

APPENDIX FIVE

EARTHWORKS + CONSTRUCTION MANAGEMENT PLAN





ENVELOPE ENGINEERING

LAND
STRUCTURE
MANAGE

EARTHWORKS AND CONSTRUCTION MANAGEMENT PLAN

SHELLY BAY TAIKURU

DOCUMENT CONTROL RECORD

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CONTACT	[REDACTED] [REDACTED] [REDACTED]

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1.0 PURPOSE AND SCOPE OF THE PLAN

This Earthworks Construction Management Plan (ECMP) has been prepared in accordance with Condition 18 of the Masterplan Resource Consent for the Shelly Bay Taikuru Development. Additional details have been included to satisfy Greater Wellington Regional Council (GWRC) requirements. To this end, this ECMP has been drafted to accompany the resource consent application to GWRC for land disturbance works associated with the development.

Therefore, this plan is intended to provide the information requested by Wellington City Council (WCC) as well as establish a framework for the safe and environmentally conscious completion of earthworks required for the project.

This plan covers the entire development site and encompasses all development stages. As the development will occur over several years, details such as the name of the site contact or specific laydown locations etc. may differ from the general plan. Where specific details within a development stage differ from the main plan, these will be included on a stage specific addendum. This ECMP covers all of the land disturbance works that have been applied for with GWRC, and this stage is anticipated to be completed in advance of any of the development stages.

The intention of this document is to set out the key parameters and likely site conditions that are required to be considered to assist the contractor in preparing their Construction Management Plan, for which they will be contractually responsible. It is not intended to be prescriptive, and the contractor will be free to propose alternative measures if they meet the minimum performance standards as outlined in this document and in accordance with the GWRC document "Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region – Issued Feb 2021" and if compliance is still achieved with the relevant conditions of consent.

Relevant WCC Consent Numbers:

LUC1039017

SUB1039017

SUB1204038 (South Bay)

Relevant GWRC Consent Numbers:

TBC

2.0 RELATIONSHIP WITH OTHER MANAGEMENT PLANS

This plan should be read in conjunction with the Draft Contaminated Soil Management Plan (CSMP).

3.0 ROLES AND RESPONSIBILITIES

POSITION	CONTACT DETAILS	RESPONSIBILITIES
On Site Manager	TBC – Contractor nominated person as per their overall CMP	Contractor Coordinator Community Liaison Complaints Recording After Hours Contact
Site Engineer	Site Specific. See stage specific addendums	ECMP Implementation
Civil Engineer	██████████ Envelope Engineering ████████████████████	Civil works design and construction monitoring ECMP Compliance and Review



		ESCP Compliance Inspections
Geotechnical Engineer	Initia Geotech Ltd	Slope Stability Assessment and Monitoring Fill Certification Soil Validation Reports
Environmental Advisor	Site wide: TBC Stage Specific: Contractor Representative to be confirmed per stage.	ESCP Implementation
Traffic Management	██████████ Stantec	Traffic Management Planning Traffic Engineering Transportation Stakeholder Engagement

4.0 COMMUNICATION AND COMPLAINTS PROCEDURE

The following communication and complaints procedure shall be in place for adjoining property owners/occupiers, or the general public.

Complaints may be referred to the Project by WCC, GWRC, or members of the public. It is the responsibility of the Project Manager to respond to and follow up all complaints. The Project Manager is responsible for ensuring suitably trained, experienced, and qualified personnel are always available to respond to complaints including after hours and on weekends when complaints could be received. On-call staff will be notified of the complaint by the Project Manager. The on-call staff will respond by visiting the area in question and then implementing mitigation and corrective measures where it is deemed necessary and in accordance with direction from the Project Manager. The on-call staff will provide regular updates regarding the situation to the Project Manager. The Project Manager will in turn provide an update to the WCC or GWRC. If the site receives a complaint alleging adverse effects from or related to the exercise of this consent the CMO will be notified within 24 hours of receiving the Complaint

A register of all complaints will be maintained by the Project. The Register will identify the following information:

- A unique number for each complaint.
- Date and time the complaint was originally made.
- Name and contact details of the person to whom the complaint was originally made.
- Name and contact details of the person(s) making the complaint.
- A description of the complaint.
- Date and time the complaint was received by a member of the Project team.
- Name and contact details of the person(s) tasked by the Project Manager with addressing the complaint.
- A description of the corrective actions assigned and the time frame for addressing the actions.
- Date and time the corrective actions were completed.
- Date and time the person(s) making the complaint were notified of the completion of the corrective actions.

4.1 COMPLAINT INITIAL ACTION



Actions to be taken as soon as possible by the staff member responding to the complaint on behalf of the Project Manager:

- Fill out a complaint form.
- Note the time, date, identity and contact details of complainant. Wind direction and strength and weather conditions are recorded. Note if complainant has been referred from a consent authority.
- Ask the complainant to describe the nature of the complaint; whether it is a constant or an intermittent problem; how long has it been going on for; if it is worse at any time of day, does it come from an identifiable source.
- As soon as possible after receipt of a complaint undertake a site inspection. Note all noise, dust or vibration (nuisance) producing activities taking place, which staff member(s) or sub-contractor(s) are responsible for the mitigation methods that are being used.
- If complaint was related to an event in the recent past, note any nuisance producing activities that were underway at that time, if possible.
- As soon as practical (preferably within 30 minutes) visit the area from where the complaint originated to ascertain if the nuisance is still a problem.
- If it becomes apparent that there may be a source of nuisance other than activities on the Project causing complaint it is important to verify this. Photograph and document the source and emissions. Take measurements wherever possible.
- As soon as possible after the initial investigations have been completed contact the complainant to explain any problems found and remedial actions taken.
- If necessary, update any relevant procedures to prevent any recurrence of problems.
- Complete complaint form and file on complaint register.

4.2 FOLLOW UP ACTIONS

The Project Manager will advise the WCC and GWRC as soon as practical that a complaint has been received, what the findings of the investigation were, and any remedial actions taken. Following that the Project Manager will advise Project staff and sub-contractors that a complaint has been received, what the findings of the investigation were, and the remedial actions taken.

5.0 SITE SIGNAGE

Please refer to attached plans 1098-01-231 to 233 showing locations for site signage in respect of the proposed Earthworks. Additional stage specific signage may be included in addition to the signage shown on this plan, refer to stage specific addendum for details.

6.0 CONSTRUCTION HOURS

As per the Masterplan Resource Consent LUC1039017 Condition 13, the site shall operate within the following hours:

Monday to Saturday 7:30 am to 6:00 pm for general site works.

Monday to Friday from 6:30 am for quiet setting up of site (not including running any machinery)

No works on Sundays or public holidays.

7.0 DUST, NOISE AND VIBRATION MANAGEMENT

Dust shall be managed on site through a combination of keeping open earthworks areas minimised and the application of water from watercarts and hoses during the drier months.

The contractor for each stage will be required to have a Construction Noise and Vibration Management Plan (CNVMP) prepared by a suitably qualified and experienced person, for submission at least 10 working



days prior to construction commencing. The plan must include specific reference to the contractors proposed methodology and their intended plant performance characteristics for noise and vibration, along with mitigation measures as well as details of:

- i) the area affected by the work.
- ii) the times and days when the noise and vibration is likely to be generated.
- iii) a contact name and number of the works supervisor who can be contacted if any issues arise; and
- iv) how noise and vibration complaints will be managed and responded to.

8.0 EROSION AND SEDIMENT CONTROL

8.1 CONTROL OF SEDIMENT AND DEBRIS ON SHELLY BAY ROAD

All site entrances shall utilise stabilized construction entrances. Significant entrances shall utilise wheel washes to ensure no site debris or sediment is tracked onto Shelly Bay Road.

Where sediment is tracked onto the roadway, street sweepers and water trucks to be used to clean the roadway. As further described in the following sections, sediment washed from road towards the coast will be captured with silt fences and other controls to prevent sediment laden water entering the CMA/harbour.

8.2 EROSION AND SEDIMENT CONTROL OBJECTIVES

All siteworks are to be carried out in a manner that minimises potential adverse effects on the environment.

The main objective of sediment and erosion control is to reduce the rate of erosion and minimise the amount of sediment discharged from bare earth surfaces, while providing practical measures to reduce the total amount of sediment leaving the site.

The principles of Erosion and Sediment Control that will be applied include:

- Completing all works within the minimum time practicable
- Segmentation of catchments to limit the extent of impact.
- Stabilisation of exposed areas as soon as practicable
- Perimeter controls for the diversion of clean water.

The methods of control sediment runoff control that may be applied include:

- Topsoil bunds
- Decanting earth bunds
- Silt fences
- Sediment Control Ponds
- Filter socks

The location and detail of the above proposed measures are shown on plans 1098-01-230 to 1098-01-237 and discussed in further detail below. The area / catchments for the sediment control devices are illustrated on plans 1098-01-231 to 233 and have been designed to ensure compliance with GWRC guidelines and to provide strict control over the extent of areas to be treated and to limit the potential for clean water to run across the site.

8.3 EROSION CONTROL



To avoid erosion and sediment-laden stormwater generation on the site, the following erosion control measures will be implemented:

- The Stabilised Construction Entrance will limit the transfer of sediments from the site onto the local road environment.
- Temporary Surface Roughening and Contour Drains will be used across the extent of the earthworks area to minimise the erosion effects of rainfall and surface water scouring and in order to control the movement of silt to the proposed bunds and pond areas.
- Stormwater flow management will be reviewed as works progress and applicable methods applied as required in consultation with the Supervising Engineer and WCC and GWRC staff.

8.4 SEDIMENT CONTROL

Diversion channels and/or earth bunds will intercept sediment laden runoff, diverting flow to the sediment control devices including Decanting Earth Bunds (DEBs) and Silt Retention Pond (SRPs). DEBs and SRPs will discharge to land before entering stabilised artificial watercourses or reticulated stormwater systems. Emergency discharges are possible, with standard designs for these devices incorporating a stabilised emergency spillway (with erosion protection) in the event of large storm events. These are designed for 1% AEP (1 in 100-year storms), and although the discharge may not be fully treated, the provision of protection such as silt fences required around the perimeter of the site will significantly reduce any discharge of silt.

Clear water diversions are required to ensure that clean, external runoff does not run across the earth worked areas and is not contaminated by exposed soil on the site, and these have been designed in accordance with the GWRC guidelines. Where possible these diversions have been positioned parallel to contour lines (ie at a gentle gradient) however the steep nature of the eastern portion of the development site has meant that there are some diversions with grades significantly steeper than 2%. Where grades are steeper than 2% the diversions will be lined with filter fabric and have rock dams installed to control water velocity.

Silt fences will be constructed to contain silt laden runoff within the earthworks area, including along the western boundary being adjacent to the coastal edge, and along the current lower extents of the site during construction. They are design to both filter out larger soil particles and to slow the runoff to enable finer particles to settle before discharging.

Stormwater inlet protection such as silt socks, sandbags, silt fences and catchpit filters will provide a barrier across/around catchpits to intercept and filter sediment laden runoff before it enters the stormwater system thereby preventing sediment-laden flows from entering receiving environments. These protections will be applied to the existing catchpits along Shelly Bay Road during bulk earthworks and roading upgrades, and during later stages of building construction including new stormwater services installations.

Plans 1098-01-230 to 1098-01-233 illustrate the proposed locations of all sediment and control devices. Standard details for each of these devices is shown on plans 1098-01-235 to 1098-01-237.

8.5 SITE STABILISATION

The standard of compaction and method of determination will be set out in NZS4431 and NZS4402. Where this is not applicable the requirements will be specified by the Geotechnical Engineer.

The Contractor will be required to arrange regular control tests to ensure that adequate compaction has been attained over the entire area where fill materials are placed. The frequency of testing will conform with NZS4431 and control testing in accordance with NZS4402.

On completion of subgrade formation, an inspection will be carried out by the Supervising Engineer and Geotechnical Engineer to determine compliance for shape, grade, strength and uniformity.

Site stabilisation will be via grass seed/hydroseeding and carried out in accordance with the methodology provided in Section 9.0 below on topsoiled areas to be landscaped.

For roading and building platform areas, stabilisation will be either by metal aggregate or temporarily with straw mulch.



8.6 SIZING OF SEDIMENT CONTROLS, DEB AND SRP

For Catchment A1 we propose to construct a Sediment Retention Pond (SRP) to control any sediment run off for the area. We have sized the SRP in accordance with the GWRC guidelines. The catchment area of earthworks is 1.8ha and using 2% for the SRP volume gives a minimum requirement 360m³. The proposed SRP will be 27m x 9m x 1.5m deep, achieving a total storage of 364.5m³, exceeding the volume required in the guidelines.

For Catchment B1 we propose to construct a Sediment Retention Pond (SRP) to control any sediment run off for the area. We have sized the SRP in accordance with the GWRC guidelines. The catchment area of earthworks is 1.32ha and using 2% for the SRP volume gives a minimum requirement 264m³. The proposed SRP will be 25m x 7.5m x 1.5m deep, achieving a total storage of 281.25m³, exceeding the volume required in the guidelines.

For Catchment B2 we propose to construct a Decanting Earth Bund (DEB) to control any sediment run off for the area. We have sized the DEB in accordance with the GWRC guidelines. The catchment area of earthworks is 2,550m², and using 2% for the DEB volume gives a minimum requirement 51m³. The proposed DEB will be 14m x 4m x 1m deep, achieving 56m³, exceeding the volume required in the guidelines.

For Catchment C2 we also propose to construct a Decanting Earth Bund (DEB) to control any sediment run off for the area. This catchment area of earthworks is 2450m² and using 2% for the DEB volume gives a minimum requirement 49m³. The proposed DEB will be 13m x 4m x 1m deep, achieving 52m³, exceeding the volume required in the guidelines.

Catchments A2, A3 and B3 incorporate the northern extent of the existing Shelly Bay Road where minor road trimming and footpath/ parking construction will be undertaken. These areas are intended to be constructed as cut and cover operations, with further protection provided by bunding and silt fences, as necessary.

8.7 STORMWATER DRAINAGE AND OUTFALLS

New stormwater lines are to be constructed with coastal outfalls, either replacing existing mains or constructed to accommodate the additional runoff generated. Within the site the construction will be managed by the ESCP provisions described above. Additional measures will be required to accommodate the specific requirements of the outfall structures.

These will be integral with the upgraded seawall structures which will be part of a specialist Design Build contract which has yet to be finalised. Despite this, there are construction principles which will need to be followed to minimise the risk of sediment discharge to the coastal environment. The current intention is to construct the seawalls as flexible structures, incorporating rip rap, which adjusts to settlement; it also serves to trap sediment and reduce flow velocities.

Riprap aprons should be constructed, where possible, at zero percent grade for the specified length. In general, ungrouted, properly sized riprap provides better assurance of long-term performance. Filter cloth laid between the soil and riprap to minimise the likelihood of soil erosion at the interface.

Construction of the outfall protection must be done at the same time as construction of the pipe outfall itself.

Generally, it is best to construct the outfall unit from the bottom up, to prevent concentrated flows from being discharged into an unstabilised location. Where the outfall is part of a replacement system, the existing outfall may be able to be utilised during the construction phase. If construction of the outfall system is done from the top end first, the entrance to the system should be blocked off to prevent flow from travelling through the pipe until the outfall protection is completed.

It is important that a sequence of construction be established and followed, such as, for example:



1. The foundation area will be cleared of trees, stumps, roots, grass, loose rock, or other unsuitable material.
2. The cross-section will be excavated to design with over-excavated areas backfilled with moist soil compacted to the density of the surrounding material.
3. Abrupt deviations from the design grade or horizontal alignment will be avoided.
4. Filter cloth and riprap will be laid line and grade and, in the manner specified. Sections of fabric should overlap at least 300 mm and extend 300 mm beyond the rock. The filter cloth will be secured at the edges via secure pins or a key trench.
5. The construction operations will be carried out to minimise erosion or water contamination, with all disturbed areas vegetated or otherwise protected against soil erosion. Rip Rap to be clean metal without included silt or clay. Temporary access to the coastal area should be constructed of similar material to avoid silt contamination.
6. Construction will be carried out at periods of low tide.

8.8 MAINTENANCE OF ESC DEVICES

The following schedule is proposed for the setup and monitoring of ESC devices across the site:

Monitoring Type	Monitoring By	Frequency	Recording
Set-up of site ESC	Engineer	Prior to commencement of earthworks.	Engineer's written site inspection record.
Daily Inspection	Contractor	At the start and end of each working day.	Contractor's site diary to be retained on site and reviewed at weekly meetings.
Routine Weekly Inspection	Engineer/Contractor	Weekly (prior to site meeting).	Engineer's written meeting minutes.
During heavy rain events	Contractor	During or immediately after heavy rain events.	Contractor's inspection record to be provided to the Engineer within 24 hours of the rainfall event.
Prior to removal of ESC devices.	Engineer	Prior to removal of any ESC device.	Engineer's written site inspection record.

The Engineer will inspect ESC devices and certify that they have been correctly installed prior to the commencement of bulk earthworks.

8.9 DEWATERING

The Preliminary Geotechnical Assessment Report (Aecom, 2016) outlines that, based on trial pits and groundwater measurements taken in several boreholes, groundwater was measured at depths of 0.7m to 1.9m. The assessment also noted that, due to the proximity of the site to the CMA, it is anticipated that the groundwater level close to the foreshore will be related to the sea level and tidal variations and that tidal effects will decrease moving inland.

Dewatering devices may be required in the following instances:

- To dewater trenches, excavations including for the construction of:
 - Foundations,
 - Stormwater quality devices (i.e., tree pits and rain gardens)
 - Wastewater Pump
 - Seawall construction and coastal outfalls.
 - Lift shaft pits.
- To dewater sediment control devices for maintenance, or at the decommissioning stage.



Dewatering guidelines are provided in the GWRC document “Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region” – Issued Feb 2021.

During the Bulk Earthworks stage, when associated ESCP devices are installed, any dewatering required be undertaken, would typically discharge into the devices provided or into diversion channels or bunds that will ultimately convey the water to a treatment device.

Once the earthworks have been completed and Civil or Building construction is undertaken, dewatering will require management along the lines of the following.

8.9.1 SITE SPECIFIC CONDITIONS

A typical cross section through the site with likely soil conditions noted, and approximate water table level is shown below.

It is unlikely that major excavations will be required on any of the site construction works with typical construction applications noted in the diagrams below.

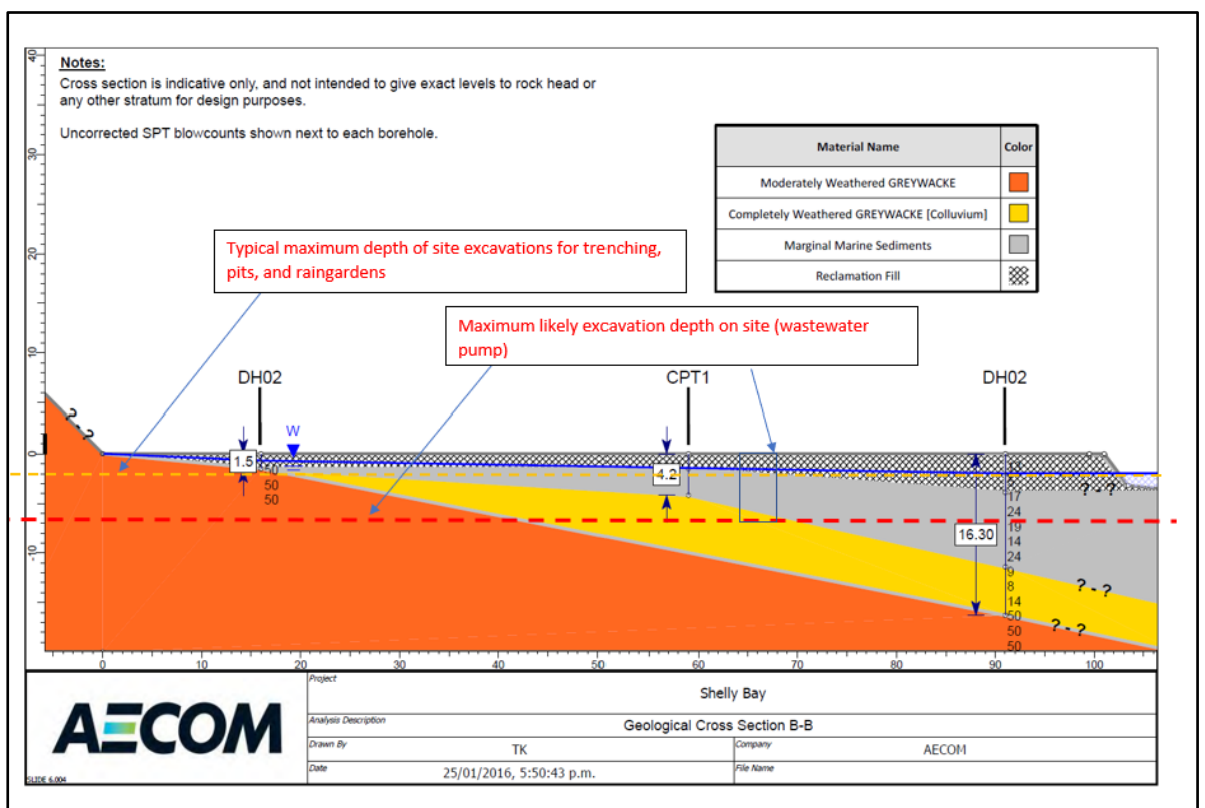


Figure 8.9.1: Site Soil Make-up and Groundwater Level

Due to the nature of the site and the limited extent of excavation required below the water table, the likely measures would be limited to:

- a) Sump Pumping, either with suction or submersible pumps, or;
- b) Well point pumping.

Specific guidance on each of these is included in the Guidelines.

8.9.2 DEWATERING SEDIMENT CONTROL

As outlined and illustrated in the GWRC guidelines, there are a variety of options for dewatering,



including settling tanks/ skip bins (refer Figure 8.9.2.1); dewatering bags (refer Figure 8.9.2.2); and turkey nests (refer Figure 8.9.2.3).



Figure 8.9.2.1: dewatering skip bin



Figure 8.9.2.2: Dewatering bag and pipe sock



Figure 8.9.2.3: Example of a mobile 'turkeys nest' used for dewatering

8.9.3 DEWATERING MONITORING

Monitoring of the discharge will be undertaken to ensure the pumped discharge always meets the required discharge standards.

The outflow from an unfiltered pump sump will be monitored by taking samples of water and checking the proportion of fines being transported. If fines are being continuously recovered or there are indications of potential excavation instability, the excavation will be backfilled, and a different dewatering method considered.

Where ESCP devices are being used for sediment control, of pumped discharge, the monitoring requirements of these devices, and the GWRC standard monitoring conditions that will be imposed on the GWRC consent, must be followed, including pH sampling and Flocculation controls where applicable.

8.9.4 CONTAMINATION PROCEDURES



Prior to commencement of the construction phase of the project the risk of encountering contaminated groundwater will be assessed by an appropriately qualified expert and if contamination is indicated, further investigation will be carried out to verify levels of contamination and allow appropriate planning for design of the dewatering system.

Site specific sampling to determine the nature and concentration of contaminants will be undertaken as required and procedures modified accordingly if contamination is identified.

Should contamination be discovered in the groundwater during construction, work will cease until management measures are confirmed or updated and implemented. It is envisaged that the GWRC consent conditions will include mechanisms to require this.

8.10 CHEMICAL FLOCCULANT

Before commencement, the contractor will be required to engage an approved consultant to carry out bench testing of soil samples from the site. If testing shows that adequate treatment is achievable without chemical flocculant, then the contractor may proceed on this basis with monitoring of the devices carried out on a weekly basis. If the results of the site bench testing are poor then the contractor will be required to have prepared a flocculation management plan (FMP) to document the setup, operation, and maintenance of a flocculation system for the site.



9.0 EARTHWORKS METHODOLOGY

The specific earthworks methodology for various activities on site shall be coordinated with the contractor with the intent of reducing the area of earthworks open at any given time and the prompt reinstatement of stabilized materials.

9.1 INITIAL ESC SITE PREPARATION WORKS

Before the commencement of bulk earthworks for a particular stage, earth bunds/silt fences will be installed throughout the stage area. The locations of these are shown on drawings 1098-01-230 to 1098-01-237. The bunds will be constructed in accordance with the cross section provided on drawing 1098-01-235 and construction details provided in Section 4.1 of the Erosion and Sediment Control Guidelines for the Wellington Region.

To prevent site access points from becoming sediment sources and to assist in minimising dust generation, a stabilised construction entranceway will be constructed in accordance with the detail on drawing 1098-01-235 and the detail provided in Section 4.8 of the Erosion and Sediment Control Guidelines for the Wellington Region

9.2 DURING BULK EARTHWORKS

Any excess material from the bulk earthworks within a stage will either be stockpiled for future use as fill in a designated stockpile area or will be removed from site along Shelly Bay Road.

The proposed erosion and sediment control methodology for this site is dynamic in nature and will be amended throughout the construction phase to ensure best practice outcome is achieved. Any amendments will be discussed with WCC's CMO and GWRC's Compliance and Enforcement Officers.

All stormwater pipe work will be installed, and silt fences and stormwater inlet protection will be placed around the new intakes across the site.

9.3 AFTER BULK EARTHWORKS

Upon completion of bulk earthworks interim site stabilisation of exposed surfaces will be applied. This will be undertaken within one month of completion of these areas and will take the form of grass seeding. Building construction will generally take place following bulk earthworks interim stabilisation of building platforms will also be undertaken using compacted granular material with a low fines content.

10.0 MEASURES TO ENSURE A TIDY SITE

The importance of maintaining a tidy site shall be encouraged through site meetings, toolbox meetings and site inspections. During inspections, the general tidiness and condition of site will be noted. Significant trip hazards and non-compliances will be raised on site and followed up with an email, with minor recommendations raised in site meetings or by email.

Skip bins shall be used to collect and dispose of general site rubbish and waste. Rubbish or material generated from demolition works or earthworks may be loaded directly onto trucks as required.

Some materials designated for recycling or reuse within the development may be stored in an appropriate location on site.

Larger deliveries of materials to site will be unloaded in an identified lay down area with materials stored there until required at their specific sites. Smaller deliveries of materials specific to a stage may be delivered directly to the appropriate site area, a specific laydown location will be identified in the stage specific addendum as required. The laydown and storage location is indicatively located as per the attached plans 1098-01-231 and 1098-01-233. This location may change as works proceed based on phasing and staging.



11.0 LOCATION OF WORKER'S CONVENIENCES

The site offices shall be in an existing building on site. These will include facilities such as toilets, a kitchen, meeting rooms and offices.

Additional facilities such as separate site sheds, lunchrooms and portaloos shall be in proximity to specific stages and activities, with their type and location determined closer to the time.

12.0 STORAGE OF FUEL AND OTHER HAZARDOUS MATERIALS

A designated fuel and hazardous fuel store shall be established on site in a location agreed between the engineer and the contractor. This storage area shall be constructed and fenced in accordance with relevant guidelines. Fuel storage to be secured against theft and vandalism.

Spill kits shall always be available on site. The kits shall be placed in locations adjacent activities with a moderate risk of spills.

13.0 SLOPE STABILITY

All excavations and retaining structures shall be constructed incrementally to maintain slope stability. This will be completed based on guidance from the Geotechnical Engineer and in accordance with contractor temporary works plans. The Geotechnical Engineer's contact details are listed in Section 3.

A Geotech Report will include temporary and permanent maximum batter slopes and heights and locations where temporary and permanent retaining is required. Procedures will also be outlined where ongoing inspections of exposed faces will be carried out to identify any unstable material that may be exposed as work continues. Where necessary, work on potentially unstable faces encountered would be halted while remediation measures are undertaken.

14.0 COLLATERAL DAMAGE TO VEHICLES AND PROPERTY

All controls and measures in place to mitigate collateral damage to vehicles is detailed in the Construction Traffic Management Plan (CTMP) required under the Masterplan Resource Consent. This plan also includes details on occupation of the public footpath and carriageway for construction related purposes.

The risk of collateral damage to existing property is minimised due to the location of the site away from other dwellings. Any damage reported will be investigated and actioned on a case-by-case basis.



15.0 RESTRICTIONS TO PUBLIC ACCESS

Public access will be restricted to certain areas of site at various points through the construction of the project. The specific location and duration of these restrictions will be determined for the various development stages.

Active works areas, such as demolition or building construction sites, will be restricted with site hoarding and fencing in a manner agreed between the engineer and the contractor.

For restrictions of public access to the roadway and berms, please refer to the Construction Traffic Management Plan (CTMP).

Long term restrictions will be communicated to the public through signage and site maps on the information boards. Short term restrictions shall be communicated to the public in the appropriate manner, signage, barriers, spotters etc.

16.0 MONITORING AND COMPLIANCE REGIME

A copy of the ECMP shall be always kept on site. Compliance to the plan shall be reviewed by the engineer on a regular basis, with non-conformances recorded in a register.

At significant milestones in the project, such as the commencing of a new development stage, the plan shall be reviewed. Should major changes be required, the plan shall be revised, reviewed, and resubmitted to the WCC Council Compliance Officer (CMO) and GWRC Monitoring and Enforcement Officer. Should minor changes or additional details be required, a stage specific addendum may be prepared and submitted to WCC and GWRC.



APPENDICES

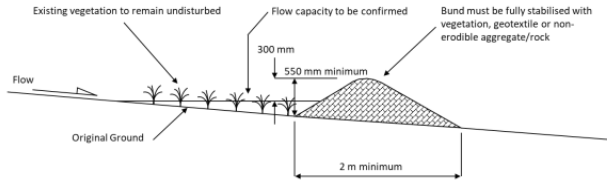
Design Storm

5% AEP without Climate Change

Channel Capacity

Triangular Channel e.g. Clearwater Diversion	
Base width	0 m
Max Depth	0.25 m
Side Slope E - 1 in	5
Side Slope W - 1 in	3
Max Width	2 m

Overflow Swale 2		
Depth	0.250 m	
Width	2 m	INPUT
Area	0.25 m ²	Width at water level
Hydraulic Radius	0.121046366	
Radius to power of 2/3	0.244700304	
Mannings N	0.03	
Grad 1:X	50.0	INPUT
slope	0.020	
Sqrt of Slope	0.141421356	
Velocity m/sec	1.15	
Flow Capacity	0.2884 M3/sec	



Cross Section

Catchment Runoff Calculations

Area	13800 m ²	maximum estimated catchment
C	0.3	
CA	4140 m ²	

Duration (mins)	Normalised	Q20 mm	Unit Runoff Rate m ³ /2	Runoff m ³	Runoff Rate m ³ /s
10.00	0.10	13.8	0.00002300	57.13	0.0952
20.00	0.15	19.6	0.00001633	81.14	0.0676
30.00	0.18	24	0.00001333	99.36	0.0552
60.00	0.25	34	0.00000944	140.76	0.0391
120.00	0.34	45.9	0.00000638	190.03	0.0264
360.00	0.55	73.8	0.00000342	305.53	0.0141
720.00	0.74	99.5	0.00000230	411.93	0.0095
1440.00	1.00	134.3	0.00000155	556.00	0.0064

OK - Less than calculated capacity

CHANNEL DEPTH/ CATCHMENT AREA RELATIONSHIP

	0.1	0.125	0.15	0.25	0.1	0.125	0.15	0.25	0.1	0.125	0.15	0.25
Channel Depth (m)	0.1	0.125	0.15	0.25	0.1	0.125	0.15	0.25	0.1	0.125	0.15	0.25
Gradient - 1 in	200	200	200	200	100	100	100	100	50	50	50	50
Slope %	0.50%	0.50%	0.50%	0.50%	1.00%	1.00%	1.00%	1.00%	2.00%	2.00%	2.00%	2.00%
Flow Capacity m ³ /s	0.013	0.023	0.037	0.144	0.018	0.032	0.052	0.204	0.025	0.045	0.074	0.288
Max Area m ²	1800	3200	5300	20800	2500	4600	7500	29500	3600	6500	10700	41700

DRAWINGS

