



Erosion, Sediment & Dust Control Assessment Report

Southern Seawall Project

Wellington International Airport Limited

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1. INTRODUCTION

This Erosion, Sediment & Dust Control Assessment Report (**ESDCAR**) provides:

- the overarching erosion and sediment control (**ESC**) principles and procedures for the earthwork activities associated with Wellington International Airport Limited Southern Seawall Project (**the Project**);
- an assessment of the effectiveness of those ESC principles and procedures in minimising potential sediment discharges to an acceptable level; and
- concepts that inform the development of the Site Specific Erosion, Sediment & Dust Control Plans (**SSESDCPs**).

It is to be read in conjunction with the following appended documents:

- Erosion, Sediment & Dust Control Monitoring Plan (**ESDCMP**)
- Chemical Treatment Management Plan (**CTMP**)
- Draft Site Specific Erosion, Sediment & Dust Control Plans (**SSESDCP**)

Prior to earthworks commencing in each area, the corresponding SSESDCP will be finalised and provided to Council for certification as required by the conditions of consent. This approach allows for flexibility, fine tuning and ownership of the ESC measures and methodologies by the project manager.

2. PROJECT DESCRIPTION

2.1. Overview

The Project is comprised of seven key elements, described below, and shown in Figure 1.

1. Establishment and use of the Miramar Golf Course Construction Yard ("**MGC Yard**"). Site establishment works, including the undertaking of fencing and bulk earthworks to establish the MGC Yard. Once established, the yard will be used for various construction activities, most notably, for the storage of rock and armour units to be used in the Southern Seawall replacement.
2. Clearance and use of the George Bolt Street Construction Yard ("**George Bolt Yard**"). The existing storage yard on George Bolt Street will be cleared, and the hangar on site demolished, before being used for general storage of rock and armour units, construction plant and equipment, as the site of a workshop and staff facilities, and other miscellaneous construction material storage associated with the Project.
3. Establishment and use of the Moa Point Construction Yard ("**Moa Point Yard**"), and site facilities at the corner of Stewart Duff Drive and Moa Point Road. Site establishment works, including fencing, vegetation clearance and re-contouring will be undertaken to establish the Moa Point Yard. The location of the Moa Point Yard directly adjacent to the Southern Seawall working face – is critical to ensure ready access to rocks and armour units as well as plant and equipment once works at Moa Point commence, thus reducing both risks associated with weather and sea state, and construction time.
4. Remediation of the Eastern Bank. The remediation works involve protection of the bank with rock. The rock protection provides a transition between the main Southern Seawall and the unprotected coastline further east, helping to reduce the active erosion of the existing bank. It will also help to support to the Stage 2 Kororā Colony.

5. Reconstruction of the Southern Seawall. The works involve overlaying the existing seawall with a layer of rock and re-used concrete units (“**underlayer**”), and a layer of concrete armour units (“**armour layer**”), excavation of the seabed and placement of rock to form the seawall toe, and associated works.
6. Creation of two kororā colonies to support kororā habitation and breeding. The colonies are located on the landward side of Moa Point Road (Stage 1), and behind the Eastern Bank Remediation (Stage 2, once construction is complete). The Stage 1 Kororā Colony will be developed before removal of habitat in construction areas begins, allowing kororā to be relocated before their existing roost and nest sites are affected. The colonies will provide shelter from the wind, kororā nestboxes and vegetation. Additionally, the colonies will be fenced to protect kororā from attacks by dogs and disturbance by people.
7. Supply of rock and armour units. Due to the number / volume and specific composition of rock and armour units required for the Project, a gradual programme of rock and armour unit supply and storage will be undertaken. While it is anticipated that most of this material will be transported via road, access to a central city marine unloading point to support the importation of rock from the South Island may be needed.

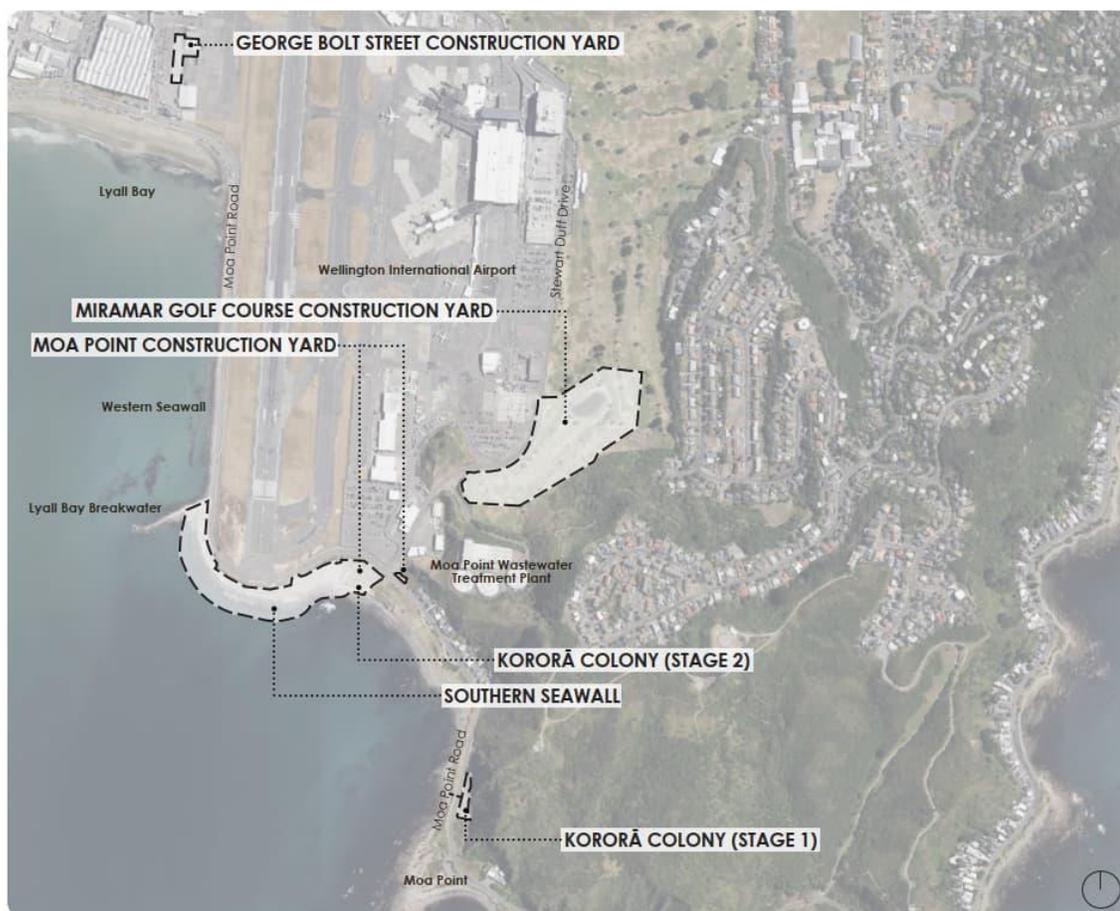


Figure 1: Southern Seawall Renewal Project Area.

The Southern Seawall renewal is a large, multi-year project, with various external dependencies. Whilst the Project timeline will be dependent on lead times for sourcing construction materials, the availability of specialist plant, safe sea state operating conditions,

weather conditions and the Airport's operational requirements, it will generally follow these broad timeframes:

1. MGC Yard site establishment works – 1 to 7 years;
2. MGC Yard rock and armour unit storage and associated activities – 4 to 7 years;
3. Establishment of the Moa Point Yard (excluding kororā management) – 6 months; and
4. Seawall construction – 24 to 30 months.

Elements of the construction programme will overlap; the overall construction programme will take approximately 6 to 8 years to complete.

3. CONSTRUCTION

3.1. MGC Yard

The MGC Yard (as shown in Figure 2) will be established in advance of the seawall construction site, in order for WIAL to commence rock and armour unit stockpiling. The MGC Yard establishment works are expected to commence as soon as consent is granted and will take up to 7 years to complete progressively as storage area is required. The establishment phase will include the following works (as particularly relevant to my assessment):

- Establishment of erosion and sediment control measures (clean water control, sediment retention devices and dirty (site) water control);
- Initial vegetation clearance and topsoil stripping;
- Earthworks to recontour the site to a level surface, suitable for yard activities (excavated material will be carted to approved earthworks disposal and / or engineered fill sites);
- Installation of drainage works; and
- Establishment of laydown and working yard areas.



Figure 2: MGC Yard.

The proposed specifications including earthworks of the MGC Yard works are shown in Table 1, with detailed design drawings included in Part C of the application documents.¹

Parameter	Specification
Yard area	< 4.5 ha
Earthworks area	~4 ha
Earthworks cut volume	~100,000 m ³
Earthworks fill volume	2,000 m ³
Earthworks cut to be removed offsite	100,000 m ³
Paved area (yard entrance and exit)	up to ~400 m ²
All-weather (permeable granular) pavements	30,000 m ²
Yard buildings	~500 m ² , approximately 4 – 5 m high

Table 1 - Proposed specifications of the MCG Yard (source: WIAL Southern Seawall Renewal Draft Description of Proposal July 25)

¹ These figures are approximate and subject to detailed design.

3.2. George Bolt Yard

The George Bolt Yard (as shown in Figure 3) includes a 2,500m² site that is currently used by WIAL for various storage activities, and a 1,000m² hangar that will be demolished and made contiguous with the existing storage yard.

During the Project, the combined George Bolt Yard will be used to store construction material, plant and equipment, as the site of a workshop and staff facilities, and for associated activities.

The George Bolt Yard is expected to operate throughout the life of the Project, with its operation to potentially be extended if required for the Western Seawall works.

The George Bolt Yard will house the primary maintenance facility for all construction plant and equipment, except for the large equipment used for placing rock and Cubipods at the seawall face, which will be serviced at the Moa Point Yard.



Figure 3: George Bolt Yard

4. SEAWALL CONSTRUCTION WORKS

4.1. Moa Point Yard

The Moa Point Yard, shown in Figure 4, will be the main operational storage area during the seawall construction works. It will be used for storing construction materials and general plant setup and maintenance facilities adjacent to the seawall workface. The Moa Point Yard will also be used for servicing large equipment that cannot easily be transported to the George Bolt Yard.

The Moa Point Yard will be passively used to support ongoing pre-reconstruction seawall maintenance from late 2026. Formal site establishment will commence six months prior to the

commencement of the Southern Seawall reconstruction and the public will be excluded from that time. It is anticipated that the Moa Point Yard will be used for 24 – 30 months to support the Southern Seawall reconstruction.

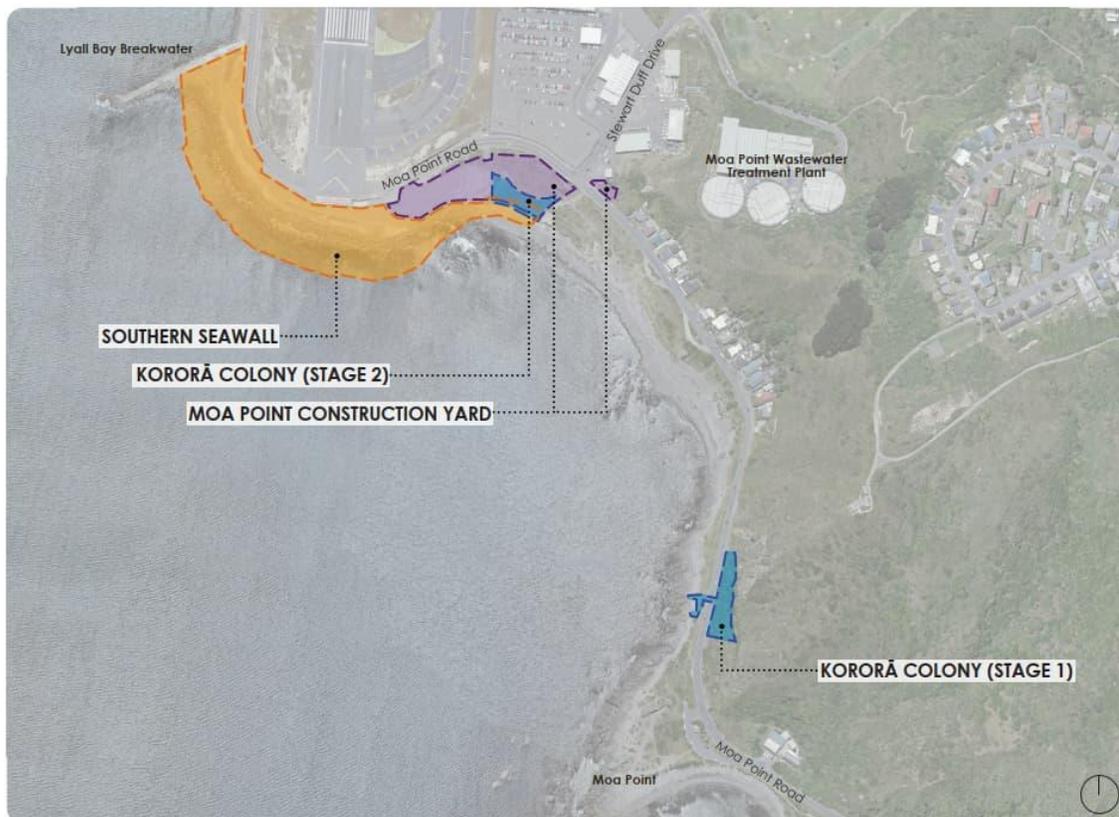


Figure 4: Moa Point Yard and Southern Seawall.

The establishment phase will include the following works

- Establishment of erosion and sediment control measures (clean water control, sediment retention devices and dirty (site) water control);
- Initial vegetation clearance and topsoil stripping;
- Earthworks to recontour the site to a level surface, suitable for yard activities. (If possible, all material will be used for levelling on site, however, if any material was found to be unsuitable for re-use, it would be removed and disposed at an appropriately authorised disposal site). Once the site has been recontoured, clay capping material may be brought in and placed to cover existing historic fill if required.
- Installation of drainage works; and
- Establishment of laydown and working yard areas.

The proposed specifications including earthworks of the Moa Point Yard works are shown in Table 2, with detailed design drawings included as in Part C of the application documents².

² These figures are approximate and subject to detailed design.

Parameter	Specification
Earthworks area	Up to 10,000 m ² (including Stage 2 Kororā Colony from Stewart Duff Drive to east end of Eastern Bank rock protection).
Earthworks volume	Up to 25,000 m ³
Paved area (crossings and accessway)	Up to 200 m ²
All-weather (permeable granular) pavements	Moa Point Yard: 9,000 m ² Moa Point Foreman's Yard: 284m ²
Yard buildings (if required)	Up to 80-100 m ² , and up to 6 m high OR Up to 170 m ² , and up to 4m high

Table 2 - Proposed specifications of the Moa Point Yard (source WIAL Southern Seawall Renewal Draft Description of Proposal July 25)

4.2. Southern Seawall

The proposed overlay approach to the Southern Seawall works involves:

- Overlaying the existing seawall with a layer of rock and re-used concrete units (underlayer), and two layers of concrete armour units (armour layer), and construction of the seawall toe;
- Replacing the Eastern Area informal rock and concrete rubble with a formal seawall (using concrete armour units, rock underlayers, hardfill, geotextile and an excavated toe); and
- Replacing the rock armour, reno mattress and gabion baskets at the seawall crest, wave trap and backslope with rock armour and underlayer, gabion baskets and a recurve wave return wall.

The existing seawall elements are shown in Figure 5. The proposed seawall is shown in drawings 3324338-CA-SK007-SK009 and SK100-SK105 in the design drawings, included in Part C of the application documents.



Figure 5: Existing Southern seawall including seawall elements

A summary of key metrics for the existing and proposed seawall is shown in Table 3.

Parameter	Specification
Existing seawall length:	~400 m
Includes:	
<ul style="list-style-type: none"> Existing formal Southern Seawall length 	~300 m
<ul style="list-style-type: none"> Existing Eastern Area informal seawall 	~100 m
Proposed seawall length (at crest)	Up to 430 m (measured at seaward side of the crest)
Increase in seawall width at existing formal seawall	~20-30 m (at varying points)
Potential excavated volume for toe	Up to 10,000 m ³
Increase in total proposed seawall footprint	Up to 12,000 m ²
Seawall crest level	~6.4 m -7.4 m NZVD16 initially (up to 1m above existing crest)

	level) with a potential further uplift to approximately 8.2m NZVD16 in future, depending on future climate change (refer to Section 1.6.5) and Airport operational requirements.
Crest wall (if required)	~220 m long (up to 8,000m ³ of steel reinforced concrete)
Concrete armour units	Up to 7,600 units to be used, with up to 40,000-60,000 m ³ of concrete
Gabion	~150 m long (2,000 m ³ of rock)
Armour rock	~10,000 - 20,000 m ³
Underlayer rock	~30,000 - 70,000 m ³
Toe rock	~15,000 - 20,000 m ³

Table 3 – Key metrics of the existing and proposed seawall

Construction

The construction of the seawall will be predominately undertaken as a shore-based construction activity. However, it is possible that some parts of the seawall may need to be constructed utilising marine-based equipment.

The landside working area during the seawall construction period extends from Moa Point Road to the Mean High Water Springs and from the Lyall Bay Breakwater to approximately opposite Stewart Duff Drive. The landside working area covers approximately 3ha.

Site Establishment

During site establishment the site will be cleared and the existing wave trap will be overlaid with aggregate to create a vehicle access.

The fibre optic cable connected to the WIAL windsock at the Southern Seawall will be relocated to a suitable and safe location to facilitate construction activities and to ensure these critical assets are not inadvertently affected by construction activity. Potholing will also be undertaken to accurately locate and protect all existing underground services that are to be left whilst construction works are being undertaken.

Eastern Bank Remediation

- Removal of any debris and vegetation within the work area, including within the existing stormwater system
- Contouring of the existing bank, with any cut material to be placed on the Moa Point Yard;
- Clearance and storage of granular beach material, excavation of toe key in rock (up to 1m deep), and placement of excavated rock on Moa Point Yard, or construct toe rock;

- Placement of geotextile along the bank;
- Construction of rock protection from the toe landward, and working progressively along the structure; and
- Replacement of beach material over the lower rock protection.

It will take approximately three months to construct the Eastern Bank Remediation.

Southern Seawall

In order to reconstruct the Southern Seawall, the existing reno mattresses and gabion baskets, Akmon armour units and rock at the crest of the existing seawall must be removed to allow underlayer rock and Cubipods to be placed. This work will be undertaken in a staged manner to ensure adequate sea defences are in place to protect the works against storm events. All weather access roads will be constructed using suitable basecourse to enable safe access for workers and equipment.

Prior to construction, discrete ground improvements will be undertaken to enable the safe support of construction equipment during the construction process.

Once the ground improvements are in place, the proposed construction activities are as follows:

- Removal of any debris and vegetation within the work area;
- Protection of existing services;
- Relocation of windsock fibre optic cable (and relocation or protection of Instrumentation Landing System if necessary);
- Progressive removal of reno mattresses, gabion baskets, rock and Akmon armour units at seawall crest;
- Construction of temporary engineered access platforms and / or engineered hardstanding for large construction equipment progressively;
- Excavation of toe trench in rock seabed, smooth rock pinnacles as required, and / or place toe rock;
- Place hardfill and geotextile in Eastern Area;
- Placement of underlayer rock and re-used Akmons to the face of the existing seawall to grades as designed;
- Installation of Cubipod armour units over the underlayer, starting from the toe;
- Replacement of Eastern Area informal rubble with formal seawall (Cubipods) concrete armour units, rock underlayers, geotextile, hardfill and rock and/or concrete armour units or toe trench for the seawall toe;
- Place gabion and crest wall (if required) and construct rock protection on crest; and
- Replace rear slope geotextile, underlayer and rock armour at western end of seawall, above Moa Point Road.

Kororā Colony Construction

The construction activities required to develop each colony are set out below.

Stage 1 Colony

- Installation of lizard fencing and local lizard relocation (within the site) to clear limited working areas for excavators and / or trucks within the colony footprint;
- Location, marking and protection of all existing services at the site;
- Installation of a kororā passage from the shoreline to the colony, including:
 - Removal of any debris and vegetation within the work area;
 - Construction of raised section of road, and excavation and installation of an 800 mm high, 2.3 m wide precast concrete underpass beneath the road;
 - Reconstruction of granular road pavement, installation of chip seal wearing course and line marking to reinstate road to original operating condition;
 - Excavation and placement of geotextile and rock to form a shallow ditch through the grass berms on both sides of the road (if required);
- Placement of nestboxes;
- Placement of rocks (including reuse of excavated rock), mainly by hand with some limited machine placement on both the eastern and western side on Moa Point Road based on ecological advice;
- Replacement of weed species with appropriate native planting in accordance with the landscape rehabilitation plan; and
- Erection of a permanent fence around the colony area, to protect kororā from dogs, wind, and human disturbance.

Stage 2 Colony

- Implementation of sediment and erosion control measures, in accordance with the ESCP;
- Removal of any debris and vegetation within the work area;
- Location, marking and protection of all existing services at the site;
- Earthworks to recontour the site to a suitable level, with earth mounds constructed inside and outside the colony area to provide shelter based on ecological advice;
- Placement of rocks (including reuse of excavated rock), mainly by hand with some limited machine placement if required, and nestboxes;
- Planting and landscaping, in accordance with the landscape rehabilitation plan; and
- Erection of a permanent fence around the colony area, to protect kororā from dogs, wind and human disturbance.

-

4.3. Earthworks Summary

Table 4 summarises the total earthworks areas anticipated for the Project.

Site	Area (ha)
MGC Yard	4.5
George Bolt Yard	N/A
Moa Point Yard	1
Southern Seawall	N/A
Kororā Stage 1	0.08
Kororā Stage 2	Included in the area of Moa Point Yard

Table 4: Anticipated earthworks areas.

5. SITE AND RECEIVING ENVIRONMENT DESCRIPTION

5.1. Summary of Environments

The Project Area is located within the eastern coastal suburbs of Wellington City on the Rongotai isthmus, between Evans Bay and Lyall Bay. The Project Area is generally located between the suburbs of Rongotai and Lyall Bay to the west, and Miramar and Strathmore Park to the east.

The land ownership and legal description of each Project element is set out in Table 5.

Project Element	Owner / Status	Legal Description	Record of Title
Southern Seawall	Vested in WCC as Local Purpose Esplanade Reserve	Lot 3 Deposited Plan 78304	WN45A/75
Moa Point Yard	Part vested in WCC as Local Purpose Esplanade Reserve Part unallocated Crown Land administered by LINZ	Lot 3 Deposited Plan 78304 & Lot 4 Deposited Plan 78304	WN45A/75, WN45A/76
MGC Yard	Wholly owned by WIAL	Lot 1 Deposited Plan 552938	973798
George Bolt Yard	Wholly owned by WIAL	PT LOT 1 DP 78304 PT SEC 1 SO 37422 SECS 2-3 SO 37422 SEC 3 SO 38205 SECS 1	1096648
Stage 1 Kororā Colony	Part owned by WIAL Part vested in WCC as Local Purpose Esplanade Reserve Part vested in WCC as Road Reserve	Lot 2 DP 78304 Lot 4 Deposited Plan 78304	WN45A/74
Stage 2 Kororā Colony	Wholly unallocated Crown Land administered by LINZ	-	-

Table 5: Landownership and legal description of each Project element.

Southern Seawall and Moa Point Yard

The Southern Seawall is situated along the coastal edge at the southeastern end of Lyall Bay. Immediately to the north is Moa Point Road and the Moa Point Road tunnel, with the Airport runway situated just beyond. The Lyall Bay Breakwater lies directly to the northwest.

The existing Southern Seawall consists of large concrete armour units abutting gabion rock baskets overlaid with concrete. Various sized rocks fill the gaps between them.

The Moa Point Beach embayment lies immediately to the east of the Southern Seawall, with a small residential settlement about 150 m further east along the landward side of Moa Point Road. The beach is comprised of cobbles and pebbles, with rocky outcrops and reefs extending seawards. The more modified Eastern Area (immediately east of the formal seawall) includes rubble among pebbles at the base of an actively eroding beach ESDCARpment.

The Moa Point Yard footprint is currently comprised of earth mounds and hollows and contains isolated bushes and patches of native vegetation, including taupata and flax.

MGC Yard

The MGC Yard is located to the southeast of the Airport, on land which formerly comprised the southern section of the Miramar Golf Course. The site features undulating terrain with defined fairways and greens, and several mature pōhutukawa trees on the margins.

A summary of the geological conditions at the MGC Yard, including any potential geohazards and the stability of the slopes in the vicinity of the proposed rock cutting is provided in Beca (2025a).

The northwestern corner of the MGC Yard is underlain by Holocene beach deposits consisting of marine gravels and sands which are free draining. The remainder of the MGC Yard is underlain by Rakaia Terrane (Wellington greywacke) rock, which comprises interbedded sandstone and mudstone. The Wellington greywacke is typically faulted, tilted and folded, with very closely to closely spaced discontinuities.

The depth of groundwater levels close to the MGC Yard vary between 1.9 to 10.9 m RL (depending on the elevation across the site).³

The estimated elevation of the top of rock at the MGC Yard ranges from 0 to 20 m RL, with rock level across the site considered to dip to the north-west towards the Airport.

Beca (2025a) provides an overview of the anticipated ground profile for the proposed cuts at the southwestern and southeastern slopes, and the flat area between these slopes.

- For the southwestern slope, the northern extent (near Stewart Duff Drive) is entirely on greywacke rock, with up to 1.7 m of fill on top, with fill thickness increasing towards the east. The greywacke on this slope is likely to be moderately strong and moderately to highly weathered, with closely to very closely spaced defects (20 – 200 mm);
- For the southeastern slope, the exact fill thickness cannot be determined, however, the fill ramps at the toe of the slopes may consist of sand overlying colluvium. The rock underlying the fill is likely to consist of weak to very weak and completely to highly weathered greywacke, with extremely to very closely spaced defects in the upper metres, while moderately strong to strong, moderately weathered greywacke rock may be present at greater depths; and
- For the flat area between the southwestern and southeastern slopes, the fill thickness generally increases to the south, with a maximum thickness of potentially 10 m.

³ Groundwater levels have been adopted from groundwater monitoring instrumentations installed at the Wellington Sludge Minimisation Facility, located approximately 80 m southwest of the site.

George Bolt Yard

The George Bolt Yard is located to the west of the Airport runway. The surrounding environment is comprised of a mix of light industrial and commercial land uses, including a range of airport-related activities to the east and large-format retail activities to the west.

The George Bolt Yard is currently used by WIAL for various storage activities, and includes a 1,000m² hangar that will be demolished and made contiguous with the existing storage yard. The site is fully fenced and entirely comprised of hard paving, with no vegetation cover.

Contaminated Land

Beca has prepared a preliminary site investigation (“PSI”) and detailed site investigation (“DSI”) for the site (Beca (2025c), Beca (2025d) and Beca (2025e)).

The PSI and DSI concluded that a number of Hazardous Activities and Industries List (“**HAIL**”) activities have (or potentially have) occurred within the site footprint. The existing HAIL activities within the project footprint are generally localised and limited in magnitude and pose low potential for significant effects on human health, the environment and the overall project. A summary of the HAIL activities associated with each project element is provided in the sub-sections below.

Miramar Golf Course Site

The golf course site was established in 1908 and recontoured into its current configuration in 1994-1995. Agrichemicals have been used on the golf course to maintain the greens, fairways and tees including organochlorine pesticides (“**OCPs**”), organophosphates, and carbamates, and the site was irrigated with reclaimed treated wastewater until 2019. The western part of the golf course site historically housed the National Airways Corporation (“**NAC**”) hangar and apron.

Due to the use of pesticides, its historic use as a NAC apron and wastewater irrigation on the site, HAIL activities A10⁴, F1⁵ and G5⁶ apply to the golf course site.

Analytical results identified per- and poly-fluoroalkyl substances (“**PFAS**”) and concentrations of perfluorooctane sulfonic acid (“**PFOS**”). PFAS was detected in soil to 1 metre below ground level (the maximum depth tested) in the western part of the site that appears to correspond with the historical NAC apron and immediately surrounding area. PFAS concentrations complied with human health and terrestrial ecological criteria. The area contains concentrations of PFOS above the conservative ecological indirect exposure criteria. This criterion is not considered relevant while the area is used by a yard and covered by a compacted surface.

Seawall Site

An area further east of the Southern Seawall and Moa Point Yard area was potentially used for fire training purposes in the 1980s based on historical aerial photos and an airport master plan. According to the Greater Wellington Regional Council (“**GWRC**”) Selected Land Use

4 Persistent pesticide bulk storage or use including sport turfs, market gardens, orchards, glass houses or spray sheds

5 Airports including fuel storage, workshops, washdown areas, or fire practice areas

6 Waste disposal to land (excluding where biosolids have been used as soil conditioners)

Register (“**SLUR**”), landfilling also occurred at the site (G3 – Landfill sites). However, there does not appear to be evidence of this beyond potential uncontrolled filling.

Due to the eastern side of the site's use as a fire practice area and the uncontrolled filling of the bank adjacent to the seawall, HAIL activity F1 applies adjacent to the seawall site.

Due to the use of land for potential uncontrolled filling, HAIL activity I⁷ applies within the Moa Point Yard area.

Analytical results identified PFAS and concentrations of PFOS. PFAS concentrations did not exceed human health criteria or direct terrestrial ecological criteria. PFOS concentrations exceeded indirect ecological criteria but remain below human health thresholds. Leachate met marine water quality guidelines but exceeded limits for unlined landfills, while complying with lined landfill criteria. Heavy metals were generally below health guidelines but above background levels in some areas. No asbestos was detected.

5.2. Receiving Environment

Stormwater from the Airport site primarily discharges to the marine waters of Lyall Bay, with additional discharges to the marine waters of Evans Bay and the surrounding residential and light commercial areas to the northeast of the Airport site. There are five stormwater catchments across the site from/within which stormwater discharges, and in which different land uses are managed. Figure 6 shows the extent of each of the catchments.

WIAL currently holds a site wide stormwater discharge permit for all of the catchments shown in Figure 6. All stormwater discharges associated with this Project are located within Catchments 4 and 5, which ultimately discharge to Lyall Bay.

⁷ Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment



Figure 6: Stormwater catchments within the WIAL site

Any discharges from the Southern Seawall Renewal face and the Moa Point Yard will be discharged directly to the coastal waters of Lyall Bay.

An overview of the coastal processes in Lyall Bay and around the Southern Seawall is provided in Beca (2025b). Lyall Bay is a highly dynamic environment, where background turbidity and light conditions are strongly influenced by weather events, resulting in variable water clarity. Storm events particularly affect water clarity with:

- Total suspended sediment increasing from 1 mg/L in calm conditions to more than 15 mg/L in bad weather; and
- The euphotic zone depth⁸ decreasing from between 20 – 30 m in calm conditions to less than 10 m in bad weather.

Higher energy environments like Lyall Bay have generally coarse sediments and low concentrations of anthropogenic contaminants.

Most of the seabed within the vicinity of the Southern Seawall consists of rocky reefs that are typical of the exposed Wellington South Coast, with mobile sediments limited to gullies between reefs. Sediment composition within 100 m of the existing Southern Seawall ranges from a dominance of gravel and very coarse sand through to a dominance of fine sand and very fine sand.

Sediment surveys undertaken by the National Institute of Water and Atmospheric Research (“**NIWA**”) in 2014 on the eastern side of Lyall Bay found the seabed within the vicinity of the Southern Seawall is composed of very coarse sand with a fine gravel component, with sediments in the remainder of Lyall Bay dominated by moderate to well sorted fine sands.

Concentrations of heavy metals and polycyclic aromatic hydrocarbons (“**PAHs**”) in Lyall Bay – commonly associated with the use and combustion of petroleum products – are well below ANZECC guideline thresholds⁹. In samples collected in April 2024, even the highest PAH concentrations were more than four times lower than the default low guideline value.

6. STATUTORY CONSIDERATIONS

6.1. Resource Management Act

The Resource Management Act 1991 (“**RMA**”) regulates the activities associated with the Project. Section 9 of the RMA governs land disturbance as a land use activity and Section 15 governs discharges of contaminants (including sediment) to land and water. The RMA is given effect to by National Environmental Standards, National Policy Statements and Regional and District Plans.

Section 105 of the RMA requires applications for discharge permits to have regard to the nature of the discharge and sensitivity of the receiving environment to adverse effects, the reasons for the proposed discharge method selected and any potential alternative methods. The proposed ESC methodology takes account of the relevant matters listed in s105 of the RMA.

Where practicable, WIAL has sought to ensure that construction phase discharges discharge to land in the first instance – through the kinds of measures described below – to minimise the potential for sediment and/or contaminants to enter water.

Consistent with the outcomes required by section 107 of the RMA, the adoption of the proposed ESC methodology is anticipated to avoid, after reasonable mixing, all or any of the following effects in the receiving waters:

- the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
- any conspicuous change in the colour or visual clarity;
- any emission of objectionable odour;

⁸ An index of light penetration, defined as the depth at which photosynthetically available radiation is reduced to 1% of surface values.

⁹ The Australian and New Zealand Guidelines for Freshwater and Marine Water Quality Default Guideline Values.

- the rendering of fresh water unsuitable for consumption by farm animals; or
- any significant adverse effects on aquatic life.

The erosion and sediment control principles and procedures described in sections 8 and 9 will ensure that the construction phase of the project will not give rise to any of the above effects.

7. ASSESSMENT METHODOLOGY

This ESDCAR follows an overall Best Management Practice (“BMP”) approach to the earthworks activities which combines the minimum design standard with appropriate staging and other controls, based on the characteristics of the individual component areas.

The ESC design approach is illustrated in Figure 7. This ESDCAR provides the overarching principles of the ESC implementation, and the various procedures that will be implemented, including ESC monitoring and confirmation of the appropriate minimum ESC design standard. The ESDCAR is developed in conjunction with other technical assessments and statutory provisions and informs the consenting process and the construction of consent conditions. The consent conditions in conjunction with the relevant design standards inform the development of the SSESDCPs.

On the basis that all my recommendations regarding ESC management have been accepted and are reflected in the proposed conditions, I am able to assess the potential effects of the Project in respect of erosion and sediment and express a view regarding the appropriateness of the measures proposed to address those potential effects.

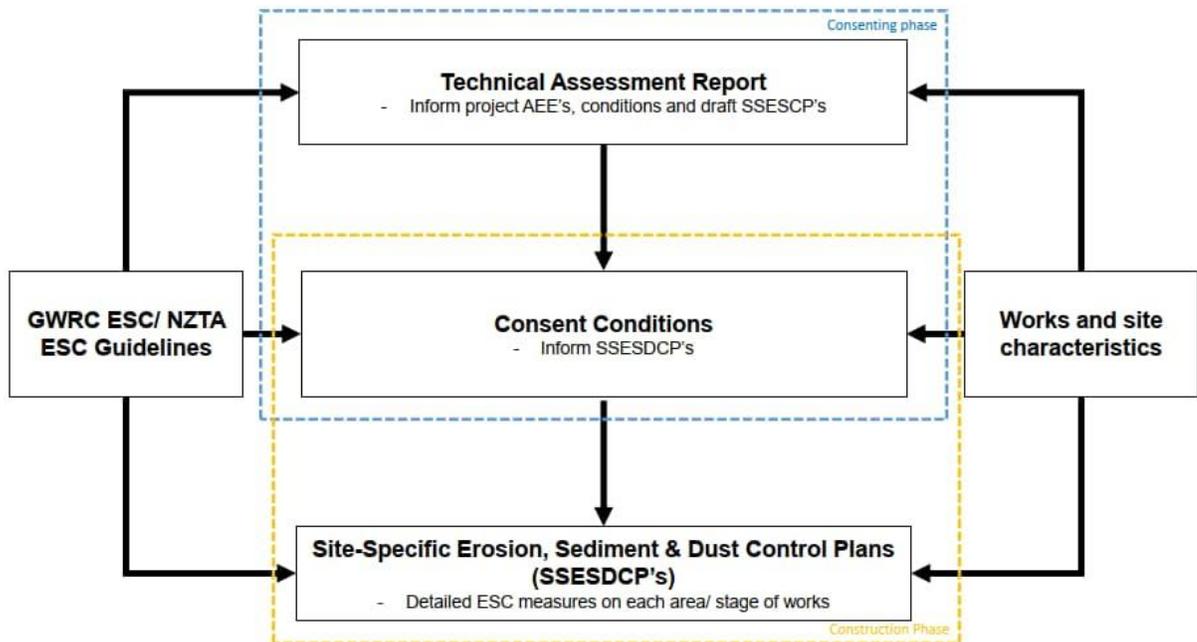


Figure 7: Erosion and sediment control design process

8. EROSION AND SEDIMENT CONTROL PRINCIPLES

8.1. Design Standards

The principles of the Greater Wellington Regional Council *Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Wellington Region*, February 2021 (the **ESC Guideline**) have been adopted for the design, construction, maintenance and decommissioning of the ESC devices.

The NZTA *Erosion and sediment control guidelines for state highway infrastructure*, September 2014 is proposed as an alternative approach in the sizing of sediment retention ponds (SRP), which I consider appropriate given the site's (MGC Yard) sandy soils. The alternative approach is detailed in the corresponding SSESDCPs.

8.2. Construction Water Management Objectives and Principles

Management of construction water will seek to achieve the following objectives:

- Minimise the potential for sediment generation and sediment yield by maximising the effectiveness of ESC devices; and
- Take all reasonable steps to avoid or minimise potential adverse effects on marine environments within or beyond the Project works boundary, with particular regard to reducing opportunities for sediment generation and discharge.

The following principles will apply and will be reflected in the SSESDCPs prior to construction activities commencing:

1. Erosion control will be given emphasis at all sites to minimise the risk of sediment discharge. This will be achieved with structural (physical measures) and non-structural (methodologies and construction staging) erosion control measures.
2. Sediment control will treat sediment-laden runoff from all exposed earthworks areas.
3. Earthworks and construction water management measures will be confirmed in the final SSESDCPs which will allow for flexibility and practicality of approach to ESC and allow the ability to adapt appropriately to specific site conditions.
4. Progressive and rapid stabilisation, both temporary and permanent, of disturbed areas using mulch, aggregate and geotextiles will be on-going during the earthworks phase. Temporary stabilisation will apply particularly with respect to stockpiles, concentrated flow paths and batter establishment. Stabilisation is designed for both erosion control and dust minimisation.
5. Comprehensive site monitoring and management will allow for continuous improvement in response to monitoring outcomes on an ongoing basis. Monitoring will include visual inspection of the construction water management devices and the downstream environment.

8.3. Design of Erosion and Sediment Control Devices

8.3.1. Erosion Control - Construction Staging and Sequencing

The extent of exposed soil and length of time that area is exposed directly influences the sediment yield from a particular area. Earthworks and construction activities will be staged and sequenced in order to minimise open areas at any given time to the greatest extent practicable. Open earthworks areas will be progressively stabilised to reduce the potential for erosion to occur.

8.3.2. Erosion Control - Clean Water Control

Clean water diversions (“**CWDs**”) are diversion channels or bunds which divert clean water runoff away from the earthwork areas. Permanent and temporary CWDs will be used for the Project to prevent runoff from the undisturbed catchment above the works from entering the construction area to ensure the works are sufficiently protected from flows from the natural catchment outside of the work area.

The details of the temporary and permanent CWDs are described in the respective SSESDCPs.

8.3.3. Sediment Control – Sediment Retention Ponds

Sediment retention ponds (**SRPs**) are impoundment devices that provide time for suspended solids to settle out before the runoff is discharged to the receiving environment. The key design criteria for all SRPs that are to be utilised across the Project are set out below.

- Sizing of the SRP for the MGC Yard will be in accordance with the NZTA *Erosion and sediment control guidelines for state highway infrastructure*, September 2014. .
- Spillways formed to safely convey the 1% annual exceedance probability (AEP) rain event.
- T-bar floating decants with a mechanism to control outflow such as a manual decant pulley system or screw on end cap.

In accordance with industry best practice, it is proposed to chemically dose the SRPs in accordance with the CTMP (Appendix A) to maximise sediment retention.

8.3.4. Decanting Earth Bunds

Decanting earth bunds (if used) (“**DEBs**”) will be utilised to treat sediment laden runoff from areas of up to 3000m². The DEB volumes will be sized at a ratio of 2% in accordance with the ESC Guidelines.

In accordance with industry best practice, it is proposed to chemically dose the DEBs in accordance with the CTMP (Appendix A) to maximise sediment retention.

8.3.5. Silt Fences and Super Silt Fences

Silt fences and super silt fences will be used to treat sediment-laden runoff from small areas that cannot be diverted to an alternative ESC device.

8.3.6. Dust Control

Dust management will be the responsibility of the contractor and managed in general accordance with the Ministry for the Environment’s “Good Practice Guide for Assessing and Managing Dust” November 2016. It is a key principle of the Project that the contractor will take a proactive approach to dust management on the site, rather than a reactive approach once any potential effects are evident.

General principles to be adopted to ensure that potential dust effects are avoided include:

- Staging of earthworks activities as much as possible and progressive stabilisation of completed surfaces to ensure that exposed areas at any one time are minimised;
- Managing the route and speed of vehicles traversing the site taking into account potential dust mobilisation and effects;
- Monitoring and maintenance of potential nuisance dust effects; and

- Implementation of appropriate control measures to suppress dust generation effects, such as water carts.

9. EROSION AND SEDIMENT CONTROL IMPLEMENTATION

9.1. Site Specific Erosion, Sediment & Dust Control Plans

The SSESDCPs will address the following information for each specific work area, which may be a site or a stage of a site. The SSESDCPs will include:

- i. the specific construction activity to be undertaken;
- ii. the area and volume of earthworks;
- iii. the locations of all earthworks;
- iv. methods for managing construction water effects for specific activities;
- v. the duration of the earthworks;
- vi. the time of the year that the earthworks are to be undertaken, and where applicable, the measures to be implemented to respond to any heightened weather risks at that time; and
- vii. stabilisation methods and timing to reduce the open area at key locations to assist with a reduction in sediment generation.

Draft SSESDCPs are provided as Appendix B. Each SSESDCP will be finalised and submitted to Council for certification prior to any earthworks occurring. Any deviation from the ESC Guidelines will be explained in the corresponding SSESDCP.

9.2. Pre-construction Site Meeting

Pre-construction site meeting will be held between Project personnel (Environmental Manager and / or ESC Specialist, Project Manager, Contractor) and GWRC and WCC staff before works commence at any site or re-commence in each earthworks season.

9.3. Construction of ESCs - Supervisions

The construction of the ESC devices will be overseen by the Environmental Manager and/or an ESC Specialist.

Hold points for construction will be established for each ESC device whereby the Environmental Manager (or ESC Specialist) will inspect the work completed, for example the installation of anti-seep collars or the installation of primary outlet, before works progress further. This oversight provides an important quality assurance measure.

9.4. As-built Certification

As-built certification of ESC devices is a critical element of effective site management. As-built checklists and/or drawings will be prepared for all ESC to ensure that they have been installed as designed. Works within the catchment of an ESC device will not commence until the as-built document for the device (or devices) has been certified by a suitably experienced ESC practitioner.

9.5. Monitoring and Maintenance

See Section 10 below.

9.6. Decommissioning

ESC devices will only be decommissioned when the construction activities have ceased, and the contributing catchment is stabilised. GWRC will be informed prior to the ESC devices being removed.

9.7. Winter Works

Earthworks during the winter period (1 June – 30 September) is anticipated to be required. The earthworks during this period will be solely the MGC Yard where the predominant soils are sand based.

The winter shutdown is effectively a risk management tool which recognises that climatic conditions are generally not favourable to earthworking during the wetter winter months.

The potential problems of earthworking during this period may include:

- Difficulty of machinery access onto the site;
- Difficulty of stabilising exposed ground either by access or germination conditions;
- Colder soil temperatures and less sunshine hours required for grass germination;
- Unsuitability of some soils to be worked in wet conditions (e.g. to ensure optimum moisture content required for geotechnical strength);
- Increased risk of sediment-laden discharge, and
- Larger flows and velocities (when working in and near watercourses).

The potential problems noted above are aggravated with soils containing higher fractions of silt and/or clay or where seasonal high-water tables are encountered. It is noted that the majority of the MGC Yard area has sand based soils.

Some of the ESC Guidelines in NZ acknowledge that winter works on sand-based soils are appropriate. For example, the NZTA ESC Guidelines outline where winter works are likely to be allowed and include:

“The site is located on sandy soils with good ground infiltration and the terrain is not too steep. (It may be preferable that earthworks be undertaken in the winter shutdown period in these locations, as this lowers the risk of dust during the drier summer months”

And the Environment Bay of Plenty’s Environmental Guideline 2010/01, which states:

“In setting this Winter Earthworks Policy, Environment Bay of Plenty recognise that it is site specific and, as an example, if your site contains only sandy soils then the winter exclusion will not apply” and “Note that it is preferable that earthworks be undertaken in the winter period in sandy soils as this lowers the risk of dust during the drier summer months.”

Risk Assessment

A risk assessment can be undertaken utilising known site conditions and recognised assessment methods. The factors that influence the potential soil loss from a site include:

- Soil type;
- Area of disturbance;
- Slope angle and length;
- Proximity of receiving environment;

- Rainfall; and
- Performance of erosion and sediment control devices.

When these factors are appropriately managed, the potential sediment related risks can be considered low.

These risk factors are assessed from a winter works perspective below.

Soil Type

The predominant soil type in the MGC Yard area is sand. Sand will erode under heavy rainfall but will fall out of suspension quickly given its particle size. Furthermore, sand soils have good infiltration which also results in less runoff. Working these soils in winter months also has the benefit of less dust generation.

Area of Disturbance

The area of works has a direct result in reducing the potential for sediment discharges. Earthworks will be progressively stabilised such that the area of disturbance is minimised and in this regard is considered low risk.

Slope angle and length

Slope angle and length is a critical risk factor in relation to potential sediment discharges. It is commonly understood that as slope increases as does the potential sediment yield. As the site is generally flat to rolling and the earthworks will create a level surface, the risk associated with slope is considered low. In addition, the low profile of the site mean that potential risk of offsite sediment discharge is low.

Proximity of receiving environment

The proximity and the sensitivity of the receiving environments are considered. Any discharges from the sites ESC will be directed to the reticulated stormwater system which discharges to Lyall Bay, approximately 780m from the site. Lyall Bay is a highly dynamic coastal environment.

Rainfall

The volume of rainfall has a direct impact on the potential volume of sediment that is discharged from the site's controls.

Rainfall records have been reviewed for the GWRC rainfall gauge at Miramar Bowling Club since 2020.

	2020	2021	2022	2023	2024	2025
Annual	796mm	840mm	1149mm	829mm	798mm	621mm
Winter	160mm	312mm	562mm	262mm	346mm	

It is acknowledged that saturated soils in winter periods poses additional sediment related risks, however this has been appropriately managed by an SRP that is sized for 2.6ha.

Performance of erosion and sediment control devices

Erosion and sediment control measures should generally be planned to link functionally to form a “treatment train” with each measure having a specific role within the framework of surface water management, soil protection and stabilisation, and sediment capture.

The erosion and sediment controls will comprise:

- Progressive stabilisation (millings & basecourse);
- Cleanwater and sediment laden diversions; and
- Chemically treated (PAC) sediment retention pond.

Sampling results from PAC chemically treated SRP’s during ALPURT (Northern Motorway Extensions) and the Millwater development in Silverdale, show SRP efficiencies ranging from 78% through to 99%. The high efficiencies are generally associated with SRP’s where they meet the design standards of GWRC ESC guidelines. These higher efficiencies were achieved with traditional rain activated chemical dosing systems.

Summary

With the appropriate team, earthworks methodology, erosion and sediment controls in place and appropriate ESC monitoring, it is considered that the risk associated with the winter works can be appropriately managed to a level that is considered low risk.

10. MONITORING AND RESPONSES

10.1. ESC Monitoring

Monitoring of the ESC devices and outcomes will be undertaken in accordance with the appended Erosion, Sediment & Dust Control Monitoring Plan (**ESCDMP**) provided in Appendix C. It provides a programme and methodology to ensure that ESC devices have been designed, installed, and managed in accordance with the ESC management structure described in section 8 and 9 of this Report, and to monitor the effectiveness of ESC for the duration of the construction phases of the Project.

Environmental compliance and performance will be achieved through appropriate location, design, installation, as-built certification, maintenance, and monitoring of ESC devices. ESC management in this context is not restricted to physical structures but also includes work practices and methodologies.

Regular monitoring will be undertaken by the Environmental Manager, ESC Specialist or Project Manager to ensure ESC devices are operating as designed and are maintained in accordance with guidelines and consent conditions. This monitoring underpins the successful implementation of the ESC management system, to achieve the anticipated environmental outcomes and ensure compliance with the resource consent conditions. This monitoring includes pre- and post-rainfall checks and maintenance and is considered "business as usual".

The monitoring will also provide continual feedback to ensure successful ESC performance and early detection of activities or problems that have the potential to result in an adverse environmental effect.

The frequency of the ESC device monitoring will vary throughout each construction phase and reflect areas of changing activity and risk within the Project. During active construction (earthworks) in a given area, the monitoring will be undertaken daily as well and pre and post rainfall events. Monitoring will report any repairs or issues that need to be addressed and the timeframe for completion of those actions.

The regular monitoring will be supported by monitoring of weather, rainfall events, and will include wet weather responses and contingencies.

10.2. Performance Targets

The ESC design seeks to meet the following targets listed below.

- 170 NTU.
- pH between 5.5 and 8.5.

The parameters would be measured by manual sampling in response to a rainfall trigger event of 20mm / 24 hours or 7mm/hr. That event is of a size that places stress on the SRP i.e. it is 'working hard'. Water samples will also be taken at those times and analysed for turbidity and pH.

These targets must not be adopted as compliance standards. Imposing performance limits and compliance standards is not consistent with the operation of the ESC Guideline. The approach of monitoring against targets rather than imposing limits has been adopted by the Environment Court and Horizons Regional Council in the consenting of the Te Ahu a Turanga; Manawatū Tararua Highway Project and Otaki to North Levin.

The performance of an impoundment device such as an SRP that is assumed when assessing the effects of an earthworks project, is based on average sediment removal efficiency across a range of storms. Limits cannot be practically applied to a SRPs even for a small earthworks site given the variability of the sediment load in runoff that occurs throughout a storm or across various storms. That variability cannot be controlled by those constructing the Project. However, the standard of ESC implemented can be controlled (i.e. maintaining best-practice measures).

SRP efficiency is dependent on many factors. In simple terms, the sediment retention efficiency (i.e. the settlement rate) is limited by the residence time of water in the pond and the water velocity through the pond. The slower water moves through the pond, and the longer it remains in the pond, the more settlement of sediment will occur.

This 'residence time' is controlled by the inflow rate of water to the device, which itself is controlled by the rainfall intensity, duration and volume, the slope of the site (i.e. a steeper site means faster runoff), the soil type, the soil moisture condition of the site (a dry site will generally soak up more rainfall), the surface condition (a rougher surface retains more water), and ground cover (more runoff eventuates from exposed ground, and less from vegetated ground).

As water enters the device, the sediment-laden water is denser than the water that is already in the pond (from which some of the sediment has settled out). The denser water flows to the lower part of the water column and displaces the cleaner water upwards. The cleaner top layer of water is skimmed off by the decants. The decants are designed to discharge at a rate of 3L/s/ha of contributing catchment. Depending on the catchment size, an SRP may have multiple decants. The height of the decants is offset so that small events only engage the lower decant, with larger events progressively activating additional as the water level in the pond rises (due to the inflow exceeding the decant rate).

The residence time of water in the pond reduces as each additional decant activates and the pond efficiency progressively decreases. If the inflow rate causes the water level to rise further and spill into the primary spillway (the upstand pipe / manhole riser), the efficiency further reduces. It further reduces if flows discharge over the emergency spillway, which provides for

the safe discharge of flows from low frequency larger events that exceed the combined capacity of the decants and primary spillway.

The factors described above mean that a compliance limit cannot be met with any certainty for a range of typical storms, but this does not mean that the discharge of sediment is unacceptable.

Rainfall triggered monitoring of the SRP will be undertaken to understand the performance of the Project's ESC measures through a range of larger (but still relatively frequent) storm events.

Two rainfall response triggers will be adopted; being 7mm in one hour, and 20mm in 24 hours. These triggers have been adopted as intensities and durations above which a range of more significant outflows are likely to occur from SRPs.

Performance targets have been established for the SRP. These targets are

- 170 NTU; and
- pH between 5.5 and 8.5.

If an SRP does not achieve the performance targets as set out in the ESCMP then the target exceedance actions will occur. In summary this includes:

- Within 24hrs of a threshold exceedance, a full audit of the condition of the control device and its contributing catchment will be carried out and recorded in writing;
- Remedy and record any obvious causes on site that may have contributed to a threshold exceedance as soon as practicable; and
- Identify any additional reasons for the exceedance and opportunities to modify the management of the site to improve overall performance which may include:
 - Consideration of additional ESC;
 - Increased maintenance of controls;
 - Progressive stabilisation in sub-catchments; or
 - Make amendments to methodologies and sequencing of works and refine controls if necessary

Failure to achieve the above performance standards does not mean that there has been an environmental effect, it essentially results in refinement of the ESC system.

10.3. ESC Design

As stated, the principles of the ESC Guideline will be adopted for the management of sediment-laden runoff from the works sites and whenever practicable, ESC devices will be designed and managed in full accordance with that guideline. Through necessity, deviation from specific ESC Guideline design will be required as follows.

10.3.1. MGC Yard

The earthworks for the MGC Yard can be divided into two areas, the "MGC Yard rock armour stockpile and construction yard" and the "Northern stockpile area"

The MGC Yard is located in an area where the soils are predominantly sand and therefore free draining. In that regard impoundment and infiltration will be incorporated into the sediment control during the earthworks. This approach was successfully used during the construction of the temporary carpark to the north of the MGC Yard (by HEB Construction).

The MGC Yard rock armour stockpile and construction yard earthworks are approximately 2.6ha and will be serviced by an SRP and perimeter bunds.

The ESC Guidelines do not provide any guidance in relation to sizing of SRP's where the predominant soils are sand. The NZTA ESC Guidelines outline a hydrological approach to sizing SRP's which is based on the following.

- Soil;
- Slope;
- Rainfall;
- Ground cover; and
- Risk associated with the design.

This approach will ensure that the management of sediment-laden runoff should be as good or better than that from an ESC Guideline device.

The Northern stockpile area can either be diverted to the SRP once the main earthworks are completed or ESC measures will be designed in accordance with the ESC Guideline, including clean and dirty water diversion (perimeter bunds), cut and cover and progressive stabilisation, given that the earthworks are only minor grading to ensure there is no clash with existing services.

10.3.2. Moa Point Yard

An existing stabilised access off Moa Point Road has been upgraded to provide for construction traffic. The entrance has been constructed and is being maintained in accordance with Section E2.6 of the ESC Guidelines.

The Moa Point Yard will be constructed using a 'cut and cover' approach (Section G3.1.2 ESC Guidelines). This approach means that the contractor can only strip an area of the platform where the surface will be stabilised with aggregate at the end of each day's operation.

As a contingency measure a perimeter bund will be installed around the extent of the Moa Point Yard. The perimeter bund will be constructed and maintained in accordance with Section E2.1 of the ESC Guidelines.

10.3.3. Seawall

All land-based works associated are to be either undertaken on existing stabilised surfaces, or where there is minor reshaping undertaken as 'cut and cover' (Section G3.1.2 ESC Guidelines). This approach means that the contractor can only strip an area of the platform where the surface will be stabilised with aggregate at the end of each day's operation.

The seawall works themselves are based on a construction methodology that has taken into account the coastal processes of Lyall Bay. The WIAL Southern Seawall Renewal Assessment of Effects on Coastal Processes provides recommendations regarding construction monitoring, including visual inspections of the cleanliness of the underlayer and Eastern Bank Remediation and Kororā Colony rock and concrete armour unit stockpiles before placement in the Coastal Marine Area and Total Suspended Solids monitoring during below water toe excavation.

Due to the seabed sediments, any sedimentation arising from excavation of the seawall toe is expected to be minimal.

While consideration has been given to the use of sediment and erosion control devices during the works, due to the wind and wave environment, such measures are not practicable when considered against the low sedimentation that is anticipated during excavation of the seawall toe.

10.3.4. Stage 1 Kororā Colony

The earthworks associated with the Stage 1 Colony are very minor in area and volume (900m³ over 800m²). The works in the road reserve will generally be undertaken using 'cut and cover' (Section G3.1.2 ESC Guidelines). This is necessary as the road remains open to traffic throughout the works.

Any minor reshaping at the inlet and outlet of the Kororā underpass (culvert) will either be undertaken using 'cut and cover' or utilise a silt fence at the downslope extent of works.

10.4. Estimate of Sediment Yield

For consenting purposes, the requirement to estimate sediment yield from earthworks projects has varied throughout New Zealand. The practice of forecasting likely sediment yield from construction sites began in the Auckland region during the 1990s and was used to assist in the design of ESC measures within a project. This approach allowed potential variability in sedimentation yield across a site to be identified as well as informing the construction industry of the indicative volumes of sediment that could be generated and discharged from earthworks if not appropriately managed.

Typically, an estimate of sediment yield is undertaken to assist in the assessment of potential sediment-related effects of significant earthworks activities for which consent is sought. Sediment yield is the amount of sediment that is discharged to the receiving environment. If no ESCs are implemented, sediment yield will be high. With the adoption of appropriate ESCs the sediment yield will be acceptably low.

The estimate of sediment yield is most commonly generated using the Universal Soil Loss Equation ("USLE") which takes account of the following variables:

- Slope length and gradient
- Soil type
- Rainfall
- Surface cover
- Surface roughness
- Earthworks area
- Time of exposure
- Efficiency of ESC

A USLE does not however account for the treatment methods proposed (infiltration and impoundment) and cut and cover.

The risk of sediment related effects is further reduced by the shallow slopes of the site which in effect reduce runoff velocity and erosion. The site's predominantly sand soils, although they are generally non-cohesive and are more susceptible to erosion than silts and clays, settle out easily and can be controlled using simple management practices on site, such as cut off drains and progressive stabilisation.

It is therefore not considered that undertaking a USLE provides any benefit to the way the Project will be managed. The site lends itself to the implementation of best practice ESC measures in general accordance with the ESC Guideline.

There are no topographical or other constraints that would result in ESC performance being below that expected, observed and measured on other earthworks projects throughout New Zealand, and in particular within this type of environment.

Similar projects within the vicinity of the site include WIAL carpark and the redevelopment of the Miramar Golf Course. The ESC specialists for the Project are familiar with the design, implementation and management of ESC devices for these other projects, and the environment within which they are located.

A general principle of minimising and staging earthworks to the greatest extent practicable has been adopted.

Based on the conclusions of this assessment, it is considered that the ESC devices proposed for the Project will mitigate any potential adverse sediment related effects such that they are less than minor or negligible.

11. CONCLUSION

The Southern Seawall Project earthworks have the potential to result in changes to water quality during the construction phase as a result of the discharge of sediment from earthworks during rain events

As part of the Project earthworks activities, the ESCs will be implemented to minimise sediment-related effects to an acceptable level.

To ensure that final construction management input is provided for and to also allow for flexibility with the specific ESC implementation on site, final SSESDCPs will also be provided prior to earthworks commencing in a given works area. The final SSESDCPs will confirm the detailed design, specific ESC locations, and the staging and sequencing of works for that location or activity and will provide a staged approach to the works within a site and across the Project.

The implementation of SSESDCPs will enable the construction team to have ongoing input into the ESC design prior to and during construction, subject to compliance with the design and implementation standards specified in this report.

The Project will utilise best-practice ESC devices that meet or exceed the outcomes anticipated by the ESC Guidelines.

An ESC management structure and monitoring plan will be adopted to ensure that the ESC measures are designed, constructed, maintained, and decommissioned in accordance with best practice and as anticipated by this ESDCAR.

Overall, it is anticipated that the proposed ESC management approach will ensure that the sediment yield from the works will be minimised to an acceptable level and that any adverse sediment-related effects will be temporary and minor.

APPENDIX A: CHEMICAL TREATMENT MANAGEMENT PLAN

APPENDIX B: SITE SPECIFIC EROSION AND SEDIMENT CONTROL
PLANS

APPENDIX C: EROSION AND SEDIMENT CONTROL MONITORING PLAN