complaints will be managed, investigated and resolved (as appropriate) in accordance with MAP Contractors policy and in collaboration with Tauranga City Council.

Enquiries and complaints will be dealt with in a responsive manner so that stakeholders feel their concerns are being seriously dealt with and not dismissed. This will assist in building a relationship of trust and reliability between the community and project team.

The TCC Communications and Stakeholder Manager and MAP Project Manager will handle the enquiries and complaints that arise on a project. A project team representative will be available 24 hours a day, seven days a week.

If any member of the project team is approached in the field by someone distressed or concerned about the project, they will notify the TCC Communications and Stakeholder Manager and MAP Project Manager immediately.
A central point of contact will be maintained for enquiries and complaints, to enable the content and distribution of information to the community to be managed and monitored.

Details of enquiries and complaints will be recorded and maintained in the project's Community Database. If a hard copy record of enquiries and complaints is required, a 'Stakeholder and Community Contact Record' and a 'Register of Complaints and Enquiries' forms will be used.

The following protocol will be used as a basic guide used for handling enquiries and complaints.

The member of the project team who receives the enquiry or complaint will record and forward it to the TCC Communications and Stakeholder Manager immediately.
If approached directly by a member of the community with a complaint, the project team member will listen to the person's concerns and advise them to contact the TCC Communications and Stakeholder Manager.

Alternatively, the team member will ask for the person's contact details and advise that a team member will be in contact as soon as possible.

The TCC Communications and Stakeholder Manager will nominate someone from within that team or the wider project team and ensure a response and appropriate action has commenced as soon as possible after receiving the enquiry and complaint.

In conjunction with project management, the enquiry/complaint will be managed until resolved.

7.1 Environmental Complaints Form

The complaint process will employ the use of a complaint form to address all site-specific activities throughout the project

The form will contain but not be limited to:

Name and address of complainant;
Identification of the nature of the complaint;
Date and time of the complaint and alleged event;
Weather conditions at the time of the complaint;
Operational processes on site during the time of the complaint; and
The result of any investigation or inquiry carried out in respect to the complaint, other relevant parties informed of the results of the complaints inquiry and actions taken.

7.2 Environmental Complaints Register

A stakeholder database of all queries relating to the Project will be managed by the TCC Communications and Stakeholder Manager, with input and viewing ability by the MAP Project Manager. It will contain all complaints received for the project.

These complaints will be discussed within the regular progress meetings held by TCC & MAP Projects Ltd.

8. Health and safety

Working under MAP Project Ltd's company-wide framework during the Delivery Phase will help to ensure we will deliver on our commitment to best-practice management of safety and health.

MAP Project Ltd's Health and Safety Policy sets out the minimum mandatory requirements to provide a safe workplace for workers and visitors to our worksites or workplaces. This Policy applies to all entities controlled by the business where the business exerts management control. It applies at all levels of the organization.

Minimum requirements

MAP Projects Ltd sets the following minimum safety requirements:

Senior leaders must demonstrate a personal visible commitment to our safety, health and environmental (SHE) Cultural Framework, and ensure all workers understand the requirements of the management system as it applies to the work they are undertaking, so that work is undertaken safely and efficiently.

Safety and health objectives, targets and key performance indicators must be established, with performance against these monitored and analysed to provide the basis for continuous improvement.

The MAP systems define a framework that requires the application of the hierarchy of controls to eliminate or minimise risks to a worker's health and safety when working on certain high-risk construction activities. If it is not reasonably practicable to eliminate the risk, all effort must be made to minimize those risks.

A Safe Work Method Statement (SWMS) must be developed where a worker is required to undertake a task that the business has determined to be high risk construction work.

All safety and health incidents must be reported in accordance with the incident notification requirements, thoroughly investigated, and appropriate corrective action undertaken with the aim of preventing a recurrence of the incident.

All workers must take reasonable care for their own health and safety, and take reasonable care that their acts or omissions do not adversely affect the health and safety of other people.

Effective communication, cooperation and consultation channels must be in place as is reasonably practicable to consult with workers who are or are likely to be directly affected by a matter relating to work health and safety.

The competency of a worker must be assessed when a worker is:

Undertaking a task that the business has defined as high risk construction work and where a regulatory high- risk work licence applies.

Operating load shifting equipment, or other powered mobile plant.

Undertaking a task that is covered by a regulatory high-risk work licence or where regulatory provisions exist for any worker.

Managers and supervisors must ensure workers are competent to undertake their duties safely and efficiently.

All plant and equipment whether it is hired, leased, purchased, designed, constructed, operated or maintained must be risk assessed, and appropriate controls implemented, to continuously eliminate or manage risks, to ensure the health and safety of any worker.

Modifications to plant and equipment outside the manufacturer's standards must not be done unless a detailed change management process is followed, including assessment of risk, engineering and statutory authority certification (if required).

All levels of the organisation must be prepared to respond to an emergency and, in the event of an emergency, plans and capabilities are in place to eliminate or minimise the damage to people, preserve ongoing operations and our reputation.

8.1 Specific Site Hazards

Site investigations to date indicate that there are no potential hazards associated with the presence of soil contamination and fill materials.

Hazards associated with site:

- Working in and around live watercourses
- Compaction plant working close to shoulder of embankments
- Road traffic
- The Public
- Buried Services
- Working within excavations

There is the potential for additional hazards to be identified and encountered during the project. MAP and their sub-contractors are responsible for reviewing any new work element and assessing whether there are any new associated hazards and associated elimination, isolation and minimisation measures. Following any assessment; all personnel will be briefed on the health and safety procedures associated with the new hazard.

8.2 Personal Protective Equipment (PPE)

All workers must wear as a minimum the following:

- Gloves (suited to the task in hand)
- Safety boots with ankle support.
- Hi-Vis outer layer (TTMC-W17 compliant Hi-Vis outer layer when working in the road corridor)
- Hard hat
- Safety glasses
- Additional PPE as required by the specific task or tool

Changes to site specific PPE requirements are to be reflected in all health and safety documentation and all parties notified.

8.3 Incident reporting

Any incidents shall be reported to the Engineer and the TCC Project Manager, within 24 hours for minor incidents and immediately for all others.

Appendix A: Erosion and Sediment Control Plan

TC24/20 Awaiti Place and Ohauiti Stormwater Upgrades ECI

Erosion and Sediment Control Plan

Details of revision amendments

Document name	Revision	Document No.	Author
Erosion & Sediment Control Plan	A2	TC24/20-ESCP-001	Andy Hollins

Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
A	08 Sept 2020	G Cooper	M Prater	M Prater	First Issue – Consent Application
A1	09 April 2021	A Hollins	M Prater	M Prater	Second Issue – Consent Application
A2	20 May 2021	A Hollins	M Prater	M Prater	Second Issue – Consent Application

Revision Details

Revision	Details
A	Consent Application Management Plan
B	
C	
D	
00	
01	
02	

1. Introduction

1. Purpose and Scope

This Erosion & Sediment Control Plan (ESCP) is a preliminary plan for consent application purposes. This plan will be developed during SP1 and SP2 to ensure we satisfy the requirements of the resource consent conditions and to provide guidance on the management of construction derived erosion and sediment.

The plan sets out management methods, controls and reporting standards to be implemented to minimise the impact of construction activities the local environment people, businesses, and infrastructure while also meeting the legislative requirements relating to construction noise and vibration associated with the project. Compliance with resource Consent Conditions will be achieved through the implementation of the Environment Bay of Plenty Erosion and Sediment Control guidelines for Land Disturbing activities and frequent audits of these controls by the MAP Projects Ltd (MAP) construction team.

The Erosion & Sediment Control Plan will be implemented throughout the entire construction period and is intended to be the primary tool to confirm how the environmental impact of land disturbing activities will be controlled. Successful execution of any ESCP can only be achieved through an informed, engaged, and empowered site team.

It is intended that this plan will be updated throughout the construction phase of the project as required.

2. Project Description

The Awaiti Place and Ohauiti Reserve Stormwater Upgrades is part of Tauranga City Council's (TCC) improvements of its stormwater network. Awaiti Place has been identified as a high flood risk environment and in order to mitigate the risk TCC have opted to implement the recommended solution of a flood attenuation facility upstream of McFetridge Lane and a new pipeline Awaiti pond and Poike Road.

The Awaiti Place and Ohauiti Reserve Stormwater Upgrades project covers the area of south of McFetridge Lane and the corridor from Awaiti Pond, along Awaiti Place, to Poike Road.

3. Location

The location of the project is shown below in Figure 1-1.

Figure 1-1: Extent of the Project Area (highlighted in red, base map from Google Maps)

4. Environmental Management Plan Framework

The project requires a set of environmental management and mitigation plans to ensure the successful construction of the project. The Construction Management Plan (CMP) will set the overall framework for the management of the project, including environmental and social aspects of the project and is supported, by a series of sub management plans focussing on specialist environmental areas, as identified in the consenting phase of the project.

5. Roles and responsibilities

The listed site personnel in Table 1.1 will be required to ensure construction noise and vibration is considered and signed off in the work method statements and relevant schedules associated with the planned construction activities.
Roles and responsibilities for the implementation of this Plan are provided in Table 1-1.

Table 1-1: Plan Implementation - roles and responsibilities

Name	Role	Contact details	Responsibility
Andy Hollins	Contractor's Representative	andy@mappro.co.nz 027 2447368	Responsible for all day to day operations on the project
Bruce Watson	Contractor's Project Manager	bruce@mappro.co.nz 021 266 6327	Ensuring the Construction Environmental Advisor and the Zone Managers are aligned in their approach to ensuring environmental compliance
Jon Auld	Construction Environmental Manager	jon.auld@mappro.co.nz 027 322 2440	Day to day implementation of the CMP and sub management plans and mitigation plans onsite Onsite environmental compliance
TBC	Community Engagement Manager	TBC during SP1	Communication with stakeholders and the public throughout the construction phase Implementation of the feedback procedure

6. Scope

The scope of the Works is located on two distinct sites as follows:

Pukepoto Dam

- Site establishment and access
- Location, removal, and relocation of existing services
- Implementation of erosion and sediment controls
- Muck-out of watercourse
- Ground improvements (deep-soil mixing)
- Stockpiling to topsoil and unsuitable materials
- Stockpiling of imported cohesive materials
- Construction of earth dam (bulk cut & fill)
- Constructiuon of spillway
- Pipe crossing of McFetridge Lane, incl. inlet & outlet structures
- Landscaping

Awaiti Place

- Site establishment and access
- Location, removal, and relocation of existing services
- Implementation of erosion and sediment controls
- Awaiti pond modifications (removal of unsuitable material and modifications to inlet and outlet structure and raising of dam crest)

- Construct new stormwater pipeline, incl. crossing of Poike Road and outlet structures and dedicated fish passage
- Construction of in stream scour protection

7. Methodology

1. General

Construction will involve the establishment of site facilities, installation of erosion and sediment controls, bulk earthworks, and general site preparation activities.

Catchment areas will be established progressively to facilitate construction activities during the duration of the earthworks period; each catchment will consist of an appropriate sediment control measures, and clean/dirty water diversion network to provide for expected surface water flows during the earthworks and associated activities.

Staged ESCPs will be developed in collaboration with a specialist consultant and submitted to the Bay of Plenty (BoPRC) for certification, these plans will generally describe individual catchments or parts thereof, and the specific activities required for the Works.

Upon completion of each catchment area; the sediment controls will be commissioned and signed off by a suitably qualified erosion and sediment control professional prior to commencement of any sediment creating activities within that area.

Materials used in the construction of the earth dam will be a mix of site-won, and imported materials to enable the efficient implementation of the construction programme, and provide for material imbalances within the cut-fill earthworks operation. Local borrow-pits are being investigated to minimize the quarrying and haulage of materials. Pipe surround will be imported aggregate.

The actively worked un-stabilised catchment area will be limited to 10ha unless approved in writing by the Bay of Plenty Regional Council.

8. Programme

The construction of Pukepoto Dam will be carried out from late 2021 and is planned to be complete that by the end of 2022.

To suit TCC funding streams the Awaiti pipeline works may commence in the 2022 season and may run into the following winter. The ESCP controls will be specified so that WBOPRC can consent to winter workings.

The Awaiti Pond modification will commence at the beginning of the 2022/2023 earthworks season and is planned to be completed that earthworks season.

9. Legislative Requirements

The specific resource consent conditions and how they are addressed by the project will be outlined in Table 9-1 once the Consents are granted. **EXAMPLES OF TYPICAL CONDITIONS INCLUDED FOR ILLUSTRATION PURPOSES**.

Table 1-2: Relevant Resource Consent Conditions

Condition number	Condition	Cross Reference that demonstrates compliance
For the purpose of the CNV conditions: **BPO – means the Best Practicable Option in accordance with s16 of the RMA** **Major Construction Activity – means any construction activity that would result in an exceedance of** **Work Area – means any area where construction works associated with the Project are undertaken (E.g. all active works areas and construction support areas).** **Additional definitions relevant to the consent conditions can be found in Appendix A.**		

RMC 1	*The outline plans ('**OP**') shall include the following plans for the relevant stage(s) of the Project:* *a. Erosion and Sediment Control Plan ('ESCP') prepared in accordance with conditions RMC 2* *The ESCP may be amended following the submission of the OP(s) if necessary to reflect any changes in design, construction methods, or management of effects. Any amendments are to be discussed with and submitted to the Council for information without the need for a further OP process, unless those amendments once implemented would result in materially different effects to that described in the original ESCP.*	*This document*
RMC 2	*A ESCP shall be prepared by a suitably qualified and experienced person, and shall be submitted as part of the relevant OP. The purpose of the ESCP is to provide a framework for the protection of watercourses during the construction works and implementation of the Best Practicable Option ('**BPO**') for the management of all unstabilised earthworks and sediment effects.*	

10. Erosion and Sediment Control

1. Staged ESCP Approach

Erosion and Sediment Control Sub-plans for catchment areas (i.e. Pukepoto Dam Site, the Awaiti Pond Site, and the Awaiti Pipeline) will be progressively submitted to council in collaboration with an appropriately qualified and experienced erosion and sediment control practitioner for certification prior to the commencement of activities proposed within each catchment area.

Stages will be completed sequentially, but there will be some concurrent working in each of the areas.

A progressive survey of the open earthwork area will be coordinated by the project survey team and earthworks contractor to ensure compliance with the project conditions. Records of completed and planned earthworks staging will be made available to the council where required.

Earthworks will be stabilised against erosion as soon as practicable and in a progressive manner as earthworks stages are complete.

Preliminary design ESCP devices will include the following as a minimum:

Awaiti Place

• Proposed pipe to be laid in small/manageable sections with clean water diversion paths to be used and directed via existing SW pipeline downstream.

• Silt fence to be installed upstream of 1800 dia pipe to protect the stream and fish passage.

• Super silt fence area to be placed near Awaiti pond to dry any excavated material from the pond prior to removal.

• Super silt fence to be installed across Poike road around the 1800 dia pipe.

• Earth bunds are proposed for the Awaiti Road Decanting Earth Bund (downstream of the pond) and Poike Road Outlet (downstream of the proposed energy dissipator)

• Stabilized area for site office, laydown area, container work area, and temporary fence to be implemented around at the left side of Poike Road intersection.

• Clean water diversion drains are to be constructed around Awaiti pond, Junction box and existing channel on Poike Road.

• Geocloth protection (silt socks) are to be installed around the existing catch pits on any surrounding areas.

McFetridge Lane

- Silt fence to be installed around the full extent of the earthworks area (Pukepoto Dam, proposed culvert and energy dissipation area).
- A decanting earth bund is to be placed north of McFetridge Lane with two decants.
- A stabilised area to be provided for the temporary access from Ohauiti Road, site office, laydown area and container work area. A temporary fence is to be implemented at the open area near Ohauiti Road.
- Clean water diversion drains to be installed and maintained around the Pukepoto Dam and around energy dissipator structure during the construction.
- Geocloth protection (silt socks) to be installed at existing catch pits.

2. Sediment Control

The project team will be briefed and trained to ensure MAP have the knowledge and good practices on site throughout the Works; the Earthwork Supervisor will be the ESCP Champion on site and held accountable for the establishment and maintenance of EWSCP measures.

The MAP Earthworks Supervisor and MAP Project Manager will carry out regular ESC walkovers prior to and immediately following an expected rainfall event to identify any risks and action the required remediation.

The MAP Earthworks Supervisor will be responsible for the monitoring and maintenance of all ESC devices across the site.

3. Certification

An as-built survey of all ESCP implementations will be carried out and maintained in project records.

Certification by the Bay of Plenty Regional Council or an appropriately qualified and experienced erosion and sediment control practitioner will be obtained prior to the commencement of works within each ESCP catchment area.

4. Primary ESC Devices

The project may employ any of the approved Erosion and Sediment Control Practices detailed within the Environment Bay of Plenty document "Erosion and Sediment Control Guidelines for Land Disturbing Activities, Guideline 2010/01" over the course of the project. These practices will be designed and executed in accordance with the guidelines and in collaboration with an appropriately qualified and experienced erosion and sediment control practitioner.

The primary Erosion and Sediment Control devices that will be employed by the project are runoff diversion channels/bunds, sediment retention measures, and silt fences.

5. Runoff Diversion Channel/Bund

The runoff diversion bunds (and channels) will be designed and constructed as per Environment Bay of Plenty document "Erosion and Sediment Control Guidelines for Land Disturbing Activities, Guideline 2010/01".

6. Sediment Retention Pond

Sediment retention ponds if required will be designed and constructed as per Figures 51, 53, 54 schematic of Environment Bay of Plenty document "Erosion and Sediment Control Guidelines for Land Disturbing Activities, Guideline 2010/01".

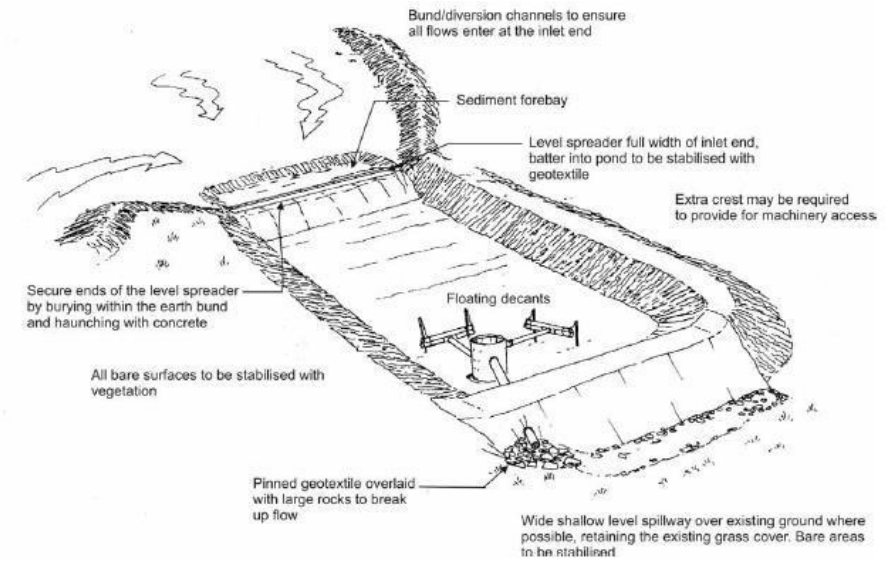


Figure 51 Sediment retention pond schematic.

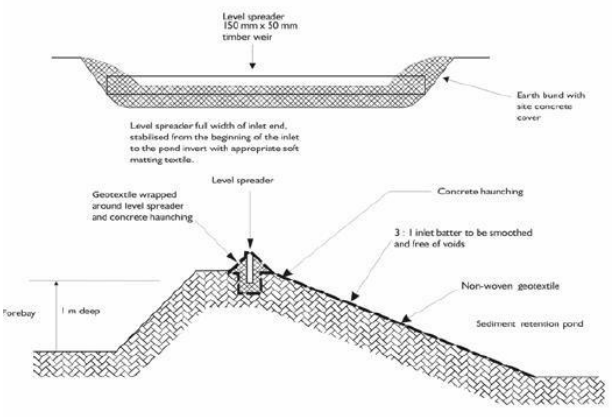


Figure 54 Level spreader detail – courtesy of Auckland Regional Council.

All SRP's will be designed as per the volume requirements specified within the BoPRC guidelines

Ponds within the site will not be flocculated. The requirement for flocculation will be periodically reviewed.

8. Silt Fence

As per Figure 73 of the Environment Bay of Plenty document "Erosion and Sediment Control Guidelines for Land Disturbing Activities, Guideline 2010/01".

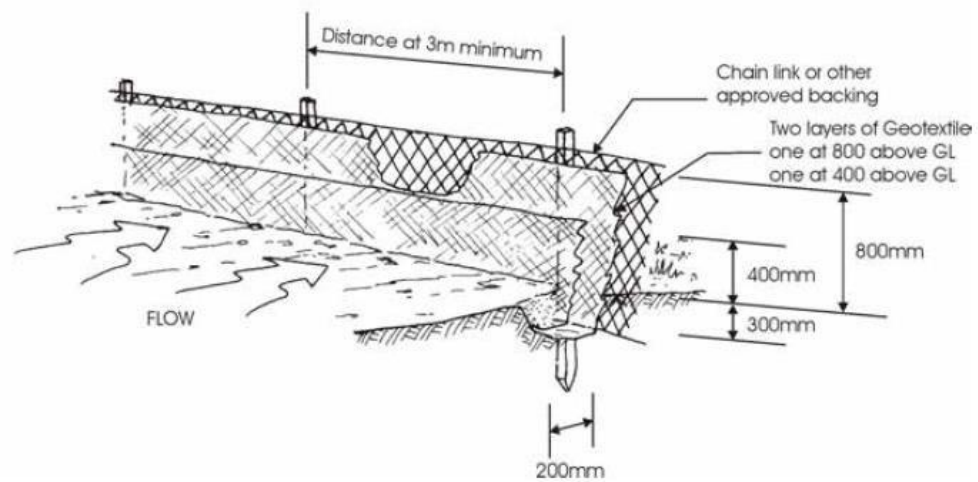


Figure 73 Super silt fence schematic.

Figure 75 Super silt fence clearly delineating disturbed area and protected vegetation - photo courtesy of Ridley Dunphy Environmental Limited.

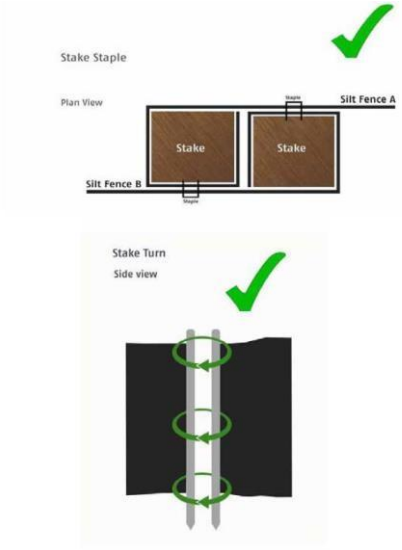


Figure 76 Super silt fence joins - courtesy of Fletcher Construction Company Limited.

9. Stabilised Entrance

As per Figure 43 and 45 of the Environment Bay of Plenty document "Erosion and Sediment Control Guidelines for Land Disturbing Activities, Guideline 2010/01"

2. Secondary ESC Devices

1. Contour Drains

Contour drains will be implemented where ponding may occur across level ground or to temporarily divert the flow of water within a catchment area to optimise the effectiveness of controls. Contour drains will be designed and implemented as per the BoPRC guidelines.

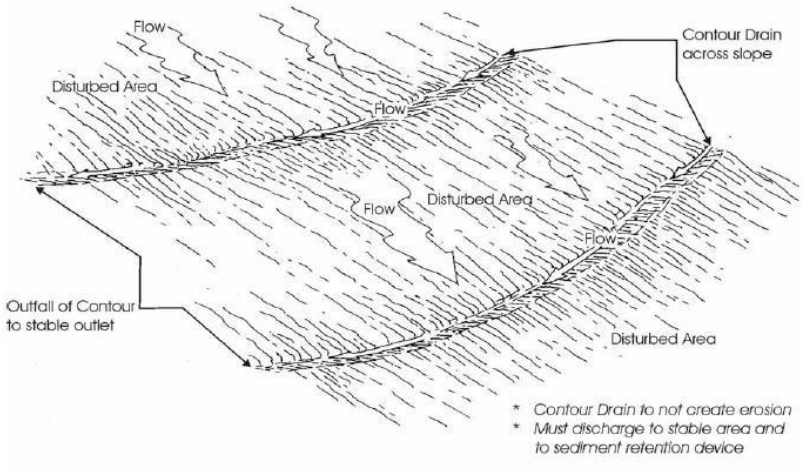
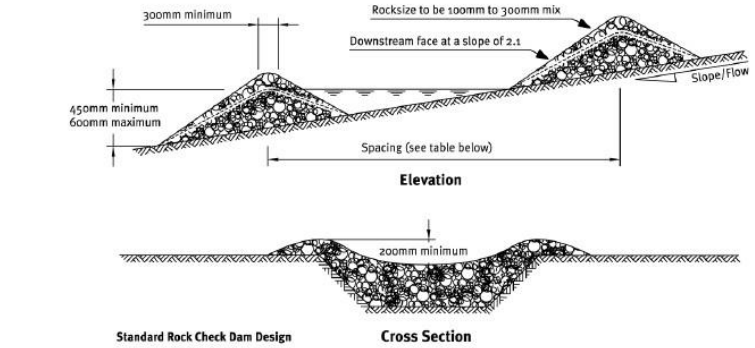


Figure 24 Contour drain schematic.

2. Rock Check Dams

Where velocities within a Runoff Diversion Channel or Contour Drain become too great and create an elevated erosion risk to the site; a check dam will be implemented to slow the velocities of the sediment laden water.

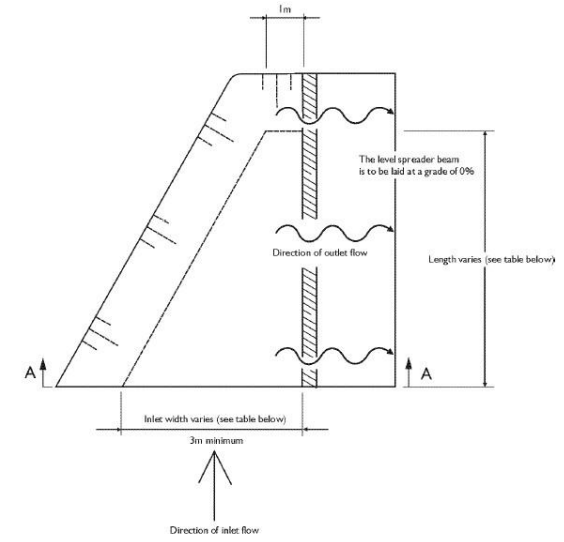


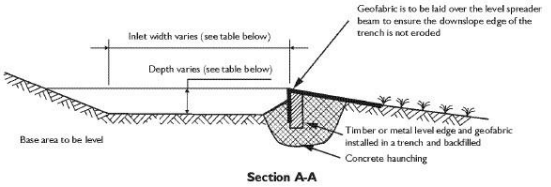
Slope	Spacing (m) Between Dams (450mm centre height)	Spacing (m) Between Dams (600mm centre height)
2% or less	24	30
2% to 4%	12	15
4% to 7%	8	11
7% to 10%	5	6
over 10%	Use Stabilised Channel	Use Stabilised Channel

Figure 42 Rock check dams - image courtesy of Auckland Regional Council 1999.

3. Level Spreader

Where clean water diversions or erosion/sediment control devices generate excess velocities in the management of water flow across the site, devices such as a level spreader will be implemented to ensure flow concentrations are dispersed.





Design Flow (m^3/sec)	Inlet Width (m)	Depth (mm)	End Width (m)	Length (m)
0-0.3	3	150	1	3
0.3-0.6	5	180	1	7
0.6-0.9	7	220	1	10

Figure 50 Level spreader detail - image courtesy of Auckland Regional Council 1999.

4. Stormwater Inlet Protection

New or existing stormwater inlets will be protected from collection of sediment laden runoff where necessary using the following measures:

Bunding using a sediment sock or sand bags; Covering

using a geotextile filter cloth and scoria; Wrapping

geotextile fabric around the cesspit grate; or

through the use of a sediment filter bag within the drainage structure

3. Principles for Minimising Sediment Discharge

1. Minimise Disturbance

Objective: to limit the area and duration of soil disturbance, using a minimum earthworks strategy (low impact design), setting Limits of Disturbance and demarking 'No Go' areas on site.

On site

- Exposed areas will be limited during construction to reduce the potential for generating erosion and the limits of disturbance will be clearly identified on ESCP drawings. A minimal earthworks strategy will be adopted where areas will be cleared for excavation in accordance with staging
- Active work sites are to be managed to limit area of exposed/disturbed soil as stages progress, to reduce daily potential for sediment discharge.

2. Stage Construction

Objective: to limit the time and area of soil that is exposed and prone to erosion. Staging of construction enables earthworks to be undertaken in small units over time with progressive stabilisation, to limit erosion. Careful planning is needed to accommodate the range and sequence of earthworks activity.

On site

- Each construction work pack will be linked to an approved ESCP stage that covers activities to be undertaken in that area

3. Protect Steep Slopes

Objective: to avoid or minimise disturbance of steep slopes, control upslope surface water flows and rehabilitate (cover/vegetate) promptly.

On site

- Existing vegetated slopes above cut areas will not be disturbed
- Cut batters will be straw mulched on completion prior to planting, or will otherwise have suitable alternative landscape treatment applied..
- Fill batters will be straw mulched, or will otherwise have suitable alternative landscape treatment applied.

4. Protect Watercourses

Objective: to prevent channel disturbance and control sediment discharge to watercourses, including temporary and permanent drainage channels.

On site

- Clean water diversions will be used, in accordance with staging where appropriate, to prevent upslope surface flows from entering works areas.
- Depending on area of stage works, dirty water from the cut and fill sites will be treated with Sediment Retention Ponds (SRP's) before discharge to vegetated terrain or existing drainage channels.
- Additional ESC measures to stabilise temporary (diversion channels) or permanent drains include placement of check dams to control flow velocity, and use of linings if necessary.
- Areas exposed adjacent waterways/drains will be limited daily, and will be progressively and promptly stabilised with straw mulch, aggregate or a similar protective layer.
- Existing stormwater inlets and those that may installed as works proceed will be protected with suitable measures.

5. Stabilise Exposed Areas Rapidly

Objective: to stabilise disturbed soils at the earliest opportunity, in accordance with staging.

On site

- Cut slopes will be straw mulched on completion.
- Temporary drainage channel stabilisation may include turfing or use of suitable linings (depending on gradient and velocity), in addition to use of check dams.
- Fill slopes will generally be grassed on completion, and may have temporary protection (e.g. straw mulch) applied pending final landscape treatment.

6. Install Perimeter Controls

Objective: to prevent upslope surface runoff from discharging into the work site, and to provide sediment control for initial site development works.

On site

- For establishment works such as access road upgrade, table drains can be modified as combined clean/dirty water diversions draining to a SRP or similar device, which can discharge treated water to existing drains or flat stable, vegetated terrain
- Install a Stabilised Construction Entrance at the main site access point
- Grade and drain the construction site compound, and direct runoff through suitable sediment trapping devices such a Silt Fence (SF) or Super Silt Fence (SSF).
- Install track surface runoff controls on main construction routes, discharging to vegetated terrain, to prevent dirty water discharge to ephemeral watercourses.
- Upslope clean water diversions will be installed in preparation for areas of cut work, or for diversion of ephemeral flow paths. These will discharge to existing flow paths, or via a Level Spreader (LS) to return concentrated flow to sheet flow.

7. Employ Detention Devices

Objective: capture of sediment-laden runoff during storms, including a chain of controls and water treatment methods.

On site

- Depending on staging and size of worked areas, sediment treatment basins such as SRP's will be sized and located where required
- SRP volumes will be designed in accordance with the BoPRC guideline requirements
- Details of 'dead' and 'live' storage levels
- Flocculation treatment will be used if it is required to achieve satisfactory levels of dirty water treatment. Water treatment standards will need to be agreed with BoPRC and a specific Flocculation Plan will be prepared, detailing methods (batch or continuous) dosage levels and water quality monitoring.
- Other sediment detention devices include Silt Fences (SF) or Super Silt Fences (SSF)

8. Management of Materials

Objective: to control erosion (water or wind) of stockpile materials and contain potential sediment loss.

On site

- Stockpiles will be located away from surface flow paths, drainage channels and water bodies
- Soil stockpiles can be protected by the up-slope diversion of clean water runoff (earth bund), along with downslope sediment control such as a Silt Fence or sediment sock
- Topsoil will not be stored in stockpiles greater than 3 m in height, to maintain soil structure and integrity
- Short to medium-term soil stockpiles will be stabilised appropriately with temporary grassing, geotextile or fabric covers, or a suitable soil binder product applied in accordance with the manufacturer's instructions.

9. Experience and Training

Objective: to ensure trained and experienced personnel are responsible for installing and maintaining erosion and sediment control measures.

On site

- A pre-construction meeting will take place with the Contractor (delegated ESC personnel) and a representative from BoPRC. This meeting is to ensure that the requirements of BoPRC in terms of the implementation of the ESCP are understood and met by the Contractor.
- All personnel will be trained in the implementation and intent of ESC and environmental management within the project induction and specific civil Work Pack inductions; including our responsibility to adhere with the conditions of the resource consents.
- An appropriately qualified and experienced erosion and sediment control consultant will be engaged to provide training to project staff and sub-contractors

10. Assess and Adjust

Objective: to ensure all ESC measures are regularly monitored and maintained, and upgraded or relocated as required in relation to progression of works and changes in site conditions.

On site

- Assign responsibility for implementing the ESCP and monitoring control measures as site works progress
- All ESC devices will be regularly monitored to identify any damage or impacts on effectiveness, and will be promptly repaired, and will have accumulated sediment removed for appropriate disposal
- It will be the responsibility of the Contractor to ensure that all devices are regularly inspected and maintained.

4. Heavy Rainfall Response and Contingency Measures

The Contractor will register with NZ MetService for serve weather warnings. Following any heavy rainfall warning, rainfall forecasts and storm warning will be monitored by the Project Manager to update expected rainfall data and the ESC measures will be inspected and repaired/cleaned as required. Exposed surfaces will be prepared by removing loose material and compacting the surface of fills and use of Surface Roughening techniques.

The following contingency measures are proposed:

- Temporary surface stabilisation measures can be applied with straw mulch, or by use of a suitable soil binder product used in accordance with the manufacturer's directions
- Ensure any temporary stockpiled material is away from drainage paths and water bodies.
- Ensure machinery is not parked in flow paths or potential flood zones
- Contingency measures will be recorded on a Sediment Control and Maintenance Sheet.

5. Controls used to manage water quality

Controls that are adequate to minimise water use to ensure compliance and to reduce risk to the lowest acceptable rating achievable, are implemented before any relevant works commence. Elimination of the hazard is the first preference of control, followed by engineering, then administrative controls. Controls used on this Project include:

- Erosion and sediment controls must be designed, developed and implemented in consultation with the construction team and the Environment Manager
- Clean water diversions must be installed prior to the commencement of work.
- Erosion and sediment controls must be installed prior to or immediately upon any disturbance to vegetation or soil. These controls must remain in place until re-vegetation, stabilisation or hard scaping has occurred. If these controls require maintenance the supervisor should be notified.
- All materials must be stockpiled away from water flow paths.

- Sediment laden water (dirty water) captured on-site must be preferentially reused, e.g. dust control.
- Water discharged from site is in strict accordance with the site dewatering procedure, which is approved by the Safety, Health and Environment Manager.
- No transfer/discharge will be made without a Permit To Dewater approved by the Environment Manager.
- All hazardous substances (liquids and solids) are stored and managed according to Health and Safety at Work Act 2015 and the Hazardous Substances and New Organisms Act 1996.
- All refuelling points, including refuelling/lube trucks, will carry hydrocarbon spill kits.

6. Site Responsibilities

1. Project Manager

The Project Manager will be ultimately responsible for the development and implementation of all Erosion and Sediment Control activities for the project.

Project Manager: **Bruce Watson**
Email: **bruce@mappro.co.nz**
Phone: **021 266 6327**

2. Earthworks Supervisor

The Earthworks Supervisor is the person responsible for the implementation and maintenance of the Erosion and Sediment Control measures, and updating the ESCP as required during the works with the Project Manager.

The ESCP report and drawings may be optimised by the Supervisor before the start of any activity on site. Any proposed changes to the documents must be approved by the Engineer and BoPRC prior to works commencing.

3. Environmental Manager

The Environmental Manager will be responsible for review and approval of ESCP application and coordination of environmental auditing in accordance with the approved ESCP plans from Bay of Plenty Regional Council.

Environmental Advisor: **Jon Auld**
Email: **Jon.Auld@mappro.co.nz**
Phone: **027 322 2440**

7. Monitoring and Frequency

Erosion and sediment control devices will be checked during a weekly site walkover by the Project manager and Earthworks Supervisor. In the event that a rainfall or storm event is forecast and following a rainfall event; the SCT will conduct a site walkover to ensure that all ESC devices are performing as intended. Additionally, individual crews will be responsible for monitoring environmental controls in their work area at the beginning and end of each shift.

Once a week the sites erosion and sediment control plans will be audited along with their implementation on site by the project team; the results of the audit and any actions taken will be recorded and maintained within the project management systems to be readily available where required.

The site will be monitored and maintained until vegetation is established or the site is grassed to such an extent that it prevents erosion and prevents sediment from entering watercourses.

1. Maintenance

Regular maintenance will be carried out on ESC devices as deemed required through audits/inspections, daily crew inspections or as identified and instructed by the Earthworks Supervisor and/or the Project Manager. Maintenance will be directed by the Earthworks Supervisor and put in place through the use of on-site plant, equipment and materials as needed.

All weather access will be provided to all key ESC devices to aid in their maintenance and management throughout the duration of the project.

2. Review

Where changes or modifications to the approved ESCP are required in order to carry out works; methods will first be evaluated to ensure that a change is required, then the modified ESCP will be submitted to the Bay of Plenty Regional Council for re-certification prior to the commencement of activities requiring the change/modification

8. Dust Management

1. Construction Created Dust

Construction activities have the potential to generate dust. The potential construction dust effects associated with earthworks and construction activities of the Project such as;

Exposed surfaces
Stockpiles of dusty materials
Vehicle movements on sealed or unsealed roads
Road works and road construction

The purpose of this section is to facilitate the avoidance, remediation and mitigation of any adverse effects of discharges of dust and hazardous air pollutants generated from the construction activities, and to promote proactive solutions to the control of dust from the site.

The document identifies the following:

Various sources of dust that may be created during the construction project.
Dust mitigation and prevention methods.
Methods to minimise the discharge of hazardous air pollutants.
Monitoring methods.
Methods for managing complaints regarding discharges into air and keeping compliance records.

2. Compliance

The protocols and policies are to be implemented throughout the site for compliance with specific consent conditions once received

3. Scope

The intention of the main Construction Works activities are to complete the construction and commissioning of the new Pukepoto dam, modifications to the Awaiti Pond dam and the construction of the new pipeline from Awaiti pond to the outfall north of Poike Rd.

Activities for the Construction Works include: Pukepoto Dam

- Site establishment and access
- Location, removal, and relocation of existing services
- Implementation of erosion and sediment controls
- Muck-out of watercourse
- Ground improvements (deep-soil mixing)
- Stockpiling to topsoil and unsuitable materials
- Stockpiling of imported cohesive materials
- Construction of earth dam (bulk cut & fill)
- Constructiuon of spillway
- Pipe crossing of McFetridge Lane, incl. inlet & outlet structures
- Landscaping

Awaiti Place

- Site establishment and access
- Location, removal, and relocation of existing services
- Implementation of erosion and sediment controls
- Awaiti pond modifications (removal of unsuitable material and modifications to inlet and outlet structure and raising of dam crest)
- Construct new stormwater pipeline, incl. crossing of Poike Road and outlet structures and dedicated fish passage
- Construction of in stream scour protection

4. Environmental Issues Management

1. Bulk Earthworks

Cut and fill volumes are expected to facilitate the construction of all site erosion and sediment controls as well as the reclamation of the existing wetland areas. Up to 8,000 m^3 of imported cohesive fill will be used for the Pukepoto Dam construction, although the volume of suitable site won material will be maximised. Granular fill, approx. 1,000m^3, will be imported such purposes as the dam drains, pipe bedding and surround,

establishment of access routes, construction of laydown areas, infilling/stabilization of worsites, and the construction of site erosion and sediment control (ESC) measures.

All earthworks activities will be carried out so that all dust and particulate emissions are kept to a practical minimum to the extent that there are no dust discharges beyond the boundary of the site that cause an objectionable effect

2. Receiving Environment

The Project will adopt measures for minimising dust; particularly where the Project interfaces with residential and operational prison areas.

The Environmental Representative will ensure that all personnel are aware of nearby sensitive receivers when carrying out activities that have the potential to generate dust.

1. Potential High Risk Dust Receivers

Residential properties locations:

McFetridge Lane
Sirocco Place
Smylie Close
Ohauiti Road
Awaiti Place
Poike Road
Harrisfirld Drive
Austen Way

2. Meteorology

The Project will monitor the direction of wind and the relative location of sensitive receivers when carrying out activities that may generate dust. The Project Manager will facilitate the continuous monitoring of weather forecasting to identify adverse storm or rainfall events. This will be implemented by using existing weather forecasting websites;

http://www.weatherhq.co.nz

http://www.metvuw.com

https://www.windfinder.com

3. Factors Influencing Dust Generation

Construction of the Project will entail earthworks which will generate dust. Dust can affect human health and be a nuisance to the surrounding public by causing dust deposits on and in houses, cars and washing. Dust may impact on people's enjoyment of outdoor living areas and cause perceived or actual health impacts.

There is the potential for dust to be generated from most of the construction activities including:

- Vegetation and topsoil removal, stockpiling and spreading;
- Cut and fill operations;
- Excavation;
- Road construction (reinstatement and temporary haul routes);
- Vehicle movements on roads, haul, stockpiles and yard surfaces;
- Ground improvement using lime and/or cement (deep soil mixing)

- Loading and unloading of bulk materials; and
  Wind generated dust from dry exposed surfaces such as stockpiles, yard areas, haul roads and roads.

This list of activities with dust potential will be reviewed on a regular basis.
There are five major factors, which influence the potential for dust to be generated. These are:

- Wind speed across the surface. Dust emissions from exposed surfaces generally increase with increasing wind speed. However, dust pick up by winds is only significant at wind speeds above 5 m/s (11 knots or a Beaufort scale number of 3). Above wind speeds of
  10m/s (20 knots) dust pick up increases rapidly.
- Moisture content of the material. Moisture binds particles together preventing them from being disturbed by winds or vehicle movements.
- The area of exposed surface. Vegetated surfaces are less prone to wind erosion than bare surfaces. The larger the areas of exposed surfaces the more potential there will be for dust emissions.
- The percentage of fine particles in the material on the surface. The smaller the particle size of material on an exposed surface the more easily the particles are able to be picked up and entrained in the wind.
- Disturbances such as loading and unloading of materials and vehicles travelling over exposed surfaces tend to pulverise any surface particles. Particles are lifted and dropped from rolling wheels and the surface. Dust is also sucked into the turbulent wake created behind moving vehicles.

Systems for controlling dust emissions will include methods that modify the condition of the materials (e.g. use of water sprays) so that it has less potential to lift with the wind or with disturbances, such as vehicle movements, and methods that reduce the velocity of the wind at the surface (e.g. the use of permeable fencing or similar temporary wind breaks).

Watering of exposed surfaces and materials that may be disturbed is a primary method of control. As a general guide, the typical water requirements for most parts of New Zealand are up to 1 litre per square metre per hour. Watering of surfaces is most effective when the water is applied prior to strong winds occurring and prior to particularly dusty activities commencing (which therefore requires that weather forecasts are checked on a daily basis).

The discharge of dust from the Project has the potential to have effects on two scales:

- Individually from a source where the effects of dust discharges are localised in the immediate area surrounding the construction area.
- Cumulative effects may be observed where the dust generated from all the nearby
  dust sources combine to affect air quality of the area as a whole.

Therefore, it is important that all dust sources be minimised as far as practicable, including those well separated from sensitive locations, as all dust generated will have an effect on the overall air quality in the area.

4. Factors Influencing Odour

There are two main activities associated with the construction of the Project that have the potential to cause discharges of odour:

- The use of bitumen in road reinstatememnts and
- Disturbance of organic material during excavations.

This plan recognises that the use of bitumen in asphalting is a normal part of both road construction and road maintenance. However, it is possible to limit both the amount of odour discharged from this activity (for example, by controlling the temperature of the bitumen during

application) and to minimise its impact (for example, by minimising the time taken to apply asphalt in any particular area).

Where the construction involves disturbance of land contaminated with organic material discharges of odour may occur. The geotechnical investigations to date do not lead us to believe there is a significant risk of encountering organic material that will cause an odour nuisance.

5. Factors Influencing Discharges of Hazardous Air Pollutants

The only significant source of hazardous air pollutants associated with the construction of the Project is engine exhaust emissions from construction traffic. Poorly maintained vehicle engines discharge many times the amount of air pollutants than well maintained engines. Unnecessary idling of vehicle engines while parked can also cause significant local effects.

There are no specific emissions standards for engine exhaust emissions from construction vehicles in New Zealand, although trucks and other vehicles used on public roads must comply with relevant land transport rules enforced by the Ministry of Transport. The "Land Transport Rule: Vehicle Exhaust Emissions 2007" (as amended) specifies requirements for discharges of smoke from vehicle exhausts:

Section 4 - Visible smoke check:

4.1 Scope of section 4 - This section applies to all motor vehicles that must be certified for operation in service under section 7 of Land Transport Rule: Vehicle Standards Compliance 2002; and

- are powered by an internal combustion engine.

4.2 Visible smoke check

4.2(1) A vehicle to which this section applies must not emit clearly visible smoke when the vehicle's engine is running at its normal operating temperature, under either of the following conditions:

- for a continuous period of five seconds when the engine is idling
- as the engine is being accelerated rapidly to approximately 2500 revolutions per minute or approximately half the maximum engine speed (whichever is lower).

4.2(2) Sub-clause 4.2(1) does not apply if the driver of the vehicle produces documentation that proves that:

- the engine is original equipment for the vehicle; and
- the engine's design does not allow the vehicle to reasonably comply.

6. Training

Environmental training for all staff will be undertaken as part of the project site induction programme and toolbox sessions.

7. Implementation and Operation

There are a range of routine measures that must be in place to mitigate (i.e. minimise) the effects of discharges of dust. In addition, additional mitigation may also be required in the event that:

- monitoring indicates that abnormal discharges of dust are occurring;
- weather conditions are changing such that dust discharges are more likely; and/or
- complaints are received regarding discharges of dust

If the available mitigation methods are unsuccessful in controlling the discharges and those discharges are causing significant adverse effects beyond the Project, especially in residential areas, the activities causing the discharge should be suspended until adequate mitigation has been put into place.

Water used for dust suppression will be provided the mains water system, and if available from the erosion and sediment control devices on site.

8. Dust Mitigation Measures

The dust prevention methods recommended in Table 1 below are methods that have been found to be effective for many sites across New Zealand. The methods can be used alone or in combination depending on the circumstances and are considered to be sufficient to mitigate adverse effects of dust discharges from the Project.

In all cases the Project will apply best practicable option for the management, suppression and monitoring of dust.

Dust mitigation measures will be implemented on a case by case basis; taking into account weather forecasting, soil conditions and dust management performance.

Where possible, any sections of exposed cut that are expected to remain open for an extended period of time will be stabilised to prevent the generation of dust and minimise service area for dust treatment.

In general the project will have the following resources to manage and mitigate dust generating activities;

- Water cart(s) – dampen exposed surfaces
- Road sweeper/vacuum loading truck(s) – maintain dust free site access
- Geotechnical fabrics – stabilise exposed surfaces
- Straw mulch – stabilise exposed surfaces
- Polymers – stabilise exposed surfaces
- Adequate water take – dampen exposed surfaces

Table 1: Dust Control & Mitigation

Source of Dust	Control
Stockpiles	- Limit the height and slope of stockpiles to reduce wind entrainment. Stockpiles exceeding 3m in height have a higher risk of discharging dust. - Orientate stockpiles to maximise wind sheltering as much as possible. - Maximise shelter from winds as far as practicable. - Apply polymers to limit disturbance and limit dust emissions Keep active stockpiles damp at all times or cover stockpiles of fine materials. - Dampen inactive stockpiles if they are producing visible dust emissions from a water cart or pumped water for dust suppression. - Vegetate/stabilise stockpiles if inactive for more than three months. Supply adequate water to support optimum vegetation growth.
Unpaved Surfaces such as Roads and Yards	- Limit the amount of exposed surfaces as much as possible. - Retain as much vegetation as possible. - Stabilise cleared areas not required for construction, access or for parking if liable to cause excessive dust during windy conditions. Methods may include metalling, grassing, straw/ hay mulching or the establishment of vegetative cover - Apply polymers to limit disturbance and limit dust emissions - Keep roads and exposed surfaces damp. - Cover surfaces with coarse materials where practicable. - Compact all unconsolidated surfaces where practical. - Regularly maintain roads by grading and the laying of fresh gravel.
Sealed Surfaces	- Regular removal of dust through washing or vacuum sweeping.
Vehicles	- Limit vehicle speeds on unsealed surfaces to 10km/h. - Limit load sizes to avoid spillages. - Cover loads of fine materials. - Minimise travel distances through appropriate site layout and design. - Minimise mud and dust track out from unsealed areas to sealed areas by provision of wheel cleaning facilities at site exits to sealed roads.

Earthmoving and Construction	- Limit the extent of earthworks carried out during dry conditions as far as practicable. - Where possible cut and cover methodology will be used. - Adequate watering systems must be available to dampen areas that are to be excavated prior to any earthwork commencing and shall be used permanently on sites once the final site shape has been established and further earthworks are not required. - Limit drop heights during loading and unloading. - Prior to a cut and fill activity, pre-dampen the area to allow time for penetration of the soil. - Where required cease all dust generating operations until such time that effective dust management can be implemented
Ground Improvement (Deep Soil Mixing)	- Ensure sufficient water, staff and resources are on standby during the deep soil mixing operation - Adequate dust control systems such as a water cart must accompany all liming and/or cement additive operations - Prevailing wind conditions must be considered prior to the commencement of all liming and/or cement additive operations - An approved ESCP directly addressing the application of lime and/or cement must be prepared by a suitably experienced erosion and sediment control practitioner and then submitted for approval from Waikato
Miscellaneous	- Ensure sufficient water is available on site (sufficient to apply a minimum of 10 mm/day to all exposed areas of the site). - Ensure sufficient water, staff and resources are on standby after normal working hours to apply water to dust generating surfaces should the need arise. - Take account of daily forecast wind speed, wind direction and soil conditions before commencing an operation that has a high wind potential. - Stabilize exposed surfaces wherever practical. - Install wind fences where practicable and if appropriate.

2. Deep Soil Mixing

It will be necessary to mix lime or cement with the soft soils under the footprint of the Pukepoto Dam to improve the engineering properties of the in situ material (bearing capacity, stiffness, permeability). Prior the commencement of any lime and/or cement additive activities; a task specific erosion and sediment control plan will be submitted to the Bay of Plenty Regional Council for approval, and will be accompanied by an appropriately detailed methodology statement in relation to the control of dust during application.

3. Water Supply

Construction water will be supplied from the existing water mains via metered standpipe at an agreed and controlled rate into temporary tanks at a rate that does not overload the existing capacity of the network. The tanks will incorporate a valve operated shut-off system to enable continuous low volume filling – allowing water to be stored to supplement periods of high peak demand. A designated fill point for water carts will be established and trucks will fill from a pump connected to the temporary tanks.

During periods of reduced availability of supply through the water main; alternative sources shall be procured both on site and external including:

- Sedimentation ponds
- External consented water take sites

4. Control of Vehicle Exhaust Emissions

The following key actions should be carried out to minimise emissions from vehicle exhausts:

- All construction machinery used on the site must be maintained at least in accordance with
- manufacturers' requirements.
- Where excessive exhaust smoke is identified from any construction vehicle that vehicle should be serviced as soon as is practicable and taken out of use until such maintenance has been completed.
- Construction vehicles should not be left idling while parked or unattended.

5. Monitoring Requirements

1. Dust Monitoring

Table 2 below outlines the dust monitoring programme that is to be implemented. The application of this monitoring will be the responsibility of the Project Manager in conjunction with site personnel.

The frequency of the monitoring is defined but in the instance of strong winds, discharges of dust that cross the site boundary or a complaint, the monitoring programmes will be undertaken more regularly.

In general the Project will have the following equipment available for monitoring air quality;

- On site weather monitoring equipment

Table 2: Dust Monitoring Activities

Monitoring Activities	**Frequency**	**Responsibility**
Observe weather conditions and check weather forecasts for strong winds and rainfall to plan appropriate dust management response	Daily and as conditions change	Project Manager
Inspect land adjacent to the site, construction exits and adjoining roads for the presence of dust deposits	Twice Daily	Site Supervisor
Inspect all unsealed surfaces for dampness and to ensure that surface exposure is minimised.	Daily and as conditions change	Site Supervisor
Inspect stockpiles to ensure adequate covering, stabilisation or dampness. Ensure stockpile height is less that 3m or appropriately stabilised.	Daily and as conditions change	Site Supervisor

Inspect dust generating activities (as listed in Table 3) to ensure dust emissions are effectively controlled.	Daily and as new activities are commenced	Site Supervisor
Monitor dust generating activities and water application rate.	In winds over 5.5m/s (11 knots or a Beaufort scale number of 3)	Site Supervisor
Inspect wheel cleaning equipment to ensure effective operation.	Weekly	Site Supervisor

2. Monitoring of Vehicle Exhaust Emissions

The following monitoring requirements will apply to all construction vehicles used on the Project:

- Daily visual inspection to ensure no visible emissions from vehicles; and
- Monthly check of vehicle logs to ensure that servicing and maintenance checks of vehicles are undertaken as they are due and that any additional maintenance that has been required has been carried out.

6. Reporting and Review

1. Complaints Management

The actions to be taken as soon as possible by Project staff when managing complaints associated with dust nuisance effects is detailed below.

Project signage will be erected prior to works commencing detailing 24 hour contact telephone number for the purpose of receiving and providing information and responding to complaints associated with
the project including air quality issues.

It is the responsibility of the Communications & Stakeholder Manager to respond to and follow up all complaints regarding air quality issues with the assistance of the Project Manager.

The Project Manager is responsible for ensuring that suitably trained personnel are available to respond to complaints at all times.

2. Actions to be taken by Project staff receiving complaint

Record details of the Environmental Complaint noting:

- The identity and contact details of complainant;
- The dates, time and duration of the issue leading to the complaint; Location of the complaint and source of the issue;
- Weather conditions, wind speed and direction at the site when the event occurred; If the complaint has been referred from Bay of Plenty Regional Council

As soon as possible after receipt of a complaint, undertake a site inspection, noting;

- all dust producing activities taking place at the time (especially if the complaint was related to an event in the recent past);
- the dust mitigation methods that are being used;

- direct any remedial action necessary to be undertaken; and follow up with complainant with action taken or plan arranged
- If it becomes apparent that there may be a source of dust other than the construction project causing the complaint, verify and document this, including phot ographing the source and emissions.
- As soon as possible after the initial investigations have been completed, contact the complainant to explain any problems found and remedial actions taken. If an investigation is required, any adverse effects will be recorded and actioned.
- If necessary update any relevant procedures to prevent any recurrence of problems and record any remedial action taken.
- Provide complaint /investigation details to the Communications & Stakeholder Manager.

3. Follow up Actions

The Environmental Representative will advise the Regulatory Authority as soon as practical that a complaint has been received and what the findings of the investigation were and any remedial actions taken.

Site personnel are advised that a complaint has been received and what the findings of the investigation were and any remedial actions taken.

4. Reporting

All non-compliances are recorded and reported as incidents to TCC.

Appendix B: Construction Noise and Vibration Management Plan

TC24/20 Awaiti Place and Ohauiti Stormwater Upgrades ECI

Preliminary Construction Noise & Vibration Management Plan

Document name	Revision	Document No.	Author
Preliminary Construction Noise and Vibration Management Plan	B	TC24/20-CNVMP-001	Gregory Cooper

Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
A	31 May 2020	G Cooper	M Prater N Clayton	M Prater	Tender Issue
B	17 Aug 2010	G Cooper	M Prater	M Prater	Consent Application
B1	20 May 2021	A Hollins	M Prater	M Prater	Consent Application

Revision Details

Revision	Details
A	Tender Issue Management Plan
B	Consent Application Management Plan
B1	Consent Application Management Plan
C	
D	
00	
01	
02	

Table of Contents

1 Introduction

7. Purpose and Scope

This Construction Noise and Vibration Management Plan is a preliminary plan for consent application purposes. This plan will be developed during SP1 and SP2 (if awarded) to ensure we satisfy the requirements of the resource consent conditions and to provide guidance on the management of construction noise and vibration.

The plan sets out management methods, controls and reporting standards to be implemented to minimise the impact of construction noise and vibration on people, businesses, and infrastructure while also meeting the legislative requirements relating to construction noise and vibration associated with the project.

The Construction Noise and Vibration Management Plan shall be implemented throughout the entire construction period and is intended to be the primary tool to inform the project's management of construction noise and vibration effects. Where construction noise or vibration levels are predicted or measured to exceed the designation condition limits, activity specific noise or vibration management plans will be prepared to specifically address these activities.

It is intended that this plan will be updated throughout the construction phase of the project as required.

8. Project Description

The Awaiti Place and Ohauiti Reserve Stormwater Upgrades is part of Tauranga City Council's (TCC) improvements of its stormwater network. Awaiti Place has been identified as a high flood risk environment and in order to mitigate the risk TCC have opted to implement the recommended solution of a flood attenuation facility upstream of McFetridge Lane and a new pipeline Awaiti pond and Poike Road.

The Awaiti Place and Ohauiti Reserve Stormwater Upgrades project covers the area of south of McFetridge Lane and the corridor from Awaiti Pond, along Awaiti Place, to Poike Road.

9. Location

The location of the project is shown below in Figure 1-1.

Figure 1-1: Extent of the Project Area (highlighted in red, base map from Google Maps)

10. Management Plan Framework

The project requires a set of environmental management and mitigation plans to ensure the successful construction of the project. The Construction Management Plan (CMP) will set the overall framework for the management of the environmental and social aspects of the project and is supported by a series of sub management plans focussing on specialist environmental areas, as identified in the consenting phase of the project.

11. Roles and responsibilities

The listed site personnel in Table 1.1 will be required to ensure construction noise and vibration is considered and signed off in the work method statements and relevant schedules associated with the planned construction activities.
Roles and responsibilities for the implementation of this Plan are provided in Table 1-1.

Table 1-1: Plan Implementation - roles and responsibilities

Name	Role	Contact details	Responsibility
Gregory Cooper	Contractor's Representative	andy@mappro.co.nz 027 244 7368	Responsible for all day to day operations on the project
Bruce Watson	Contractor's Project Manager	bruce@mappro.co.nz 021 266 6327	Ensuring the Construction Environmental Advisor and the Zone Managers are aligned in their approach to ensuring environmental compliance
Jon Auld	Construction Environmental Manager	jon.auld@mappro.co.nz 027 322 2440	Day to day implementation of the CEMP and sub management plans and mitigation plans onsite Onsite environmental compliance
TBC	Community Engagement Manager	TBC during SP1	Communication with stakeholders and the public throughout the construction phase Implementation of the feedback procedure
TBC	Acoustic Specialist	TBC during SP1	Suitably qualified acoustic specialist who prepares CNVMP and associated documents and audits their implementation

9. Legislative Requirements

The specific resource consent conditions and how they are addressed by the project will be outlined in Table 9-1 once the Consents are granted. **EXAMPLES OF TYPICAL CONDITIONS INCLUDED FOR ILLUSTRATION PURPOSES**.

Table 9-1: Relevant Resource Consent Conditions

Condition number	Condition	Cross Reference that demonstrates compliance
For the purpose of the CNV conditions: **BPO – means the Best Practicable Option in accordance with s16 of the RMA** **Major Construction Activity – means any construction activity that would result in an exceedance of the standards in RMC 4 and RMC 5.** **Work Area – means any area where construction works associated with the Project are undertaken (E.g. all active works areas and construction support areas).** **Additional definitions relevant to the consent conditions can be found in Appendix A.**		
RMC 1	*The outline plans (**'OP'**) shall include the following plans for the relevant stage(s) of the Project:*	*This document*

Condition number	Condition	Cross Reference that demonstrates compliance
	*b. Construction Noise and Vibration Management Plan ('**CNVMP**') prepared in accordance with conditions RMC 2 to RMC 10* *The CNVMP may be amended following the submission of the OP(s) if necessary to reflect any changes in design, construction methods, or management of effects. Any amendments are to be discussed with and submitted to the Council for information without the need for a further OP process, unless those amendments once implemented would result in materially different effects to that described in the original CNVMP.*	
RMC 2	*A CNVMP shall be prepared by a suitably qualified and experienced person, and shall be submitted as part of the relevant OP. The purpose of the CNVMP is to provide a framework for the development and implementation of the Best Practicable Option ('**BPO**') for the management of all construction noise and vibration effects, and additionally to define the procedures to be followed when the noise and vibration standards in the CNV conditions are not met following the adoption of the BPO.* *The CNVMP shall be prepared in accordance with the requirements of Annex E2 of New Zealand Standard NZS 6803:1999 'Acoustics – Construction Noise' (NZS 6803:1999) and shall address the following matters as a minimum:*	
	a. Description of the works, anticipated equipment/processes and their scheduled durations;	*Section 3*
	b. Hours of operation and duration for the Major Construction Activities;	*Section 3.3*
	c. The construction noise and vibration standards for the Project as set out in Tables RMC A to RMC B below;	*Section 4*
	d. Identification of affected occupied buildings and any other sensitive receivers (including unoccupied buildings) at each Work Area;	*Section 4 + 8*
	e. Management and mitigation options to be adopted for all works during the Project, including prohibition of tonal reverse alarms;	*Section 9*
	f. Minimum separation distances from receivers for plant and machinery where compliance with the construction noise and vibration standards are met;	*Section 8*
	g. A procedure for developing and implementing the Site Specific Construction Noise Management Plans ('SSCNMPs') and Site Specific Construction Vibration Management Plans ('SSCVMPs') (as required by conditions RMC 7, RMC 8 and RMC 9 below) forming part of this CNVMP;	*Section 10*
	h. Methods and frequency for monitoring and reporting on construction noise and vibration;	*Section 11*
	i. Procedures for engaging with stakeholders, notification of proposed construction activities and responding to noise and vibration complaints consistent with conditions SCP.1-SCP.16;	*Section 5*
	j. Procedures for the regular training of the operators of construction equipment to minimise noise and vibration and procedures for the management of behaviours for all construction workers;	*Section 14*
	k. Contact details for the Project Manager (or nominee) and the Requiring Authority's Project Liaison Person (phone and email addresses); and	*Section 1.5*

Condition number	Condition	Cross Reference that demonstrates compliance
	l. The process for identifying businesses which operate processes, machinery or equipment that may be unreasonably disrupted by construction vibration even where the project vibration standards are met. For any such businesses identified, a SSCVMP shall be prepared in accordance with RMC 9 and complied with.	Section 4
RMC 3	Where construction noise is predicted to exceed the standards in RMC 4, at any location, and a traffic noise barrier will ultimately be required for the operational phase, the Requiring Authority shall implement the required traffic noise barrier at that location in accordance with the SSCNMP. In the event that it is not practicable to install the traffic Section 4.2 + 4.3	Section 9
	noise barrier at the location for construction-related reasons, prior to the commencement of work, the Requiring Authority shall install the traffic noise barrier as soon as it is practicable to do so.	
RMC 4	Noise arising from construction activities shall be measured and assessed in accordance with NZS 6803:1999 Acoustics - Construction Noise and (subject to RMC 7) shall comply with the noise standards set out Table RMC A:	

Table RMC A: Construction noise standards

Day	Time	L_{Aeq} *	L_{AFmax} *
Residential Receivers			
0630h Monday to 0630h Saturday	0630h - 0730h	55 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	65 dB	80 dB
	2000h - 0630h	45 dB	75 dB
Saturdays 0630h Saturday to 0630h Sunday	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB
Sundays 0630h Sunday and Public Holidays to 0630h the following morning	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	55 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB
Industrial and commercial receivers			
All Days	0730h - 1800h	70 dB	--
	1800h - 0730h	75 dB	--

Condition number	Condition	Cross Reference that demonstrates compliance
	L_{Aeq} and L_{AFmax} have not been defined in the designation conditions and have been taken as defined in NZS 6801:2008.	
RMC 5	*Vibration arising from construction activities which may affect people and buildings shall be measured in accordance with ISO 4866:2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures, and shall comply with the Category A vibration standards*	*Section 5*

Table RMC B: Construction vibration standards for people and buildings

Receiver	*Details*	*Category A**	*Category B**
Occupied PPFs*	*Night-time 2000h – 0630h*	*0.3mm/s PPV*	*1mm/s PPV*
	Daytime 0630h – 2000h	*1mm/s PPV*	*5mm/s PPV*
Other occupied buildings	*At all times*	*2mm/s PPV*	*5mm/s PPV*
All other buildings	*At all times*	*5mm/s PPV*	*Tables 1 and 3 of DIN4150-3:1999*

**For vibration, protected premises and facilities (PPFs) are defined as dwellings, educational facilities, boarding houses, homes for the elderly and retirement villages, marae, hospitals that contain in-house patient facilities and buildings used as temporary accommodation (e.g. motels and hotels).*

** Peak Particle Velocity (PPV) has not been defined in the designation conditions. The definition has been taken as that from NZTA Research Report 485.*

If measured or predicted vibration from construction activities exceeds the Category A standards, the Requiring Authority shall consult with the affected receivers to:

a. Discuss the nature of the work and the anticipated days and hours when the exceedances are likely to occur; and

Condition number	Condition	Cross Reference that demonstrates compliance
	b. Determine whether the exceedances could be timed or managed to reduce the effects on the receiver. *The Requiring Authority shall maintain a record of these discussions and make them available to the Council on its request.* *If measured or predicted vibration from construction activities exceeds the Category B standards, those activities may only proceed subject to condition RMC 8.*	
RMC 6	*Vibration arising from construction activities which may affect underground pipe work shall be measured in accordance with DIN4150-3:1999 Structural vibration – Part 3: Effects of vibration on structures, and (subject to condition RMC 8) shall comply with the vibration standards in Table RMC C.* ***Table RMC C: Construction vibration standards for underground pipe work*** *Pipe material* — *PPV (measured on the pipe)* ***Steel (including welded pipes)*** — *100mm/s* ***Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)*** — *80mm/s* ***Masonry, plastic*** — *50mm/s*	*Section 7*
RMC 7	*A SSCNMP shall be prepared when construction noise is either predicted or measured to exceed the standards in Table RMC A, except where the exceedance of the standards in Table RMC A is no greater than 5 decibels and:* *a. For day time between 0700 and 2200 - the exceedance of the standards in Table RMC A does not occur on more than 14 consecutive days in any rolling 8 week period; or* *b. For night time between 2200 and 0700 - the exceedance of the standards in Table RMC.A does not occur on more than 2 consecutive nights in any rolling 10 day period.* *The objective of the SSCNMP is to set out the BPO for the minimisation of noise effects of the construction activity. The SSCNMP shall as a minimum set out:* *i. Construction activity location, start and finish dates;* *ii. The predicted noise level for the construction activity;* *iii. Noise limits to be complied with for the duration of the activity;* *iv. The mitigation options that have been selected and the options that have been discounted as being impracticable;* *v. The proposed noise monitoring regime; and* *vi. The consultation undertaken with owners and occupiers of sites subject to the SSCNMP, and how consultation outcomes have and have not been taken into account.* *The SSCNMP shall be submitted to the Council for certification at least 7 working days in advance of Construction Works which are covered by the scope of the SSCNMP. If the Council does not respond within 5 working days (excluding time associated with requesting and receiving further information) then certification is deemed to have been given.*	*Section 10 + Appendix E*
RMC 8	*A SSCVMP shall be prepared when construction vibration is either predicted or measured to exceed the Category B standards in Table RMC.B and the standards in Table RMC.C. The objective of the SSCVMP is to set out the BPO for the minimisation of vibration effects of the construction activity. The SSCVMP shall as a minimum set out:* *a. The relevant construction activity location, start and finish dates;* *b. The predicted vibration level for the construction activity;* *c. The pre-condition surveys of buildings and pipe work which document their current condition and any existing damage;*	*Section 10 + Appendix F*

Condition number	Condition	Cross Reference that demonstrates compliance
	d. An assessment of each building and any pipe work to determine susceptibility to damage from vibration and define acceptable vibration limits that the works must comply with to avoid damage; *e. The mitigation options that have been selected and the options that have been discounted as being impracticable;* *f. The proposed vibration monitoring regime;* *g. The methods adopted to minimise amenity effects on buildings which remain occupied during the works;* *h. The consultation undertaken with owners and occupiers of sites subject to the SSCVMP, and how consultation outcomes have and have not been taken into account.* *The SSCVMP shall be submitted to the Council for certification at least 7 working days in advance of Construction Works which are covered by the scope of the SSCVMP. If the Council does not respond within 5 working days (excluding time associated with requesting and receiving further information) then certification is deemed to have been given.*	
RMC 9	*For any buildings identified in condition RMC.1(l), the Requiring Authority shall prepare an SSCVMP which shall include:* *a. Consultation with the owners and/or occupiers of sites identified to ascertain the sensitivity of processes, machinery or equipment to construction vibration;* *b. Construction vibration limits specific to the sensitive activities which must be complied with that will avoid unreasonable disruption of the businesses;* *c. Procedures and methods for monitoring compliance with the vibration limits established;* *d. A process for dealing with any disagreement which may arise, particularly in relation to the determination of specific vibration limits;* *e. The relevant construction activity location, start and finish dates;* *f. The mitigation options that have been selected and the options that have been discounted as being impracticable; and* *g. The consultation undertaken with owners and occupiers of sites subject to the SSCVMP, and how consultation outcomes have and have not been taken into account.*	*Appendix B*
RMC 10	*If any damage to buildings or pipe work is shown to have occurred, by reference to pre-condition survey findings from RMC.7(c), as a result of vibration from the construction of the Project, any such damage shall be remedied by the Requiring Authority as soon as reasonably practicable subject to any associated asset and/or owner agreement.*	*Section 11*

Condition number	Condition	Cross Reference that demonstrates compliance

10. Project Overview

1. Construction Methodology

The project involves a wide range of construction activities over two distinct geographic areas. A basic overview of the construction works is given below;

Awaiti Pond – Outlet Structure and Conversion to a Dry Pond

Dredging the pond to maximise storage capacity, including disposal of (potentially) contaminated sediment to an approved landfill site;

The existing pond outlet structure is inadequate to pass the desired storm flow and requires upgrading. It has been assumed that a new, similar outlet structure, approximately 2.5m diameter will be constructed, including fish-ladder, low level 200mm DN inlet, weir and scruffy dome - similar in most respects to (and adjacent to) the existing outlet structure. A new larger bore (1600mmDN min) will be required to be constructed through the pond wall and connected to the proposed 1600DN gravity line and the new outlet structure.

Dedicated Pipeline

Currently stormwater flows from Awaiti Place and McFetridge Lane converge at a "junction box" (which constitutes a bottleneck) at the south end of the right-of way, south of Awaiti Place cul-de-sac. The objective is to divert the bulk of the 100yr storm flow from the Awaiti sub-catchment away from this bottleneck by installing a new 1600ID bypass pipeline from the Awaiti pond, down Awaiti Place, to the canal immediately upstream of the two existing Poike Road culverts. Alternative considerations (to be reviewed during detailed design) are to continue the new 1600ID pipeline under Poike Road to tie in downstream of Poike Road or to install a third culvert under Poike Road, adjacent to the two existing culverts. The existing 1050DN pipe between the pond and junction box will be used to divert flows during construction and will be decommissioned following construction of the new 1600ID pipeline.

Further innovations in the above regard can be discussed at detailed design stage with the successful contractor.

Localised protection (berms) will be investigated at detailed design stage to minimise risk of localised flooding, particularly to properties immediately downstream of the Awaiti pond and in the vicinity of the right-of way access. The extent of these works will be determined during detailed design..

Pukepoto Dam

McFetridge Lane currently serves as access to the local residents for the new McFetridge subdivision. The road effectively forms an (inadequate) attenuation pond. The large residential development downstream of the pond suggests that it may also be classified as high Potential Impact Classification (PIC) (which is a rating that represents the consequence of a dam failure) dam and would likely need significant upgrading. It was not considered feasible to raise the existing road/dam and the decision was made to investigate the option of a larger dam, upstream of the road.

The proposed earth dam will be approximately 10m high and designed to contain the 100yr flood without spilling.

The dam will likely also be classified as a High PIC dam (assessment currently underway by Riley Consultants) and will be designed accordingly, including a spillway on the eastern bank, approximately 15 to 20m wide, designed to cascade into the pond upstream of the existing road, together with erosion protection.

The dam will provide pedestrian access across the top to link in with the existing track around the upstream reserve, with appropriate H&S warnings in the event of flooding.

A building consent will be required for the dam.

Access to the site will be a key consideration as will be availability of suitable fill material.

The dam will be designed to be dry normally. A low-level intake will provide attenuation of low intensity storms, whilst higher level inlet(s) and a scruffy dome will provide the passage for higher intensity inflows.

The dam outlet will discharge to the existing pond upstream of the existing road (McFetridge Lane). Low flows will discharge through the existing 900DN pipe culvert (modelling will confirm whether upsizing is required and will be reviewed during detailed design) whilst higher flows will further attenuate and (for higher flows) cascade off the road.

Appropriate scour protection will be required.

Landscaping will be an important consideration.

2. Timeframe

At the time of writing this revision of the CNVMP the timelines shown in Table 3-1 were anticipated for construction activities.

Condition			Cross Reference that demonstrates
Table 10-1: Anticipated Timelines for Major Construction Activities.			
Construction Activity	**Duration**	**Start Date**	**End Date**
Separable Portion 1		July 2020	June 202
Separable Portion 2			
Awaiti Pond		Mid 2022	2023
Dedicated Pipeline		Nov 2022	May 2023
Pukepoto Dam		Nov 2021	June 2022

3. Hours of operation

The project has a focus on wellbeing and in general the focus will be on working longer hours Monday to Friday and no work to occur on weekends unless necessary. Work during the week is anticipated to start at 0630. However, the first half hour of the day is likely to be taken up with prestart meetings and safety briefings. During the summer months' work may continue until around 1900 in the evenings.

The bulk of the intended working hours (other than night works) fall within the periods with the most lenient designation condition noise and vibration limits. However, work before 0730 in the morning and after 1800 in the evenings will be managed.

We do not anticipate that night work will be required.

Due to the proximity to houses night works are not appropriate for trucks importing fill material to site to avoid daytime traffic.

However, if required night works will generally be scheduled between 2000 and 0600 on Sunday to Thursday nights. Works expected to cause high noise or vibration levels would be scheduled for as early in the night shift as possible as past experience has found people are less accepting of potentially disturbing activities in the early hours of the morning.

Night works are subject to much lower noise and vibration limits and unless these works occur at large separation distances from sensitive receivers, night works will likely require Site Specific Construction Noise Management Plans (SSCNMPs) and Site Specific Construction Vibration Management Plans (SSCVMPs).

Some works may be scheduled to occur over public holiday long weekends. This would be done to try and avoid longer term disruptions to the public. Works of this nature would be subject to the lower noise and vibration limits associated with both night works and with working on Sundays/public holidays, where applicable. Works occurring continually over a three-day period have the potential to have large noise and vibration impacts. In order to manage this, site specific management plans and good communication and consultation will be required.

11. Sensitive Receivers

1. Residential Properties and Protected Premises and Facilities (PPFs)

For the purposes of identifying sensitive receivers and applying the construction noise limits given in Table RMC.A of the designation conditions 'Residential Receivers' will be taken to include all PPFs.

However, it should be noted that for some forms of PPFs, such as schools and childcare centres, the less onerous noise limits for commercial properties may be applied when the buildings are not in use. Communication will be required with the occupants of these PPFs to determine when they may not be in use.

For the purposes of this CNVMP a reasonably broad approach has been taken to identifying properties that may be affected by construction noise and vibration. The properties identified here should be the minimum considered for communications relating to works in their respective areas. More detail on the communication with stakeholders is given in Section 5.

Where the predicted noise and vibration levels, indicate the properties may be subject to high construction noise or vibration levels, site specific noise and vibration management plans should identify the affected properties and discuss specific effects and potential mitigation.

There are two main residential areas adjacent to the project that may be exposed to high levels of construction noise and some vibration;

The Awaiti Place pipeline corridor including the intersection with Poike Road. Note this includes houses along Poike road backing onto the construction area.

The properties on and around McFetridge Lane.

A desktop study and canvas of the area will be required during SP 1 to ensure all PPFs are identified.

2. Commercial Properties

There are very few commercial properties affected by the project. While these commercial properties are all subject to the same noise and vibration limits in the consent conditions, the effect that noise and vibration will have on these receivers is likely to be very different depending on the use of the commercial property. A desktop study and canvas of the area will be required during SP 1 to ensure all commercial properties are identified.

Condition number	Condition	Cross Reference that demonstrates compliance

3. Vibration Sensitive Receivers

The Resource Consent may, as with RMC.1 clause (l) in the example conditions above, require that there is a process for identifying businesses which operate processes, machinery or equipment which is sensitive to vibration. If any of these businesses are identified, a special SSCVMP needs to be prepared. Examples of vibration sensitive activities which may need to be considered are;

Hospitals, particularly operating theatres and medical imaging equipment, both human and animal;

Precision laboratories;

Childcare centres, particularly if construction activities coincide with 'nap times';

Precision fabrication workshops, particularly equipment such as laser cutters and CNC milling machines;

Small delicate work such as jewellers or watch repairers etc.;

Some businesses with stores of liquids such as chemicals or wine could be affected by very large vibration levels (containers falling of shelves) although this is unlikely.

The process for identifying these businesses is as follows:

Initial screening to identify any of the business types mentioned above prior to construction starting.

Additional screening of properties identified as requiring a SSCVMP. This additional screening should be based on actual information for the equipment expected to be used for the construction activities.

Once these properties have been identified a special SSCVMP is required. Information to be included in these management plans is listed in the designation conditions and a template is included as Appendix B to this report. For any vibration sensitive businesses or processes identified, ambient vibration measurements should be made to establish a baseline.

4. Pipes

The Resource Consent may, as with RMC.5 above, give maximum vibration limits for different pipe materials which may be encountered on site. Minimum separation distances will be calculated from representative equipment vibration levels. If works within these separation distances is anticipated, then the process below should be followed.

Separation distances should be recalculated using vibration data from the actual equipment to be used.

If the works are still to be within the minimum separation distance, and the construction methodology cannot be altered to reduce the vibration levels, then the vibrations on the pipes should be directly monitored during the works to ensure the designation condition limits are not exceeded.

12. StakeholderEngagement

A key aspect of managing the effects of construction noise and vibration is having good communication with property occupants and owners. More information will be available on stakeholder engagement within the Stakeholder and Communication Plan for the project to be developed during SP 1.

It is important that the community are able to keep up to date with information around the construction activities and also are able to contact the construction team should they have any concerns or feedback. The following should be performed throughout the construction activities;

During construction, there will always be a contact person available on site, and their contact details will be prominently displayed at the entrance to the site so that they are clearly visible to the public.

Where site specific construction noise or vibration management plans are required, consultation with owners and occupiers of the affected sites shall be undertaken. The site-specific management plans need to document the outcomes that have, and have not, been taken into account. Site specific management plans should also be circulated to those affected under the plan.

Where measured or predicted construction vibration levels exceed the criteria specified in the consent conditions, consultation is required with the occupants of the property to discuss the nature of the works and determine if scheduling of the works could be used to minimise the impact.

Prior to the works a newsletter or similar will be distributed to all properties within at least 200m of the works. The newsletter will provide contact details and will detail the overall nature of the works. The same information will also be published in an advertisement in a local newspaper. If required by TCC or the resource consent, the web address for this CNVMP should be circulated with these communications.

Individual notification will be provided and meetings offered to all properties within 50m of the works. For any properties within approximately 20m of the works individual consultation will be continued throughout the works.

Condition number	Condition	Cross Reference that demonstrates compliance
	Further information will be regularly provided to all neighbouring properties with an update on the progress of the works, and the specific activities (including locations) due to be undertaken next. This may be provided by newsletters and/or by email or social media. Updates should be provided as regularly as possible.	

13. Noise Sources

This section gives information on the noise levels expected from various construction activities. The main construction activities have been detailed in Section 3.1.

It should be noted that during the final preparation of this CNVMP construction noise modelling using representative noise levels for construction activities is advised. The actual equipment used during the project may give different noise levels to those predicted here. However, the values given in this CNVMP will allow for the identification of construction activities that may result in noise levels that exceed the designation conditions. During the preparation of Site Specific Construction Noise Management Plans (SSCNMPs) the noise level produced by the actual equipment to be used should be obtained to ensure actual noise levels can be accurately modelled and managed.

Representative noise levels for the expected equipment will be taken from Annex C of NZS 6803. Where multiple pieces of equipment are expected to be working in the same area the noise levels shall be combined. Using rearranged versions of the noise propagation equations given in Annex D of NZS 6803, the separation distances for certain noise levels may be calculated. Where construction activities are being modelled against the Monday to Saturday daytime resource consent condition limits, separation distances may be calculated for 70 dB LAeq and 75 dB LAeq (tbc by Resource Consent) to represent the daytime noise limit. Similarly, for night works, separation distances will be calculated for 45 dB LAeq and 50 dB LAeq (tbc by Resource Consent).

For the prediction of noise levels, propagation will be assumed to be over the appropriate surfaces. Note the use of hard surfaces is a conservative approach. For the majority of activities modelled, the prediction of separation distances assumes that there is no screening present and the topology around the source is flat. In reality, most receivers will be screened by buildings, planting, and noise walls in some cases, and the actual minimum separation distances will be less than those calculated. However, these separation distances are still a useful tool for demonstrating which activities are likely to exceed designation condition limits. For this screening process, it will be assumed that the sources remain stationary. For this screening process, it has been assumed that the sources remain stationary and that they are running for the entire duration.

Table 6.1 gives a basic description of the construction activities anticipated to occur during daytime works and unmitigated separation distances required for the daytime designation condition limits.

Table 6.2 gives a basic description of the anticipated night works and the unmitigated separation distances required for the night time designation condition limits.

Table 13-1: Anticipated Daytime Construction Activities and Noise Levels EXAMPLES FOR ILLUSTRATION PURPOSES.

Description of construction works	Plant operating during works with NZS 6803 Annex C reference.	Noise Level LAeq @ 10 m [dB]	Separation distance for 70 dB LAeq [m]	Separation distance for 75 dB LAeq [m]
Earthworks – Excavation. Large areas of excavation will be required.	*2x tracked excavators – Table C.3(46)* *1x Lorry – Table C.3(46)*	*87*	*69*	*39*
Placement and compaction of fill material. A 3 dB reduction has been applied to these works to account for the fact not all plant is likely to be running at full power concurrently.	*1x Tracked excavator – Table C.3(46)* *1x Tipping fill material – Table C.3(60)* *1x Lorry – Table C.3(46)* *1x Vibratory Roller – Table C.3(116)*	*84*	*52*	*29*

able: 13-2: Anticipated Night Time Construction Activities and Noise Levels EXAMPLES FOR ILLUSTRATION PURPOSES.

Description of construction works	Plant operating during works with NZS 6803 Annex C reference.	Noise Level LAeq @ 10 m [dB]	Separation distance for 45 dB LAeq [m]	Separation distance for 50 dB LAeq [m]
n/a	*n/a*	*n/a*	*n/a*	*n/a*

Note: With night works, any noises heard at residential dwellings that are considered by the occupants to be unnecessary are more likely to result in feedback. These may be things such as people shouting, tailgates on trucks slamming or chains on trucks rattling. If these types of 'unnecessary' noises can be minimised the amount of feedback received should lessen.

14. Vibration Sources

This section gives information on the vibration levels expected from various construction activities. The main construction activities have been detailed in Section 3 although not all of these activities have been treated as sources of vibration. As with the noise sources in Section 6, the vibration sources will be based on values from literature and are not from the specific pieces of plant intended to be used on the project. The actual construction plant used on the project will produce different vibration levels. The values given here are still useful for identifying construction activities which are likely to produce vibration levels that will exceed the designation condition limits. Where vibration levels are predicted to exceed the designation condition limits, SSCVMPs will be required to manage the vibration levels and these should include actual vibration levels measured for the intended pieces of equipment.
Representative vibration levels for the expected pieces of plant will be taken from reference documents such as BS 5228-2:2009 and NZTA Research Report 485.

1. Vibratory Compaction

Calculation of vibration levels from vibratory compaction have been calculated using information from reference documents such as BS 5228-2:2009 and NZTA Research Report 485. The vibration levels will be based on actual measurements from vibratory roller operating on a representative soils once on site in SP2. A vibration attenuation coefficient for the local soils will be assumed and adjusted for frequency.

2. Excavator

Vibration levels for excavators will be modelled using information from reference documents such as BS 5228-2:2009 and NZTA Research Report 485. Generally, where large excavators (20 t) are being used within 60 m of residential properties there should be some consultation with the occupants to discuss the works and possible scheduling to reduce effects. Where excavators are to be used less than 10-15 m from buildings, then a SSCVMP is likely to be required.

3. Vibration Levels

Table 7.1 gives a basic description of the construction activities anticipated to occur during daytime works and separation distances required for the daytime designation condition limits. Table 7.2 gives a basic description of the anticipated night works and the separation distances required for the night time designation condition limits. Table 7.3 gives separation distances for vibration levels of 50 mm/s, 80 mm/s and 100 mm/s which are used for assessing the potential for damage to pipes of various materials as defined in sample conditions above. It should be noted that the vibration criteria relating to pipework are as measured directly on the pipe.

Table 14-1: Anticipated Daytime Construction Activities and Associated Vibration Levels. EXAMPLES FOR ILLUSTRATION ONLY

Description of construction works	Separation distance for PPV of 1 mm/s [m]	Separation distance for PPV of 2 mm/s [m]	Separation distance for PPV of 5 mm/s [m]
Placement and compaction of fill material.	*55*	*38*	*19*

Table 14-2: Anticipated Night Time Construction Activities and Associated Vibration Levels. EXAMPLES FOR ILLUSTRATION ONLY

Description of construction works	Separation distance for PPV of 0.3 mm/s [m]	Separation distance for PPV of 1 mm/s [m]	Separation distance for PPV of 2 mm/s [m]	Separation distance for PPV of 5 mm/s [m]
n/a	*n/a*	*n/a*	*n/a*	*n/a*

Table 14-3: Separation Distances Required to Avoid Damaging Pipework. EXAMPLES FOR ILLUSTRATION ONLY

Description of construction works	Separation distance for PPV of 50 mm/s [m]	Separation distance for PPV of 80 mm/s [m]	Separation distance for PPV of 100 mm/s [m]
Placement and compaction of fill material.	*<5*	*<5*	*<5*

Values have been rounded up to the nearest whole metre to be conservative. Separation distances under 5 m have been noted as <5 m. If construction methodologies with high vibration levels are to be used in close proximity to pipework, or other sensitive services, on-site monitoring should be performed.

15. Mitigation

Based on the predicted noise and vibration levels discussed in Sections 6 and 7 some forms of mitigation may be required to help reduce both the noise and vibration levels, and the effect that they have on nearby residents and properties. The mitigation options below will be considered to meet the consent conditions and to ensure best practice.

1. Construction Noise Mitigation

Use of 'white noise' non-tonal reversing alarms. These are regularly used on construction sites to reduce annoyance and feedback related to the more traditional reversing 'beepers'. The use of tonal reversing alarms on site is to be prohibited;

The use of temporary noise walls or enclosures. For the most efficient performance, these should be located as close to the noise source as possible. Commercial products for the construction of temporary barriers and enclosures are available and information on enclosure design can be found in NZS 6803;

Selecting the quietest equipment which is suitable for the job. This may mean avoiding using equipment which is larger or more powerful than required, although sometimes smaller underpowered equipment may make more noise due to increased engine loading;

Workers to be trained in, and focusing on, operating equipment in a quiet manner;

Regular maintenance performed on the machinery. This might include tightening of loose/rattling panels or tuning of poorly running engines;

Minimise slamming doors and unnecessary shouting;

Fit engines with exhausts and mufflers;

Minimise the use of horns when safe to do so;

Use of rubber seals around tailgates and a resilient bedding layer in truck trays;

Use of low noise concrete breaking attachments. Particularly important on this project with the majority of concrete breaking works occurring during night works;

Avoid the use of tracked equipment where possible and regularly grease tracks when tracked equipment is used;

Installation of operational noise walls during early stages of construction.

Where high noise levels are expected and other mitigation options will not be effective, offer of temporary relocation of affected people may be an option. This may range from occupants for significant periods through to offering event tickets for shorter periods of respite.

The extent of noise mitigation, including possible noise barrier locations and heights should be covered in detail in the required site specific construction noise management plans.

2. Construction vibration mitigation

It is difficult to mitigate the propagation of vibrations through the ground. It is far more effective to minimise the initial vibration levels created. Some means of minimising the initial vibration levels generated are shown below:

Try to maintain large separation distances between equipment generating large vibration levels and sensitive receivers,

Select construction and demolition methodologies that minimise vibration levels. Generally, avoid equipment which employs large impact or induced vibrations when working in close proximity to sensitive receivers.

Where works expected to generate significant levels of vibration are to be performed in close proximity to sensitive receivers, monitoring equipment should be used (at least during the initial construction stages) to flag if problematic vibration levels are being generated, i.e. levels likely to result in feedback or property damage.

16. Monitoring

1. Noise

Noise monitoring shall be conducted in accordance with NZS 6803:1999.

Noise monitoring will be conducted using the dedicated sound level meter kit which will be stored at the site project offices for the duration of the project. The calibrator will be verified by an accredited laboratory annually and the sound level meter and microphone biannually. If additional noise monitoring is to be performed by consultants, the equipment used will be clearly detailed in their reporting.

Monitoring will be conducted as follows:

When the works start, to verify the sound levels assumed for each of the major items of equipment, and to assess how effective noise control measures are.

At regular intervals during the works, at least every two weeks, to check ongoing compliance with the construction noise criteria;

During critical phases of construction, such as during the earthworks filling operations, concrete breaking, and other noisy activities;

During night works where the management of noise levels will be critical, particularly on the first night of a new construction activity;

As required for the preparation and compliance with SSCNMPs; and

If required, in response to construction noise related feedback.

A photograph should be included with the survey reports showing the sensitive receivers from the point of view of the noise meter. These photographs are a good reference for how the measured noise level may relate to levels at the receivers.

If noise monitoring indicates that project resource consent conditions limits are being exceeded then this plan should be updated and a SSCNMP should be created for the construction activity immediately.

2. Vibration

Where vibrations may affect a building or people, measurements should be made in accordance with ISO 4866:2010. Where vibrations may affect underground pipework the measurements should be made in accordance with DIN 4150-3:1999[1]. Additional monitoring may be required and can be performed by external consultants provided they have equipment capable of achieving the measurement standard.

Vibration monitoring should be performed in the following situations:

When the works start, to verify the vibration levels assumed for each of the major items of equipment;

During critical phases of construction, such as during earthworks filling operations, vibratory compaction, concrete breaking, and any other activities with high vibration levels;

During night works where the management of vibration levels will be critical, particularly on the first night of a new construction activity;

When reasonable negative feedback is received about construction vibration levels;

As required for the preparation and compliance with SSCVMPs.

If vibration monitoring indicates that project designation conditions limits are being exceeded then this plan should be updated and a SSCVMP should be created for the construction activity immediately.

3. Building Condition Surveys

For all locations where the SSCVMP identifies that vibration levels may exceed 5 mm/s a building condition survey should be completed prior to the works. Qualified building survey staff who will conduct the building condition surveys (to be updated once survey staff have been confirmed).

A report will be prepared for each building surveyed, including:

A description of the building condition and any existing cosmetic and structural damage,

Sketches and photographs showing the location and extent of any existing damage such as cracks, and

Verification of the report by the surveyor and building owner.

Following the works all building condition surveys will be repeated. Reports will be prepared including:

Sketches and photographs of any new damage, and

Verification of the report by the surveyor and building owner.

17. Feedback

The following procedure shall be followed for all noise and vibration feedback:

1. All noise and vibration feedback should be immediately directed to the Community Engagement Manager.
2. As soon as the feedback is received it will be recorded on the project feedback register.
3. An initial response will be made and recorded. Depending on the nature of the feedback the initial response could be to immediately cease the activity pending investigation, or to replace an item of equipment. However, in some cases it might not be practicable to provide immediate relief. The person providing the feedback and Tauranga City Council (TCC) will be informed of actions taken.
4. Where the initial response does not address the feedback, further investigation, corrective action and follow-up monitoring shall be undertaken as appropriate. The complainant and TCC will be informed of actions taken.
5. All actions will be recorded on the feedback register and the feedback record will then be closed.

[1] DIN 4150-3:1999 Structural Vibration – Part 3: Effects of vibration on structures.6. More information on the feedback process can be found in the Stakeholder Communication Plan (SCP).

18. Construction Noise and Vibration Induction and Training

The resource consent conditions for this project may require that there are procedures for the regular training of the operators of construction equipment to minimise noise and vibration as well as expected site behaviours for all workers and as such these items should be included with the rest of the operators training.

A section of the site induction will emphasise the importance of minimising construction noise and vibration generated during construction activities. As part of this induction people will be made aware of some of the mitigation measures given in this CNVMP and the prohibition of tonal reversing alarms on the project, if required by the resource consent. Shouting should be avoided on site when it can be safely avoided.

Appendix C: Accidental Discovery Protocol

Accidental Discovery Protocol

STEP ACTION	1 Recognition	2 Find		3 Communication	4 Verify Find		5 Authorisation Process		6 Action		7 Restart Works
	Taonga, timber, stone, bone* Training of monitors Briefing of contractors Monitoring of earthworks	Stop all work Within 20m of find Secure site with Fence or barrier	Opportunity to conduct appropriate rituals + ceremonies such as karakia	**CONTACT** ***IWI CULTURAL MONITORS TBC***	**YES** Assess & record **CONTACT** ***IWI CULTURAL MONITORS TBC***	**NO** Go to step 6	**CONTACT** ***Human remains*** Heritage New Zealand Pouhere Taonga: 07 577 4530 NZ Police Tauranga Central Police Station 07 577 4300 ***Taonga*** Ministry for Culture & Heritage 04 499 4229 ***Archaeology*** Heritage New Zealand Pouhere Taonga: 07 577 4530	Opportunity to conduct appropriate rituals + ceremonies such as karakia	a. Removal to close-by designated area b. Leave on-site in place c. Re-internment d. Investigate & Record e. Further actions f. No further action	Opportunity to conduct appropriate rituals + ceremonies such as karakia	No further action
LEAD	Project Manager	Project Manager		Custodial Advisor	Custodial Advisor / Archaeologist	Project Manager	Custodial Advisor / Archaeologist		Project Manager		Custodial Advisor