



GLEN ISLA PROTECTION SOCIETY

GLEN ISLA DUNE – WAIHI BEACH

COASTAL PROTECTION PROJECT

Western Bay of Plenty District Council -
Resource Consent Application and
Assessment of Environmental Effects

11 October 2024

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REPORT INFORMATION

Report Status	FINAL
Our Reference	MDL002583
Author	Ellen Robotham
Review By	Luke Faithfull
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PART A

Resource Consent Application

FORM 9

APPLICATION FOR RESOURCE CONSENT

Sections 88 and 145, Resource Management Act 1991

To: Western Bay of Plenty District Council

1. **Glen Isla Protection Society (“GIPS”) apply for the following type(s) of resource consent:**

Land use consent as a discretionary activity, in accordance with section 9(3) of the Resource Management Act 1991.

2. **The activity to which the application relates (the proposed activity) is as follows:**

- > Establishment of a coastal protection structure and associated earthworks in the Coastal Erosion Area – Primary Risk and Coastal Erosion Area - Rural; and
- > Structures, earthworks and clearance of native vegetation within Natural Feature/Landscape – S24 – Open Coastal landscape Landward Edge Protection Yard.

3. **The site at which the proposed activity is to occur is as follows:**

Recreational Reserve and Esplanade Reserve land at Waihi Beach comprising part of the reserve commonly referred to as Three Mile Creek Reserve and legally described as Lot 18 DPS 22035 and Lot 19 DPS 22035.

The site is adjacent to 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place, Waihi Beach, and immediately south of Three Mile Creek. The site is described further in the attached Assessment of Environmental Effects.

Copies of the Records of Title for the site is attached as **Appendix A** to the Assessment of Environmental Effects.

4. **The full name and address of the owner (other than the applicant) of the site to which the application relates is as follows:**

Western Bay of Plenty District Council,
1484 Cameron Road,
Greerton,
Tauranga 3112



5. **The other activities that are part of the proposal to which the application relates are as follows:**

Activities associated with the construction phase of the proposal, including transport, noise and signs. These activities are proposed to comply with the relevant Western Bay of Plenty District Plan standards as described in the attached Assessment of Environmental Effects.

6. **The following additional resource consents are needed for the proposal to which this application relates and have been applied for:**

Earthworks in the Erosion Hazard Area and Sand Dune Country within 50m of the Coastal Marine Area, and vehicle use in the Coastal Marine Area from the Bay of Plenty Regional Council.

Resource consent for these activities have been sought under a separate application.

7. **I attach an assessment of the proposed activity's effect on the environment that—**

- (a) includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and
- (b) addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and
- (c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

8. **I attach an assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991.**

9. **I attach an assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act.**

10. **I attach the following further information required to be included in this application by the district plan, the regional plan, the Resource Management Act 1991, or any regulations made under that Act:**

- > Records of Title
- > Coastal Process Assessment (Davis Coastal Consultants)

- > Landscape and Visual Effects Assessment (Isthmus Group)
- > Ecological Effects Assessment (BlueGreen Ecology)
- > Memorandum – Location of Mean Highwater Springs, Glen Isla Place, Waihi Beach (Davis Coastal Consultants)
- > Engineering Design Report (Davis Coastal Consultants)
- > Glen Isla Place Tree Protection Plan (Arbor Care Ltd)
- > Construction Methodology (Davis Coastal Consultants)
- > Noise Trial Report (Marshall Day Acoustics)

Date: 11 October 2024



Signature:

(Person authorised to sign on behalf of applicant)

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PART B

Assessment of Environmental Effects

1. INTRODUCTION

The Glen Isla Protection Society Incorporated (“**GIPS**” or “**the Applicant**”) comprise a group of beachfront homeowners at 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place, Waihi Beach. Their properties, located immediately south of “Three Mile Creek”, adjoin an approximately 200m stretch of unarmoured coastline which is part of the Three Mile Creek Reserve and owned by the Western Bay of Plenty District Council (“**WBOPDC**”).

Following a series of recent large erosion events, including Cyclone Gabrielle, GIPS proposes to establish a buried revetment structure (“**the structure**”), supplemented with dune reshaping and replanting at Three Mile Creek Reserve on land legally described as Lot 18 DPS 22035 and Lot 19 DPS 22035. The intent is to protect the Reserve land and adjacent properties from further erosion, and future-proof the properties from the effects of sea-level rise.

This Assessment of Environmental Effects (“**AEE**”) supports a resource consent application to establish a coastal protection structure and associated earthworks in the Rural Zone which have an overall activity status of **discretionary** under the Western Bay of Plenty District Plan (“**District Plan**”).

This AEE is supported by the following information and technical assessments:

- > Records of Title
- > Coastal Process Assessment (Davis Coastal Consultants)
- > Landscape and Visual Effects Assessment (Isthmus Group)
- > Ecological Effects Assessment (BlueGreen Ecology)
- > Memorandum – Location of Mean Highwater Springs, Glen Isla Place, Waihi Beach (Davis Coastal Consultants)
- > Engineering Design Report (Davis Coastal Consultants)
- > Glen Isla Place Tree Protection Plan (Arbor Care Ltd)
- > Construction Methodology (Davis Coastal Consultants)
- > Noise Trial Report (Marshall Day Acoustics)

An application for the necessary resource consents from Bay of Plenty Regional Council (“**BOPRC**”) has been made separately to this application.



2. BACKGROUND

Waihi Beach is a coastal township located on the east coast of the North Island at the northern extent of the Bay of Plenty Region. It is an approximately 10km long, open-coast barrier beach orientated north-east, with a long history of coastal erosion and protection / mitigation activities.

The Coastal Processes Assessment (**Appendix B**) provides a detailed review of historic beach changes at the site, and the below summarises the various coastal erosion mitigations that have been adopted along Waihi Beach, particularly the coast fronting 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place.¹

Following severe storm events in the late 1950s, the former Ohinemuri County Council put coastal erosion protection measures (primarily hard protection structures) in place along Waihi Beach in response to beachfront residents' concerns. This response continued over the following 30 years.

In 1983, a seawall was constructed south of Three Mile Creek, approximately 20m seaward of the boundary of the Glen Isla Place properties which border the coast. This seawall was essentially an extension of the various sections of sea walls that had been built over the preceding decades to the north of Three Mile Creek.

Between 1993-2008, WBOPDC investigated and sought consent to undertake protection works to replace existing sea walls and ad hoc protection at Waihi Beach. Construction of the scheme began in 2009/2010. A permanent revetment, which was to be located 5 metres off the private property boundaries, was originally investigated for the Glen Isla dunes. This proposal was substituted with a soft protection method involving enhanced sand dunes and planting of dune vegetation, which was subsequently constructed in 2011. Remnants of the historic seawall were also removed at this time.

The soft protection dune enhancement was entirely washed away by a severe storm within a few weeks of being finished. No erosion protection or care initiatives have been put in place since 2011.

Tonkin & Taylor Ltd provided a review of Primary and Secondary Risk Coastal Protection Areas ("**CPA**") in 2015. Two planning timeframes were applied to identify the coastal hazard extent at sufficient time scales for planning and accommodating future development, being

¹ The summary of coastal erosion mitigations relies on C. Dullnig, 'Waihi Beach Coastal Protection Consequence of 1930's Stormwater Control Measures', 2016, other publicly available documents, and observations of GIPS members.

2065 (50 years) and 2115 (100 years). Maps attached to the reassessment report identify properties at 1, 3, 5, 7, 9, 11-12 Glen Isla Place as “Primary Risk CPA” (shown as double hatch in **Figure 1**), and the wider coastal area as “Secondary Risk CPA” (shown as single hatch in **Figure 1**).

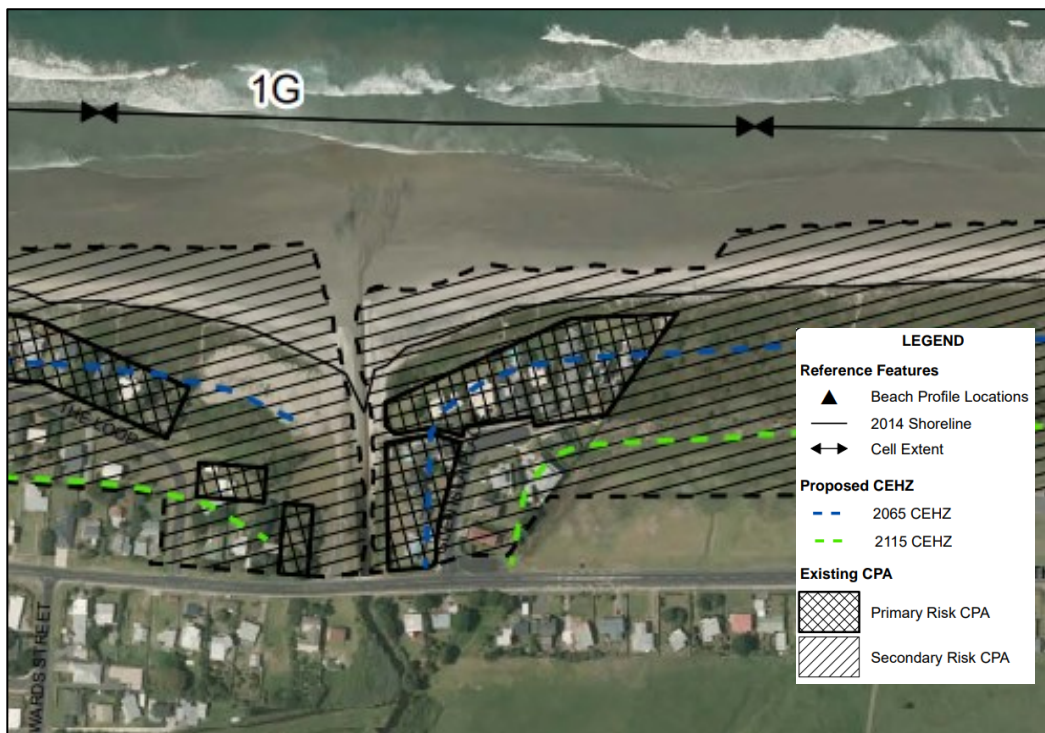


Figure 1: Map from 2015 Tonkin & Taylor Report

Significant further erosion of the remaining dune area occurred during Cyclones Hale and Gabrielle in early 2023 which resulted in the loss of up to 3 metres, in horizontal dune width.

While some indigenous vegetation has regenerated in the northern half of the Glen Isla dunes, southern parts of the Glen Isla dune have not naturally recovered, and are now approximately 5 metres wide, a loss of up to 15 metres from the position of the 1983 seawall.

In response to recent events, GIPS approached WBOPDC to explore coastal protection options for the Glen Isla dune within the Council’s Reserve land. The outcome of this, as detailed in Section 4 below, is the subject of this resource consent application.



3. EXISTING ENVIRONMENT

3.1 SITE LOCATION AND CONTEXT

Waihi Beach is a coastal township in the Western Bay of Plenty at the base of the Coromandel Peninsula, approximately 10km east of the inland town of Waihi. The settlement is well established with a mixture of traditional baches and recent beach house development. The township's layout is generally parallel to the beach, with development located close to the coastal margin for much of the central and northern beach extent.

Various ad-hoc structures and coastal protection works have been constructed over the decades to manage coastal erosion at Waihi Beach. Notably, exposed rock revetments extend along approximately 420m in front of The Loop, and approximately 500-600m in front of Shaw Road.

The profile of Waihi Beach is generally very flat, with a broad intertidal zone offering a deep open beach at low tide, and a narrow beach against the fore dune and existing coastal erosion structures at high tide.

The site is located approximately halfway along Waihi Beach within the Three Mile Creek Reserve which is classified as Local Purpose Esplanade and Recreation Reserve under the WBOPDC. The site is adjacent to nine private residential properties, being 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place, which are owned by GIPS members. The project site is legally described as Lot 18 DPS 22035 (.4130 ha) Rec Res and Lot 19 DPS 22035 (.6620 ha) LP Espl (refer **Figure 2**).²

² These legal descriptions and areas are as described in Appendix 1 to the Katikati-Waihi Beach Ward Reserves Management Plan.



Figure 2: Site location at Waihi Beach (Source: Coastal Processes Assessment).

The coastline at the site is characterised by a gently sloping intertidal area which rises slowly to an unarmoured, narrow, vegetated bank. The dune slope is gentler at the northern end, where sand accumulation appears to be supported by the presence of groynes along the banks of Three Mile Creek. The southern end of the site comprises a narrow dune terrace with a steep, eroded face exemplary of the susceptibility of the frontal dune to episodic storm erosion. The Coastal Processes Assessment (**Appendix B**) provides a detailed description of the morphology and coastal processes at the site.

The GIPS properties are located landward of the narrow frontal dune, at an elevation of approximately Relative Level (“RL”) 4.0m. Residential dwellings on the GIPS properties are generally set at the landward edge of the property with grassed lawns on the seaward side. The dwellings are a mix of single and two-storey dwellings. Some properties have fences erected along the seaward property boundary. These built structures are easily seen at the top of the dune from the beach. The Landscape and Visual Amenity Effects Assessment (“LVA” at **Appendix C**) provides a more detailed description of the character of the site and broader context.

The vegetated extent of the back dune system is approximately 20m wide closest to the channel outlet and narrows to approximately 4-5m wide towards 12 and 14 Glen Isla Place. Indigenous plants are most prominent in the northern foredune (including beach bind weed, spinifex, and pingao), and in the very south (where pohuehue on the terrace and spinifex

along the erosion scarp face are notable). Knobbly club rush and pohuehue are the common native dune plants throughout, however, the great majority of the back terrace and terrace slope is covered by exotic species, many of which are considered serious weed species. A mature Norfolk Pine is located close to the boundary, on private land at 13 Glen Isla Place.

The predominant vegetation types are summarised in **Figure 3**. A fulsome description of the site's flora and fauna is provided in the Ecology Assessment at **Appendix D**.



Figure 3: Predominant vegetation types (Source: Ecology Assessment).

Three Mile Creek Reserve is a 'Neighbourhood Amenity Reserve' and provides public access to and along Waihi Beach. From Seaforth Road, the public can access the coast via the public pedestrian accessways on the northern and southern banks of Three Mile Creek which run all the way to the open beach. From Glen Isla Place, there is a dedicated pedestrian access way between property numbers 9 and 7 that connects to the accessway along the southern bank of Three Mile Creek. The open beach provides for access along the coast. The unmanicured vegetated dune area does not provide for public access or other recreation, given it is a sensitive habitat and the public are discouraged from walking through these areas.

Public walking access from Seaforth Road and Glen Isla Place via Three Mile Creek Reserve is indicated in the figure below.





Figure 4: Indicative location of public beach access at Three Mile Creek.

Three Mile Creek is located immediately to the north of the site. Three Mile Creek is a man-made diversion of inland drainage channels that was dug through the dune in the early 1930's. Training walls, made of sandbag groynes, line the northern and southern banks of Three Mile Creek. Three Mile Creek is periodically dredged by WBOPDC in accordance with the relevant Reserve Management Plan. Dredging typically occurs monthly, and sand is deposited immediately south of Three Mile Creek, seaward of the dunes.

Island View Reserve is located to the south of the site. The open beach is vested in Council as Esplanade Reserve, and the vegetated dune land to the south is Crown Land (owned Department of Conservation (“DoC”)) held for conservation purposes and is a Recreation Reserve.³ WBOPDC has been appointed by the Minister to control and manage the reserve.

³ As per the Katikati Waihi Beach Ward Reserves Management Plan.



Figure 5: DoC Reserve land (orange speckle) and Council Reserve / Esplanade Reserve land (green speckle). (Source: District Plan maps).

The following photos, taken during a site visit on 4 and 5 April 2024, are indicative of the existing environment.



Figure 6: Dune face looking north from 16 Glen Isla Place. The Norfolk Pine at 13 Glen Isla Place is prominent in the middle ground.



Figure 7: Dune face looking north from in front of 13 Glen Isla Place. Sand spoil disposal area is visible as lighter sand area.



Figure 8: Sand spoil disposal area from Three Mile Creek maintenance works located in front of 9 Glen Isla Place. Regenerating vegetation can be seen behind the sand disposal area.



Figure 9: Example of existing dune vegetation in front of 11 Glen Isla Place, looking north.



Figure 10: Example of existing dune vegetation in front of 15 and 16 Glen Isla Place, looking southeast.

3.2 PLANNING OVERLAYS

The reserve land is zoned Rural in the District Plan (delineated by the light yellow area in Figure 11). The adjacent properties at 9-16 Glen Isla Place are zoned Residential (delineated by the grey area in Figure 11).



Figure 11: District Plan zoning

Parts of the site are also subject to the following District Plan overlays (refer **Figure 12**):

- > Coastal Erosion Area – Primary Risk (delineated by the faded red line);
- > Coastal Erosion Area – Rural (being land zoned Rural and within 100m of Mean High Water Springs);
- > Coastal Inundation Area (delineated by the burgundy hatch); and
- > Landscape Area: Natural Feature/Landscape – S24 – Open Coastal landscape Landward Edge Protection Yard (delineated by the black dots).



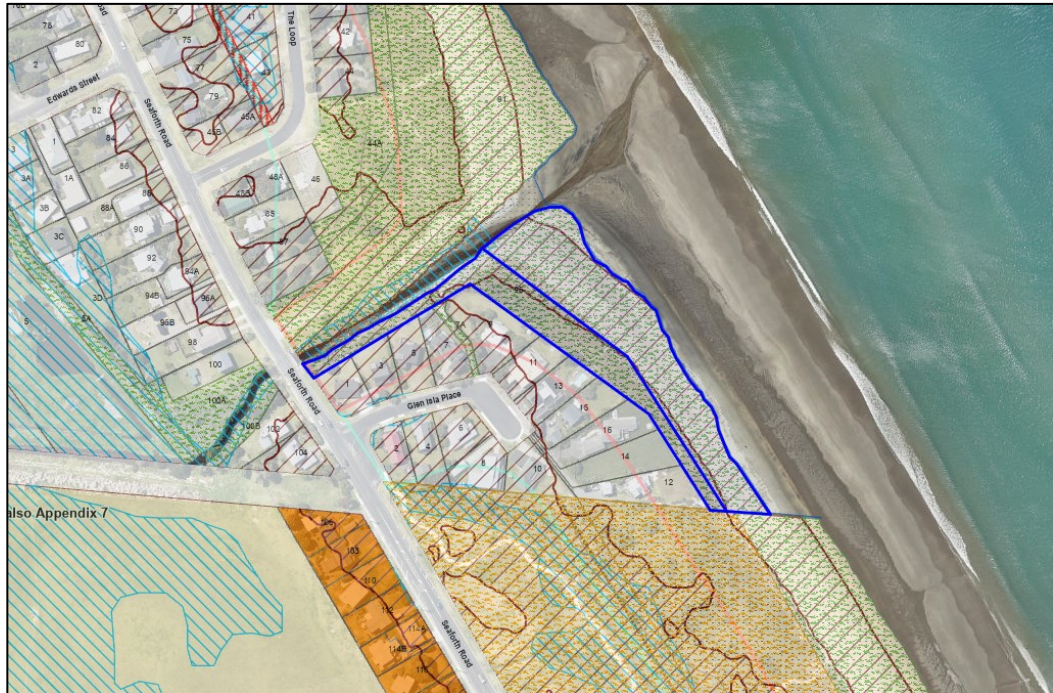


Figure 12: District Plan Overlays

The reserve land and private properties are also subject to the following Non District Plan Layers – Natural Hazards (refer **Figure 13**):

- > Waihi Beach Floodable (delineated by the dark blue hatch area); and
- > Omokoroa Stage 3 Liquefaction Types (delineated by the orange area).



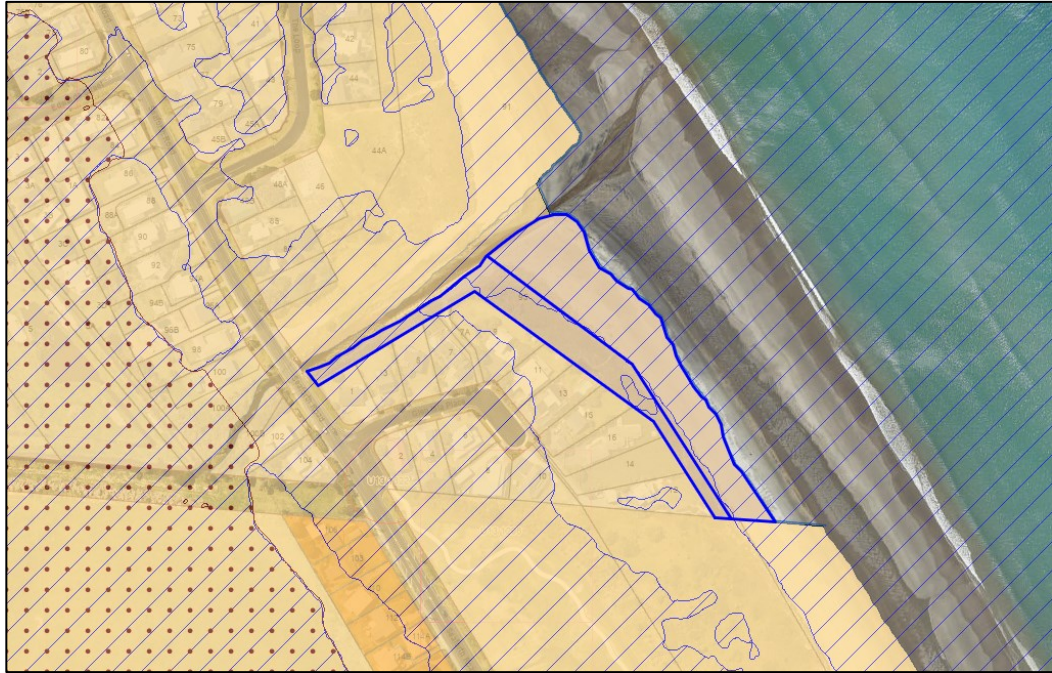


Figure 13: Non-District Plan Layers

For completeness, it is also noted that under the Bay of Plenty Coastal Environment Plan (“**Coastal Plan**” - refer **Figure 14**), the reserve land is located within the Coastal Environment (delineated by the yellow line) and Indigenous Biological Diversity Area B1 – Central Waihi Beach (delineated by the orange line and black hatch).



Figure 14: Excerpt of the Coastal Plan.

3.3 COASTAL MARINE AREA

The proposed works are located within the Coastal Environment but not within the coastal marine area (“**CMA**”).

The CMA is defined by the RMA as follows:

coastal marine area means the foreshore, seabed, and coastal water, and the air space above the water—

- (a) of which the seaward boundary is the outer limits of the territorial sea:
- (b) of which the landward boundary is the line of mean high water springs, except that where that line crosses a river, the landward boundary at that point shall be whichever is the lesser of—
 - (i) 1 kilometre upstream from the mouth of the river; or
 - (ii) the point upstream that is calculated by multiplying the width of the river mouth by 5

GIPS engaged Davis Coastal Consultants to analyse the position of mean high water springs (“**MHWS**”), to inform identification of the landward boundary of the CMA. The methodology and conclusions utilised by Davis Coastal Consultants are set out in full in **Appendix E**.

The position of MHWS springs is shown in **Figure 15**, with the red area representing the envelope within which MHWS has been since 1987. The 2011 and 2024 MHWS are

represented by blue dashed lines. As demonstrated by the figure below, the project site is landward of the CMA (noting that the project design has evolved from the below figure).

This position was provided to BOPRC and subsequently accepted via email on 13 May 2024. This is the basis upon which the project has progressed, the position against which the consenting requirements have been determined and the proposed construction methodology and management measures have been developed.

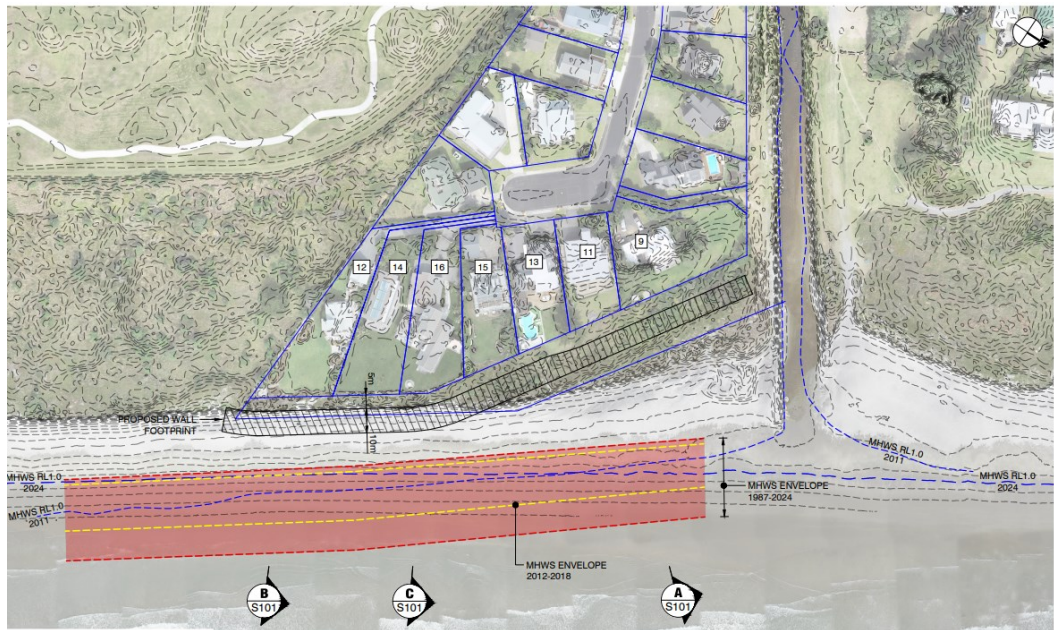


Figure 15: Historic Extent of MHWS 1987-2024 (Source: Memorandum – Location of Mean Highwater Springs Glen Isla Place, Waihi Beach).



4. DESCRIPTION OF THE PROPOSAL

The Applicant proposes to install a coastal protection structure on Recreational Reserve and Esplanade Reserve land at Waihi Beach to protect the Reserve land and adjacent properties from further erosion, and future-proof this land for the effects of sea-level rise as well as enhancing the dune environment through planting. The proposed structure will be located in the back and foredune area seaward of 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place but landward of the CMA. The use of the land has been agreed to by WBOPDC Reserves through a separate process and is subject to a formal agreement which sits outside of the RMA process. Upon completion, as per agreement with Council, the structure will be vested to WBOPDC.



Figure 16: Location of proposed coastal protection structure at Glen Isla Place, Waihi Beach

4.1 STRUCTURE DESIGN AND DUNE RESTORATION

The Engineering Design Report (**Appendix F**) includes a full description of the proposed structure and the design considerations informing the proposed structure. Key elements of the design are summarised here.

The coastal protection structure will be a buried rock revetment, approximately 200m long running generally parallel to the landward residential site boundaries.

The southern section, approximate 70m in length, runs parallel to the property boundaries and beach orientation with the rear of the structure approximately 5m from the property boundaries of 12, 14 and 16 Glen Isla Place. The northern section, approximate 130m in length, is on two slightly different alignments. From 16 Glen Isla Place, the structure runs north approximately 57m to a point approximately 7.6m from the boundary of 13 Glen Isla

Place, where a large established Norfolk Pine is located near the property boundary. The structure then continues to run north the final 73m to a point approximately 6.5m off the boundary with 9 Glen Isla Place.

The setback off the Norfolk Pine is recommended by Arbor Care Ltd to protect the health of the tree (refer **Appendix G**).

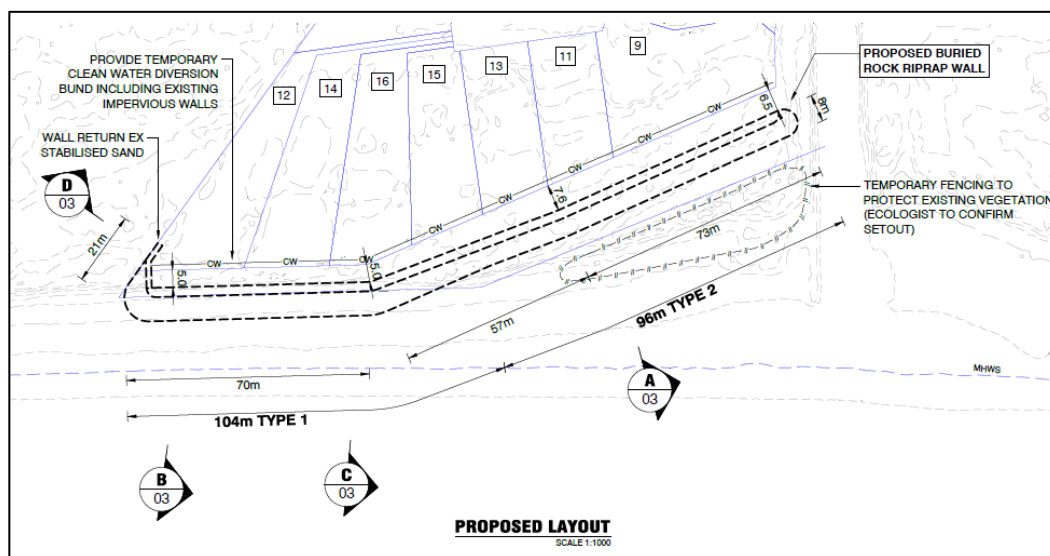


Figure 17: Proposed layout of proposed coastal protection structure at Glen Isla Place, Waihi Beach

The structure will be constructed out of Andesite sourced from a local quarry at Waihi Beach. To the extent practicable, rocks with a weathered appearance and a variety of sizes will be selected to ensure a more naturalistic appearance to the revetment should the structure become exposed.

While subject to detailed design, the structure will be designed in accordance with accepted design guidelines (CIRIA C683) and will comprise a:

- > Slope no steeper than 1:1.5 at the northern end and a slope of 1:2 at the southern end;
- > Double outer armour layer with an average rock diameter of 1.1m, pending availability of suitable rock from the local quarry at Waihi Beach;
- > Double underlayer with an average rock diameter of 250mm;
- > Geotextile lining (BIDIM A44 or similar); and
- > Minimum crest width of three armour rocks.



The crest level is to be approximately RL 3.5 and the base of the structure is proposed to be constructed at approximately RL 0.0.

The northern end will be terminated with a sloped face similar to the front face. It will be designed to be separate from the Three Mile Creek groynes and not impact the integrity of these structures. At the southern end, a return continuing approximately 20m landward constructed of stabilised sediment is proposed with no construction works extending into the neighbouring DOC reserve area.

The entire structure will be buried under at least 0.5m of sand, sourced from the footprint of the structure, and recontoured to mimic natural dune form. The dune face at the southern end will be placed at 1:3, on approximately the alignment of the dune face surveyed by LiDAR in 2011, slightly landward of a typical stable dune face. The dune face will be kept as landward as practicable. The northern end will be reinstated to match existing ground level.

All disturbed areas will be revegetated with indigenous dune plant species, as recommended in the Ecology Assessment.

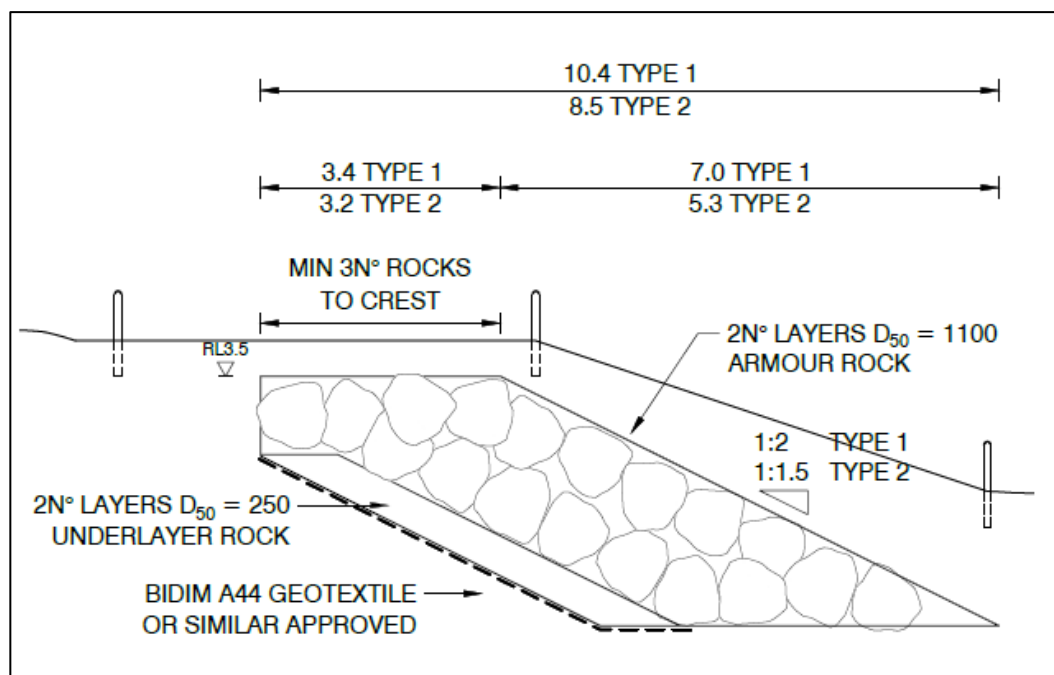


Figure 18: Typical cross section (Source: Engineering Design Report)

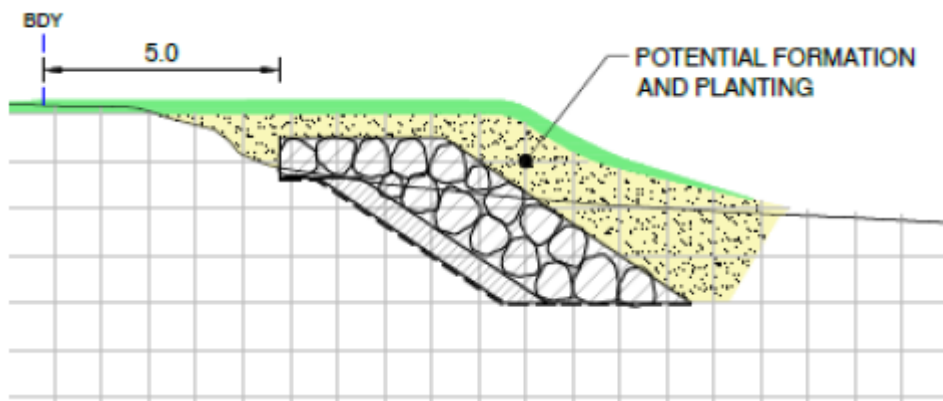


Figure 19: Example cross section of southern portion (Source: Construction Methodology)

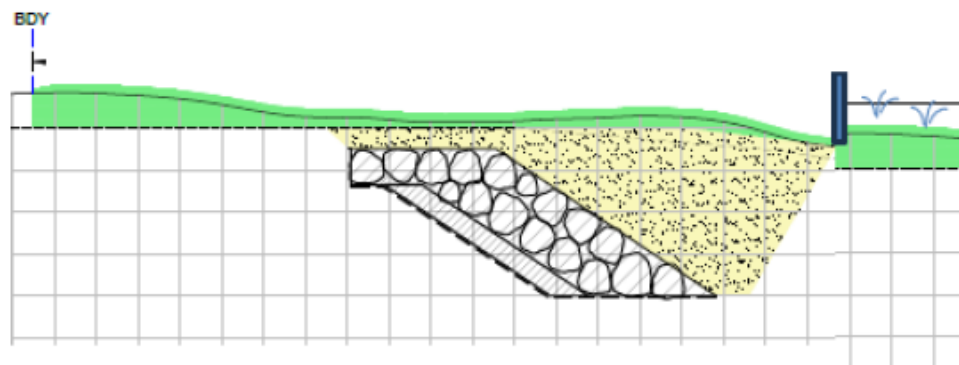


Figure 20: Example cross section of northern portion (Source: Construction Methodology)

4.2 CONSTRUCTION METHODOLOGY

The full construction methodology is attached as **Appendix H**. Key elements of the construction methodology include:

- > Working hours will be 7am – 5pm, Monday – Friday when enabled by the tide. Work will not be undertaken at night or once daylight becomes unsuitable. However, the work is tidally and storm dependent and work may continue outside working hours for up to three days a week every two weeks. This may include Saturday working outside school holiday periods. No work will take place before 6am or after 8pm.
- > It is anticipated that the entire project will be completed in 4 months however, an allowance of 6 months is proposed to accommodate periods of inclement weather, and other unforeseen issues. On this basis a specified project duration of 6 months between



April to November, inclusive, is proposed. Work will not be undertaken at Easter or other Public Holidays.

- > Where strong onshore conditions, storms or extreme tides threaten the works footprint, the works site shall be made safe, and works will cease while there is a threat of tidal interaction with the works.
- > The only activity below MHWS will be vehicle movements with the express purpose of delivering machinery and materials to the project site. During these times, signage and spotters from the construction team will ensure that the health and safety of other users of the beach is provided for.
- > Construction activities will occur within an identified construction corridor to minimise disturbance of the dunes as far as practicable. Given the sandy nature of the site, no specific erosion and sediment control measures are required.
- > Vegetation removal will be minimised as far as practicable. In principle, it will be limited to the area of disturbance, being the footprint of the structure and the sloping sides of the construction trench. The 'northern spinifex foredune' area will be fenced, and disturbance of this area will be avoided.



Figure 21: Indicative location of vegetation removal (blue) and northern dune vegetation to be protected (Source: Construction Methodology).

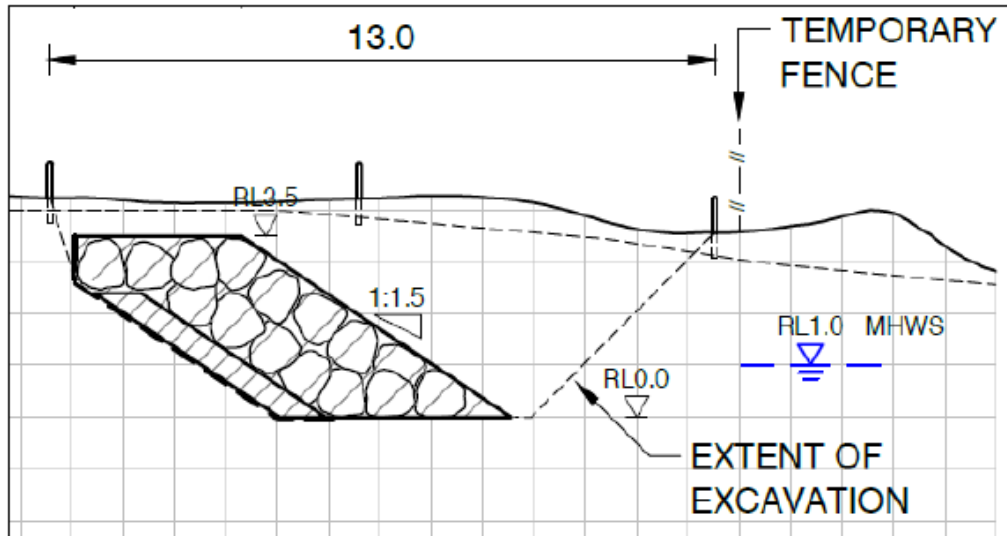


Figure 22: Indicative area of excavation to place the structure in the northern portion (Source: Construction Methodology).

- > The estimated area of disturbance associated with construction of the structure is approximately 2,500m². Earthworks are to occur to a depth of approximately 0.0mRL, requiring a maximum excavation of 5m at the northern end.
- > Construction will occur in a staged manner. In general, the footprint will first be lowered to RL 2.0 to form a work platform. Works anticipated to occur within a single tidal cycle include excavation to target depth and the first lift (placement of geotextile and first armour layer) occurring in approximately 10m long sections. Placement of second and third armour layers is anticipated to occur in sections of approximately 50m. Should this extent of works not be feasible within a tidal cycle, the construction methodology will be updated as required.
- > Excavated material will be stored seaward of the construction area, above the normal tide range, for use in site reinstatement.
- > Rock material will be delivered to site on an “as required” basis as much as practicable such that stockpiling on site is minimised but efficient construction can continue. Temporary stockpiles will be placed on heavy gauge geotextile. Any rocks not placed during the work day will be stored within the construction corridor.
- > All machinery and equipment shall be kept overnight on the wall alignment above RL 3.0. All equipment will be kept in good condition, clean and free from any leaks. No refuelling will be undertaken within the CMA and only equipment that cannot readily leave site (excavators) will be refuelled on site. A spill kit will be present on site.

- > Noise and vibration monitoring will be undertaken while works are occurring. The construction methodology will be updated if monitoring results show levels higher than the permitted construction levels.
- > At the completion of construction, disturbed dune areas to be re-vegetated with a mix of indigenous fore- and back-dune species to effectively bind the disturbed sand and re-build the dune. The planting will be with species as identified in the planting plan to be developed by the project ecologist.
- > If required, a wind fencing may be utilised along face of new planting and at dune crest to minimise wind-blown sand to back dune area and protect plants while they are establishing.

4.3 ALTERNATIVES CONSIDERED

In developing the Proposal, the Applicant considered a range of coastal protection options, which have been summarised below. A full assessment of various options is provided in the Engineering Design Report (**Appendix F**).

It is noted that avoidance and managed retreat are not considered appropriate options in this scenario because development has already occurred adjacent to the coast, and the coastal erosion risks can be addressed by conventional engineering approaches, similar to those elsewhere on the Waihi Beach. Historical ‘soft’ options have also been unsuccessful when used in isolation.

GIPS considered that dune reestablishment and a high-quality dune revegetation approach would be part of any coastal protection option.

4.3.1 Do Nothing

This coastal management approach allows the beach to act in an entirely natural manner. The dune line will fluctuate and may retreat with losses and gains accepted. This results in the highest quality natural dune and coastal systems.

For the proposed site, historical residential and urban infrastructure development has been undertaken adjacent to the beach front and therefore, this approach is not appropriate. The extensive dune front work of seawalls, groynes and dune replenishment along the residential properties elsewhere at Waihi Beach is ample evidence that the GIPS properties are at risk without coastal protection measures. The Do-Nothing Approach is therefore inappropriate at the site.



4.3.2 “Soft Engineering” (Renourishment and Planting)

This option relies solely on the enhancement of natural defences provided by the sand dunes through the planting of indigenous species.

Historic reliance on enhanced natural defences in isolation has proven unsuccessful at the proposed site. Significant dune enhancement planting project was undertaken in 2011, with the cost being financed through a targeted rate on the beachfront properties. The plantings were lost only 3-4 weeks after completion due to storm surges. There is no perceptible difference between the coastline that was nourished and the adjacent coastline to the south suggesting that renourishment effects have been lost. It is likely that the renourishment helped fill the dune adjacent to the Three Mile Creek groyne and more quickly attain a prograded position associated with the groyne.

Targeted sand nourishment is also likely to have a very short residence time, with sand redistributed to the adjacent beach. Sand renourishment placed on a beach system within the tidal zone is quickly redistributed by wave action during higher water levels. Very large volumes of sand would be required for renourishment to hold an unnaturally seaward dune line. The minimal duration and ongoing cost of the previous renourishment preclude this being a practicable solution for the beach area adjacent to the GIPS properties.

Notwithstanding the above, reinstatement of degraded dune areas can help to accelerate the natural dune recovery processes. When coupled with planting, this work helps reestablish a healthy dune system which will tend to sit further seaward than a degraded dune system and results in less risk from smaller, more regular events, and is effective in maintaining cover to a buried structure for longer periods. Dune reinstatement and replanting of this type provides minimal additional protection to the backshore against extreme storm events.

4.3.3 Seawalls / Structures of various materials and configurations

The Applicant has considered a number of materials and configurations for a coastal protection structure, including:

- > Stabilised sediment wall;
- > Rip rap / Rock Revetment;
- > Rock Masonry;
- > Concrete walls; and
- > Vertical walls.



Rock masonry and concrete walls were not considered appropriate for this site because of the need for stable foundations, and Policy 8.2.2.8 of the District Plan which specifically recommends avoiding concrete foundations. Similarly, a vertical wall is not appropriate at this site because the limitations on the height of timber fences, and avoidance of the use of concrete would result in a steel sheet pile wall, which would be subject to surface rust and become unsightly. Vertical walls also provide a complete barrier to pedestrian access and if they become exposed could create a fall hazard.

Stabilised sediment, while having potential to result in a more natural looking texture and colour to the surrounding beach than a rock revetment, is not considered appropriate for the whole length of seawall because it is a less proven technology, requires specialist plant to achieve a high-quality outcome, and tends to be more expensive and labour intensive than a rock revetment.

A buried rock revetment solution has been identified as the preferred option because of the benefits of:

- > Providing for construction outside the CMA;
- > Enabling a soft engineering / dune enhancement approach to be incorporated into the overall design;
- > Widely, tested and accepted design formulation for coastal erosion;
- > Proven solution at Waihi Beach , with northern seawall walls managing recent large storm events;
- > Using locally sourced rock for the revetment; and
- > Local contractor experience with rock revetments.



5. RESOURCE CONSENT REQUIREMENTS

The activities relating to the proposal described in Section 4 of this AEE are subject to rules in the District Plan.

Coastal protection works including seawalls in the Coastal Erosion Area – Primary Risk and Rural require resource consent as a **discretionary activity** under Rule 8.3.4.a.iv.

Buildings/structures, earthworks with a vertical face of greater than 1.5m, and clearance of native vegetation within Identified Natural Feature and Landscape S24 – Open Coastal landscape Landward Edge Protection Yard require resource consent as **restricted discretionary activities** under Rule 6.4.3.1.b., c., and d.

Earthworks associated with an activity requiring resource consent as a discretionary activity also require resource consent under Rule 4A.5.b.

The following activities meet the relevant rules and standards and may occur without consent as **permitted activities**.

Activity	Relevant Rule / Standard	Compliance
Transport	4B.4.1, 4B.4.4, 4B.4.5, 4B.4.6, 4B.4.7	Will comply. The proposal utilises an existing access onto Seaforth Road, which is a Collector Road in a predominantly urban environment. The proposal does not relate to a subdivision, and the existing access is flat, wide and located approximately 60m from the nearest intersection. The Reserve land is sufficient to provide on-site manoeuvring and parking for the types of vehicles accessing the site.
Noise	4C.1.3.1	Will comply. Construction noise and vibration will comply with District Plan noise standards ⁴ as demonstrated by Noise Trial results (Appendix I).

⁴ With regard to vibration, the Explanatory Statement at Section 4C.1 of the District Plan identifies that ‘Vibration from activities has not been an issue in the District. In many cases Council can manage vibration effects through the management of noise emissions or through the provisions of the Health Act. Specific standards to manage vibration are therefore not proposed.’



Activity	Relevant Rule / Standard	Compliance
Signs	4D.4.1.4, 4D.5.1	Will comply. All health and safety signs erected in conjunction with the proposal will not exceed 0.6m² and will comply with relevant location and design standards in section 4D.5.1. Any signs will not be illuminated.

Overall, the proposal requires resource consent under the District Plan as a **discretionary activity**.



6. ASSESSMENT OF ENVIRONMENTAL EFFECTS

This section of the AEE addresses the actual and potential environmental effects associated with the proposal, including:

- > Positive effects;
- > Effects on coastal processes and coastal water quality;
- > Ecological effects;
- > Natural Character;
- > Public Access;
- > Noise and Vibration;
- > Structural stability and maintenance; and
- > Cultural effects.

This section of the AEE has been informed by the technical reports provided as appendices to this AEE.

6.1 POSITIVE EFFECTS

The proposal is proposed to protect Three Mile Creek Reserve land and adjacent existing residential development from coastal erosion.

The proposal will also result in positive effects which are discussed in further detail under the relevant headings below. In particular, the proposal is anticipated to result in net benefit for ecological values due to the proposed remediation/mitigation planting of indigenous dune vegetation and will result in predominantly Moderate-High positive effects on natural character, landscape, and visual amenity.

6.2 COASTAL PROCESSES

The Applicant has engaged Davis Coastal Consultants to undertake an assessment of the proposed structure on the coastal process environment. This report is attached in full as **Appendix B**.

The Assessment considers existing coastal processes, projected sea-level rise and provides a probabilistic analysis of future erosion hazard and long-term shore retreat.

The key conclusions of that report, primarily driven by the structure's location within the dune system and outside of the CMA, are summarised here.



- > The proposed structure will have less impact on coastal processes than other structures present at Waihi Beach.
- > Even in the advent of shoreline retreat, beach lowering and groyne effects will be less than minor due to the lack of protrusion into the surf zone and shore parallel alignment, and the proximity of the far larger Three Mile Creek groynes.
- > Initially, end of wall effects⁵ will be negligible due to the limited interaction of the structure with coastal processes.
- > Any adverse effects of the proposed structure on adjacent areas due to rip currents/differential head are expected to be negligible.
- > It is highly unlikely, even under conditions of future sea-level rise, there will be appreciable issues between the northern wall end and the Three Mile Creek groynes.
- > During the 30-50 year period, some storm scour may occur at the southern end. This erosion is likely to be in the order of 2-5m on a 5-15m length of shoreline and will not put any structure or infrastructure at risk. It is likely to be no worse than, and difficult to discern from, dune erosion elsewhere on the natural coastline.



Figure 23: Potential scour at southern wall end

⁵ Such as rip currents / differential head, deflection of swash and wave energy by end of the structure, and sediment lock-up.



- > The potential for the proposed structure to cause “sediment lock-up” and adversely affect the availability of sand will be negligible and will have no discernible effect on the surrounding beach.
- > The proposed structure has the potential to become increasingly exposed in the event the forecasted climate driven sea-level rise and retreat of the shoreline occurs.
- > At current sea levels, the proposed structure would only be exposed by a large storm event, for example the scale of the recent Cyclone Gabrielle/Hale storms. This type of storm event is anticipated to expose the top 1.0-1.5m of the structure no more than once every 5-10 years. Natural processes are anticipated to quickly restore sand and dune vegetation as is evident following the recent storm events.
- > Over the 20-40 year period, increasing extent of the top 1.0-2.0m of the structure is anticipated to be exposed at all times with high tide reaching the structure during storm events, and MHWS anticipated to be at the toe of the structure by the 30-40 year period.
- > Over a 30-50 year period, the structure will continue to be progressively more exposed. The effects of the structure would temporarily lower the beach during and immediately after storm events and temporary minor additional erosion of the dune adjacent to the southern wall end. Remedial work to the toe of the structure may be required over the 40-50 year period.
- > During the 50-100 year period, a significant upgrade may be required to the structure, including lowering or improving the foundation, increasing the outer armour size, and/or raising the wall crest. The design of the wall is readily adaptable to any future requirements.

It is therefore considered that the landward position, length, alignment, and design of the structure appropriately avoids and minimises adverse effects on coastal processes, even when taking into account the effects of sea-level rise and shoreline retreat over the long-term.

6.3 NATURAL CHARACTER AND NATURAL FEATURES

The Applicant has engaged Isthmus to undertake an Assessment of Landscape and Visual Amenity Effects (“**LVA**”) for the proposal. It includes assessment of effects on the natural character of the site and its immediate surroundings. The LVA is attached in full as **Appendix C**.

The key aspects of the LVA are:



- > The site is not identified as an area of Outstanding, Very High or High natural character in statutory planning documents. This is consistent with the observed character of the area.
- > The site is within ONF S24 - Open Coastal Landward Edge Protection Yard under the District Plan. The overlay is defined as containing “all land adjoining the open coastline, zoned Rural and within 100m of MHWS”. No other specific characteristics or values are identified in the District Plan for the ONF. The proposal will avoid adverse effects on the characteristics contributing to values of the ONF.
- > The site contributes to the natural character of Waihi Beach through its naturalised dune landform and planting. The existing natural character of the site is reduced by the earlier dune modifications and placement of structures; the exotic and residential/amenity-type plantings present on the dune (and visible from the beach); and the clear views of dwellings and associated structures (fencing and garden structures) at the top of the dune.
- > At completion, the effect on natural character at the site is assessed as **Moderate-High positive**. Perceptions of natural character will increase particularly at the south end with a higher-quality coastal edge and new planting visible across the full extent of the dune.
- > If exposed, either in the short or long term, the structure would be seen with planting retained to the north and top parts of the dune (at areas protected by the structure). It would be seen as part of a modified context which includes other structures close to the site; and would be visually consistent with other areas of rock revetment to the north of the site along Waihi Beach. In the long term, the structure will ensure a higher-quality coastal edge (providing a “naturalised” appearance of rock revetment seen together with planting), than would be likely to occur with the (future) effects of climate change.
- > Landscape effects relating to public access are assessed as **High positive**, as the proposal will protect the existing public access along the coast.
- > In views from Waihi Beach, effects on visual amenity are assessed as **Moderate-High positive**. The increased visual amenity will result from views of enhanced and more extensive areas of naturalised indigenous planting.
- > Effects on views from Three Mile Creek are assessed as **Neutral**. Views will be of new planting at the northern end of the site and the change will be less discernible.



- > **Low adverse** temporary construction effects are considered to be appropriately minimised by the proposed construction methodology and timing of works. These are interpreted to be “less than minor”.⁶
- > The proposal meets the relevant objectives and policies of the New Zealand Coastal Policy Statement (“**NZCPS**”) and the regional and local statutory planning documents, in that it will not generate adverse effects on the attributes/characteristics contributing to values of the ONF identified over the site; and will not generate significant adverse effects on the attributes contributing to the natural character of the site and its more immediate surroundings at Waihi Beach.
- > The LVA recommends that:
 - > A detailed planting plan is provided for the proposed revegetation of the site, with confirmation of plant placement on the ground by an ecologist or landscape architect prior to planting, to ensure that a naturalised appearance to new planting is achieved, with species located in naturalised groupings and any appearance of “bands” or “lines” of particular species avoided.
 - > Rock is sourced from a local Waihi Beach quarry, and with a variety of sizes selected to ensure a more naturalistic appearance to the revetment (should rocks become exposed after a large storm event or over time due to the effects of climate change). For parts of the structure at risk from erosion/exposure, rocks with a weathered appearance should be used (as far as possible).

The Applicant has accepted and adopted the recommendations of the LVA.

Overall, the effects of the proposal on natural character, landscape and visual amenity are predominantly positive effects and adverse construction effects are less than minor, and considered to be appropriately managed.

6.4 ECOLOGICAL EFFECTS

The Applicant has engaged BlueGreen Ecology to undertake an assessment of effects on ecological values. This report is attached in full as **Appendix D**. By way of summary, the assessment concludes that:

- > The site is located within an ‘Indigenous Biological Diversity Area B (IBDA; B1 Central Waihi Beach)’ layer overlay of the Coastal Plan.
- > The site contains three main vegetation assemblages:

⁶ Per the NZILA Rating Scale guidance provided in Appendix A to the LVA.



- > 'Northern spinifex foredune' (400 m²) of High ecological value;
- > 'Central exotic terrace, hollow and riser slope' (2430 m²) of Negligible ecological value; and
- > 'Southern pohuehue' (175 m²) of Low ecological value.
- > The 'northern spinifex foredune' meets the following criteria under the NZCPS:
 - > Policy 11(a)(i) due to the presence of pingao (At Risk);
 - > Policy 11(a)(iii) due to sand dunes being natural rare ecosystems;
 - > Policy 11(b)(i) being an area of predominantly indigenous vegetation in the coastal environment; and
 - > Policy 11(b)(iii) being indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification.
- > The 'southern pohuehue assemblage' meets Policy 11(b)(i) of the NZCPS, being an area of predominantly indigenous vegetation in the coastal environment.
- > The proposed construction methodology appropriately avoids effects on the 'northern spinifex foredune'.
- > The proposed structure and construction footprint will result in the loss of 0.17% of that 'southern pohuehue assemblage' vegetation community assemblage at the local scale (0.007 ha of 4 ha), which is considered Negligible. Given the Low ecological value of this vegetation assemblage and Negligible effect, this effect is considered Very Low at the local scale, and any adverse effects can be appropriately remedied and mitigated.
- > The loss of 0.5% of exotic dune vegetation at the local scale (0.2425 ha of 52 ha) will have a Very Low adverse effect due to the Negligible ecological value of this vegetation assemblage and negligible magnitude of effect.
- > With the proposed remediation / mitigation planting to restore and enhance disturbed areas, the proposal is considered to have a net benefit.

A planting plan is proposed which seeks to replace all disturbed vegetation with appropriate native species and to secure the disturbed area.

As noted above, the proposal avoids significant adverse effects and appropriately remediates and mitigates all other adverse effects such that the proposal will have a net positive ecological benefit.

6.5 TRANSPORT IMPACTS

The proposal utilises an existing vehicle access to Three Mile Creek Reserve from 91 Seaforth Road. Seaforth Road is identified as a Collector Road in Section 4B.4.1 of the District Plan. The nearest intersection, being the intersection with Glen Isla Place, is located some 60m to the southeast.

The access is sufficiently wide to accommodate turning trucks and provides for sight lines in excess of 100m. There is sufficient space within the Reserve to accommodate manoeuvring.

The access will be used intermittently for the delivery of machinery and construction materials. Any potential impacts on traffic are further minimised by the timing of the construction period over the quieter winter months, when roads are anticipated to be less busy. It is noted that this is the same access point which is used by WBOPDC contractors for their machinery which undertakes the maintenance / dredging works within three Mile Creek.

Effects on traffic are anticipated to be acceptable and temporary in nature, associated only with the construction phase of the project.

6.6 PUBLIC ACCESS

As noted in Section 3 of this AEE, public access along this extent of Waihi Beach is provided above the MHWS and connects to the formed public accessway provided on both the northern and southern banks of Three Mile Creek.

With regards to temporary effects arising during construction, the proposed works are to occur for a 4-6 month period, predominantly over the colder winter months. This ensures that public access at the busiest times of year, particularly the summer/Christmas holiday period, will not be interrupted.

The location of the works, within the dunes and back dune area in front of 9 and 11-16 Glen Isla Place, will mean that even during high tide there will be public access maintained along the beach. Access to the beach will remain available at all times on the northern side of Three Mile Creek, and via Island View Reserve to the south.

Access along the southern side of Three Mile Creek to the beach will be maintained, to the extent practicable, during construction of the northern section of the structure. However, there may be a short period, 1-2 weeks, where access restrictions may be in place when the construction works are located in the northern most extent of the structure immediately adjacent to the accessway. These restrictions will be managed through fencing off the construction site from the accessway to separate any pedestrians from the site for health and safety reasons.



Any temporary interruption of public access is considered appropriate for protecting the health and safety of the public around an active construction area and will be managed through the use of signage and spotters from the construction team.

With regard to long-term effects on public access along the beach, these are more linked to the impacts of sea level rise and therefore, while not a direct effects of the proposal, sea level rise has been considered in the Coastal Processes Assessment (**Appendix B**).

While public access along the coast will not be affected in the short-term, this access is anticipated to become more restricted as the effects of climate change driven sea-level rise and shoreline retreat occur. By the 30-40 year period, when MHWS is predicted to be at the base of the structure, public access in front of the wall may become limited during high tides. This is consistent with the impacts that will be seen along the extent of the beach where other coastal protection structures are located.

Overall, the proposed location of the structure is the best practicable option and will not contribute to public access issues on the wider beach. It is therefore considered that the proposal will not result in any adverse effects on public access along the coast and to the wider beach environment due to its location in the dune system.

6.7 NOISE AND VIBRATION

The Applicant engaged Marshall Day Acoustics (“**Marshall Day**”) to undertake a trial of construction noise and vibration effects associated with the proposal. The findings of this trial are attached in full as **Appendix I**.

The noise trial simulated the anticipated construction activities by operating the machinery and equipment that will be used by the contractor and involved tipping large rocks onto the sand at distances that match the separation distance to the nearest residential dwellings, being 7 and 9 Glen Isla Place, from the proposed works.

The key conclusion of the trial report is that noise and vibration levels during the works will comply with the District Plan construction noise standards of 75dB L_{Aeq} and 90 dB L_{AFmax} . During the trial, Marshall Day measured noise levels of 72dB L_{Aeq} and 88 dB L_{AFmax} at 35 metres.

Regarding vibration effects, Section 4C.1, 18.4.1(t) – Noise and vibration, of the District Plan contains the Explanatory Statement identifies:

‘Vibration from activities has not been an issue in the District. In many cases Council can manage vibration effects through the management of noise emissions or through the provisions of the Health Act. Specific standards to manage vibration are therefore not proposed.’



Therefore, while the District Plan does not include standards for vibration, the works are anticipated to comply with German Standard DIN 4150-3:2016. For the trial, Marshall Day adopted the most stringent limit of 5 mm/s peak particle velocity (PPV) for frequencies between 0 – 10 Hz. They measured vibration levels of 0.7 mm/s PPV and 0.6 mm/s PPV at 35 and 65 metres respectively. Actual vibration levels at any residential dwelling are anticipated to be less than the recorded measurement at the boundary due to the loss of energy when vibration transfers from the ground into a building.

While the trial confirmed any noise or vibration from the proposal will be permitted, the Applicant proposes to undertake noise and vibration monitoring while works are occurring to ensure noise and vibration effects are kept within acceptable levels at adjacent residential areas. The works methodology will be updated if required as a result of monitoring.

6.8 CULTURAL EFFECTS

Regarding the impacts of the project on cultural values and interests, as set out in Section 7.2, GIPS extended opportunities to engage with mana whenua in order to build a further understanding of their relationship with the project area, and how their relationship can be recognised and provided for, as well as their role as kaitiaki. However, it is noted that none of these engagement offers have been accepted.

Notwithstanding, and acknowledging no specific commentary has been provided by mana whenua, when considering the proposal and tangible cultural impacts it is noted that:

- a) The project will not be located within any recorded ‘Sites of Significance to Māori’ as identified in the District Plan;
- b) The project will not be located within any Statutory Acknowledgement Area nor will any aspects on the project impact on these areas;
- c) The Applicant has considered the impacts of the project on the natural values of the coastal environment and coastal processes. In this regard it is noted that the proposed site remediation will result in net ecological benefit and predominantly positive effects on natural character, landscape and visual amenity.

The Applicant proposes to implement an Accidental Discovery Protocol to prudently manage the risk of unearthing any kōiwi or other wāhi tapu during earthworks.



7. CONSULTATION

Through development of the project, GIPS have consulted with and / or extended invites to engage to:

- > Neighbouring landowners, including residents of 1-10 Glen Isla Place;
- > Ngāti Ranginui Iwi Society Inc;
- > Ngāti Te Wai;
- > Te Runanga o Ngai Te Rangi Iwi Trust;
- > Te Runanga o Ngāti Pukenga Iwi;
- > Te Whanau a Tauwhao ki Otawhiwhi;
- > WBOPDC; and
- > BOPRC.

7.1 RESIDENTS OF 1-8 AND 10 GLEN ISLA PLACE

GIPS have held numerous formal and informal conversations with neighbouring properties at Glen Isla Place since early 2024. A range of correspondence and information documents on the proposal has been provided to the Glen Isla residents (provided as **Appendix J**) through the development of the proposal and prior to lodgement of the application.

GIPS understand that key concerns raised by residents of Glen Isla Place include:

- > Adverse noise and vibration effects of construction;
- > Traffic impacts; and
- > Walking access to the coastal margin.

The impacts of the proposal on these matters have been detailed in Section 6.

7.2 IWI, HAPŪ AND MARAE

GIPS have extended multiple invitations to engage to iwi, hapū and marae who were identified as having a cultural association with Waihi Beach.

A high-level summary of the proposal and an invitation to meet to discuss the proposal was sent to Ngāti Ranginui Iwi Society Inc, Ngāti Te Wai, Te Runanga o Ngai Te Rangi Iwi Trust, Te Runanga o Ngāti Pukenga Iwi, and Te Whanau a Tauwhao ki Otawhiwhi on 2 July 2024, again on 29 July 2024 and on 27 August 24.

Other than a response from Ngāti Te Wai Hapu deferring to Te Whanau a Tauwhao ki Otawhiwhi received on 31 July 24 via email, no responses have been received on the invitations to engage.

While invites to engage have not been accepted, GIPS have requested that this application be publicly notified and through this process iwi, hapū and marae can make submissions on the proposal.

7.3 WESTERN BAY OF PLENTY DISTRICT COUNCIL

In October 2023,⁷ GIPS sought approval in principle from the WBOPDC for a proposal to establish a buried coastal protection structure on the Reserve land adjacent to their properties. The Council approved in principle the private construction of a consented structure subject to the following conditions:

- > A resource consent being granted by the relevant consent authority;
- > Consents and construction fully funded by the property owners; and
- > Agreement with WBOPDC on operational cost and responsibilities.

In accordance with these conditions, an application for the requisite consents from BOPRC are applied for under a separate application concurrently, and the consent and construction costs are fully funded by GIPS.

Subsequent to the discussions with WBOPDC Reserves team, GIPS have also attended a pre-application meeting and had discussions with WBOPDC regarding specific consent requirements and undertaking of the noise trial (Refer to Section 6.7).

7.4 BAY OF PLENTY REGIONAL COUNCIL

Pre-application consultation with BOPRC has largely focussed on the location of the structure with regard to the CMA and defining consent requirements as well as the regional activities associated with the noise trial (Refer to Section 6.7).

⁷ The meeting [agenda](#) and [minutes](#) are available on the District Council's website.



8. STATUTORY ASSESSMENT

8.1 INTRODUCTION

The RMA is the principal statutory document governing the use of land, air and water. The purpose of the RMA, as set out in Section 5 of the RMA, is to “*promote the sustainable management of natural and physical resources*”. This section of the AEE sets out the framework under the RMA that applies to the resource consents that are being sought from WBOPDC.

8.2 SECTION 104 ASSESSMENT

Regarding the consideration of resource consent applications, section 104 of the RMA states:

104 Consideration of applications

- (1) *When considering an application for a resource consent and any submissions received, the consent authority must under section 104(1), subject to Part 2, have regard to—*
- (a) *any actual and potential effects on the environment of allowing the activity; and*
 - (ab) *any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and*
 - (b) *any relevant provisions of—*
 - (i) *a national environmental standard:*
 - (ii) *other regulations:*
 - (iii) *national policy statement:*
 - (iv) *a New Zealand coastal policy statement:*
 - (v) *a regional policy statement or proposed regional policy statement:*
 - (vi) *a plan or proposed plan; and*
 - (c) *any other matter the consent authority considers relevant and reasonably necessary to determine the application.*

Section 104 of the RMA does not give primacy to any of the matters to which a consent authority is required to have regard. All of the relevant matters are to be given such weight as the consent authority sees fit in the circumstances, and all matters listed in section 104(1) are subject to Part 2 of the RMA (although it is understood that a consent authority is not



required to consider Part 2 of the RMA unless there is uncertainty in the relevant statutory planning documents).

With respect to Section 104(1)(a) of the RMA, the actual and potential effects on the environment from the activities are set out in Section 6 of this AEE. In summary, while there may be some temporary impacts during the construction, the proposal will result in an overall positive effect.

In terms of Section 104(1)(b) of the RMA, the following sub-sections provide an assessment of the resource consent application against the:

- > NZCPS;
- > National Policy Statement for Indigenous Biodiversity 2023 (“**NPS-IB**”);
- > Bay of Plenty Regional Policy Statement (“**RPS**”); and
- > District Plan.

In terms of Section 104(1)(c) of the RMA, the following documents are considered relevant and reasonably necessary to determine the application and are assessed in the following sub-sections:

- > Tauranga Moana Environmental Management Plan 2016-2026;
- > Western Bay of Plenty Coastal Erosion Responses Policy 2017; and
- > Katikati – Waihi Beach Ward Reserve Management Plan 2018.

8.3 SECTION 104B ASSESSMENT

Section 104B of the RMA relates to consideration of discretionary activities:

104B Determination of applications for discretionary or non-complying activities

After considering an application for a resource consent for a discretionary activity or non-complying activity, a consent authority—

- (a) may grant or refuse the application; and*
- (b) if it grants the application, may impose conditions under section 108.*

8.4 NEW ZEALAND COASTAL POLICY STATEMENT 2010

The NZCPS is a national policy statement under the RMA and took effect in December 2010. An assessment of the proposal against the relevant NZCPS provisions is provided below.



Objective 5, Policy 24, Policy 25, Policy 26 and Policy 27 (Coastal hazard risks)

Objective 5 is the dedicated coastal hazard objective. It seeks to ensure that the management of coastal hazard risks considers responses for existing development and protects or restores natural defences to coastal hazards. It is given effect to by Policies 24-27.

Policy 24 lays the foundation for a risk-based coastal hazard management approach which takes a 100-year perspective. The identification of coastal hazard risks is to take into account national guidance and the best available information on the likely effects of climate change on the region or district. As noted in Section 2 above, WBOPDC have undertaken hazard mapping in accordance with the requirements of Policy 24 and included hazard maps in the District Plan. The project site has been identified as being susceptible to coastal erosion and coastal inundation over the next 100 years. Furthermore, the Coastal Processes Assessment (**Appendix B**) and Engineering Design Report (**Appendix F**) consider the effects of the proposal over a 100-year timeframe, and the proposed design of the structure responds accordingly.

Policy 25 is the overarching policy for managing the risk of social, environmental and economic harm from coastal hazards in areas of the coastal environment that are potentially affected by coastal hazards. Policy 26 addresses natural defences against coastal hazards while Policy 27 specifically addresses the protection of significant existing development in areas likely to be affected by coastal hazards. NZCPS Guidance on Objective 5 and Policies 24-27 indicates that “*Areas of significant existing development may include areas of residential development...*”.

With regard to Policies 25 and 26, given its intent, the proposal will not increase the risk of adverse effects from coastal hazards, and the proposal will contribute to the protection and enhancement of natural defences provided by the existing sand dunes which hold significant biodiversity value.

With regard to Policy 27:

- > The proposal relates to the protection of existing residential development;
- > The Applicant has considered the consequences of a number of options relative to the option of “doing-nothing” and evaluated the costs and benefits of these options, as set out in the Engineering Design Report (**Appendix F**) and Section 4 of this AEE. The preferred option is the most effective while minimising environmental and social costs;

- > The opportunity to avoid the risks from coastal hazards has already passed for existing development at Glen Isla Place and a hard protection structure is the only practical means to protect these properties;
- > The form and location of the proposal have been designed to minimise adverse effects on the coastal environment, including visual and amenity effects on beach users, and the ecological effects on existing indigenous sand dune vegetation;
- > The proposal provides significant environmental benefits through removal of exotic vegetation, proposed dune enhancement following construction and protects significant indigenous biodiversity, and it is appropriate to be located on reserve land (which has been supported by the WBOPDC Reserves team through a separate agreement).

Objective 3, Policy 2 and Policy 17 (The Treaty of Waitangi, tangata whenua and Māori heritage)

Objective 3 and Policy 2 relate to the relationship of tangata whenua with their rohe and protecting characteristics of special value, which include places of historic cultural or spiritual significance. Policy 17 directs the protection of historic heritage in the coastal environment from inappropriate development.

Policy 2 of the NZCPS specifically requires kaitiakitanga to be taken into account in relation to the coastal environment, including provision for the exercise of kaitiakitanga by tangata whenua, and providing opportunities for direct involvement of tangata whenua in decision making. As referenced in Section 7.2, the Applicant has extended multiple invitations to iwi, hapū and marae groups to engage on the proposal however, none of these invitations have been taken up.

While there are no known sites of significance to Māori within the project area, an Accidental Discovery Protocol is proffered as a condition of this consent to ensure a proactive approach is taken should items of potential significance or interest be uncovered during earthworks.

Objective 6 and Policy 6 (Activities in the coastal environment)

Objective 6 and Policy 6 recognise that some uses and development in the coastal environment, including the provision of infrastructure, is important for social, economic and cultural well-being and the protection of coastal environment values does not preclude appropriate uses and development.



The proposal has a functional need to be located in the coastal environment in order to protect existing development and Council reserve land from coastal erosion. The proposal does not seek to enable further urban development.

The proposal is setback from the CMA and has been designed to be of an appropriate form, scale and location to ensure coastal environment values are protected. Public access along the beach will be maintained, significant adverse effects on ecology and biodiversity will be avoided, and the proposal appropriately remediates and mitigates all other adverse effects on ecology such that the proposal will have a net benefit. The proposal will have predominantly positive effects on natural character, as described in preceding sections of this report.

Objective 1 and Policy 11 (Indigenous biological diversity)

The reserve land is identified as IBDA-B1 and contains some areas of indigenous dune vegetation. The Ecological Assessment (**Appendix D**) identifies that the ‘northern spinifex foredune’ meets the following criteria under Policy 11 of the NZCPS:

- > Policy 11(a)(i) due to the presence of pingao (At Risk);
- > Policy 11(a)(iii) due to sand dunes being natural rare ecosystems;
- > Policy 11(b)(i) being an area of predominantly indigenous vegetation in the coastal environment; and
- > Policy 11(b)(iii) being indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification.

In addition, the ‘southern pohuehue assemblage’ meets Policy 11(b)(i) of the NZCPS, being an area of predominantly indigenous vegetation in the coastal environment.

Policy 11(a) requires that adverse effects on more sensitive areas of indigenous biodiversity are avoided and, Policy 11(b) seeks to avoid significant adverse effects however other adverse effects may be avoided, remedied or mitigated.

As described in Section 6.4, adverse effects of the proposal are considered to be appropriately avoided, remedied or mitigated for the following reasons:

- > Adverse effects on ‘northern spinifex foredune’ will be avoided through the design of the proposal and construction methodology, which avoids the identified area of *At Risk* vegetation;
- > There are no significant adverse effects associated with the loss of the ‘southern pohuehue assemblage’ or the ‘central exotic terrace, hollow and riser’;



- > Other adverse effects arising from the loss of vegetation in these areas is of a negligible magnitude, and appropriately remedied and mitigated through the minimisation of disturbed area and revegetation of disturbed areas with indigenous dune species.
- > A planting plan is provided to ensure remediation / mitigation of the disturbance will result in a net ecological benefit at the local scale.

Objective 2, Policy 13 (Preservation of natural character), Policy 14 (Restoration of natural character) and Policy 15 (Natural features and natural landscapes)

Objective 2 seeks the preservation of natural character and protection of natural features and landscape values. The reserve land is identified as Natural Feature/Landscape – S24 in the District Plan. The LVA confirms the proposal is not in or adjacent to any an area of Outstanding, Very High or High Natural Character.

For natural character areas that are not ‘outstanding’, Policy 13(b) requires significant adverse effects on natural character to be avoided, and all other effects on natural character are to be avoided, remedied or mitigated.

For natural features and natural landscapes that are not ‘outstanding’, Policy 15(b) requires that significant adverse effects on other natural features and landscapes (including seascapes) be avoided, and all other effects on those features and landscapes be avoided, remedied or mitigated.

With the adoption of the recommendations made in the LVA, the proposal is considered to give rise to predominantly positive effects on natural character, landscape and visual amenity. Construction effects on these values will be temporary, minimised through methodology, and overall less than minor. Once completed, the proposal will avoid adverse effects on the characteristics contributing to values of the ONF overlay.

The proposal is therefore consistent with the direction of Policy 13(b) and 15(b) to avoid significant adverse effects, and avoid, remedy or mitigate other adverse effects.

Objective 4, Policy 18 (Public open space) and Policy 19 (Walking access)

Objective 4 seeks to maintain and enhance public open space qualities and recreation opportunities of the coastal environment. Policy 18 requires the need for public open space to be recognised and the provision of public space. Policy 19 requires the public expectation and need for walking access to and along the coast to be recognised, and that walking access is maintained and enhanced.

The location of the works, within the dunes and back dune area in front of 9 and 11-16 Glen Isla Place, will mean that even during high tide there will be public access maintained along



the beach. Access to the beach will remain available at all times on the northern side of Three Mile Creek, and via the Island View Reserve to the south.

Access along the southern side of Three Mile Creek to the beach will be maintained, to the extent practicable, during constitution of the northern section of the structure. However, there may be a short period, 1-2 weeks, where access restrictions may be in place when the construction works are located in the northern most extent of the structure immediately adjacent to the accessway. These restrictions will be managed through fencing off the construction site from the accessway to separate any pedestrians from the site for health and safety reasons.

Upon completion of the works, all existing accessways will be available for use.

As per the assessment against Objective 2, Policy 13 and Policy 15 above, the proposal is considered compatible with the natural character, natural feature, landscape and amenity values associated with the reserve land. These values would be maintained and enhanced through the proposed planting. In this regard, it is noted that the dunes do not currently provide for active or passive recreation.

Policy 20 (Vehicle access)

Policy 20 relates to the control of vehicles on beaches and adjacent public land in certain circumstances.

The proposed construction methodology confirms that only vehicles with the express purpose of undertaking the proposed works would be provided access to the beach and adjacent public land. The proposed methodology and access route is intended to minimise time below MHWS, avoid contamination of the tidal area and avoid disturbance that would not be restored by natural processes within 7 days. There will be no refuelling within the CMA and only equipment that cannot readily leave site (excavators) will be refuelled on site. A spill kit will be present on site.

Potential damage to sand dunes or harm to indigenous vegetation and habitat that may be caused by these vehicles is controlled by the proposed construction methodology. As noted in Section 6, the works have been designed to minimise the disturbance of the dune area and all disturbed areas will be subject to replanting upon the completion of works.

8.5 NATIONAL POLICY STATEMENT FOR INDIGENOUS BIODIVERSITY 2023

The NPS-IB came into effect in August 2023. It provides direction to councils to protect, maintain and restore indigenous biodiversity requiring at least no further reduction

nationally. It provides direction on how to identify and protect significant indigenous biodiversity and manage the adverse effects of subdivision use and development.

The NPS-IB includes one objective:

- (1) *The objective of this National Policy Statement is:*
- (a) *to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date; and*
 - (b) *to achieve this:*
 - (i) *through recognising the mana of tangata whenua as kaitiaki of indigenous biodiversity; and*
 - (ii) *by recognising people and communities, including landowners, as stewards of indigenous biodiversity; and*
 - (iii) *by protecting and restoring indigenous biodiversity as necessary to achieve the overall maintenance of indigenous biodiversity; and*
 - (iv) *while providing for the social, economic, and cultural wellbeing of people and communities now and in the future.*

The most relevant policies are replicated and commented upon below.

Policy 2: Tangata whenua exercise kaitiakitanga for indigenous biodiversity in their rohe, including through:

- (a) *managing indigenous biodiversity on their land; and*
- (b) *identifying and protecting indigenous species, populations and ecosystems that are taonga; and*
- (c) *actively participating in other decision-making about indigenous biodiversity.*

The Applicant has extended invitations to engage on the proposal to hapū, marae and iwi with an interest in Waihi Beach in an attempt to understand how to provide for their relationship with Waihi Beach and their role as kaitiaki. While none of these invitations have been taken up, commentary on impacts of the proposal on ecology and biodiversity have been provided in Section 6 above.

Policy 3: A precautionary approach is adopted when considering adverse effects on indigenous biodiversity.

A precautionary approach is required when the effects of a proposed activity on indigenous biodiversity are uncertain, unknown, or little understood but those effects could cause significant or irreversible damage to indigenous biodiversity (Clause 3.7).



The potential effects of the proposal have been identified and assessed in the Ecology Assessment (refer **Appendix D**) and summarised in Section 6.4 above. The Ecology Assessment concludes that the proposal will have a net ecological benefit. It is therefore considered that the potential effects of the proposal on indigenous biodiversity are known and well understood and will not cause significant or irreversible damage to indigenous biodiversity such that a precautionary approach is not necessary to adopt in relation to this proposal.

Policy 7: SNAs are protected by avoiding or managing adverse effects from new subdivision, use and development.

It is noted that the RPS and District or Regional Plans have not yet been amended to include provisions giving effect to Clause 3.21, however, the project site is identified as IBDA-B1 in the Regional Natural Resources Plan.

The Ecology Assessment states that the proposal includes the enhancement of the indigenous dune vegetation and will not involve the permanent destruction of significant habitat of indigenous biodiversity. Clause 3.11(3) requires any adverse effects on an SNA to be managed by applying the effects management hierarchy (as specified by clause 3.10(3) and (4)) or under any alternative management approach that is consistent with provisions of the RPS, District Plan and Regional Plan relating to restoration (Clause 3.21).

The Ecology Assessment includes an assessment of the proposal against the effects management hierarchy and recommends a planting plan which will ensure remediation / mitigation of the works result in a net ecological benefit.

Policy 10: Activities that contribute to New Zealand's social, economic, cultural, and environmental wellbeing are recognised and provided for as set out in this National Policy Statement.

In giving effect to Policy 10, Clause 3.5. requires local authorities to consider that the protection, maintenance, and restoration of indigenous biodiversity contributes to the social, economic, and cultural wellbeing of people and communities. The proposal will provide benefits for cultural, social and economic well-being as documented in Section 6 of this AEE. In this context, this is primarily achieved through the ecological remediation and mitigation which will result in a net ecological benefit, and the proposed construction methodology which avoids disturbance of, therefore avoids significant adverse effects on, high value indigenous dune vegetation.

Local authorities must also consider that the protection, maintenance, and restoration of indigenous biodiversity does not preclude subdivision, use and development in appropriate places and forms. The proposal has a functional need to be located in this area and significant adverse effects of the proposal on indigenous biodiversity are avoided and all



other adverse effects are remedied / mitigated, demonstrating that the proposal is located in an appropriate place and is of an appropriate scale and form to fulfil its function.

Policy 13: Restoration of indigenous biodiversity is promoted and provided for.

The proposal seeks to enhance the indigenous biodiversity within the dune area. The Applicant has adopted the planting plan recommendation in the Ecology Assessment and proposes to carry out the plantings in the first planting season after works are completed as a requirement of consent conditions

Overall, the proposal is consistent with the objective and relevant policies of the NPS-IB.

8.6 BAY OF PLENTY REGIONAL POLICY STATEMENT (RPS)

The RPS sets out regionally significant issues, and associated objectives and policies to address the issues. This planning policy framework is to be given effect by regional plans and district plans, which are discussed later in this report.

The issues, objectives and policies relevant to this application relate to the management of the coastal environment, integrated resource management, iwi resource management, matters of national importance, water quality and land use, and natural hazards.

The following sections identify the relevant objectives and provide an assessment against the relevant policies which give effect to those objectives.

Coastal Environment

The relevant objectives pertaining to the coastal environment are:

Objective 2

Preservation, restoration and, where appropriate, enhancement of the natural character and ecological functioning of the coastal environment.

Objective 4

Enable subdivision, use and development of the coastal environment in appropriate locations.

Policy CE 12B requires the avoidance of inappropriate hazard mitigation in the coastal environment. In this regard, it is noted that:

- > The Applicant has undertaken an assessment of a range of options, as set out in Section 4.3 of this AEE;
- > The proposal is the only practical means to protect the reserve land at the Glen Isla dune and the adjoining existing residential properties at Glen Isla Place;



- > The proposal incorporates soft engineering over top of hard structures to enhance natural defences provided by the sand dunes and a naturalised coastal area; and
- > As set out in Section 6.6, public access along and to the beach will be maintained throughout the construction period. Once the works are complete, public access to the beach along the existing formed accessways either side of Three Mile Creek will not be impacted.

The proposal has been designed and located to be consistent with the other relevant policies of the coastal environment chapter. In particular:

- > The proposal is not in an area identified as having Outstanding, Very High or High Natural Character in Appendices J or I. Significant adverse effects on natural character are avoided by burying the structure and enhancing the sand dunes;⁸
- > The proposal has been designed in a manner which is appropriate to the natural character of the coastal environment. The natural character of the site and an assessment of effects is attached at **Appendix C**. The proposal is appropriately located outside the CMA and has a functional need to locate in the coastal environment. Section 6 provides an assessment of effects of the proposal and describes the manner in which those effects are avoided, remedied or mitigated;⁹
- > Proposed dune enhancement will protect and restore the capacity of the sand dunes to provide existing development with a protective buffer from coastal erosion;¹⁰
- > An assessment against Policy 11 of the NZCPS is provided above. An assessment of ecological effects attached as **Appendix D** confirms that indigenous biodiversity will be protected and enhanced such that the proposal will have a net positive effect on ecology values;¹¹
- > The proposal safeguards the life supporting capacity of coastal ecosystems by maintaining the extent and profile of the sand dunes and undertaking planting of indigenous dune plant species which is likely to enhance habitat for indigenous species;¹² and
- > Potential adverse effects of the proposal on marine water quality have been provided for in the proposed construction methodology by managing the refuelling of machinery and

⁸ Policy CE 2B

⁹ Policy CE 8B

¹⁰ Policy CE 4A

¹¹ Policy CE 6B

¹² Policy CE 9B



ensuring sand and rock stockpiles are located outside the tidally influenced area. The proposal does not create significant impervious area.¹³

Integrated Resource Management

The relevant objectives relating to integrated resource management are:

Objective 10

Cumulative effects of existing and new activities are appropriately managed.

Objective 11

An integrated approach to resource management issues is adopted by resource users and decision makers.

Objective 12

The timely exchange, consideration of and response to relevant information by all parties with an interest in the resolution of a resource management issue.

The Applicant has adopted an integrated approach as demonstrated by:

- > Undertaking a number of technical assessments to reduce scientific uncertainty and avoid serious or irreversible adverse effects;¹⁴
- > Having regard to the likely effects of climate change with particular regard to predicted sea level rise, and cumulative effects as demonstrated through the Coastal Processes Assessment attached as **Appendix B** and the Engineering Report attached as **Appendix F**;¹⁵
- > Designing the proposal in a way which recognises the interconnected nature and multiple values of natural and physical resources, responds to potential adverse effects, and maximises the potential benefits by combining hard protection with enhancement of natural defences. The proposal has been informed by assessment against a number of alternatives over 100-year period;¹⁶
- > Consulting with neighbours, community members and tangata whenua, as detailed in Section 7 of this AEE. The Applicant has also requested the application be publically notified;¹⁷

¹³ Policy CE 10B

¹⁴ Policy IR 1B

¹⁵ Policy IR 2B

¹⁶ Policy IR 3B

¹⁷ Policy IR 4B



- > The effects of the proposal are assessed in Section 6 of this AEE. In summary, adverse effects are considered to be appropriately avoided, remedied and mitigated. The proposal is not anticipated to contribute to the incremental degradation of water quality or sites of significance to Māori, or increase risk from natural hazards;¹⁸ and
- > The necessary resource consents from BOPRC are being applied for in a separate application.¹⁹

Iwi Resource Management

With regard to iwi resource management matters, the following objectives are relevant to the proposal:

Objective 13

Kaitiakitanga is recognised and the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) are systematically taken into account in the practice of resource management

Objective 15

Water, land, coastal and geothermal resource management decisions have regard to iwi and hapū resource management planning documents

Objective 17

The mauri of water, land, air and geothermal resources is safeguarded and where it is degraded, where appropriate, it is enhanced over time

As noted above, GIPS has extended invitations to engage with mana whenua who have an interest in Waihi Beach to understand their relationship with the project area, and how their relationship can be recognised and provided for, as well as their role as kaitiaki.²⁰

The proposal has been developed taking into account the mātauranga-based policy-framework articulated in the Tauranga Iwi Management Plan 2016-2026, as detailed further in Section 8.8.²¹

The Applicant has, from a western science perspective, sought to avoid and remedy adverse effects on values of the coastal environment, including by protecting water quality of coastal and freshwaters and enhancing indigenous biodiversity values. The Applicant also proposes

¹⁸ Policy IR 5B

¹⁹ Policy IR 6B

²⁰ Policy IW 2B and Policy IW 3B

²¹ Policy IW 4B



to implement an Accidental Discovery Protocol during construction works to prudently manage the risk of unearthing kōiwi or other wāhi tapu during earthworks.²²

Matters of National Importance

With regard to matters of national importance, the relevant objectives are:

Objective 18

The protection of historic heritage and outstanding natural features and landscapes from inappropriate subdivision, use and development.

Objective 19

The preservation of the natural character of the region's coastal environment (including coastal marine areas) wetlands, lakes and rivers and their margins

Objective 20

The protection of significant indigenous habitats and ecosystems, having particular regard to their maintenance, restoration and intrinsic values.

Objective 21

Recognition of and provision for the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga

Objective 22

The coastal marine area, lakes and rivers are generally accessible to the public

The Applicant has recognised and provided for the relevant matters of national importance by:²³

- > Giving particular consideration to the protection of IBDA-B1 by designing works to minimise disruption to areas with predominantly indigenous vegetation. The Applicant has developed a methodology and design which appropriately avoids, remedies and mitigates adverse ecological effects. While no avifauna, herpetofauna or macroinvertebrates were observed using the dunes as habitat during the ecologist's site visit, the protection and enhancement of the dune habitat is appropriate to recognise and protect the significant indigenous habitat that may be provided by the dune ecosystems;²⁴

²² Policy IW 5B and IW 6B

²³ Policy MN 1B

²⁴ Policy MN 2B



- > Using the identified criteria to inform assessments of effects on natural character, natural features and landscapes, indigenous vegetation and public access;²⁵
- > Incorporating the retention of sand dunes and enhancement of indigenous vegetation as part of the proposal;²⁶
- > As set out in Section 6.6, public access along and to the beach will be maintained throughout the construction period. Once the works are complete, public access to the beach along the existing formed accessways either side of Three Mile Creek will not be impacted;²⁷ and
- > Avoiding adverse effects on natural character and indigenous biodiversity to the extent practicable, and remedying and mitigating all other adverse effects.²⁸

Land Use and Water Quality

With regard to land use and water quality, the following objective and policy are considered relevant to the proposal:

Objective 29 *Land use activities are:*

- 1 *within the capability of the land to support the activity;*
- 2 *integrated with the wider environmental values of their surroundings; and*
- 3 *within the capacity of receiving waters to assimilate any discharge*

Policy WL 7B: Minimising the effects of land and soil disturbance

Achieve regional consistency by controlling land and soil disturbance activities to:

- (a) *Avoid accelerated erosion and soil loss; and*
- (b) *Minimise silt and sediment runoff into water, or onto or into land that may enter water, so that healthy aquatic ecosystems are sustained.*

The proposal is consistent with Policy WL 7B in that earthworks will be managed to avoid erosion and loss of the sand dunes, and minimise sediment run off. Measures to protect the health of Three Mile Creek and the coastal aquatic ecosystems include:

- > Setting the area of works back from the CMA and the open waters of Three Mile Creek;

²⁵ Policy MN 3B and Policy MN 7B

²⁶ Policy MN 4B

²⁷ Policy MN 5B and Policy MN 6B

²⁸ Policy MN 8B



- > Ensuring all excavated material is reused onsite to bury the structure and no spoil is placed in the CMA;
- > Limiting activities in the CMA to only those vehicle movements required to deliver machinery and construction materials; and
- > Ensuring no refuelling occurs within the CMA and refuelling of equipment that cannot readily leave the site will occur in accordance with a refuelling plan.

In addition, enhancement planting of indigenous dune vegetation will assist in minimising accelerated erosion and loss of this area.

Natural Hazards

There is one objective specific to natural hazards in the RPS:

Objective 31

Avoidance or mitigation of natural hazards by managing risk for people's safety and the protection of property and lifeline utilities.

The supporting policies establish a risk management approach and require the management of risk to result in lower levels of risk, or maintain low levels of risk.²⁹

With regard to the proposal, it is noted that;

- > The District Plan identifies the project site as within Coastal Erosion Area – Primary Risk and Rural;
- > The proposal does not include any land use change or development that would increase the risk from coastal erosion, and the proposal directly reduces the risk of coastal erosion to existing residential development;³⁰
- > Davis Coastal Consultants has considered the effects of sea-level rise over a 30, 50 and 100-year period;³¹ and
- > The District Plan maps natural hazard areas and provides for coastal hazard protection as a discretionary activity.³²

It is therefore considered that the proposal is consistent with the relevant provisions of the RPS.

²⁹ Policies NH 1B, 2B and 3B.

³⁰ Policy NH 5B.

³¹ Policy NH 11B.

³² Policy 12A.



8.7 WESTERN BAY OF PLENTY OPERATIVE DISTRICT PLAN

The following sections of the District Plan are considered relevant to this proposal and are assessed in turn below:

- > Section 8 - Natural Hazards;
- > Section 18 - Rural;
- > Section 4 – Amenity;
- > Section 5 - Natural Environment; and
- > Section 6 – Landscape.

Section 8 - Natural Hazards

The relevant objectives and policies of the Natural Hazards chapter are:

8.2.1 Objectives

1. *Minimisation of the risk of natural hazards to human life and the natural and built environment.*
2. *Protection of the existing natural character of the coastal environment and other natural features having recognised ecological, landscape or other significance to the District.*

8.2.2 Policies

1. *Adopt the best practicable options (including the ‘do nothing’ option) in the management of areas actually or potentially at risk from natural hazards and where possible adopt avoidance rather than mitigation or remedial measures.*
2. *Control or prevent the establishment of activities which have the potential to increase the extent to which natural hazards have or may have an adverse effect on human life or the natural or built environment.*
5. *Ensure that where hazard protection works are necessary their form, location and design are such as to avoid or mitigate potential adverse environmental effects.*
6. *Enable natural ecosystems in currently undeveloped areas to migrate inland as a result of dynamic coastal processes (including sea level rise as predicted by recognised national or international agencies).*
7. *Encourage the conservation and enhancement of natural features such as sand dunes and wetlands which have the capacity to protect existing developed land.*

The proposal is consistent with the above objectives and policies for the following reasons:



- > The proposal is the best practicable option for protecting the existing residential development at Glen Isla Place from coastal erosion, as set out in Section 4 of this AEE;
- > The design of the proposal has been refined over several iterations to avoid adverse effects on the natural environment such that potential adverse effects are considered to be appropriately avoided, remedied or mitigated, with a net benefit for ecology outcomes and predominantly positive natural character, landscape and visual amenity effects, as set out in Section 6 of this AEE; and
- > There is no available space for the dunes to migrate, and the proposal seeks to enhance the natural defence afforded by the dunes by undertaking enhancement planting.

Section 8.5.2 of the District Plan provides a list of matters to guide the assessment of Discretionary Activities. Each relevant matter is replicated in italics below with an assessment against the proposal following.

8.5.2.b. Coastal Erosion Areas – Primary Risk and Rural

- i. *Extent to which the [building/structure](#) is relocatable, taking into account the design, location and materials of the [building/structure](#), access to remove the [building/structure](#), and the ability to rehabilitate the [site](#) including the removal of all parts of [buildings/structures](#) and services and the reinstatement of land to protect natural character and the ability of dunes to act as a buffer against erosion.*
- ii. *Avoidance of the use of concrete and block wall foundations, [walls](#) and flooring, except that for sheds and garages (used for non-habitable purposes) all of these are allowed other than concrete and block walls.*
- iii. *The degree to which the ability of [buildings](#) or [structures](#) to be relocated is affected.*
- iv. *The extent to which the proposal addresses any identified natural hazard and the degree to which the physical risk to [buildings/structures](#) from coastal erosion can be avoided or mitigated.*
- v. *Additions and alterations to existing [buildings/structures](#) should be landward of the existing [building/structure](#).*
- vi. *New [buildings/structures](#) or significant redevelopment of existing [buildings/structures](#) should be situated as far back from the toe of the foredunes as practicable. The most recent measurements of the toe of the foredune are available from [Council](#).*
- vii. *Imposition of consent conditions requiring that where the toe of the foredune comes within a distance of a [building/structure](#) which may put it at immediate risk (minimum of 8m), the [building/structure](#) is to be relocated a sufficient distance back from the toe of the foredune to mitigate that risk. The distances specified in the conditions will depend on the latest scientific information*



available to [Council](#).

- viii. *The impact that the proposal will have on the natural character of the coastal environment, recognising the ecological values of the dune area, and dune restoration.*
- ix. *Registration of an encumbrance instrument on the title to address any of the matters above.*
- x. *Scientific information from a suitably qualified coastal expert which demonstrates that the land within the Coastal Erosion Area is not under any actual or potential risk from coastal erosion. For the purpose of meeting this rule any assessment of coastal hazards shall include those standards outlined in the Bay of Plenty Regional Coastal Environment Plan.*

8.5.2.c. Floodable Areas and Coastal Inundation Areas

- i. *The effect of the proposed subdivision (including, but not limited to any building site, [building/structure](#) or earthworks) on the capacity of ponding areas and function of overland flow paths.*
- ii. *The provision of finished site levels to mitigate adverse effects associated with inundation. For Waihi Beach (Planning Maps A03 and U01-U04) the flood level shall be based on the 2% AEP (inclusive of climate change).*
- iii. *In the case of Floodable Areas, any verifiable new information which demonstrates that the subject site is not in fact susceptible to flooding.*

These matters have been addressed in the technical assessments and design reports which have been provided in support of the GIPS proposal. The design elements have been summarised in Section 4 and the impacts and measures to address these have been summarised in Section 6.

It is considered that the intent of this criteria is to avoid structures that will be susceptible to the risks of erosion, rather than structures whose very purpose is to mitigate those effects on extant structures inland. Therefore, given the structure's purpose is to mitigate coastal erosion it is inevitably on land that is (or would be, in the structures absence) under risk from coastal erosion, it is considered that the proposal appropriately provides for the relevant matters above.

Section 18 – Rural

As identified in Section 3.2 of this AEE, the project site is zoned Rural. The relevant objectives and policies pertaining to the Rural Zone are:

18.2.1 Objectives

- 3. *Appropriate provision for activities not directly based on primary production but which have a functional or other legitimate need for a rural location.*



5. *Maintain the rural character and amenity values associated with the low density rural environment.*
6. *Protection and enhancement of ecological, landscape, cultural, heritage and other features located in the rural environment which are of value to the wider community.*

18.2.2 Policies

10. *Activities with a functional or other legitimate need for a rural location should not be established in rural areas unless they are able to be undertaken without constraining the lawful operation of productive rural land uses which are carried out in accordance with accepted management practices.*

While the site is zoned Rural, it is not considered versatile land³³ and currently contains sand dunes which are identified as IBDA-B1 under the Coastal Plan. The LVA confirms that the site does not exhibit characteristics which would be typically associated with a rural area or rural character such as wide, open areas of pasture and/or agricultural uses and livestock.

There are no existing productive land uses and it is unlikely that primary production activities would establish on this site, therefore the proposal does not give rise to potential conflict.

With regard to effects associated with the construction phase, such as noise, traffic generation, signs and amenity, these are considered to be less than minor. The proposal seeks to manage construction noise and traffic in accordance with the permitted standards of the plan.

With regard to construction of a coastal protection structure, the structure has a functional need to be located within the dune environment and the proposal is considered to result in predominantly positive effects on visual amenity and ecological values associated with enhanced indigenous planting proposed.

The proposed use of the site for coastal hazard protection, along with dune enhancements, is therefore an appropriate use of this piece of rural land.

Section 4 - Amenity

Of particular relevance to the proposal are the following objective and policies pertaining to noise and vibration:

4C.1.2.1 Objective

An environment free of unreasonable noise in accordance with the character and amenity of the zone within which the noise is generated and received.

³³ The area is classified as LUC Class 8 on the Manaaki Whenua Landcare Research [website](#).



4C.1.2.2 Policies

1. *Ensure activities do not generate noise levels inconsistent with the character and amenity of the zone in which the generated noise is received.*
2. *Exempt from the maximum permitted noise level requirements are those activities which are an integral part of accepted management practices of activities associated with production land in rural areas as well as other activities clearly of a temporary nature (e.g. construction works, military training exercises).*
3. *Have regard to any relevant New Zealand legislation, standards, guidelines and codes of practice, in the assessment of applications for resource consents.*

The Applicant engaged Marshall Day Acoustics to undertake a noise and vibration trial (refer **Appendix I**) which confirms construction noise and vibration will comply with the relevant noise standards.

The proposed hours of work will be 7.00 am to 5.00pm Monday to Friday (working hours) to the extent practicable. Work will not be undertaken at night or once daylight becomes unsuitable. However, the work is tidally and storm dependent and work may continue outside working hours for up to three days a week every two weeks. This may include Saturday working outside school holiday periods. No work will take place before 6am or after 8pm.

In addition, the works are proposed to occur during the quieter autumn and winter months (April – November inclusive, although works are anticipated to be completed within 4 to 6 months), when there are less visitors to the beach.

The noise and vibration associated with the proposal are therefore considered to be in accordance with the character and amenity of the zones within which the noise is generated and received.

Section 5 - Natural Environment

With regard to the Natural Environment, the following objectives and policies are relevant to the assessment of this proposal.

5.2.1 Objectives

1. *Protection of all significant native plant and animal habitats within the Western Bay of Plenty District.*
2. *Support and encourage the protection and enhancement of ecosystems of importance for both the natural processes they offer and any ecological benefits in terms of connectivity, buffering or the provision of habitat for threatened species.*
3. *Preservation of the natural character of the [District's](#) coastal environment*



(including the coastal marine area), rivers, lakes, and their margins.

5.2.2 Policies

1. *Ecological [sites](#) that have been scientifically identified as significant should be protected.*
5. *Likely changes in sea level should be provided for in ways that allow for the natural inland migration of the coast and associated identified native habitats and ecosystems.*
6. *Protection measures should take into account natural seasonal fluctuations in habitat character and sensitivity.*
7. *An approach which is precautionary but responsive to increased knowledge should be adopted where the management of the environment is hindered by lack of understanding about processes and the effects of activities.*
8. *Activities should not adversely affect any identified significant native plant and animal habitats and ecosystems.*
9. *The adverse effects of inappropriate subdivision, use and [development](#) on the natural character of the coastal environment, [wetlands](#), rivers, lakes, and their margins should be avoided. Where avoidance is not practicable, such effects should be appropriately remedied or mitigated.*
12. *Activities should not result in the release of animal or plant pests that are likely to cause harm to native vegetation, habitats and native fauna.*

The Glen Isla dunes is not an ecological feature or a Recommended Area for Protection under the District Plan, however, the Coastal Plan identifies the dunes as IBDA B1. The Ecological Assessment (**Appendix D**) confirms the site contains areas that are significant from an ecological perspective. The proposal is consistent with the relevant objectives and policies in that:

- > The proposal benefits from an assessment of coastal processes, ecological effects and landscape effects. It is therefore considered that the potential effects of the proposal are known and well understood, and a precautionary approach is not necessary to adopt in relation to this proposal;
- > The construction methodology ensures that the area of disturbance avoids the ‘northern spinifex foredune’ which is dominated by spinifex with scattered pingao (an *At Risk* dune species);
- > The proposed works are to predominantly occur over the winter period and avoid the bird nesting season;
- > The Applicant will implement a planting plan to ensure rehabilitation of the disturbance area will result in net ecological benefit;



- > The proposed planting will also support the resilience of the sand dunes in providing for coastal erosion protection which is particularly important given the lack of space for the dunes to migrate; and
- > The proposal will not involve the planting of exotic plant species or release of animal pests.

With regard to natural character, the LVA confirms that the proposal will preserve natural character, avoid adverse effects and will result in predominantly positive effects associated with the planting of disturbed areas with indigenous dune species. Where low adverse temporary construction effects cannot be avoided, they are appropriately minimised and mitigated by the proposed construction methodology and the proposed 6 month window for construction to occur.

The Coastal Processes Assessment and Engineering Design Report confirm that the proposed structure is appropriately located to protect existing reserve land and residential dwellings. The proposed design enables a responsive management approach to future maintenance and upgrades of the structure which may be required after 50 or so years subject to actual sea level rise.

Section 6 - Landscape

The relevant landscape provisions are:

6.2.1 Objectives

The unique visual quality and character of the [District's](#) outstanding natural features, landscapes and [viewshafts](#) are protected from inappropriate subdivision, use and [development](#).

6.2.2 Policies

1. *Within areas identified as being outstanding natural features and landscapes, landscape character should be protected and enhanced by managing the adverse effects of inappropriate land use and [development](#) activities.*

The site is located within ONF S24, which covers all land adjoining the open coastline, zoned Rural and within 100m of MHWS. As summarised in section 6.3 above, the site contributes to the natural character of Waihi Beach through its naturalised dune landform and planting, however, the existing natural character of the site is reduced by historic dune modifications, exotic plantings present on the dune, and the clear views of dwellings and associated structures at the top of the dune. The natural characteristics and visual qualities of the site are summarised in Section 6.3 and further described in the LVA (**Appendix C**).



The LVA confirms that the proposal will avoid adverse effects on the characteristics contributing to values of the ONF overlay. With regard to the matters of discretion listed at Section 6.6.1.3. of the District Plan, it is noted that:

- > The proposal would be built to match existing ground levels and will not change the visibility of existing structures, and therefore is not anticipated to adversely affect the integrity of the landform and skyline profile;
- > Vegetation clearance is restricted to the footprint of the structure and construction trench. An area of high value spinifex and pingao will be fenced off and any disturbance of this area will be avoided;
- > The extent and location of earthworks is limited to that required for the construction of the structure;
- > Remediation of the site includes placement of sand on a slope no greater than 1:2. All disturbed areas are to be planted with indigenous species in accordance with a planting plan prepared by an ecologist. In addition, plant placement will be confirmed by an ecologist or landscape architect to avoid the creation of “lines” to ensure the revegetated dune face appears as naturalistic as possible;
- > Effects on visual amenity are considered to be generally positive;
- > There are no Significant Ecological Features within the site;
- > Access to the site will be provided using the existing vehicle entrance to Three Mile Creek at Seaforth Road and along the open beach. No new access tracks or roads are proposed. Proposed timing of the construction phase is between April-November but avoiding holidays to minimise effects on beach users. Planting is timed for spring or autumn as practicable to provide the best possible planting outcome;
- > No new lot boundaries are proposed; and
- > Production forestry is not proposed.

The proposal is therefore consistent with the relevant provisions of the District Plan.

8.8 TAURANGA MOANA IWI MANAGEMENT PLAN 2016-2026

The Tauranga Moana Iwi Management Plan 2016-2026 (“**the Plan**”) is the collective voice of Ngāti Ranginui, Ngāi Te Rangi and Ngāti Pūkenga as it relates to Tauranga Moana and the surrounding lands and waters, including the CMA from Ngā Kuri-a-Whare in the north-west to Wairakei Stream in the south.

The collective vision for Tauranga Moana is:



Tauranga Moana Iwi and hapū work together and are actively involved in restoring and enhancing the mauri of Tauranga Moana.

For local authorities and plan users, the Plan is intended to influence resource management documents and processes, articulate expectations regarding engagement, and build cultural awareness and understanding.

It is the opinion of the Applicant that the proposal is consistent with the relevant objectives and policies for the reasons summarised below.

The provisions of section 6 relate to Tūhauora Tinana: Healthy Waters and emphasise:

- > Restoration and protection of the mauri of Te Awanui and coastal areas;
- > Avoidance of the degradation of water quality; and
- > Reduction of the impacts of sedimentation on Te Awanui.

The proposal is located outside the CMA and Te Awanui / Tauranga Moana and the proposed methodology will ensure that the earthworks do not result in sediment or other contaminants entering the CMA, such that mauri of these coastal waters will be protected.

The provisions of Section 7 (Tūhauora Whenua: Healthy Land) emphasise the protection, and where possible enhancement, of the mauri of land.

The proposed works will ensure the health of the sand dune habitat is enhanced by undertaking planting of native dune plants species following the completion of works.

With regard to Tūhauora Wairua: Cultural Heritage (Section 8) and Tūhauora Whanau: Our People and Relationships (Section 9), the Plan seeks to:

- > Recognise and protect traditional sites, areas, landscape and practices of cultural and spiritual significance;
- > Empower Tauranga Moana Iwi and hapū to participate in resource management process and decisions;
- > Emphasise the importance of active involvement and effective working relationships.

As set out in Section 7.2, the Applicant has extended the offer of engagement to iwi, hapū and marae with an interest in Waihi Beach to recognise the importance of active involvement and participation in resource management processes. Acknowledging that none of these offers have been taken up by any party, the intent of this engagement is to understand the connection of iwi, hapū and marae to the project area, and to ensure their relationship is and role as kaitiaki is recognised and provided for.



The Applicant acknowledges that effects on cultural values will continue to be considered where engagement with mana whenua continues.

8.9 WESTERN BAY OF PLENTY COASTAL EROSION RESPONSES POLICY 2017

The Coastal Erosion Responses Policy 2017 (**“the Policy”**) provides a framework for consistent decision-making by Council where Council-owned land is affected by coastal erosion, in a way that gives effect to the relevant legislative requirements and is affordable for the affected community.³⁴

Section 5 of the Policy sets out assessment criteria where coastal erosion is, or is likely to, affect a strategic asset. An assessment against each criterion is set out below.

- (a) *Assess whether there is a clear need for the works in terms of a risk assessment based on a methodology that assesses the inherent threat to life and/or property or existing nationally or regionally important infrastructure;*

Properties at Glen Isla Place are identified within the “Coastal Erosion Area – Primary Risk” in the District Plan Maps.

- (b) *Take a holistic approach to reduce any significant adverse environmental effects elsewhere in the relevant coastal system irrespective of the ownership of potentially affected coastal land;*

The Coastal Assessment confirms that there no significant adverse effects elsewhere in the coastal system anticipated as a result of the proposal, albeit there is potential for minor, temporary scouring to occur to the south of the proposed structure.

- (c) *Address the issue of end effects of the proposed works where it affects private or public land;*

As noted above, there is potential for minor, temporary scouring to occur to the south of the proposed structure. This erosion is likely to be in the order of 2-5m on a 5-15m length of shoreline and will not put any structure or infrastructure at risk. It may be no worse than, and difficult to discern from, dune erosion elsewhere on the natural coastline.

- (d) *Consider whether the proposal maintains and enhances public walking access to the inner harbour or open coast, or where that is not practicable provides alternative linking access close to the coastal marine area;*

Existing access provided along the banks of Three Mile Creek will be maintained. Public access along the coast will be protected over the next 20-30 years. Subject to the actual impacts of sea level rise, access along the beach may become limited between 30-50 years

³⁴ Refer to Policy Objectives 2.1 and 2.2.



as sea-level rise and shoreline retreat occurs and during storm events and king tides, but this is relevant for the length of Waihi Beach and not limited to the site. It is noted that several access points to the Waihi Beach along its extent, including Seaforth Road and The Loop, such that alternative access points will continue to be available.

- (e) *Consider whether the proposal will not or may not have an adverse effect on amenity values (as defined in section 2 of the RMA);*

Adverse effects are considered to be less than minor, with proposed dune planting resulting in a net ecological benefit and contributing to positive landscape, natural character and visual amenity effects, as set out in Section 6.3 of this AEE.

- (f) *Consider whether the proposal demonstrates and includes the outcomes of consultation with major stakeholder and community groups;*

Consultation has been summarised in Section 7 above. Additionally, the Applicant has requested public notification of this proposal.

- (g) *Consider the ability and willingness of individuals and/or the wider community to pay for the costs of maintaining the shoreline in a fixed position indefinitely;*

The Applicant will cover the cost of construction. Based on the Coastal Processes Assessment and Engineering Design Report, maintenance of the structure would not be required for at least 40-50 years. The proposed structure lends itself to a flexible management regime, whereby various approaches can be used to maintain the structure, such as extending the toe or placing an additional armour layer.

- (h) *Consider whether the construction and maintenance costs of protection works are greater than the capital value of the strategic assets to be protected;*

The structure will provide protection of the reserve land and for seven beach front properties adjoining this land. Based on T&T's erosion modelling (refer section 2 of this AEE), the structure may also protect other properties on Glen Isla Place. In addition, the proposal provides benefits for the amenity and ecology of Three Mile Creek Reserve through dune restoration and planting. It is therefore considered that the capital value of assets protected by the proposal outweigh the maintenance costs associated with the proposal noting that the structure would be vested to WBOPDC upon completion.

- (i) *Consider whether the adverse effects of physical mitigation works on the natural character, cultural sites and values, historic heritage and public access to the environment are greater than the value of the strategic assets to be protected;*



As discussed in Section 6 of this AEE, adverse effects on natural character and public access are anticipated to be less than minor. There are no known cultural sites or values, or historic heritage sites within the project site, however, an Accidental Discovery Protocol is proposed in case sites of significance are uncovered during works.

- (j) Recognise that the NZCPS generally discourages hard protection measures but recognises in some cases they may be the only practicable means of protecting existing nationally or regionally important infrastructure;*

As set out in Section 8.4 above, the proposal is considered consistent with the provisions of the NZCPS.

- (k) Recognise and consider the environmental and social costs of permitting hard protection structures to protect private property, and consider whether there is any significant public or environmental benefit before locating these structures on public land;*

The Applicant has considered a number of alternatives, as set out in Section 4.3. This preferred option is considered to avoid significant environmental and social costs and will result in the preservation and improvement of the ecological and natural character values of the dune system, which is both a public and an environmental benefit.

- (l) Consider, where existing inner harbour or coastal protection structures have failed, whether replacement is a sustainable option;*

The proposal combines hard and soft protection measures as soft protection methods alone have proven unsuccessful in withstanding significant storm events.

- (m) Consider, where erosion occurs so rapidly, whether there is insufficient time to construct protection works; and*

The proposal is anticipated to take 4-6 months to construct. There is considered sufficient time to construct the works.

- (n) Consider what action is appropriate when property owners decide to relocate their own buildings as an individual response to erosion issues.*

This matter is not relevant to this proposal.

The proposal is consistent with the NZCPS, RPS, Coastal Plan and is affordable for the affected community, now and into the future. It is therefore considered that the proposal is consistent with the Policy.

8.10 KATIKATI – WAIHI BEACH WARD RESERVE MANAGEMENT PLAN 2018

Chapter 6.65 of this Reserve Management Plan covers the 3.9ha area of Local Purpose Esplanade and Recreation Reserve around Three Mile Creek and river mouth.





Figure 24: Extent of Three Mile Creek Reserve (yellow outline).

The Reserve Management Plan policies specific to Three Mile Creek are:

- 6.65.1 Continue to manage the recreation reserve and Local Purpose reserve as a single entity.*
- 6.65.2 Maintain rock revetment/dune and groyne structure in accordance with resource consent.*
- 6.65.3 Continue to maintain the reserve as coastal access and neighbourhood recreational facility*
- 6.65.4 Where public recreation, amenity and natural character values are not adversely affected, provide for community enhancement and maintenance of reserve land.*
- 6.65.5 Investigate safety improvements for beach access and implement as funding of coastal protection works permit.*
- 6.65.6 Extend and enhance pedestrian linkage to other walkway/cycleway connections.*
- 6.65.7 Freedom Camping is prohibited in the reserve including any associated roads/car parks.*
- 6.65.8 Generic objectives for Local Purpose and Recreation Reserves and generic policies apply.*



In addition, objectives for local purpose and recreation reserves are recorded in the district-wide Reserve Management Plan.³⁵ They relate to:

- > Protection of the natural environment, significant features, and beauty of the locality;
- > Maintaining public access; and
- > Maintaining the reserve's value as a soil and vegetation conservation area.

While WBOPDC have previously acknowledged that a hard protection structure is not entirely consistent with this policy,³⁶ the proposal is consistent with the above objectives and policies in that:

- > The main purposes of the reserve, namely the protection of the natural environment, indigenous vegetation conservation, and providing public access, will continue to be provided for;
- > The proposal does not affect the ability for WBOPDC to maintain the rock revetment/dune and groyne structures of Three Mile Creek;
- > As discussed in Section 6.3 above, adverse effects on natural character and amenity are considered to be appropriately avoided, remedied and / or mitigated. It is noted that the Glen Isla dunes do not currently provide for recreational values;
- > The proposal does not provide for Freedom Camping; and
- > This erosion control response has been considered on its merits, proposed planning will utilise indigenous plant species, in accordance with the relevant generic reserve management policies.³⁷

It is further noted that WBOPDC have provided their approval in principle for the proposal, as the owners of the reserve land

³⁵ Refer [Part One: Reserve Management Plan – District-wide reserve management information](#), page 10.

³⁶ Refer to the [Minutes of Projects and Monitoring Meeting No. PMC23-4](#), held on 31 October 2023.

³⁷ Refer [Part One: Reserve Management Plan – District-wide reserve management information](#), particularly Policy 16 – Coastal Erosion Responses, and Policy 22 – Planting.



9. ASSESSMENT AGAINST PART 2 OF THE RMA

It is noted that case law in the Court of Appeal decision on *RJ Davidson Family Trust v Marlborough District Council* [2018] NZCA 316 determined that:

“If a plan that has been competently prepared under the Act it may be that in many cases the consent authority will feel assured in taking the view that there is no need to refer to pt 2 because doing so would not add anything to the evaluative exercise. Absent such assurance, or if in doubt, it will be appropriate and necessary to do so. That is the implication of the words “subject to Part 2” in s 104(1), the statement of the Act’s purpose in s 5, and the mandatory, albeit general, language of ss 6, 7 and 8.”

This decision confirms that it can be appropriate to consider Part 2 when assessing a resource consent in specific circumstances but otherwise an assessment against Part 2 will not add to the evaluative exercise. In this instance, the application is a Discretionary Activity under the Western Bay of Plenty District Plan. A comprehensive assessment has been provided against the relevant objectives and policies of the NZCPS, RPS, District Plan, all of which have been prepared having regard to Part 2. It is relevant that the RPS includes objectives and policies which relate directly to Part 2 matters and was changed to give effect to the NZCPS in 2015.

In this circumstance then, it is considered that an assessment against Part 2 would ‘not add anything to the evaluative exercise’ and is not therefore necessary.



10. NOTIFICATION

As a Discretionary Activity under the District Plan, notification of this application needs to be considered in accordance with tests set out in sections 95A and 95B of the RMA.

The Applicant requests that the application is publicly notified in accordance with s95A(3)(a).

It is therefore considered that an assessment against the other tests of sections 95A and 95B, including an assessment of potentially affected persons, is not required.



11. CONCLUSION

GIPS seek land use consent, as a discretionary activity, for the construction and establishment of a buried coastal protection structure at the Glen Isla dune, adjacent to private properties at 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place, Waihi Beach. The Applicant has requested that the application be publicly notified.

At the completion of construction, the approximately 200m long rock revetment would be completely buried with sand and recontoured and revegetated with indigenous dune species, to present as a natural dune face upon completion.

The structure is appropriately located outside of the CMA and designed to avoid and minimise potential adverse effects on coastal processes. Soft protection elements have been incorporated into the proposal, including the contouring and revegetation of dune faces with indigenous flora, which will contribute to a net ecological benefit and positive effects on natural character, landscape and visual amenity values.

Construction phase effects of the proposal, such as effects on noise, traffic and amenity, are considered to be appropriately managed by the timing of the works and proposed construction methodology.

A comprehensive suite of assessments have been undertaken to support the resource consent application. The conclusions from these assessments are summarised in Section 6.

Overall, the proposal has been designed to be consistent with the relevant provisions of the NZCPS, RPS, District Plan, and other relevant non-statutory plans such as the Western Bay of Plenty Coastal Erosion Policy, in that it avoids significant adverse effects, appropriately minimises or mitigates other effects, and provides for the protection and restoration of natural character at the coast.

In summary, for the reasons set out in this assessment of environmental effects, the Applicant considers that there are no impediments to granting a land use consent for the proposed works.





A



APPENDIX A

Records of Title



APPENDIX B

Coastal Process Assessment (Davis
Coastal Consultants)



APPENDIX C

Landscape and Visual Effects
Assessment (Isthmus Group)



APPENDIX D

Ecological Effects Assessment
(BlueGreen Ecology)



E

APPENDIX E

Memorandum – Location of Mean
Highwater Springs, Glen Isla Place,
Waihi Beach
(Davis Coastal Consultants)



APPENDIX F

Engineering Design Report (Davis
Coastal Consultants)



APPENDIX G

Glen Isla Place Tree Protection Plan
(Arbor Care Ltd)



APPENDIX H

Construction Methodology (Davis
Coastal Consultants)



APPENDIX I

Noise Trial Report (Marshall Day
Acoustics)



APPENDIX J

Glen Isla Place Residents - Project
Summary Documents

Coastal Protection Structure for Glen Isla Protection Society



Engineering Design Report



Rev B

October 2024

Job Ref: 23028

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Appendix A Design Drawings – Buried Backstop Wall

Appendix B Calculations

1.0 Introduction

The Glen Isla Protection Society (“**GIPS**”) comprise a group of beachfront homeowners at 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place, Waihi Beach. Their properties, located south of “Three Mile Creek”, adjoin an approximately 200m stretch of unarmoured coastline, subject to coastal erosion. This land is vested in the Western Bay of Plenty District Council (“**WBOPDC**”) as Esplanade Reserve.

Following a series of large erosion events, including Cyclone Gabrielle, the adjacent property owners are seeking to provide a buried rock revetment, supplemented with dune nourishment and replanting. The intent is to protect the backshore from further erosion, and future-proof their properties from the effects of sea-level rise.

The proposed structure will be landward of the foredune system and allow the beach to function as it has in recent decades. It will only be exposed during the largest storm events, when it will protect the backshore and limit the extent of the largest of the natural beach fluctuations.

GIPS have instructed Davis Coastal Consultants to prepare this report, setting out the design philosophy and assumptions and calculations undertaken as part of the structure and dune development. The retreat of the beach due to climate change driven sea level rise has been considered and is addressed through the design and future adaptation of the structure in future decades.

A further report by Davis Coastal Consultants (Assessment of Coastal Processes October 2024) addresses in detail the coastal processes at the site and the erosion management options considered for this project.

2.0 Description of Existing Environment

2.1 Location

Waihi Beach is a coastal township located on the east coast of the North Island at the northern extent of the Bay of Plenty Region. It is an open coast beach, situated approximately 10km east of the inland town of Waihi. The site is directly south of Three Mile Creek (Figure 2.1a) and extends south from the creek along approximately 200m of coastline, seaward of properties 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place.

The wall extents are shown below (Figure 2.1b).



Figure 2.1a: Waihi Beach



Figure 2.1b: Site adjacent to Three Mile Creek, Waihi Beach

2.2 Site Description

The site is located towards the centre of Waihi Beach, along a stretch of coastline characterised by a gently sloping intertidal area (approximately 1:17) which rises slowly to an unarmoured, narrow, vegetated back dune. The beach is part of the barrier system associated with Tauranga Harbour which all faces northeast and is exposed to the open ocean. The properties are located landward of the narrow frontal dune, at an elevation of approximately RL4-5.

The current vegetated extent of the back dune system at the site is approximately 20m wide closest to the channel outlet and narrows to approximately 4m wide in front of 12 and 14 Glen Isla Place. The dune is vegetated with a small number of isolated shrubs and trees at the landward section with more ground cover species at the seaward extent. At the northern end of the site, the dune slopes from RL4.5 at the bank crest to the foreshore at RL3 at approximately 1:16. At the southern extent of the site, the dune comprises of a recovering storm scarp and

slopes more steeply at 1:4 from RL4.5 to RL3 towards a sandy beach which is approximately 100m wide.

Three Mile Creek comprises the northern extent of the site. The Creek discharges via twin geotextile training groynes across the upper intertidal area and foreshore. The banks of the creek are armoured up past the site for approximately 120m to the road bridge. The Creek discharge is naturally blocked by sand movement within the intertidal zone and is manually cleared by excavator approximately once a month with the sand deposited in front of the northern end of the site, near the groyne.

Since construction of the stream training groynes in 2011, the northern end of the site has been accreting. The dune has realigned closer to the general beach alignment rather than as part of the stormwater outlet “inlet” system. This has led to the wider partly-vegetated dune at the northern end.



Figure 2.2: Features of the site

3.0 Options Assessment

3.1 *Beach Erosion Management Options*

A number of options are available to address erosion of a dune beach where it threatens property, buildings and infrastructure. The preferred erosion management option is to ensure built development is kept sufficiently away from the coastline so as to avoid any issues. Many New Zealand beaches, including Waihi Beach, have undergone historic development that did not achieve this, rendering this management option irrelevant.

Similarly, where aggressive long-term shoreline retreat is occurring over short timeframes, options to remove built development from the area should be considered. Given the financial and emotional implications, this option is only considered where more modest intervention is not practicable or would have significant environmental effect.

Waihi Beach is already highly modified with a number of groynes and approximately 1.3km of seawall immediately north of the Glen Isla Place site. The coastal erosion risks can be addressed by conventional engineering approaches, similar to those elsewhere on Waihi Beach, so retreat options are not considered appropriate at this stage.

The options discussed for the site are:

- Do Nothing;
- Soft Engineering (Renourishment and Planting); and
- Seawalls / structures of various materials and configurations.

It is envisaged that dune reestablishment and a high-quality dune revegetation regime would be part of any coastal structure proposal.

3.2 *Do Nothing*

This is a preferred coastal management approach and allows the beach to act in an entirely natural manner. The dune line will fluctuate and may retreat with losses and gains accepted. This results in the highest quality natural system. For the proposed site, residential and urban

infrastructure development has been undertaken too close to the beach front to allow this approach. Indeed, it is understood that residential housing development occurred while the Council had in place a seawall protecting this area and therefore provided a more seaward protected dune profile, promoting more seaward development.

The extensive dune front work of seawalls, groynes and dune replenishment along the residential properties that border the coastal margin along Waihi beach is ample evidence that the GIPS properties are at risk without coastal protection measures. The Do-Nothing Approach is therefore inappropriate at the site.

3.3 “Soft Engineering” Renourishment and Planting

Renourishment has been tried in front of Glen Isla Place in 2011. The cost of this is being financed by a targeted rate on the beachfront properties. There is no perceptible difference between the coastline that was nourished and the adjacent coastline to the south (Figure 3.3) suggesting that renourishment effects have now been lost. It is likely that the renourishment helped fill the dune adjacent to the Three Mile Creek groyne and more quickly attain a prograded position associated with the groyne.

The area immediately around the groyne is more seaward than it would be without the groyne and could be considered to be ‘holding’ additional sand. Dunes over time establish a varying position dictated by the differing forcing mechanisms. The dune south of the groyne is likely to have eventually obtained its natural range of profiles without renourishment although that may have taken more time.

Further, targeted nourishment is likely to have very short residence time, with sand redistributed to the adjacent beach. Renourishment placed on a beach system within the tidal zone is quickly redistributed by wave action during higher water levels. Very large volumes would be required for renourishment to hold an unnaturally seaward dune line. The minimal duration and ongoing cost of the previous renourishment preclude this being a practicable solution for the beach area adjacent to the GIPS properties.

However, reinstatement of areas of storm cut back dune can help to accelerate the natural dune recovery processes. When coupled with planting, this work helps reestablish a healthy dune system which will tend to sit further seaward on average than a degraded dune system. Dune reinstatement and replanting of this type provides minimal additional protection to the backshore against extreme storm events. However, it creates a more seaward average dune position which results in less risk from smaller, more regular events, and is effective in maintaining cover to a buried structure for longer periods.



Figure 3.3 – View south from 14 Glen Isla Place

3.4 Coastal Armouring Discussion

Design of seawalls on a sandy beach requires consideration of both the type of wall, and situation on the beach. There are reported issues with seawalls on sandy beaches and these are discussed below, before the options for wall type are analysed. This exercise was undertaken to inform the design of the structure for this proposal, thus ensuring a robust decision-making process has been undertaken.

3.4.1 Historic Seawall Performance on Sandy Beaches

Seawalls or coastal armouring solutions for mobile sand dune beaches have a history of generally poor performance in New Zealand and, indeed, in many places internationally.

Typically, the reasons for the poor performance and/or failure are a lack of understanding of the dynamic nature of the shoreline, and poor detailing. Designs commonly have not accounted for the particular issues of walls in the coastal environment - as opposed to retaining or river armouring structures. Often medium to long term shoreline changes or retreat have resulted in wall failure. These changes are often driven by storm events or a change in long term drivers of beach shape.

In New Zealand, many beach seawalls / structures have been constructed in an ad-hoc manner often by adjacent residents rather than qualified designers / engineers and this has added to the history of poor performance. Structure failure has often led to degradation of the visual and physical amenity of the beach through the loss of wall material (rock, concrete etc.) on to the beach.

Similarly, because of poor design and placement, walls have often resulted in an unnecessary loss of public access particularly at high tide.

These negative outcomes are considered to have been one of the drivers behind current coastal policy direction (eg Policy 27, NZCPS 2010) against coastal armouring. It is therefore important to ensure these sorts of outcomes are avoided in provision of a solution. If these issues are addressed, coastal armouring can have positive outcomes in terms of managing situations where property is threatened by coastal erosion while having minimal effect on the foredune and foreshore. Any effect will tend to be transient and comprise limiting the maximum extremes of the shoreline fluctuation.

3.4.2 Wall Location

Where shoreline armouring is identified as the appropriate solution, the key design consideration to minimise the effects and maximise its efficient function is the location of the wall within the range of beach profiles likely to occur at the beach.

A wall placed too far seaward will affect the nearshore processes over most of the tidal cycle. It is likely to cause beach lowering and more likely to create public access issues. It is also prone to failure from higher wave loading, the loss of sediment around or through the wall or overtopping. Significant end effects are likely to be associated with the location of the armouring in this position, due to a greater level of interaction with incoming wave energy.

The same specification for a wall placed more landward may however, be entirely adequate. In the extreme, if the wall is placed far enough landward it will never be impacted by the sea and, by definition, have no effect. Once an understanding of the range of profiles likely and the appropriate location for the wall is confirmed, then sound coastal engineering practices will ensure successful function and minimal negative impact on coastal processes.

3.4.3 Beach Profile

The profile of the beach varies due to many drivers on differing times scales. Diurnal tidal changes, seasonal and storm event changes as well as longer term changes from longer weather patterns. Changing weather patterns can be associated with El Nino/ La Nina cycles over many years and pan-decadal patterns have also been defined. In combination with these fluctuations, changes in the beach drivers such as a change in sediment supply, change in local control points (river outlets, headlands), sea level rise or man-made effects can also create changes in the profile.

Waihi Beach has reasonable monitoring data for 30 years, and a limited amount of older data, for consideration. This monitoring tends to show a generally stable beach with possibly some overall retreat, but this may be masked by human interventions. Neither of the existing monitoring locations are in the vicinity of the site, where the effect of the groynes and the Three Mile Creek outlet have led to accretion in the historic record, albeit with periods of extreme retreat such as that witnessed in Cyclone Gabrielle.

Given a 30-year envelope of beach position it is possible to locate any armouring at the rear of the defined envelope and expect it to be only rarely exposed. The provision of a structure markedly landward of the rear of the envelope will ensure that the structure will not be visible

except as a result of extreme events. Between such events, sand on the profile will establish to historic equilibrium levels and the structure will become buried again.

Longer term changes due to such drivers as sea level rise or beach lowering associated with stormwater outlets and reflective walls would gradually tend to make the wall visible more often. If this were the case, it suggests that these long-term changes are threatening the properties and necessitate the armouring.

3.5 *Wall Type Discussion*

3.5.1 Stabilised Sediment Wall

Stabilised Sediment walls utilise beach sediment (sand) mixed with cement to create a mass structure to provide coastal protection. The result is a natural looking mass, similar to a sandstone, that has a similar texture and colour to the surrounding beach material. This ensures far less visual impact than say a rock revetment and has been mistaken for natural formation.

With suitable detailing, the wall configuration can incorporate informal or formal pedestrian high tide access (Photograph 3.5.1 below).



Photograph 3.5.1: Stabilised Sediment Wall forming a public path – Omaha 2012

The hardness of the wall depends on the quantity of binder (cement) added, with results ranging from uncemented (beach nourishment), improved soil (0.3-1MPa), to a fully Stabilised Sediment wall with an unconfined compressive strength of 3-15 MPa. This can be compared with concrete that has a strength of 10-60MPa.

The durability of a Stabilised Sediment solution is dependent on the consistency of mixing, amount of binder added and the exposure to wearing forces such as the continual lapping of tide and waves. Dune sand provides a readily mixed homogenous sediment which can provide a very strong hard stabilised wall. With sufficient well mixed cement there is no reason that the wall cannot have the hardness similar to concrete. However, in practical applications it is designed slightly less hard and allowance made for some loss of section over its lifetime. Unlike concrete it does not have the issue of steel reinforcement corroding and breaking up the structure and it is not a thin “sheet” structure like concrete. Stabilised sediment forms a much larger heavier mass than the discreet armour rocks of a revetment wall for instance.

Seawalls constructed of Stabilised Sediment are much less proven technology than rock revetments (see Section 3.5.4). Previous projects have been primarily on estuarine and harbour settings rather than open exposed beaches. Further, it requires specialist plant to achieve a high-quality outcome, and also tends to be more expensive and labour intensive than a rock revetment. Finally, the protection of Waihi Beach is dominated by existing rock revetment walls. Introduction of a differing wall material risks creating an ad hoc appearance to the beach front.

Due to the length of the structure, and the lack of local contracting experience with this style of structure, and lack of open coast examples there are risks with this solution that are avoided with the use of a Rock revetment.

3.5.2 Rip Rap/ Rock Revetment

This is a well-established coastal protection solution internationally and in New Zealand. Standardised design guidance is available defining a suitable rock size for a given wave climate and maintenance regime. A typical solution has been constructed north of Three Mile Creek and was previously considered for the Glen Isla Place properties in a report to Council (T&T February

2004). These existing walls performed well through the Gabrielle/Hale storm events and provide a "site tested" example for a solution.

Rock revetment armouring is a proven and cost-effective solution, providing a relatively dissipative robust defence. Whilst the proposal is for a buried structure, storm events and/or shoreline retreat may expose the wall periodically. In this instance, there is value in having a single armouring system for a dune system and beachfront so that a haphazard ad hoc beach front appearance is avoided.

Rock revetments are wide structures occupying a large width of the foreshore and/or fore dune. They can limit access across the profile and can result in the discharge of small rock into the beach system, if poorly constructed. As protection tends to be required because there is limited dune between development and the ocean, the wide rock revetment structures tend to be exposed and cover the foredune and in cases the upper foreshore. This results in negative effects on natural character and public access.

Given the location of the Reserve between the coastal area and the properties, the Glen Isla location would allow a revetment solution to be placed further back in the beach profile to act as a backstop wall. Based on the historic beach location the wall would be buried for almost all states of the beach profile except in large storm events or prolonged periods of retreated beach. As the beach undergoes retreat due to sea level rise over the next 50-100 years it will become progressively more exposed.

A buried rock revetment solution is considered suitable in this location, and given the existing revetments on the subject coastline is the preferred option.



Photograph 3.5.2: Rock revetment at Matheson Bay, Auckland

3.5.3 Rock Masonry

A rock masonry wall can be a high amenity seawall solution. These solutions can be compact and will therefore occupy little space across the shore profile.

Masonry walls require a stiff foundation and would require piling to levels below where sand may shift. They are relatively expensive particularly where they become high and exposed to open coast wave load. They are not considered an appropriate solution at this location.

3.5.4 Concrete Walls

Similar to the rock masonry walls these structures need very stiff foundation to prevent settlement and associated cracking. However, these structures take up a reasonably small space on the profile and can be established as backstop walls in cases where there is little room. Concrete structures are relatively thin and require steel reinforcement for tension forces associated with flexure. If wall cracks become large enough or as concrete loses its alkalinity with age, steel reinforcement can begin to rust leading to failures of the wall. Accordingly, this wall type was considered no further.

3.5.5 Vertical Walls

Vertical walls of steel sheet piles or drilled concrete piles forming a palisade wall or timber vertical retaining are options used as seawalls in some locations. At an open ocean beach care would be needed with these structures so that they were well back in the beach profile and

adequately designed. This type of wall has been subject to many failures in the coastal context. The situation is likely to require a wall too high for a timber wall leaving a steel or concrete wall. As referenced the Councils Coastal Erosion policy recommends against concrete walls. A steel sheet pile wall will be subject to surface rust and be unsightly.

Vertical walls provide a complete barrier to pedestrian access and if they become exposed could create a fall hazard. They are not considered appropriate at this location.

3.5.6 Preferred Option

Of the options considered, either the Stabilised Sediment or the Rock Revetment buried within the dune line were considered most appropriate. Alignments for both options were considered and an alignment 5m seaward of the private property boundary adopted.

By adopting a wall high up on the beach profile, that will be buried for much of its life, the structure achieves:

- Provides for construction outside the CMA
- Enables a soft engineering / replanting approach to be incorporated in the design
- Maintains public access during and post-construction

Further, a rock revetment solution has been identified as the preferred option because of the benefits of:

- Achieving a consistency of built form and style across the existing armouring on Waihi
- Widely, tested and accepted design formulation for coastal erosion
- Proven solution on the site, with northern walls managing recent large storm events
- Using locally sourced rock for the revetment
- Local contractor experience with rock revetments

4.0 Design Considerations

The proposed works include the construction of approximately 200m of buried revetment structure. The structure will primarily be located within the WBOPDC Reserve land at the northern extent, and the adjoining foredune area at the southern extent. Figure 4.0 shows the layout for the proposed structure.

The design details and design approach are detailed further below.



Figure 4.0: Layout Plan of rock wall

4.1 Design Philosophy

Landward Structure and Dune

The underlying design concept has been to provide a combination of hard and soft engineering options to achieve certainty of protection, while enhancing the natural dune's ability to adapt to short term shoreline fluctuation and thus minimise any effects on the natural character of the shoreline.]

The solution comprises a rock riprap wall constructed as landward as practicable, and a replenished, recontoured and replanted dune environment covering the structure as much as practicable. The intention is that this will provide a high-quality functioning dune environment and contribute to better environment outcomes, while also helping to mitigate the risk of coastal erosion impacts on the landward properties and the Council Reserve, as a result of large storm

events and / or ongoing coastal retreat.

4.2 Design Features

Buried Rock Revetment

At current sea levels, based on 30 years of monitoring data, the landward siting of the structure will allow a full range of natural beach fluctuations to occur in front of the structure without exposing the structure. In the most extreme storm events, the upper structure of the southern end may become exposed, and it will limit the loss of the backshore area. The structure has been placed a minimal distance from the property boundary to allow future access along the top of the structure to allow future maintenance. In addition, in the fullness of time, if beach use becomes limited by sea level rise, it may provide high tide route for emergency use. The vegetated band between the structure and private property allows an area within which a native dune plant sequence can be established following the completion of works. Dune rehabilitation, discussed in detail in the *'Glen Isla Dune - Coastal Protection Project, Ecological Assessment'*, will include foredune planting with appropriate species but also room for the transition into back dune species typical of the less dynamic beach area.

Although it is intended the structure remains buried to the extent possible, the structure has been designed to be fully exposed to incident wave action as a rock rip rap wall. It is designed cognisant of the successful performance of similar structures immediately to the north during recent storm events.

Retreat of the shoreline, due to accelerated sea level rise associated with climate change, has been considered over a 100-year period. The structure has been designed to allow the expected beach retreat over the next 50 years. Over the 50–100-year period, the structure can be readily adapted to expected further retreat.

The structure has not been designed to address overtopping or inundation other than to ensure that overtopping would not cause the structure to fail.

Dune Replenishment and Planting

Dune re-establishment will occur in all areas of land disturbance, including the seaward area in front of 12, 14 and 16 Glen Isla Place, which has historically been vegetated dune. Recent extreme storm events have removed the foredune area and the works seek to reinstate this in a comprehensive manner. Large volumes of sand have already naturally returned to the foreshore and foredune areas since the storm events, supplemented by sand from the maintenance of Three Mile Creek. These areas are already being colonised by dune building species. The rebuilding will be enhanced by using excavated material to recontour the dunes and planting native dune species. (refer to the recommendation in the Ecology Report). Planting of native dune species, in particular spinifex, on the dune front will hold sand and promote dune growth. Backshore species, where provided, on the upper bank will help lift the wind flow and stabilise this less dynamic area. Pedestrian traffic across the dune will be controlled by wind fencing which will also protect young plants, encouraging vigorous early growth.

Large scale dune building and planting was undertaken in front of the Glen Isla properties in 2011 and largely lost to storm erosion the same year. This planting was immediately adjacent to, or partly within, the active upper intertidal area and part of the sand was provided by lowering the area in front of the planting. While there is a risk to any dune rehabilitation that large storms may significantly impact works, this risk is minimised by creating the planted area landward of the active intertidal area as far as practicable and letting the dune naturally grow seaward. It is anticipated, given the current dune is recovering from it's most landward over the last 30 or more years, that the new dune can be established in a position that is rarely subject to wave action. This should allow strong growth of vegetation before being subject to wave erosion.

4.3 Structure Siting

The 200m structure will run generally parallel to the landward site boundary (Figure 4.3). The southern approximate 70m runs parallel to the boundary and beach orientation with the rear of the structure approximately 5m from the property boundary. This enables construction access on the landward side of the structure and limits disturbance to the beach system to the extent

possible. The northern approximate 130m of the structure is on two slightly different alignments. From 16 Glen Isla Place, the structure runs north approximately 57m to a point adjacent to a large established Norfolk Pine tree where it is located approximately 7.6m from the boundary of 13 Glen Isla Place. The structure continues to run north the final 73m to a point 6.5m off the boundary of 9 Glen Isla Place its northern end.

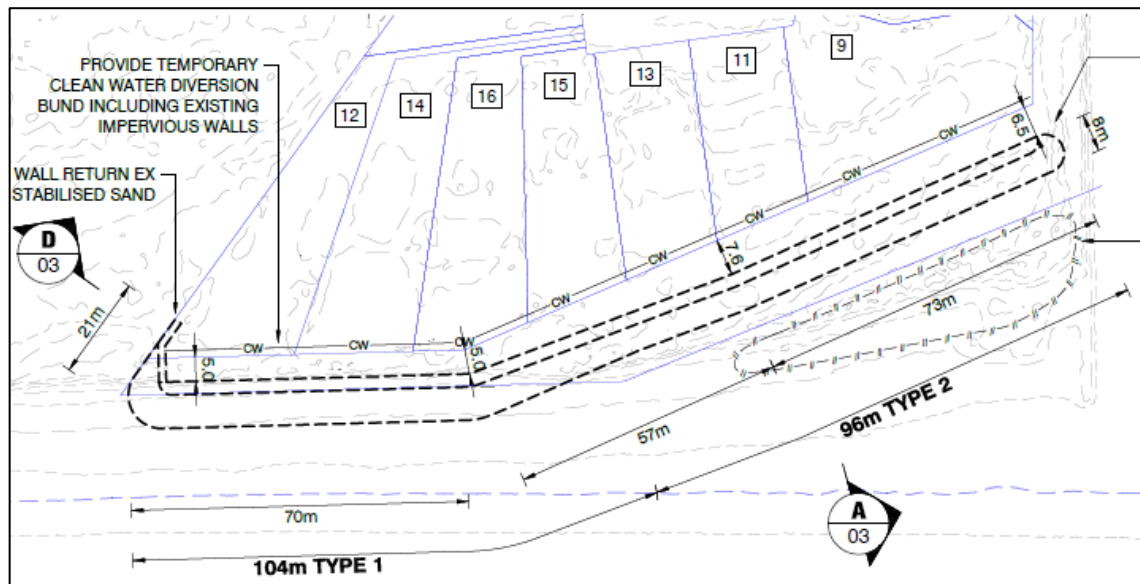


Figure 4.3: Structure Layout

4.4 Structure Ends

The northern end of the structure extends further landward and further from the seaward tip of the southern groyne at Three Mile Creek. Accordingly, the northern end of the proposed structure will be well protected from wave approach by greater width of vegetated dune.

The structure will be terminated with a sloped face similar to the front face. It will be separate from the groynes so that it does not affect them. The structure will be buried at this end, with vegetated dune re-instated to match the existing ground level.

At the southern end of the structure there is scope for a retreating beach to outflank the end of the structure. A return has therefore been designed on the structure, continuing approximately 20m landward. This could be extended in the future, if beach retreat threatens, but should be suitable for a minimum of 20 -30 years. Because there is limited room within the relevant

property, and to avoid impacting the Island View Reserve land, a smaller footprint structure has been designed comprising Stabilised Sediment, instead of rock.

Stabilised Sediment is natural beach sand (sediment) mixed with cement. It forms a material similar to a natural sandstone and is also similar but not as strong as concrete. The material is used in thick mass structures rather than thin walls that might be used with concrete. The thick mass structured do not require reinforcement and allow for the variability in the material.

The return will be in the form of a large rectangular section with a steeper almost vertical face. Although this will be more reflective the more reflective face return will not be exposed to direct wave action and therefore not reflect energy.

4.5 *Geotechnical Conditions and Foundation*

The proposed wall is located near central to Waihi Beach, which is an open coast barrier beach comprised (per the Coastal Processes Assessment) of Holocene dune deposits of the Kariotahi Group. Sand has been reported (*Harray & Healy 2010*) to be fine to medium sand (0.15-0.3mm). Such dune deposits often have considerable depth. Observation of the excavations at the mouth of Three Mile Creek when these have been undertaken to clear sand built-up at the mouth indicated sand sediments extend to a depth far below expected scour level. The absence of any firm foundation layer upon which to support the wall structure is consistent with this observation and the wider morphology of the beach system.

Accordingly, the toe of the structure has been set at RL 0 which is at approximately mean sea level. This is well outside any scour depth at the current time. It is also near the practical limit of placing rock within a 4-5m high dune. Mean sea level is significantly offshore and below scour depth at the structure toe. As discussed below, as the beach retreats the toe is more at risk of exposure.

A structure of this nature is accommodating of settling movement of the foundation. When affected by rising sea levels (see Section 4.9), the riprap will tend to lower initially as the foundation becomes insufficiently supported. This would be a trigger to undertake remedial work rather than a failure criterion. Simple remedial work will be to place a scour blanket at the

toe when required (Figure 4.5). The scour rock would be placed just below (3-400mm) sand level, and then tend to settle preferentially under wave action, to form a toe to the structure.

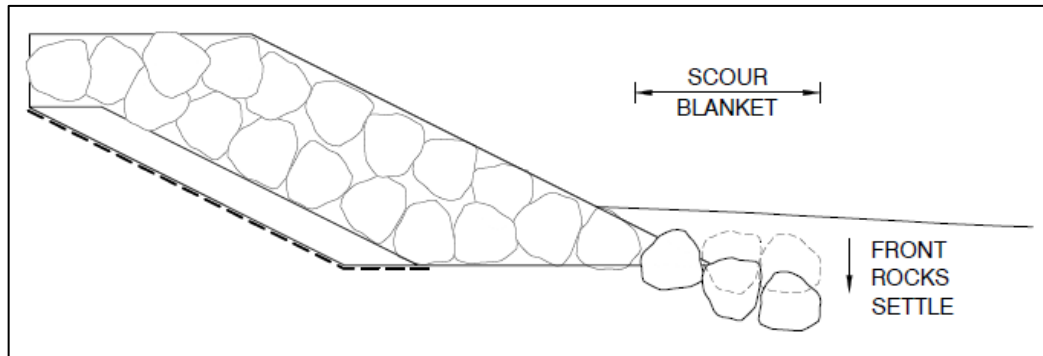


Figure 4.5: Structure Toe Scour Blanket

4.6 Structure Materials

The structure will be constructed out of Andesite sourced from a local quarry in Waihi. This material is understood to have been supplied for the majority of the work on the current Waihi Beach structures at Shaw Road and The Loop. The use of a local quarry will allow graded stockpiles to be developed so that the vast majority of rock can come to site in the correct size for immediate use. Minimal areas of the dune will need to be degraded by stockpiles and rock sorting.

4.7 Structure Gradient

The southern section of the structure will have a gradient of 1:2. The northern section is at a slight angle to the onshore wave and progressively further landward and less likely to be affected by waves. The structure has been detailed as a steeper 1:1.5 gradient.

4.8 Design Beach Profile

The beach profile in front of the site was surveyed for 6 years (2012-2018) on three profiles. The profile was averaged, and a composite average profile based on the average location of the 3, 2, 1, 0 and -0.5 contours and average slope was calculated (Figure 4.8). The slopes were sensitivity tested to ensure no significant errors arose out of the chosen profile. This slope was used to calculate depth limited waves for current wall position.

The slope of the same area of beach was taken from the 2011 LIDAR data, and used for transposing the beach landward to represent shoreline retreat due to sea level rise. The design profile was assumed to retreat uniformly back to the position indicated by the 2065 CEHZ line on the WBOPDC plan. The rate of sea level rise is increasing, suggesting the profile will retreat more slowly initially and increase in speed. The uniform retreat assumption is, therefore, conservative. Wave loads and rock sizing was checked at 10 yearly retreat intervals.

Clearly, the beach slope will be more variable and fluctuate more as it retreats. However, it is considered that this method portrays an average beach position and provides good guidance on the changing beach shape.

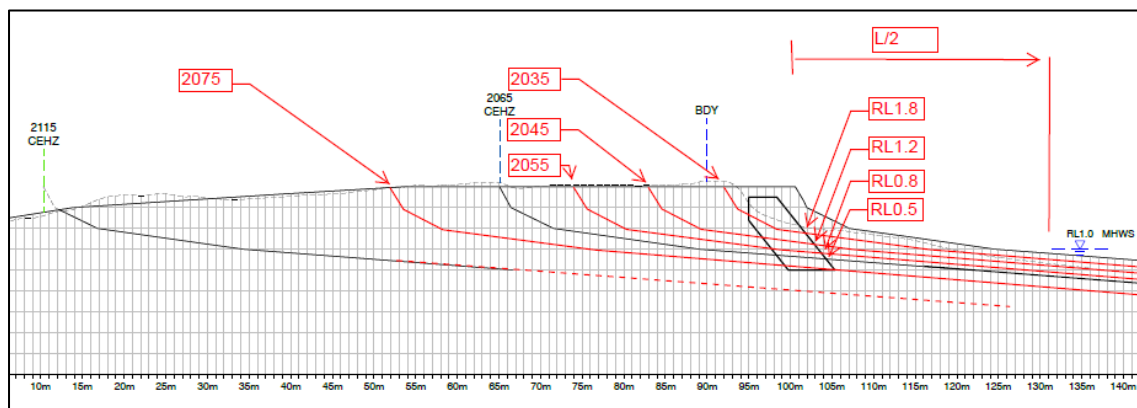


Figure 4.8: showing assumptions for foreshore lowering due to shoreline retreat

4.9 Future Sea-Level Rise Management

We have assessed the potential effects of sea-level rise over the next 100 years. Our full assessment is set out in the Coastal Processes Assessment.

The shore profile as defined by 2011 LIDAR was assumed to translate horizontally at a uniform rate between the current position and the adopted long term retreat positions. The position was plotted every 10 years and the actions on the wall derived for the resultant beach state. As the profile moves landward the beach in front of the structure will lower, leading to progressively larger wave heights and longer durations where the structure will be exposed to storm events.

A number of factors affecting Rock armour size will change over time.

Wave Height

Armour has been calculated based on incident depth limited waves. In assessing the result of the retreating beach lowering beach level and increasing water depth wave height will increase.

Currently the wall is not exposed to the design wave height and is unlikely to be in the next 10 – 20 years.

Storm Duration.

Rock size is a function of storm duration with a shorter storm requiring a smaller rock size and resulting in a slower development of damage as discussed below.

Wave height at site is depth limited and water depth at the wall has a large tidal component. Therefore, the peak wave load on the structure is short duration. More than 1.5 hours either side of high tide, water height is 0.5m lower than peak. This results in a reduced wave height such that only a 50-60% lighter rock is necessary. This short duration of peak storm waves limits overall damage propagation and allows repair if required.

Damage Development

Design of a Rock Armour wall which has varying sized rock around an “average” D_{n50} assumes a level of damage will occur in the design storm. This can be addressed by maintenance between storm events. Given design waves are associated with 1% AEP the amount of maintenance should be limited. When considering response of the wall over the next 50 – 100 years it is possible to consider higher but acceptable levels of damage in future decades. This avoids design for minimal damage in conditions the structure will not be subject to for a number of decades. This is particularly true when considered with the effects of overtopping set out below.

Overtopping Wave Load Reduction

With rising sea level greater over topping of the wall will occur. This can lead to a drop in required armour size on the wall of up to approximately 20%. This size difference equates to a drop in required armour rock mass of approximately 50% (CIRIA 5.2.2.4). Therefore, while wall damage will increase it is anticipated to stay within acceptable levels over the 30–40-year time frame.

Over the 40-50-year timeframe, the lowering foreshore level may threaten the foundation of the structure and remedial work may be required. This would comprise burying additional rock in front of the toe to act as a scour blanket during storm events (see Figure 4.5 above). It is not practicable or necessary to include this scour blanket now. It would be extremely difficult to place a rock blanket approximately 4-5 m below the beach face and it is not currently required. If required, it would not be for many decades. It is more sensible to place a scour blanket (or similar structure) in the future when the beach level will be lower and can be designed to suit the beach profile and wave climate.

If the beach progressively lowers as predicted between 50-100-years' time, the wall will need to have the foundation lowered, crest raised, and it will likely need a layer or layers of larger armour placed over the seawall. There is increasing uncertainty over the design actions extent of retreat and appropriate response with the increasing timeframe. It is anticipated that after 50 years of sea level change there will be a far greater understanding of the response of soft sediment coastlines to rapid sea level rise and of the likely future impacts of climate change.

The design of the structure allows it to be readily and progressively adapted to future requirements and this can be better addressed at that time.

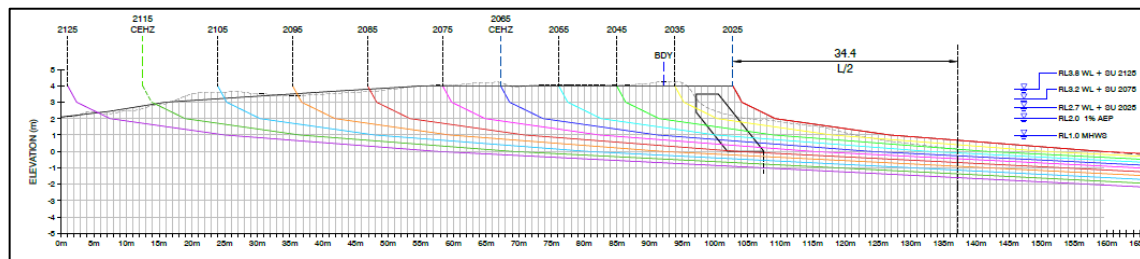


Figure 4.9: Beach retreat over 100 years

4.10 Dune Rehabilitation and Planting

Dune sand will be sourced from the footprint of the structure and used to cover the structure. The dune face will be placed at 1:3, on approximately the alignment of the dune face surveyed by LIDAR in 2011. This surveyed face was a storm cut dune and the reestablished dune should be slightly landward of a typical stable dune face. The dune face will be kept as landward as practicable.

Wind fencing will be established above and below the dune to limit windblown sand. During construction, the upper dune may be covered in coir matting or similar, to manage the windblown sand. Where used at the site, access through the fencing will be provided via an overlap, parallel to the shore so that there is no obvious path for wind to blow across the slope causing a blowout of the renourished dune.

Planting will be completed at the first spring or autumn after completion. Dune planting is a common activity in the Bay of Plenty and standard practices such as placing slow-release fertiliser and 0.7-1.0m spacing will be used. Vegetation will be native eco-sourced dune plants in accordance with a planting plan.

Over time, the dunes are likely to build seaward beyond the initial planted area. The seaward wind fence material will be removed following establishment of the foredune planting to allow this. The post and rope will be left in place to deter pedestrian traffic. This fence will only be removed within two years of construction, or earlier if it becomes storm damaged. Similarly, once the upper ground cover has established and the risk of windblown sand at the dune crest is managed, the landward fence can be removed and will be removed within two years of construction. Wind fencing may remain longer if management and ownership of the wind fencing was taken over by the WBOPDC as an aid to dune management. As discussed further

below, limited retreat is anticipated in the 10-20 years.

As detailed further the Coastal Processes Assessment, large storms and beach retreat occurs, it is anticipated that the seaward toe of the vegetated dune will be progressively exposed to wave action and may be lost or significantly compromised. It is likely that in the 30 years plus timeframe, the dune will be lost. There is no proposal to manage this dune or reinstate it.

5.0 Design Parameters

The Coastal Processes Assessment provides a detailed description of the processes at the site. The adopted parameters for design of the wall are set out below (Table 5.0).

Parameter Type	Specific Parameter	Value
Astronomical Tide	Highest Astronomical Tide (HAT)	1.2 (MVD-53)
Storm Tide (without wave effects)	1% Annual Exceedance Probability	1.98 (MVD-53)
Offshore Wave Height	H_s	5.4m
Offshore Wave Period	T_p	11s
Wave set-up	η	0.7m
Sea-level Rise	30yrs	0.3m
Sea-level Rise	50yrs	0.6m
Sea-level Rise	100yrs	1.2m
Shoreline Retreat (per TnT, 2015)	Retreat to 2065	-18m
Shoreline Retreat (per TnT, 2015)	Retreat to 2115	-54m

Table 5.0: Summarised general parameters

5.1 Nearshore Wave Height

Wave height was calculated for a depth of one-half wavelength from the wall. Calculations were made using methods of van De Meer(1988b), Goda (2000) and Battjes and Stive (BaS) (1985) for comparison. The calculations of BaS were in close agreement with Goda, assuming a foreshore slope of $m=0.02$, and adopted (Table 5.1).

Summary Breaking Depth and Wave Height			
2024 Shoreline	WL	d_b (T=11)	H_{bs} Stive
$WL_{current}$	2	1.1	0.9
WL_{50yr}	2.5	1.8	1.5
WL_{100yr}	3.1	2.6	2.1
$WL_{current} + Setup$	2.7	2.1	1.7
$WL_{50yr} + Set Up$	3.2	2.7	2.2
$WL_{100yr} + Set up$	3.8	3.4	2.8
2065 Shoreline			
WL_{50yr}	2.5	3.3	2.7
WL_{100yr}	3.1	4	3.3
$WL_{50yr} + Set Up$	3.2	4.1	3.4
$WL_{100yr} + Set up$	3.8	4.8	4

Table 5.1: Breaking Wave Height example calculation

6.0 Engineering Design

6.1 Design of Armourstone

The wall has been designed and detailed in accordance with standard texts (CERC, CIRIA et al). The wall will comprise a toe at RL0.0m and a crest at RL3.5. The most exposed face to the wall will slope at 2 (horizontal) to 1 (vertical). The wall will have two layers of $D_{n50}=1.1\text{m}$ (the average rock diameter) outer armour and two layers of $D_{n50}=250\text{mm}$ filter layers on a geotextile (BIDIMA34 or similar). The crest will be comprised of at least three armour rocks.

Primary armour calculations were undertaken using the formulas of Hudson (CERC 1984), Van de Meer (1988b) and Van Gent et al (2004) (Figure 6.1). Permeability of the core had been set for an impermeable core for Van Gent. And $P=0.1$, the minimum permeability of Van de Meer. The Van de Meer and Van Gent formula have been developed specifically for shallow water conditions and as such do not require the consideration of Wave Setup (CIRIA 4.2.2.5).

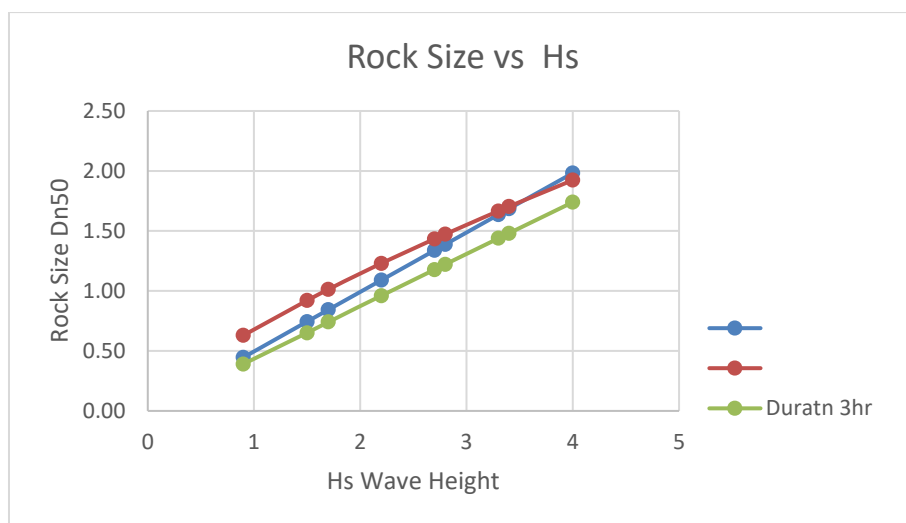


Figure 6.1: Comparison of Armour Rock Calculation

Relatively good correlation between the methods was obtained. Van Gent consistently produced the smallest rock size especially at lower wave heights. This appears to be because it takes account of the short storm duration. When a longer duration was included, it defined a rock size similar to Hudson (Table 6.1).

Hudson predictions are between the other formulas for the relevant range of rock size. Note the Hudson is not formulated for shallow water and needs consideration of wave set up.

Design was undertaken assuming wave set up and utilising Van Gent.

H _s	D _{n50}			Van Gent
	Hudson	Van De Meer	Van Gent	
	Duratn 3hr			Duratn 6hr
0.9	0.45	0.63	0.39	0.43
1.5	0.74	0.92	0.65	0.72
1.7	0.84	1.01	0.74	0.84
2.2	1.09	1.23	0.96	1.06
2.7	1.34	1.43	1.18	1.30
2.8	1.39	1.47	1.22	1.35
3.3	1.64	1.67	1.44	1.59
3.4	1.68	1.70	1.48	1.64
4	1.98	1.92	1.74	1.92

Table 6.1: Comparison of Rock Size and Storm Duration

The design water level used the 1%AEP plus wave set up was considered in rock sizing. Rock size was calculated by Van Gent to allow for the shorter storm duration and ability to progressively allow greater damage to the wall as sea level rises. The use of wave set-up with Van Gent is a conservative assumption but seemed to fit better in the context of the other two formulae.

6.2 Design of Cross Section

A design armour D_{n50} of 1.1m is adequate for 50 years with the potential for intermediate damage starting to occur near the end of that time, but this is driven by numerous factors including sea level rise, storm events, etc. With the proposed D_{n50} only the onset of intermediate damage ($S_d = 3$) occurs at the 50th year.

It is planned to use rock from a local quarry, and it is understood that 1.1- 1.2m rock is at the upper end of their manageable range. The design is for a D_{n50} 1.1m rock but the final specification may depend on rock availability.

The armour rock is not likely to be tested in the first 10-20 years, with only the upper wall exposed to swash run-up. With reference to Table 6.3a, the design armouring is adequate through to 40 years. Between 40 and 50 a slightly higher level of damage Level 3 would result from a 1%AEP wave event. Damage level 3 is between “start” and “minimal damage” and is considered a suitable level. After this period further work would need to be done to lower or protect foundation and additional larger armour rock may be needed.

The crest level is to be RL 3.5 to ensure the structure is buried beneath approximately 0.5m of sand, when recontoured to match the current dune profile, and the footing is to be to RL0.0 which is at mean sea level. The wall will generally have a face slope of 1:2 comprised of a double armour layer ($D_{n50}=1100$), with a three armour stone wide crest. Two layers of filter material will be provided at ($D_{n50}\text{Armour}/4.5=$) $D_{n50}=250$ over a BIDIM A44 Geotextile or similar (Figure 6.2).

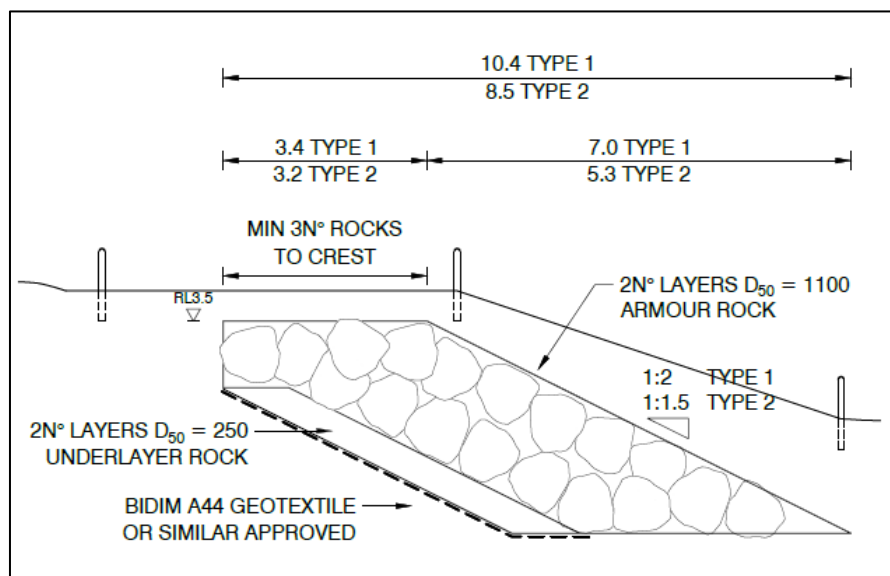


Figure 6.2: Typical section

The northern section of wall is at a slight angle to the onshore wave and progressively further landward and less likely to be affected by waves. The wall has been detailed as a steeper 1:1.5 gradient and as the 1.1m armour stone is only suitable for approximately a 300mm smaller wave. This lesser wave height is generally commensurate with the more landward position leading to a smaller wave height.

The location of the northern section of wall is close to important vegetation and limiting the structure footprint in this location helps manage any potential impacts on this vegetation.

Particular detailing care will need to be taken at the structure “elbow” (change in direction) and structure ends, particularly the southern end. At these points slightly larger armour may be required but will be dealt with in the detailed design exercise.

6.3 Allowance for Shoreline Retreat

Water depth was taken a half wavelength from the wall and is presented in the table below (Table 6.3a) for a constant wavelength. Half wave lengths varied from about 30-40m, but the shallow sloping foreshore means the changes of ground elevation and therefore water depth and depth limited wave are minimal. Damage parameters per CIRIA are included (Table 6.3b). No allowance has been made for the reduced load due to overtopping, suggesting the future performance (post 2085) are under predicted.

Year	Base of Structure GL	WL incl. setup	Bed Level @34m	Depth	Hb	S	Dn50
2025	4.00	2.7	0.68	2.02	1.7	2	0.73
2035	1.80	2.8	0.41	2.39	2.0	2	0.86
2045	1.22	2.9	0.13	2.77	2.3	2	1.00
2055	0.82	3.0	-0.1	3.09	2.6	2	1.11
2065	0.53	3.1	-0.27	3.37	2.8	2	1.12
2075	0.24	3.2	-0.45	3.65	3.0	3	1.09
2085	-0.08	3.3	-0.69	3.99	3.3	7	1.12
2095	-0.31	3.4	-0.9	4.33	3.6	8	1.18
2105	-0.54	3.5	-1.16	4.66	3.8	8	1.27
2115	-0.77	3.7	-1.4	5.07	4.2	8	1.38
2125	-0.80	3.8	-1.6	5.4	4.5	8	1.47

Wall at foundation level additional foundation required

Damage to structure excessive/ Wall failure - larger armour skin required

Table 6.3a Required armour size on retreating shoreline

Slope	Damage Level		
	Start of Damage	Intermediate Damage	Failure
1:2	2	4-6	8

Table 6.3b: Damage Level ex CIRIA Table 5.23

7.0 Exposure of the Seawall

The location of the southern end of the structure is such that over the period of monitoring records the upper layer (1-1.5m) would have only been exposed once over the last 30 years. This would have been during the recent Gabrielle and Hale set of storms. It is predicted at current sea level the wall is unlikely to be exposed more than once every 5-10 years. Such exposure would be the top layer of the wall which is quickly re buried by natural processes. Loads on the wall will be nominal and no damage will occur.

Beach retreat estimates, shown in Figure 4.9 above, provide some guidance as to the progressive exposure of the structure. Table 7.0 summarises the effect of anticipated beach retreat on the structure over the next 100 years.

Timeframe	Wall Exposure
0-10 years	Wall buried. 1-2 possible exposures of upper 1-1.5m during storm events greater than any that have occurred in the last 20 years. Structure quickly reburied by natural processes.
10-20 years	Top of 1m wall exposed for long periods. During storms upper 1.5-2.0m exposed. But all but upper 1m covers back up.
20-30 years	Upper 2-3m of face of wall exposed at all times. High tide may reach structure in large storm events.
30-40	MHWS at base of wall. Access in front may become limited for 1-2hr around high tide.
40-50	High tide at wall. Scouring during storm events may threaten toe and remedial works to toe may be required. Over topping may require raising wall crest.
50 -100	With beach retreat and sea level rise as predicted, significant upgrade may be required on the wall including increase in outer armour size which could be overlayed on the outer face. Foundation would need to be lowered or improved. Over topping may require raising wall crest.

Table 7.0 – Wall Exposure

Appendix A
**Design Drawings – Buried
Backstop Wall**

COASTAL PROTECTION PROJECT

GLEN ISLA DUNE

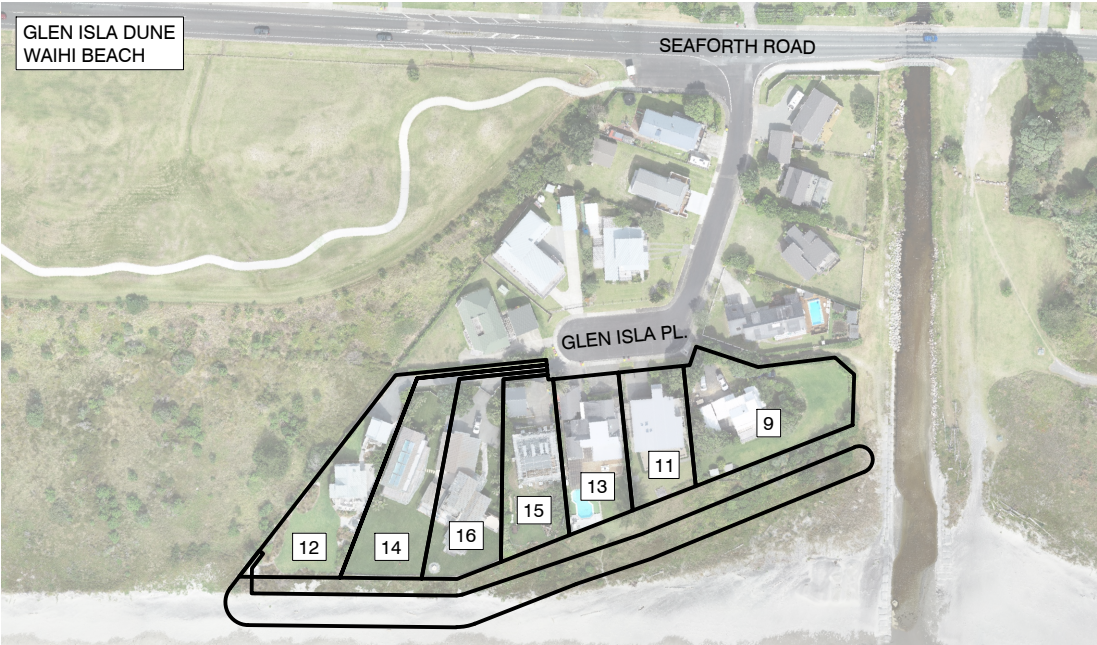
FOR

GLEN ISLA PROTECTION SOCIETY

PREPARED BY

DAVIS COASTAL CONSULTANTS

RESOURCE CONSENT



DRAWING SCHEDULE			
NO	TITLE	REV	DATE
01	DRAWING SCHEDULE AND LOCATION PLAN	A	10.10.24
02	PROPOSED LAYOUT	-	23.08.24
03	PROPOSED SECTIONS	-	23.08.24

			DESIGN: DAVIS COASTAL CONSULTANTS
			SURVEY: SEAM SPATIAL
			DRAWN: JMA
			CHECKED: -
			DATE: OCTOBER 2024
			SCALE: NTS
			CAD FILE: 23028-02 Glen Isla Place Waihi
A	RESOURCE CONSENT ISSUE	10.10.2024	NOT FOR CONSTRUCTION
-	RESOURCE CONSENT ISSUE	23.08.2024	
No.	REVISION DETAILS	DATE	

JOB TITLE:

COASTAL PROTECTION PROJECT
GLEN ISLA DUNE
WAIHI BEACH



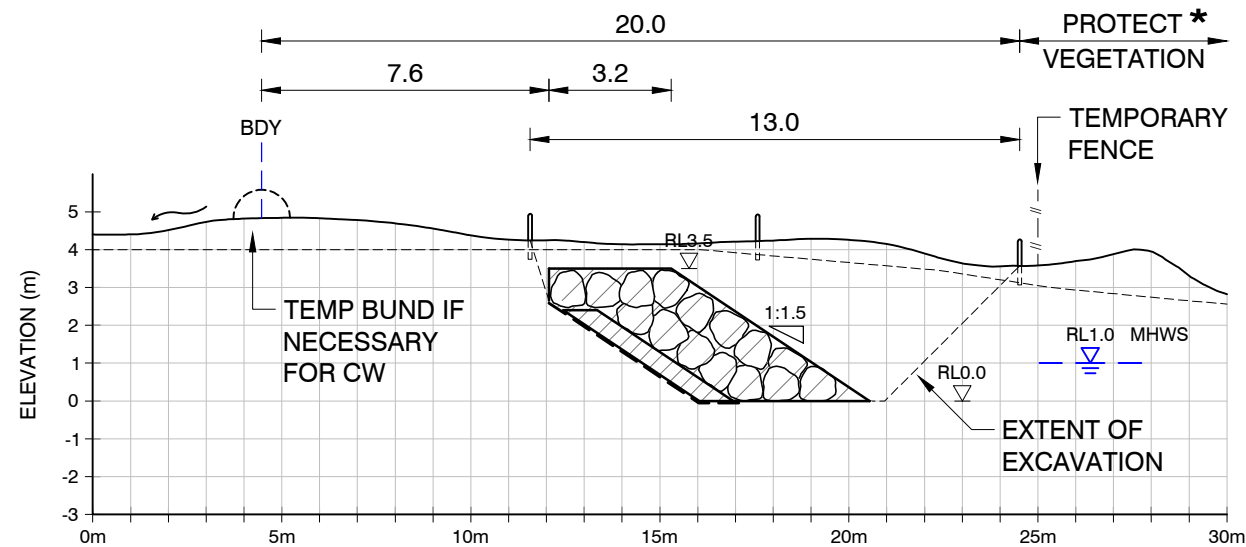
COASTAL MANAGEMENT
AND ENGINEERING
P.O. Box 185
Orewa

Phone: 09 428 0040
Mobile: 021 627 193
Email: coastal@daviscoastal.co.nz

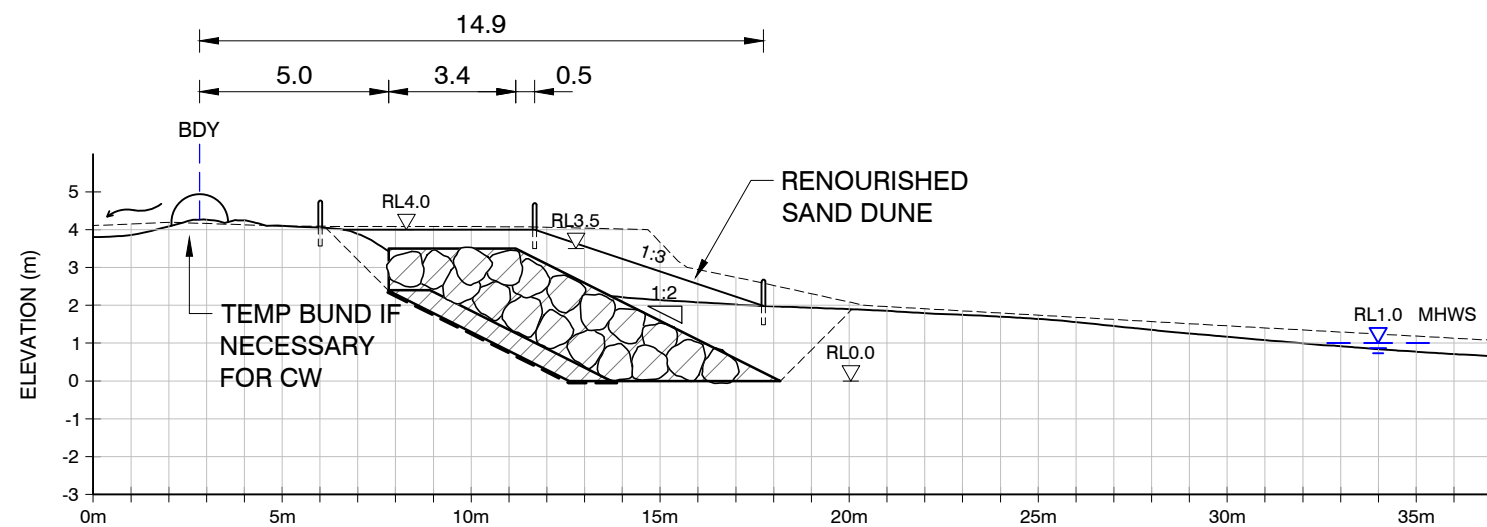
DRAWING TITLE:
DRAWING SCHEDULE AND
LOCATION PLAN

SERIES:
RESOURCE CONSENT

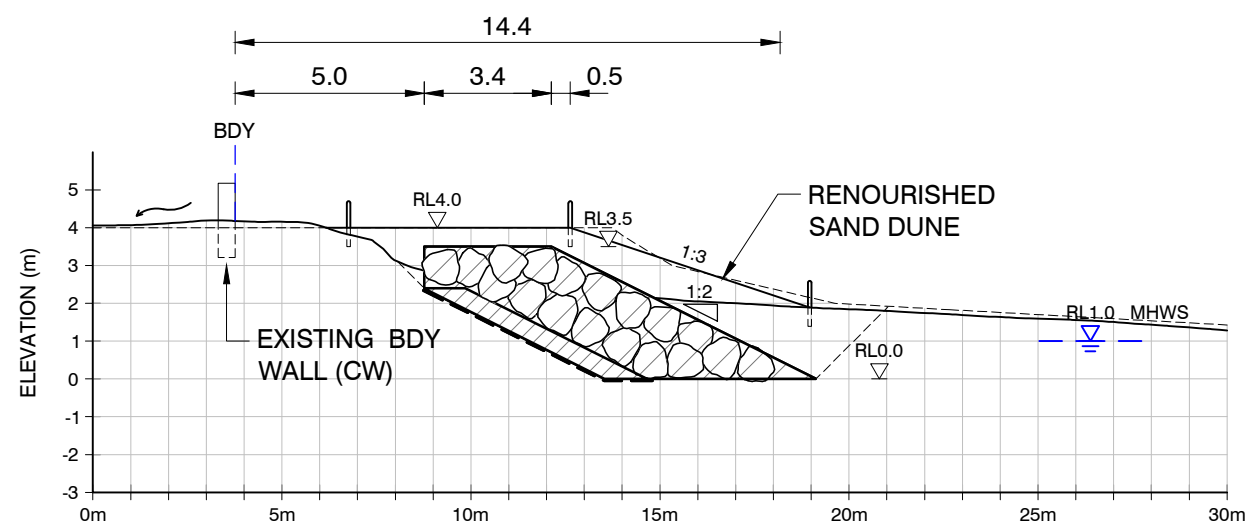
FILE NO: 23028
SHT NO: 01
REV: A



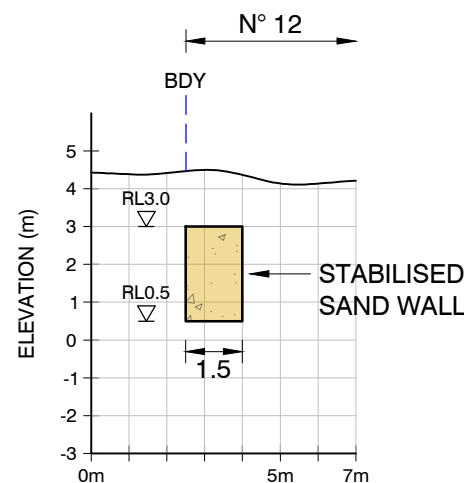
A
02 **No 11 GLEN ISLA - TYPE 2**
SCALE 1:200



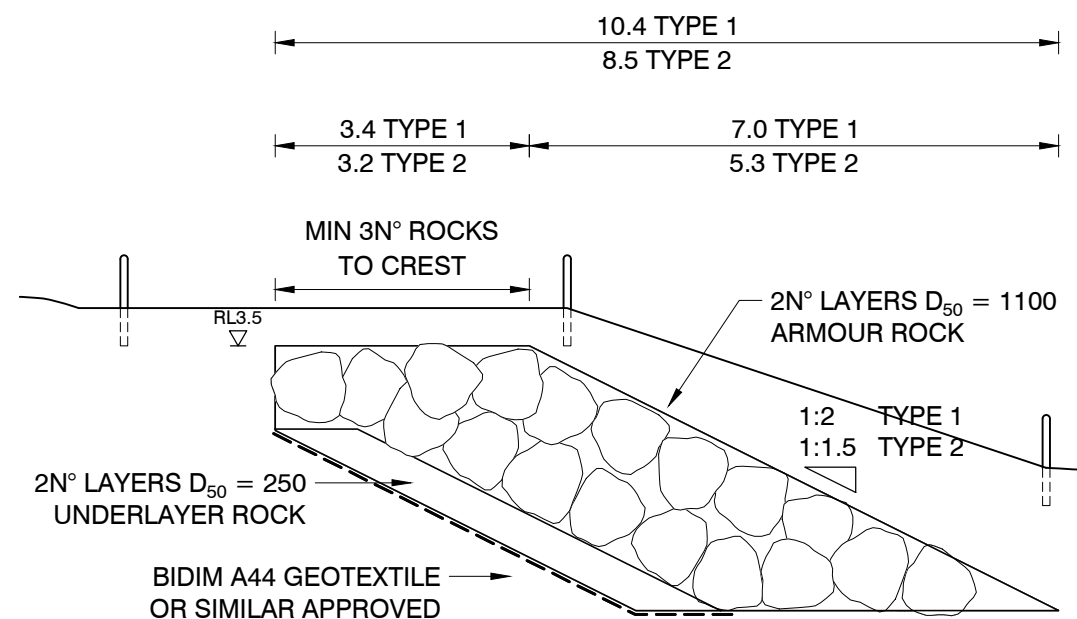
B
02 **No 12 GLEN ISLA - TYPE 1**
SCALE 1:200



C
02 **No 16 GLEN ISLA - TYPE 1**
SCALE 1:200



D
02 **SECTION**
SCALE 1:200



TYPICAL RIPRAP SECTION
SCALE 1:100

NOTES		
★ AREA OF EXISTING HIGH QUALITY DUNE VEGETATION TO BE DEFINED ON SITE BY ECOLOGIST AND PROTECTED BY TEMPORARY FENCE FOR DURATION OF WORKS		
KEY		
—	EXISTING SURFACE - 2024	
- - - - -	HISTORIC SURFACE - 2011	

No.	REVISION DETAILS	DATE
-	RESOURCE CONSENT ISSUE	23.08.2024

DESIGN:	DAVIS COASTAL CONSULTANTS
SURVEY:	SEAM SPATIAL
DRAWN:	JMA
CHECKED:	-
DATE:	AUGUST 2024
SCALE:	VARIES @ A3
CAD FILE:	23028-02 Glen Isla Place Waihi

JOB TITLE:	COASTAL PROTECTION PROJECT GLEN ISLA DUNE WAIHI BEACH
------------	--

COASTAL MANAGEMENT AND ENGINEERING
P.O. Box 185 Orewa
Phone: 09 428 0040 Mobile: 021 627 193 Email: coastal@daviscoastal.co.nz

DRAWING TITLE:	PROPOSED SECTIONS
FILE NO:	23028
SHT NO:	03
REV:	-
SERIES:	RESOURCE CONSENT

Appendix B **Calculations**

P.O. Box 185
Orewa

BURIED RIPRAP WALL - Glen Isla Dune

		Job Ref:	23028
Revision History		Name	Date
Resource Consent	Rev -	Designed: Craig Davis	18/09/2024
		Approved: Craig Davis BE CPEng CMEngNZ	
		Date:	18/09/2024

Introduction

These Calculations cover the design of a buried rock rip rap wall at Waihi Beach including consideration of a retreating coast line over 100 years

Deep water Wave Height

Ex Royal Haskonion Report

The tabular values for these offshore wave heights are presented below in Table 2-1. Peak wave period (T_p) was determined using the mean conditions associated with each wave height in the overall wave timeseries, binned by 1 m increments in the wave height.

Table 2-1: Joint-probability offshore significant wave height (H_{sig}) and associated peak wave period (T_p) at the east coast ERA5 output point for a 1% AEP water level

Direction	Joint-probability H_{sig} (m)	T_p (s)
OMNI	4.93	10.2
E	5.37	11.3
NE	4.28	9.9
N	4.56	9.7

Extreme Water Level

Ex NIWA 2019 Tauranga

	MVD-53	
Model Output Site	1% AEP	2% AEP
Site 95	2.12	1.91
Site 96 (adopted)	1.98	1.78
Moturiki Island (1997)	1.99	1.78

Sea Level Rise + Vertical Land Movement (30 – 100 years)			
Shared Socio-Economic Pathway	30yrs (m)	50yrs (m)	100yrs (m)
SSP5-8.5	0.34 (0.3)	0.55 (0.6)	1.21 (1.2)
SSP5-8.5 +VLM	0.29 (0.3)	0.49 (0.5)	1.11 (1.1)

Table 3.4: Sea-level rise and VLM to 2130 – Site 1712

Extreme Water level	$WL_{Present}$	2 RL
	WL_{50yr}	2.5 RL
	WL_{100yr}	3.1 RL

Use for Shallow Water Wave calculation for equations that already account for Wave set up (Van Gent etc)

Wave Set Up

Goda 2000 ex CIRIA 4.2.25

$$\eta = 0.7$$

Extreme Water level +Set up

WL _{Present}	2.7 RL
WL _{50yr}	3.2 RL
WL _{100yr}	3.8 RL

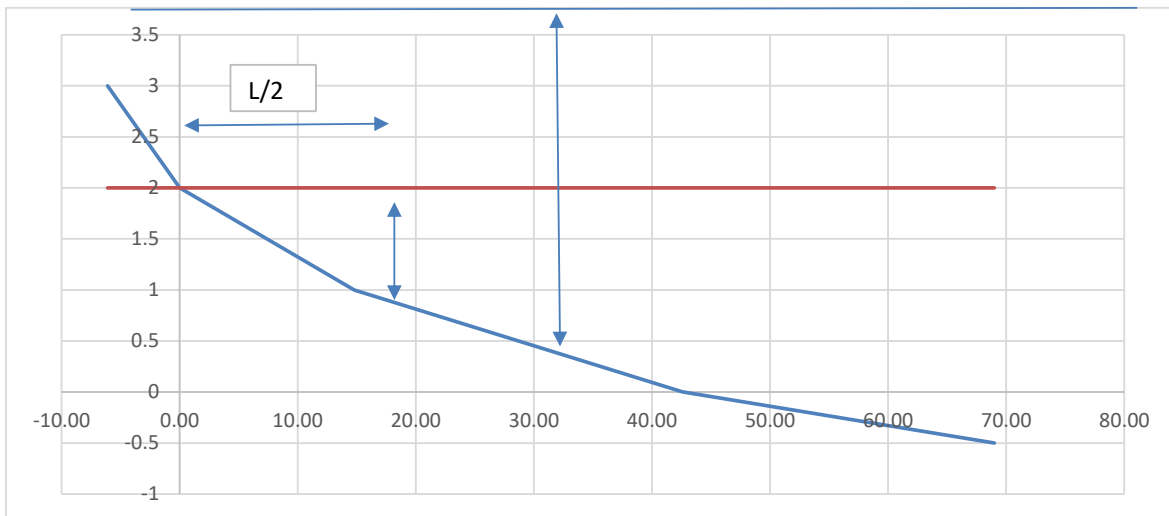
Use for Wave calculation for equations that do not already account for Wave set up (Hudson etc)

Assess Water Depth Shallow Water wave length

Present Day Beach Profile

Profile data S2 ex records

	x	RL	X _{base of bank}	WL
	8.40	3	-6.10	2
	14.50	2	0.00	2
	29.30	1	14.80	2
	57.10	0	42.60	2
26.40	83.50	-0.5	69.00	2



Waves will be depth limited check water depth at half wave length ex RL2
Shallow waves Period dependent iterate

WL _{current} =	$L = \frac{T(gd)^{0.5}}{2}$			
	T	d _{trial}	L _{shallow}	d _{S2 at L/2}
	(s)	(m)	(m)	(m)
	8	0.9	24	0.90
	9	0.97	28	0.97
	10	1.05	32	1.05
	11	1.13	37	1.13

Van Gent

$$H_s/\Delta D_{n50} = 1.75(\sqrt{\cot\alpha})(1+D_{n50\text{core}}/D_{n50})^{2/3}(S_d/\sqrt{N})^{0.2}$$

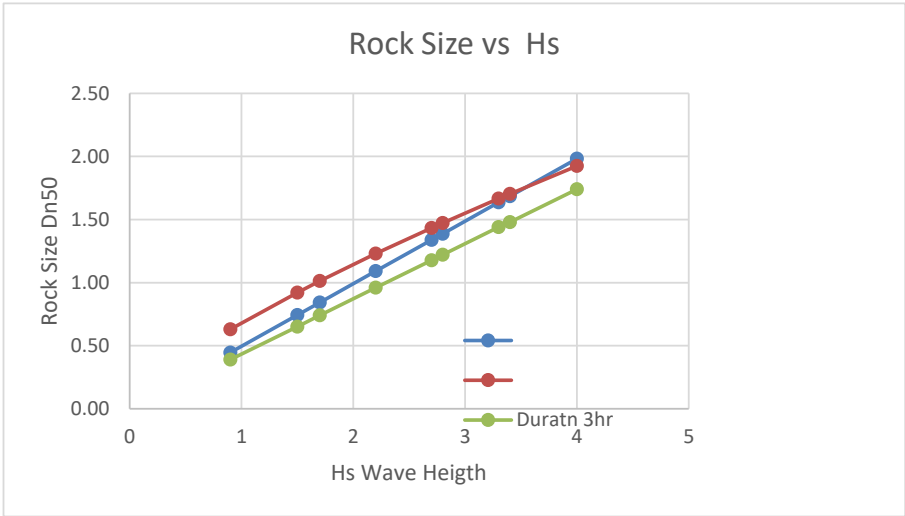
H_s	=	2.2	m
T_p	=	11	s
$T_{m-1,0}$	=	10.0	s
S_d	=	2	
Storm duration	=	3 hrs	Storm over high tide only
N	=	1080	Waves
$\cot\alpha$	=	1.5	
$D_{n50\text{core}}$	=	0	
D_{n50}	=	0.9	
ρ_s	=	2.65	t/m ³
ρ_w	=	1.028	t/m ³
Δ	=	1.622	
D_{n50}	=	1.11	m

SUMMARY				
Wave Height	D_{n50}			
	Hudson	deMeer	van Gent	Adopt
2.2	1.2	1.36	1.06	1.1
2	1.09	1.27	0.97	1.1

Design Rock		
D_{n50}	=	1.1
M_{50}	=	3.5 t

2 No	Armour Layer	900-1200 mm	$D_{n50} =$	1100 mm
2 No	Underlayer	511 mm 400 - 600 mm	Calculated as 1/10th of weight of armour layer SPM or CIRIA P =0.4	
2 No	Underlayer	200-300 mm	Calculated as D_{n50} armour layer/4.5 CIRIA P=0.1	

H _s	D _{n50}			
	Hudson	Van De Meer	Van Gent	Van Gent
	Duratn 3hr			Duratn 6hr
0.9	0.45	0.63	0.39	0.43
1.5	0.74	0.92	0.65	0.72
1.7	0.84	1.01	0.74	0.84
2.2	1.09	1.23	0.96	1.06
2.7	1.34	1.43	1.18	1.30
2.8	1.39	1.47	1.22	1.35
3.3	1.64	1.67	1.44	1.59
3.4	1.68	1.70	1.48	1.64
4	1.98	1.92	1.74	1.92



WL _{50yr}	2.5	T	d	L	d _{S2 at L/2}
		(s)	(m)	(m)	(m)
		8	1.53	31	1.53
		9	1.62	36	1.62
		10	1.71	41	1.71
		11	1.81	47	1.81

WL _{100yr}	3.1	T	d	L	d _{S2 at L/2}
		(s)	(m)	(m)	(m)
		8	2.25	38	2.25
		9	2.35	44	2.35
		10	2.46	50	2.46
		11	2.57	56	2.57

WL _{current} +Setup=	2.7	T	d _{trial}	L _{shallow}	d _{S2 at L/2}
		(s)	(m)	(m)	(m)
		8	1.77	34	1.77
		9	1.87	39	1.87
		10	1.97	44	1.97
		11	2.07	50	2.07

WL _{50yr} +Set Up	3.2	T	d	L	d _{S2 at L/2}
		(s)	(m)	(m)	(m)
		8	2.37	39	2.37
		9	2.47	45	2.47
		10	2.58	51	2.58
		11	2.69	57	2.69

WL _{100yr} + Set up	3.8	T	d	L	d _{S2 at L/2}
		(s)	(m)	(m)	(m)
		8	3.06	44	3.06
		9	3.18	51	3.18
		10	3.3	57	3.30
		11	3.42	64	3.42

Present Day Profile	
T=11	
WL	d _{S2 at L/2}
2	1.13
2.5	1.81
2.7	2.07
3.1	2.57
3.2	2.69
3.8	3.42

Wave Set Up

Goda 2000 CIRIA 4.2.25 pg329

Wave Height	H_0	5.4	m	1% AEP Storm ex RHDv
	K_r	1		
	K_d	1		
Wave Height	H'_0	5.4	m	
Wave Length	L_0	156	m	
	H'_0/L_0	0.035		
	$m=\tan\alpha$	0.04		1:25
	η/H'_0	0.12		ex Figure 4.13

Wave Set Up	$\eta=$	0.65
--------------------	---------	-------------

CIRIA 4.2.2.5 Pg329

"If design formula to be used already includes this wave set up formulation, then this effect should not be added. This is the case with formulae that were derived for shallow water"

Armour Calculation

$$H_s = 2.2$$

Hudson

$$H_s = 2.2 \text{ m}$$

$$H_{10}=1.27H_s = 2.794 \text{ m}$$

$$K_D = 2 \quad \text{for breaking waves}$$

$$\cot\alpha = 2$$

$$\tan\alpha = 0.50$$

$$\rho_s = 2.65 \text{ t/m}^3$$

$$\rho_w = 1.028 \text{ t/m}^3$$

$$\Delta = 1.622$$

$$D_{n50} = 1.09 \text{ m}$$

$$1.00942$$

Van De Meer

$$H_s/\Delta D_{n50} = c_{pl} P^{0.18} (S_d/\sqrt{N})^{0.2} (H_s/H_{2\%})(\xi_{s-1,0})^{-0.5} \quad \text{Plunging}$$

$$= c_s P^{-0.13} (S_d/\sqrt{N})^{0.2} (H_s/H_{2\%})\sqrt{\cot\alpha}(\xi_{s-1,0})^P \quad \text{Surging}$$

$$H_s = 2.2 \text{ m}$$

$$c_{pl} = 8.4$$

$$c_s = 1.3$$

$$T_p = 11 \text{ s}$$

$$T_{m-1,0} = 10.0 \text{ s}$$

$$P = 0.1$$

$$S_d = 2$$

$$\text{Storm duration} = 3 \text{ hrs} \quad \text{Storm over high tide only}$$

$$N = 1080 \text{ waves}$$

$$H_{2\%}/H_s = 1.4$$

$$H_s/H_{2\%} = 0.7$$

$$\cot\alpha = 2$$

$$\tan\alpha = 0.50$$

$$L_{m-1,0} = 156 \text{ m}$$

$$s_{m-1,0} = 0.014$$

$$\xi_{s-1,0} = 4.21 \quad \xi_{ms-1,0} = \tan\alpha s_{m-1,0}^2$$

$$\xi_{s-1,0} = 4.21 \quad \xi_{ms-1,0} = \tan\alpha/(2\pi H_s/(g T_{m-1,0}^2))^{0.5}$$

$$\xi_{cr} = 9.56$$

$$\rho_s = 2.65 \text{ t/m}^3$$

$$\rho_w = 1.028 \text{ t/m}^3$$

$$\Delta = 1.622$$

$$=$$

$$D_{n50} = 1.23 \text{ m} \quad \text{Plunging}$$

$$D_{n50} = 0.62 \text{ m} \quad \text{Surging}$$

Van Gent

$$H_s/\Delta D_{n50} = 1.75(\sqrt{\cot\alpha})(1+D_{n50\text{core}}/D_{n50})^{2/3}(S_d/\sqrt{N})^{0.2}$$

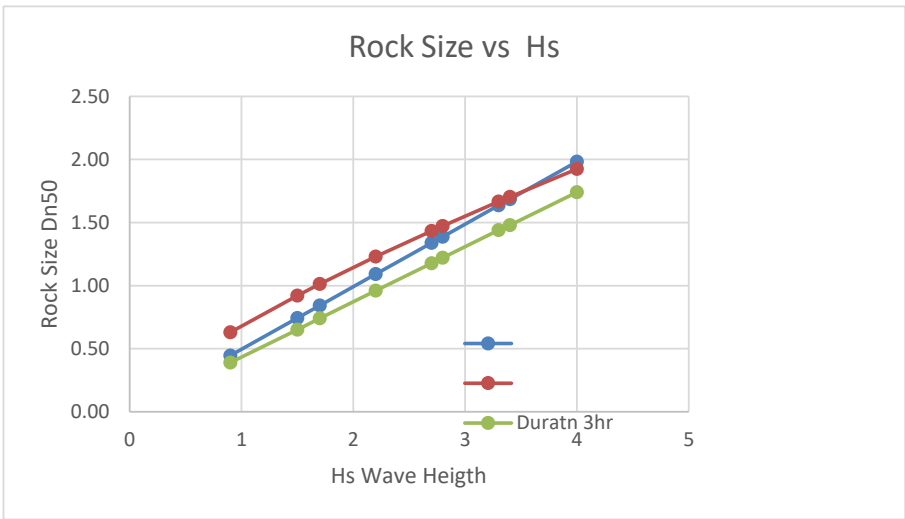
H_s	=	2.2	m
T_p	=	11	s
$T_{m-1,0}$	=	10.0	s
S_d	=	2	
Storm duration	=	3 hrs	Storm over high tide only
N	=	1080	Waves
$\cot\alpha$	=	1.5	
$D_{n50\text{core}}$	=	0	
D_{n50}	=	0.9	
ρ_s	=	2.65	t/m ³
ρ_w	=	1.028	t/m ³
Δ	=	1.622	
D_{n50}	=	1.11	m

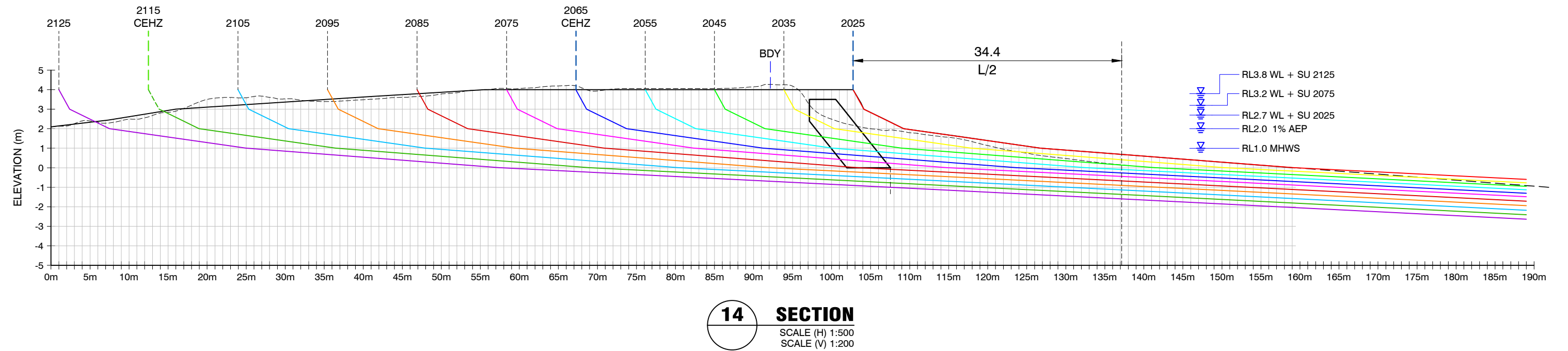
SUMMARY				
Wave Height	D_{n50}			
	Hudson	deMeer	van Gent	Adopt
2.2	1.2	1.36	1.06	1.1
2	1.09	1.27	0.97	1.1

Design Rock		
D_{n50}	=	1.1
M_{50}	=	3.5 t

2 No	Armour Layer	900-1200 mm	$D_{n50} =$	1100 mm
2 No	Underlayer	511 mm 400 - 600 mm	Calculated as 1/10th of weight of armour layer SPM or CIRIA P =0.4	
2 No	Underlayer	200-300 mm	Calculated as D_{n50} armour layer/4.5 CIRIA P=0.1	

H _s	D _{n50}			
	Hudson	Van De Meer	Van Gent	Van Gent
	Duratn 3hr			Duratn 6hr
0.9	0.45	0.63	0.39	0.43
1.5	0.74	0.92	0.65	0.72
1.7	0.84	1.01	0.74	0.84
2.2	1.09	1.23	0.96	1.06
2.7	1.34	1.43	1.18	1.30
2.8	1.39	1.47	1.22	1.35
3.3	1.64	1.67	1.44	1.59
3.4	1.68	1.70	1.48	1.64
4	1.98	1.92	1.74	1.92





KEY	
-----	EXISTING SURFACE - 2024
————	HISTORIC SURFACE - 2011
- - - - -	PROPOSED 2065 CEHZ
- - - - -	PROPOSED 2115 CEHZ

KEY			
YEAR	LEVEL AT WALL	L/2	LEVEL AT L/2
2025	4.00	34m	0.68
2035	1.80		0.41
2045	1.22		0.13
2055	0.82		-0.09
2065	0.53		-0.27
2075	0.24		-0.45
2085	-0.08		-0.68
2095	-0.31		-0.91
2105	-0.54		-1.14
2115	-0.77		-1.37
2125	-1.00		-1.6

Wave Height vs Armour Size over time

Year	Base of Wall GL	WL incl. setup	Bed Level	Depth	Hb	S	Dn50
2025	4.00	2.7	0.68	2.02	1.7	2	0.73
2035	1.80	2.8	0.41	2.39	2.0	2	0.86
2045	1.22	2.9	0.13	2.77	2.3	2	1.00
2055	0.82	3.0	-0.1	3.09	2.6	2	1.11
2065	0.53	3.1	-0.27	3.37	2.8	3	1.12
2075	0.24	3.2	-0.45	3.65	3.0	4	1.14
2085	-0.08	3.3	-0.69	3.99	3.3	7	1.12
2095	-0.31	3.4	-0.9	4.33	3.6	8	1.18
2105	-0.54	3.5	-1.16	4.66	3.8	8	1.27
2115	-0.77	3.7	-1.4	5.07	4.2	8	1.38
2125	-0.80	3.8	-1.6	5.4	4.5	8	1.47

GL at base < foundation level - additional foundation required
 Damage to wall excessive/ Wall failure larger armour skin required

Van Gent

$$H_s/\Delta D_{n50} = 1.75(\sqrt{\cot\alpha})(1+D_{n50\text{core}}/D_{n50})^{2/3}(S_d/\sqrt{N})^{0.2}$$

H_s	=	1.7	m	
T_p	=	11	s	
$T_{m-1.0}$	=	10.0	s	
S_d	=	2		
Storm dura	=	3 hrs		Storm over high tide only
N	=	1080	Waves	
$\cot\alpha$	=	2		
$D_{n50\text{core}}$	=	0		
D_{n50}	=	0.8		
ρ_s	=	2.65	t/m ³	
ρ_w	=	1.028	t/m ³	
Δ	=	1.622		
D_{n50}	=	0.73	m	



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Tree Protection Plan For The Installation Of A New Under Dune Protection Wall



For: The Glen Isla Protection Society

Prepared by: **Philip Sale**
B.Sc. (Tech)
Level 6 Diploma in Arboriculture

April 2024

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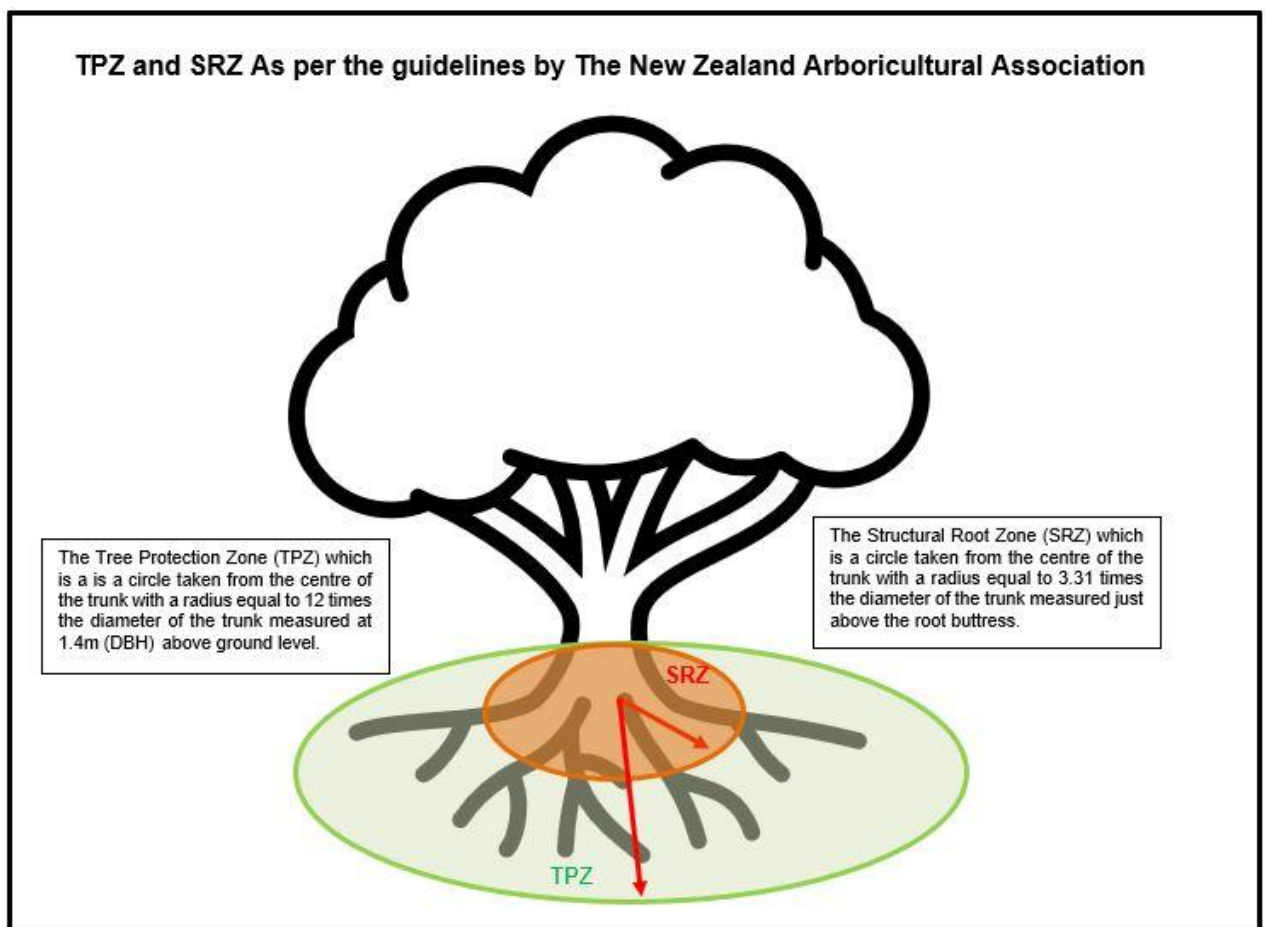
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Introduction:

The following tree protection plan is to be used when planning and installing an in-dune protection wall within the Tree Protection Zone (TPZ) of a Norfolk Island Pine tree located on the beachfront corner of 13 Glen Isla Place.

The Tree Protection Zone (TPZ) is a circle with a radius 12 x the tree's trunk diameter at 1.4 metres for single trunked specimens or 10 x ground level for multi-stemmed trees.

Structural Root Zone (SRZ) is a circle with a radius of 3.31 x the trunk diameter measured just above the root buttress. The SRZ is the area where roots are required for the stability of the tree. In this area there should be no works that affect the roots.



Site Specific Details:

The site is a sand dune area in front of several properties. The sand dunes here have suffered from erosion and the wall is to be installed to allow the reinstatement of the dunes and protect the area from further erosion.

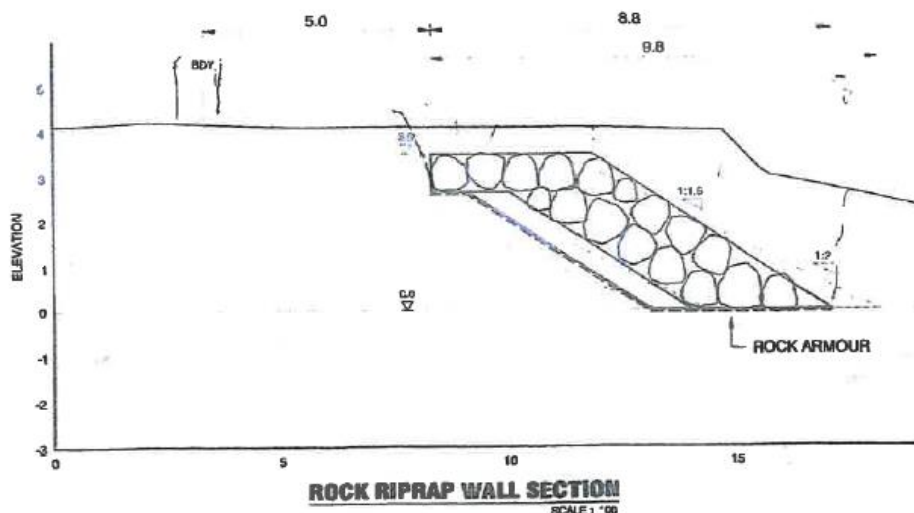




The tree is a healthy Norfolk Island Pine tree approximately 25 metres tall and with a trunk diameter of 830mm. This gives a SRZ radius of 2.74 metres. Within this area there should be no excavation, no storage of materials and no use of heavy machinery.

The TPZ is the area where the trees roots will be mostly located. Works can be carried out through this area but care should be taken to not damage the trees health. The TPZ radius is 9.96 metres.

The following diagram shows the proposed wall with its elevations in metres shown on the left.



The original wall was designed to be 5 metres from the seaward boundary of the private property. Given the available space and the ability to move the wall away from the tree I would recommend giving the tree more space. Moving the wall out by at least a metre to be no less than 6 metres from the edge of

the trunk. This would be a minimum dimension of 5.6 metres from the private property boundary, and if possible it would be preferable to be moved to between 5.6 and 7.6 metres from the property boundary.

The diagram below shows the approximate location of the property boundary (white line); excavation for the wall as currently designed (red line) and the range where I would recommend the excavation be moved to (blue shaded area) 6 to 8 metres from the trunk centre or 5.6 to 7.6 metres from the property boundary. Note this diagram is not to scale.

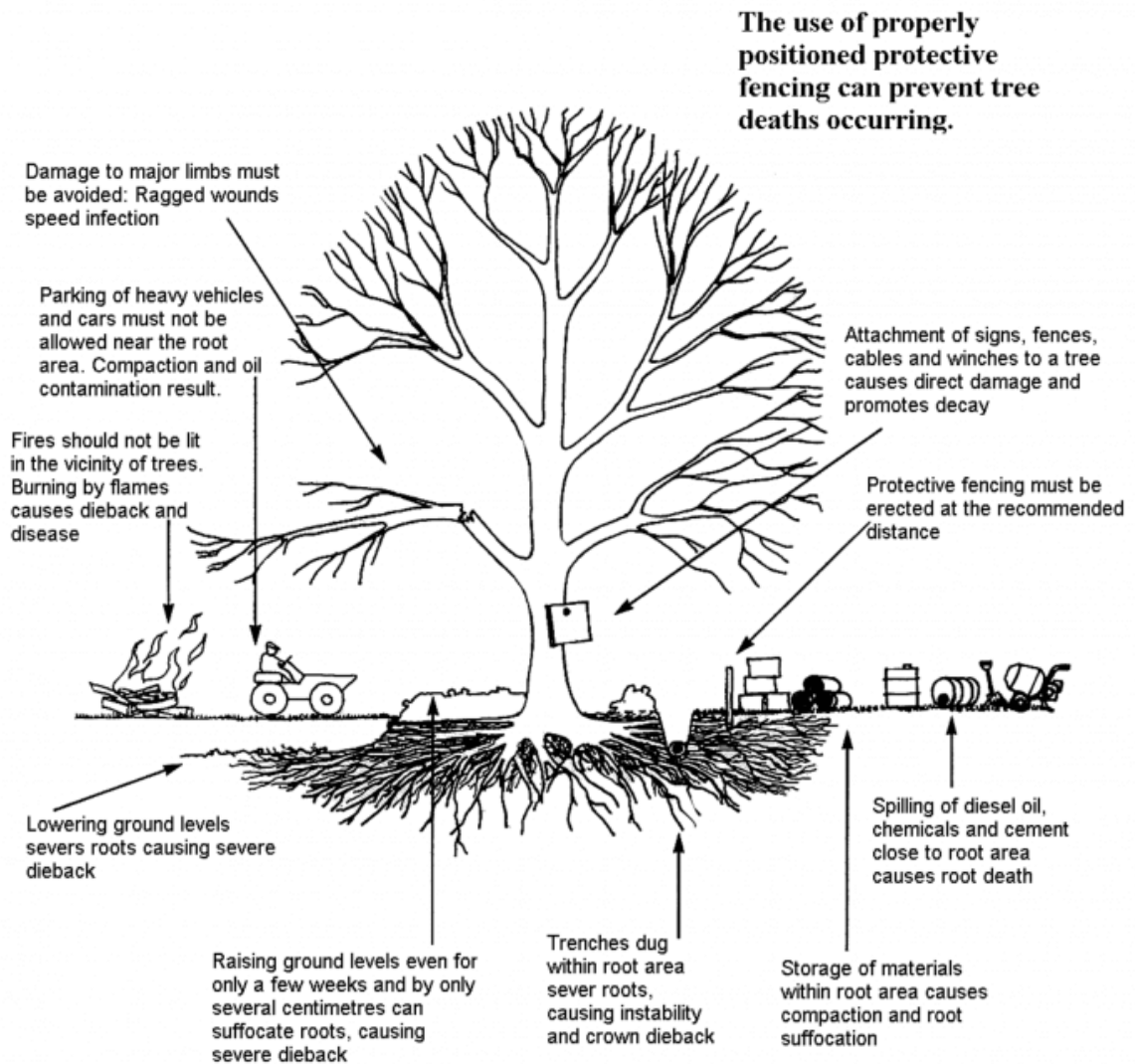


As long as the following tree protection methodology is adhered to the trees health and stability will be affected in no more than a minor way.

Methodology:

- This Tree Protection Plan is designed to protect the tree during construction of the dune protection wall.
- An arborist should be appointed to oversee the construction works.
- Before any works begin within the TPZ of this tree a meeting should be held on site with the contractor and the arborist.
- TPZ of this tree must be protected from damage throughout the duration of the project, this includes no machinery to be operated within this area without the permission of the arborist and appropriate ground protection being in place, there must be no storage of materials, spoil or equipment within the SRZ. The use of machinery within the TPZ needs to be under the supervision of the arborist.
- I would recommend placing a low fence around the SRZ as a visual barrier to operating machinery or storing materials within this area. This fence could be sectional fence 1200mm high or fence standards and danger tape.
- The excavation should be carried out under the supervision of an arborist.
- Where roots are discovered that need to be cut, these will be pruned by the arborist.
- Roots up to 30mm in diameter can be cut cleanly with a spade. Roots larger than 30mm will be cut by the arborist to leave a clean smooth cut surface.
- To avoid further damage to the tree any roots requiring cutting must be cleanly cut back to the face of the excavation or below the required level and covered with damp material such as topsoil, hessian, or geotech fabric.
- Once the excavation of the face closest to the tree has been carried out the remainder of the works can be carried out without an arborist on site as long as the equipment is operated, and all materials are stored in areas deemed suitable by the arborist.

Common causes of Tree Death



Philip Sale BSc. (TECH), Diploma in Arboriculture

Qualifications:

Bachelor of Science and Technology (Waikato University) 1995
LVL 4 Advanced Certificate of Arboriculture (Waikato Polytechnic) 1998
LVL 6 Diploma in Arboriculture with Distinction (Waikato Institute of Technology) 2007

NZArb:

Elected as a member on the Executive of the New Zealand Arboriculture Association from November 2003 to November 2005.

Publications:

"BPR/1059 – Alectryon excelsus Titoki 'The Tapu Tree'" Autumn 2013 Tree Matters The Magazine of the New Zealand Arboricultural Association INC. Edition 57 Volume 15: Issue 1

"Tree Valuation: An Unofficial New Zealand History & Review" Autumn 2008 Tree Matters The Magazine of the New Zealand Arboricultural Association INC. Volume 10: Issue 1

"Decay and Deadwood - Are we too quick to make the final cut? The ecological importance of dead and dying trees should be considered by the Arborist." Sept 2005 Issue 27 Tree Matters The Magazine of the New Zealand Arboricultural Association INC.

"Anthracnose rips through Hobbiton. Biological warfare in middle earth?" December 2003 Issue 20 Tree Matters The Magazine of the New Zealand Arboricultural Association INC.

Recent NZArb Conferences:

Wellington (2022)	Queenstown (2020)
Dunedin (2018)	Tauranga (2017)
Rotorua (2014)	Wellington (2012)

Experience:

Arbor Care Limited: (2000 to present). I am a shareholder in the company and have been working as a consultant and project manager, working in all aspects of arboriculture. I have been undertaking tree inspections for councils, developers and private customers. I have prepared risk assessments; and reports for the purposes of obtaining resource consent for subdivisions, roading and building projects.

I have appeared in The High Court, The District Court, The Environment Court, the Disputes Tribunal, and at resource consent hearings as an expert witness.

Dryad Tree Specialists (United Kingdom): (1999 to 2000). I was employed as an arborist carrying out all aspects of practical arboriculture for Councils, Private Customers and the National Trust.

Hort Research: (1996 to 1998.) I was working as a Research Technician involved in projects developing natural controls for forestry and horticultural diseases.

Forest Research Institute: (1995). I was working as a research assistant involved in projects developing accurate carbon budgets for the New Zealand exotic forestry estate.

Coastal Protection Project Glen Isla Dune, Waihi Beach



Construction Methodology Statement



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October 2024

Job Ref: 23028

Rev A

Coastal Protection Project Glen Isla Dune, Waihi Beach

for

Glen Isla Protection Society

Construction Methodology Statement



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1.0 Introduction

A Construction Methodology has been prepared to detail the likely scope and extent of permanent of works required to achieve the proposed buried coastal protection structure. It is intended to assist in understanding the potential effect of the works so these can be assessed for consideration of the Resource Consent application.

2.0 Proposal

It is proposed that a buried revetment be constructed along approximately 200m of the coastline at the site, located immediately south of Three Mile Creek, Waihi Beach. The revetment is continuous over the frontage of seven beach front properties from 12 Glen Isla Place to number 9 Glen Isla Place. It is proposed that the structure is located in the Three Mile Creek Reserve which is vested in the Western Bay of Plenty Council's Reserve (Figure 2.0a).

The southern end of the revetment is seaward of 12 Glen Isla Place, with the rear of the revetment proposed 5m from the private property boundary. The structure is continuous to the north parallel to the boundary until a change of direction of the boundary midway through 16 Glen Isla Place. From this point the wall extends north to become 7.6m from the boundary at the existing large Norfolk Pine near the boundary of 11 and 13 Glen Isla Place. The 7.6m is the distance recommended by the Arborist to ensure the proposed construction would not endanger the Norfolk Pine. From this point the wall extends further north angling closer into the boundary, such that the wall is 6.5m from the boundary at the northern end of 9 Glen Isla Place.



Figure 2.0a: Layout Plan of rock wall

Detailed Design of the revetment has not been completed however the structure will be designed in accordance with accepted design guidelines (CIRIA C683), comprising a:

- Slope no steeper than 1:1.5
- Double armour layer
- Double underlayer
- Crest width minimum of three primary armour stone widths

In addition, the crest level is to be approximately RL 3.5 to ensure the structure is buried beneath approximately 0.5m of sand (Figure 2.0b). Footing depth will be confirmed at Detailed Design but is likely to be approximately RL 0.0 or below

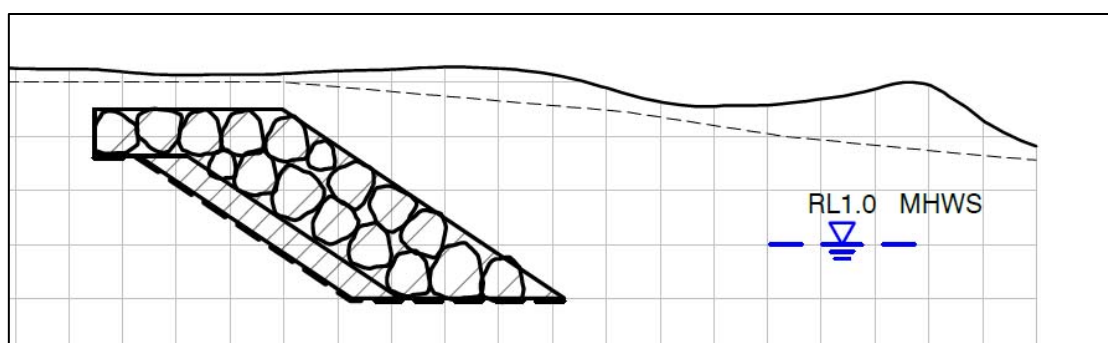


Figure 2.0b: Typical section through buried backstop wall

3.0 Construction Access

The primary construction access for delivery of machinery and rock spalls will be through the Council Reserve at 100 Seaforth Road, on the northern side of Three Mile Creek. Rock delivery by rubber tyred trailer will track through the Reserve and along the beach seaward of the groynes. (Figure 3.0a). The road frontage has a wide and open entrance off the road (Figure 3.0b) and provides a ready point of access to the foreshore. Access will be required around the seaward side of the groynes that are either side of the creek outlet and will be tidally limited.

Delivery of the excavator will occur through this access at the start of the project. It will then be left on site for the duration of the project, outside the CMA, within the Construction footprint.

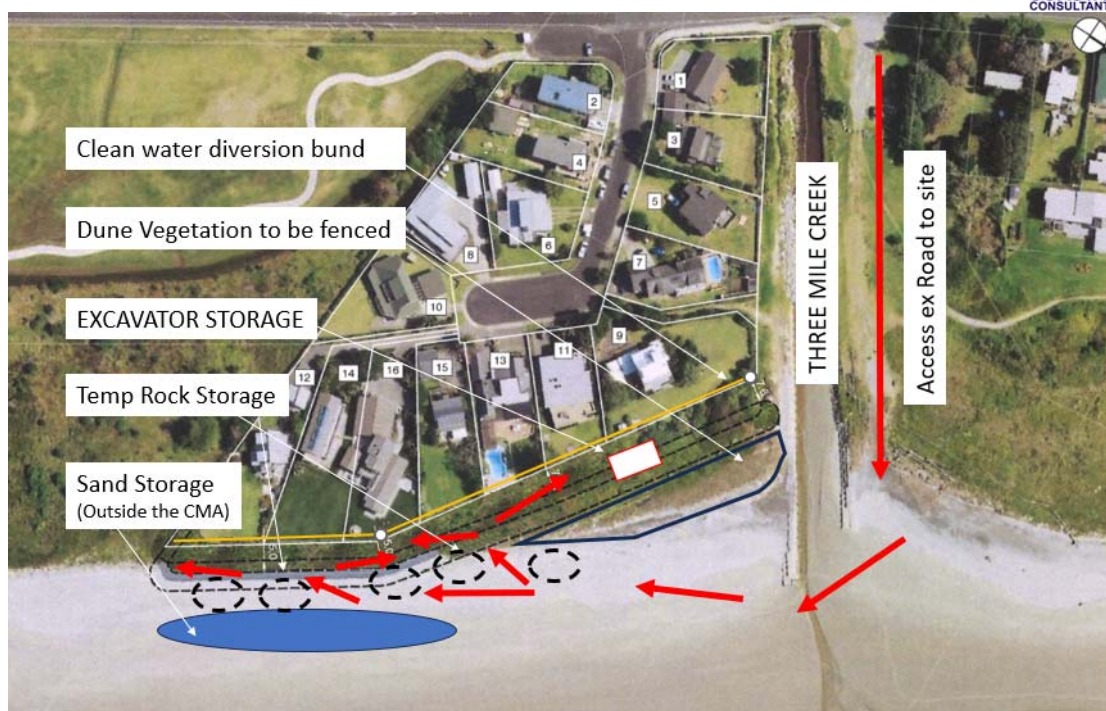


Figure 3.0a: Indicative access through Reserve and excavator storage



Figure 3.0b: Seaforth Road Reserve access

4.0 Erosion and Sediment Control

The site is atypical with regards earthworks and typical silt control measures. All material being excavated will be beach sand so that management of fines run off will not be an issue. The downhill part of the site is bounded by sandy beach and the tide. Silt fences are not practicable as they get washed away and/or prevent public access outside work hours. Uphill side of the site is well vegetated with contour generally flat but falling back from the mounded dune crest. A continuous uphill clean water diversion bund will be formed incorporating the impervious boundary walls to some sites (shown on Figure 3.0a above). No other sediment controls will be provided.

5.0 Vegetation Clearance

The extent of existing vegetation that requires clearance will be limited as much as practicable. In principle, the area of disturbance will comprise the footprint of the wall plus any sloping sides to the trench where that area is currently vegetated. An indicative area has been highlighted below (Figure 5.0a). There is a northern area of incipient and foredune with high quality Spinifex and Pingao vegetation. This area will be marked out and fenced off prior to work commencing

The southern extent of wall, seaward of 12-16 Glen Isla Place, has a limited extent of existing vegetation requiring removal. The indicative area allows for 1m landward of the rear of the wall to batter existing sand to a stable gradient.

The northern extent of wall, seaward of 9-15 Glen Isla Place, requires a greater width of clearance. This is due to the excavation for the wall placement being deeper below existing ground level. An approximate width of 13m has been defined by extending the batter above the rear of the wall near vertically to meet ground level, and forming a steep temporary batter (45°) from the wall toe to ground level on the seaward face (Figure 5.0b)



Figure 5.0a: Indicative area of vegetation requiring removal

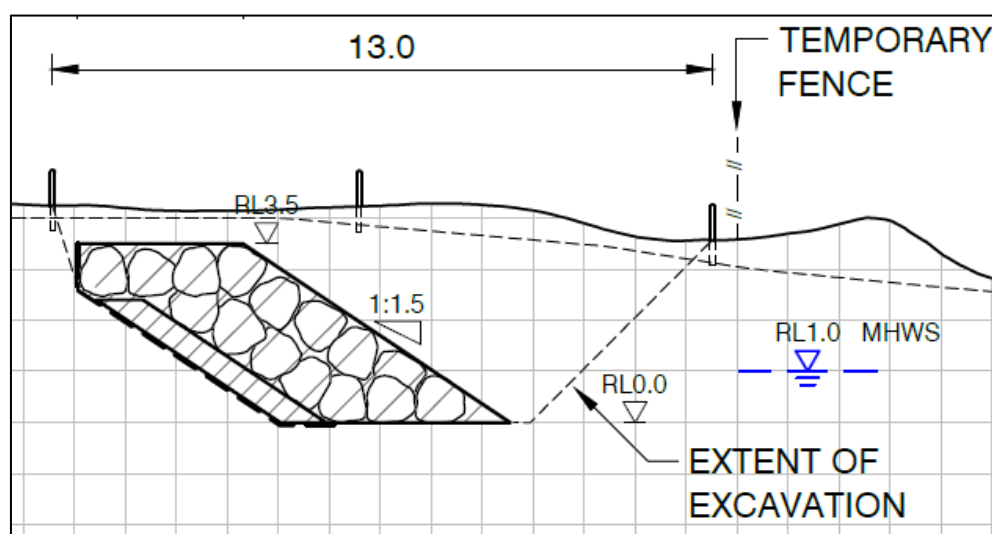


Figure 5.0b: Indicative excavation to place wall

6.0 Rock Supply and Delivery

Rock is to be supplied from the Waihi Beach quarry. It will be graded at the quarry and stock piles of suitable rock size will be established there. The engineer will agree 4-6 representative rocks for each size grade providing examples of the upper and lower bounds of the grade. These rocks will be marked and kept at the quarry adjacent to stockpile areas throughout the project. Suitable size rock will be stockpiled ahead of being required onsite and the engineer shall approve all stockpiled rock before delivery to site.

Rock will be loaded into a road legal, pneumatic tyred tractor and tipping trailer unit. It will travel directly from the quarry to the 100 Seaforth Road access point and then along the beach to the active work site. Rock will be delivered in the required grades to site on an “as required” basis, as much as is practicable, such that stockpiling on site is minimised. There may be temporary piles in order to maintain efficient construction operation, but it is anticipated that these piles will be almost completely removed daily.

Rocks will be dumped off the trailer from the minimum height practicable to minimise vibration. The dumping methodology is to be agreed with the Engineer prior to rock delivery. Areas where rock is temporarily stockpiled on site will have a heavy gauge geotextile placed before rock delivery and this will be held in place by suitably sized rocks. Following completion of rock delivery to any temporary stockpile location the geotextile under that location and all rock chips and fragments on the beach shall be removed and disposed of off-site.

During Rock placement for wall construction access to the southern section will be directly from the beach. The excavator will sit seaward of the working face and place rock. Access to the northern section shall only be along the approved wall alignment. The contractor shall maintain fencing along this alignment to ensure no damage to vegetation occurs outside the agreed access way.

7.0 Wall Construction Methodology

The proposed construction methodologies are slightly different for the two wall sections highlighted below (Figure 7.0). The southern section is to be built at and slightly landward of the existing dune face. Less excavation is required and access is available seaward of dune. The **northern wall** section, will be constructed entirely within the existing dune and seaward vegetation is to be retained. Work will generally be along the wall foot print.

For the **southern wall section**, less excavation is required and access is available seaward of dune. The construction sequence following vegetation clearance is detailed below. However, in general terms, an excavator will work from the beach placing excavated sand seaward of its work site but outside the CMA. Lengths (approximately 20-30m) of the wall foot print will be lowered to RL 2.0 to form a work platform and then shorter lengths (say 10m) excavated to target depth with the rear trench face at design batter. The geotextile, underlayer of small rock and then armour layers of rock will be progressively placed. This is likely to be in two lifts, lift 1 to RL2.0 and lift 2 to RL 3.5 (crest level). Ground level in front of the wall will be raised again to approximately RL2.0 to meet current beach level and the wall above this covered with sand full height. Wind fences will be placed before planting of the dune is undertaken.



Figure 7.0: Wall sections

7.1 Construction Sequence Southern End

1. Work will commence from the southern end, with the excavator seaward of wall. Excavation will be undertaken on the wall foot print to approximately RL2 for the wall end detail and along approximately 20m of the wall length.
2. A length of footing able to be backfilled with (at a minimum) geotextile and first underlayer in a single tidal cycle, likely to be approximately 10m will be excavated to design level
3. Sand excavated from footing can be placed in a wind row seaward of the active work site to slightly extend the working window. All sand will be placed above MHWS, outside the CMA.
4. Rear wall batter will be shaped to 1:2, this is critical as it determines final face slope
5. The batter slope seaward of wall toe will be as steep as temporarily stable, likely approximately 45°
6. Geotextile will be laid in the excavated trench including below toe of wall – ideally single 6m wide roll of geotextile used extending to full crest height and as far under wall as these reaches
7. The underlayer of smaller rock will be placed on geotextile to design batter, starting from the toe and working upwards to approximately RL 2.0, Approximately 1m clear geotextile will be left uncovered at ends (and top if required) for lapping with the subsequent section
8. This is the minimum works that need to be completed in a single tidal cycle to save re-work the following day. If this is unachievable, the excavated length or height should be reconsidered.
9. Armour rock layers are then to be placed on underlayer to just below RL 2.0 such that completion of the underlayer can be readily undertaken.
10. Excavate next (10m) section and repeat steps 1-9 above.
11. On the second lift, much longer sections (50m) of wall can be completed as this construction is above ground and outside tidal and ground water effects.
12. The second lift of geotextile and rock underlayer will be placed. This will then be covered by the armour rock before the upper wall is buried in sand.

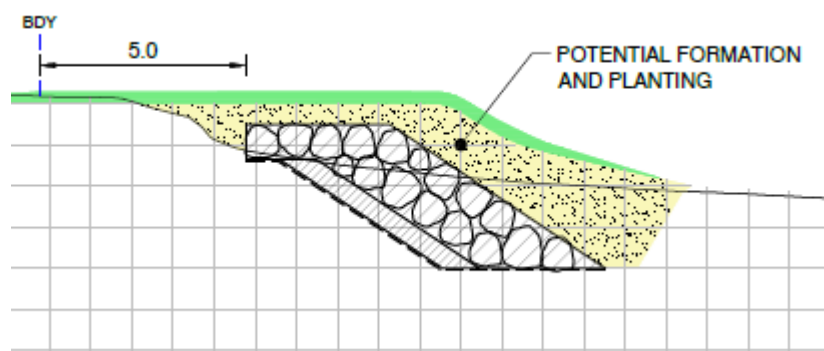


Figure 7.1: Completed Southern Wall section

For the **northern wall**, where the wall is to be entirely within the existing dune and seaward vegetation is to be retained, machinery, trucks and tracked “marooka” delivering wall materials will access along the alignment of the wall. The excavator will sit within the wall foot print and move longitudinally along the alignment.

The construction sequence following vegetation clearance is detailed below. However, in general terms, an excavator will work from within the alignment. The entire foot print will be lowered to RL 2.0 to form a work platform. Then working from the northern end, short lengths (approximately 10m) will be excavated to target depth with the rear trench face at design batter. The excavator will be within the trench and may require the temporary shoring of the seaward face of the lower trench. It is likely to need to partly fill the trench between placing the lower and upper armour layers and it may be useful to extend the lower armour layer across the base of trench.

The construction can be considered as comprised of three lifts, lift 1 to RL2.0 including first armour layer, lift 2 to RL2 including second armour layer and lift 2 to RL 3.5 (crest level). Ground level will be raised again to RL2.0 at the foot of the wall and the wall face covered with sand full height. On completion, dune planting will be established.

7.2 Construction Sequence Northern End (see Figure 7.2a)

1. Work from northern end (A), with excavator on wall alignment excavate wall foot print to approximately RL 2.0 for length of wall trucking sand to beach (B) and depositing in front of 12-16 Glen Isla Place above high tide (outside the CMA).
2. Excavate to design level a length of footing able to be backfilled with (at a minimum) geotextile and first underlayer in a single tidal cycle, likely to be approximately 10m
3. Sand excavated from first excavation would be also be deposited on front of 12-16 above high tide. However, sand excavated from subsequent sections will be used to backfill and cover completed section.
4. The rear wall batter will be shaped to 1:1.5, this is critical as it determines final face slope
5. The seaward slope of wall toe will be battered as steep as temporarily stable, likely approximately 45°. The lower part of the toe is likely to be shored up to make safe and practicable for digger operation within trench(C).

6. Lay geotextile in excavated trench including below toe of wall – ideally single 6m wide rolls of geotextile will be used extending to full crest height and as far under wall as these reach.
7. The small rock underlayer will be placed on the geotextile to design batter, starting from the toe and working upwards to RL2.0, leaving approximately 1m clear geotextile at end (and top if required) for lapping with the subsequent section.
8. This is the minimum works that need to be completed in a single tidal cycle to save re-work the following day. If this is unachievable, the excavated length or height should be reconsidered.
9. Place first rock armour layer on the underlayer working from northern end back towards south (D).
10. Remove shoring and cover the lower rock with sand to raise excavator so that a wider trench is accessible (E) to place the second rock armour layer to just below RL 2.0. The armour layer should be kept low enough such that completion of the underlayer can be readily undertaken (F).
11. Excavate next (10m) section and repeat steps 2-10.
12. On the third lift much longer sections (50m) of wall can be completed as this construction is in a wider trench and outside tidal and ground water effects.
13. The third lift of geotextile and underlayer rock will be placed. This will then be covered by the armour rock before the upper wall is buried in sand.

Following placement of the rock wall, rehabilitation of the site and installation of planting will be undertaken. This will comprise:

- A minimum of 0.5m of sand will be spread over the upper wall crest and battered down at approximately 1:2 to 1:3 to meet existing ground level over the full length of the southern section.
- Sand will be reestablished within the northern section to meet the adjacent contours along the entire length of the section.
- Disturbed dune areas will be re-vegetated with appropriate mix of indigenous fore- and back-dune species, as defined in the planting plan by the Ecologist, to effectively bind the disturbed sand and re-build the dune following works. Foredunes will be planted predominantly with Spinifex with pockets of Pingao.
- Wind fencing will be established along face of new planting and at dune crest to minimise wind-blown sand to back dune area and protect plants while they are establishing
- Planting timed for spring or autumn as practicable.

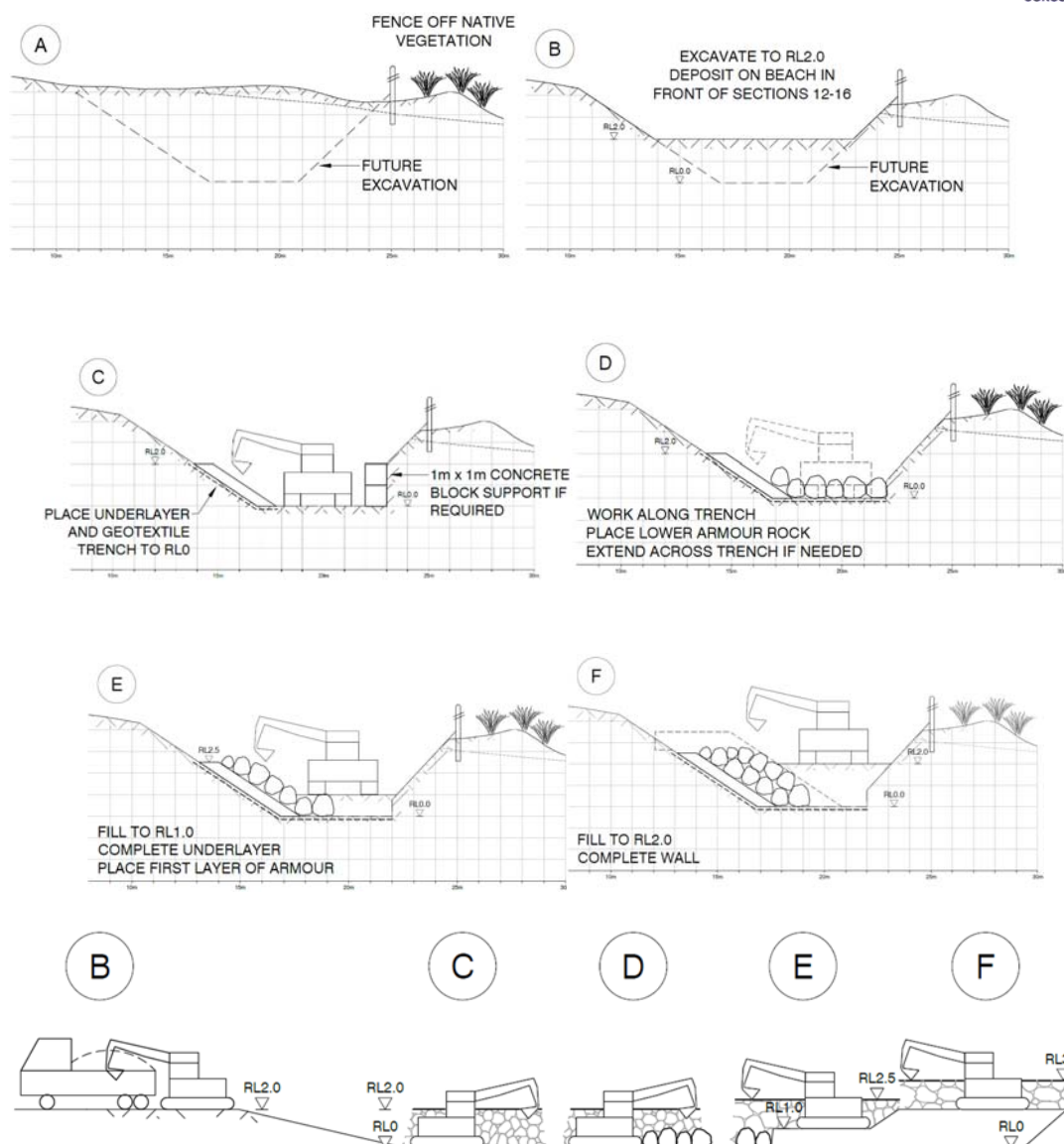


Figure 7.2a: Methodology Diagrams

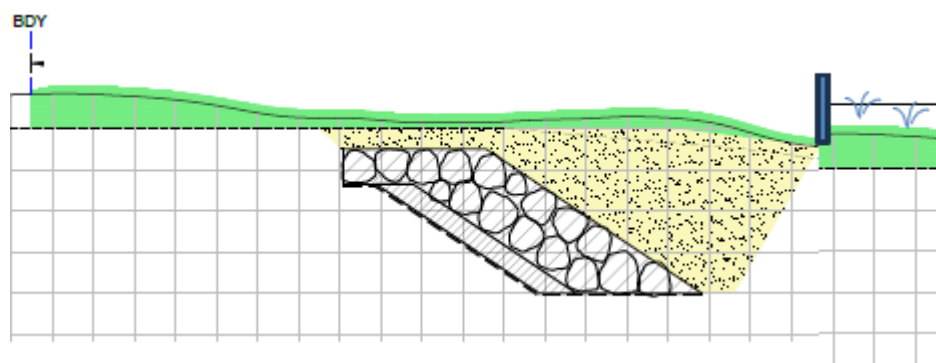


Figure 7.2b: Completed Northern Wall section

8.0 Tidal Work

To the extent practicable, all work and material delivery shall take place above high tide. Three Mile Creek will need to be crossed where it discharges onto the foreshore for material and plant delivery. Vehicle movements will be managed to minimise time below high tide and avoid contamination of the tidal area as practicable and so that disturbance is restored by natural processes in 7 days. Machinery will be clean to the extent practicable and free from any leakage of petrochemicals.

Where strong onshore conditions, storms or extreme tides threaten, the site will be made safe and works would cease while there is a threat of tidal interaction with the works.

9.0 Monitoring

Vibration monitoring of the works will be undertaken while works being are established to quantify vibration at adjacent residential areas and confirm the acceptability of the methodology. Monitoring will be undertaken throughout the project as required to ensure vibration is to be kept within acceptable levels to the relevant code of practice. The construction methodology shall be amended if required by the monitoring.

10.0 Work Hours and Project Duration

Work will be kept to within 7.00 am to 5.00pm Monday to Friday (working hours) to the extent practicable. Work will not be undertaken at night or once daylight becomes unsuitable. However, the work is tidally and storm dependent and work may continue outside working hours for up to three days a week every two weeks. This may include Saturday working outside school holiday periods. No work will take place before 6am or after 8pm.

The project is expected to be undertaken between the months of April 2025 and November 2025. It is anticipated that the entire project will be completed in 4 months. An allowance has been made for periods of inclement weather, possible slow working conditions where the construction is constrained along the wall alignment and other unforeseen issues such as rock availability at the quarry etc. On this basis a specified project duration of 6 months is proposed between the dates of April –November, inclusive. However, work will not be undertaken at Easter or other Public Holidays.

11.0 Equipment Storage and Refuelling

All machinery and equipment shall be kept overnight on the wall alignment above RL3.0. All equipment will be kept in good condition, clean and free from any leaks. No refuelling will be undertaken within the CMA and only equipment that cannot readily leave site (excavators) will be refuelled on site. A spill kit will be present on site and an agreed refuelling plan is to be submitted by the contractor to the satisfaction of the engineer and Consent Authority.

Project:	Glen Isla Protection Society - Coastal Protection Project	Document No.:	Mm 001 r01		
To:	Allan Fraser	Date:	12 July 2024		
Attention:	Allan Fraser	Cross Reference:			
Delivery:	Email	Project No.:	20240399		
From:	Ayla Wesley	No. Pages:	3	Attachments:	Yes
CC:	Luke Faithfull				
Subject:	Noise and vibration trial summary				

Summary

We have measured noise and vibration levels from a trial of rock dropping and general construction activities near Glen Isla Place, Waihi Beach. The trial was to simulate the worst-case noise and vibration levels during the proposed construction of a rock revetment along the Glen Isla Place beachfront properties.

Our measurements indicate the revetment works will comply with the relevant noise and vibration limits in the Western Bay of Plenty (WBOP) Operative District Plan (District Plan).

Section 4C.1.3 of the WBOP District Plan sets out the noise and vibration limits

The District Plan outlines the noise and vibration limits.

In Section 4C.1.3.1, the District Plan states that ‘*construction noise shall not exceed the noise limits in, and shall be measured and assessed in accordance with the requirements of NZS 6803:1999 – Construction Noise*’.

Table 2 – ‘*Recommended upper limits for construction noise received in residential zones and dwellings in rural areas*’ says that the L_{Aeq} and L_{AFmax} upper limits are 75dB and 90dB respectively, for work carried out between 7:30am and 6:00pm on weekdays.

While the District Plan does not contain vibration limits¹, we have adopted German Standard DIN 4150-3:2016, taking a conservative approach to avoiding cosmetic building damage. The limits for short term (transient) events like a rock drop are:

- 5 mm/s peak particle velocity (PPV) for frequencies between 0 – 10 Hz
- 5 – 15 mm/s PPV for frequencies between 10 – 50Hz
- 15-20mm/s for frequencies ranging from 50 – 100Hz

This means that the limit will change depending on the frequencies generated by the rock drop. The most stringent limit is 5 mm/s PPV and this is the limit we have applied to the trial.

During the trial we measured at distances relevant to the actual revetment works

During the trial, we carried out noise and vibration measurements of a rock drop and general equipment movement on 9 July 2024 from 9:50 to 10:05 am. The weather was overcast (6 okta) with calm winds of approximately 0-1 m/s. The temperature was mild, at around 13°C.

¹ Noise and vibration, Section 4C.1 of the District Plan – The Explanatory Statement identifies that ‘*Vibration from activities has not been an issue in the District. In many cases Council can manage vibration effects through the management of noise emissions or through the provisions of the Health Act. Specific standards to manage vibration are therefore not proposed.*’

We used two InstanTel vibration monitors (a Minimate unit with two geophones and a Micromate with a single geophone), an NTi XL3 sound level meter and a 01 dB Cube noise monitor. All instrumentation had valid calibration certificates, microphones were field-calibrated on site, and geophones were checked for level and weighted down with 5kg rice bags.

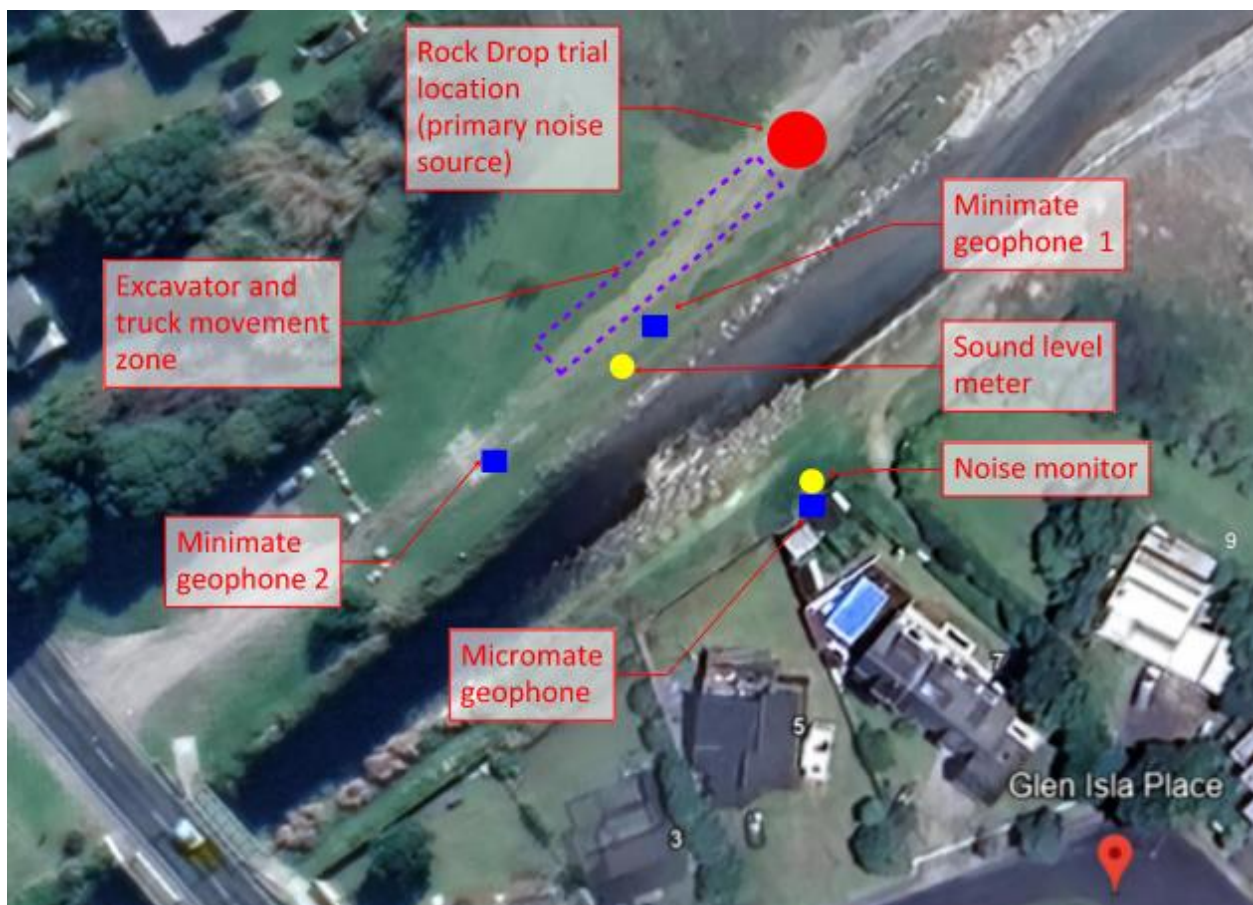
Beach Contractors Ltd operated the equipment they will use for construction activities associated with the proposed rock revetment structure and we measured it at relevant distances. The rock drop trial involved a tractor-trailer unit with several large rocks, tipping them onto the sand. The general equipment movement involved a 24t excavator (Hyundai 235 LCR-9) tracking back and forth. We measured this because we understand it was the subject of vibration damage complaints in the past.

We set up the Minimate vibration monitor with its geophones at 35m and 65m from where the rock drop took place. We also positioned the sound level meter at 35 metres. These positions match the distances the dwellings at 9 and 7 Glen Isla Place will be from the proposed revetment works.

We placed the Micromate vibration monitor in the ground just next to the boundary of 7 Glen Isla Place, and the noise monitor at 1 metre from the shed on that property. These units measured all trial activities, but the general equipment movement was most relevant based on historical issues.

Figure 1 shows an aerial photo of the trial area, with monitor locations and addresses.

Figure 1: Aerial photo showing trial area



The results indicate that noise and vibration levels during the revetment works will comply

Noise

During the rock drop, we measured noise levels of 72dB L_{Aeq} and 88 dB L_{AFmax} at 35 metres. These levels comply with the District Plan noise limits.

Appendix A shows the noise monitor data we captured at the 7 Glen Isla Place boundary (including 2.5 dB façade reflection off the shed). This shows 73 dB L_{Aeq} during the rock drop, and 60 dB L_{Aeq} during the other general works.

Note that we measured just the rock drop operation, which occurred for 45 seconds (from when the trailer started tipping to when the last rock hit the ground). This will be the noisiest part of the revetment works, but will only occur from time to time. Based on the other activities we measured during the trial (excavator works and general movement) we expect the average 15 minute noise level (specified by NZS 6803:1999) will be around 63 dB $L_{Aeq,15m}$. This readily complies with the 75 dB L_{Aeq} limit.

We were asked to predict the L_{Aeq} noise level at 20 metres (in case rock placement is needed closer than 35 metres). We estimate it would be 68 dB $L_{Aeq,15m}$, which also complies with the limits.

Vibration

During the rock drop, we measured vibration levels of 0.7 mm/s PPV and 0.6 mm/s PPV at 35 and 65 metres respectively. These values readily comply with the most stringent restrictions being the 5 mm/s PPV limit at 9 and 7 Glen Isla Place. We note that our measurements were on the ground, and as vibration transfers from the ground into a building structure, it loses energy. This means that any actual vibration levels on dwelling foundations themselves would be less than the recorded measurement.

The other activities (excavator works and general movement) generated around 0.2 – 0.4 mm/s PPV at the 7 Glen Isla Place boundary, which again readily complies with the limit. The rock drop generated 0.45 mm/s PPV (see circled area on the graph).

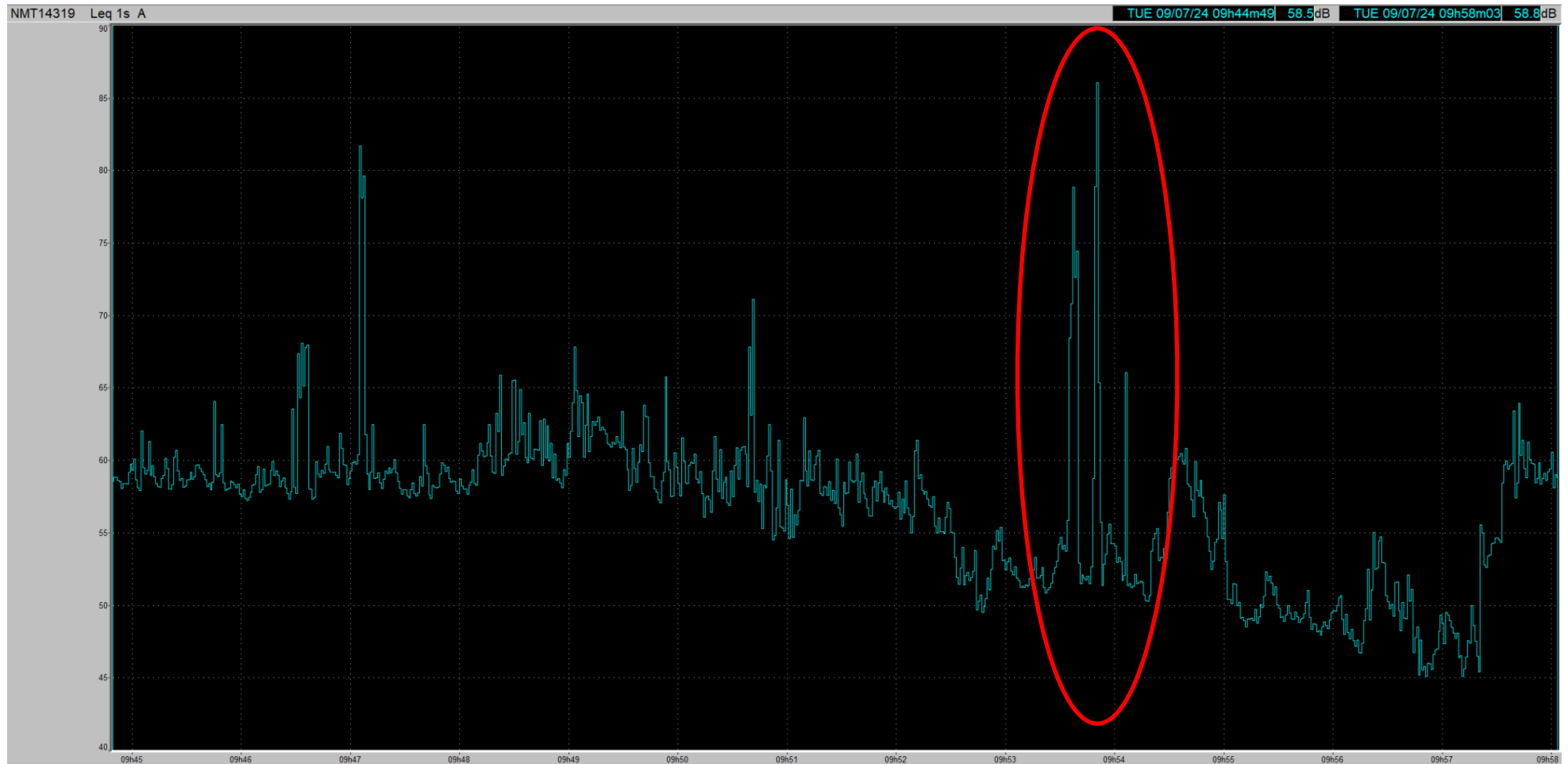
We also measured a peak of 0.66 mm/s PPV before the machinery mobilised. This was likely due to a neighbourhood dog that was running around the monitoring area, before we vacated for the measurements.

The graphs in Appendix B show our measured vibration levels, with the rock drop event indicated.

We were asked to predict the vibration level at 20 metres (in case rock placement is needed closer than 35 metres). We estimate it would be 0.9 mm/s PPV which also complies with the limits.

Appendix A – Noise data

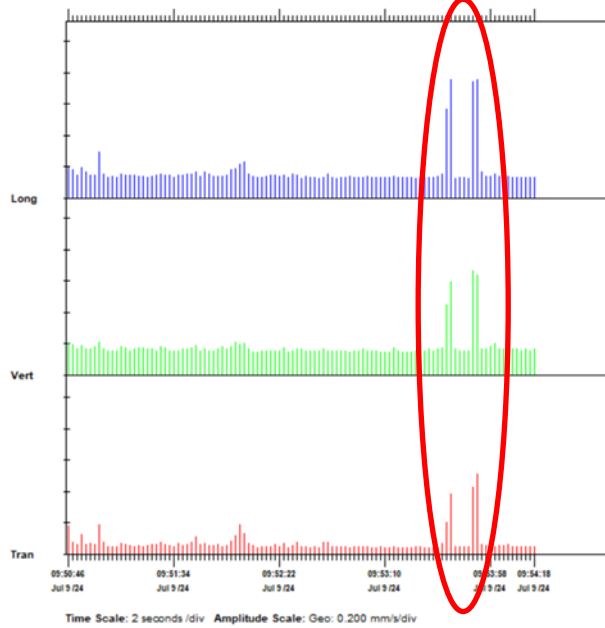
L_{Aeq} noise level measured at 7 Glen Isla Place (rock drop circled in red)



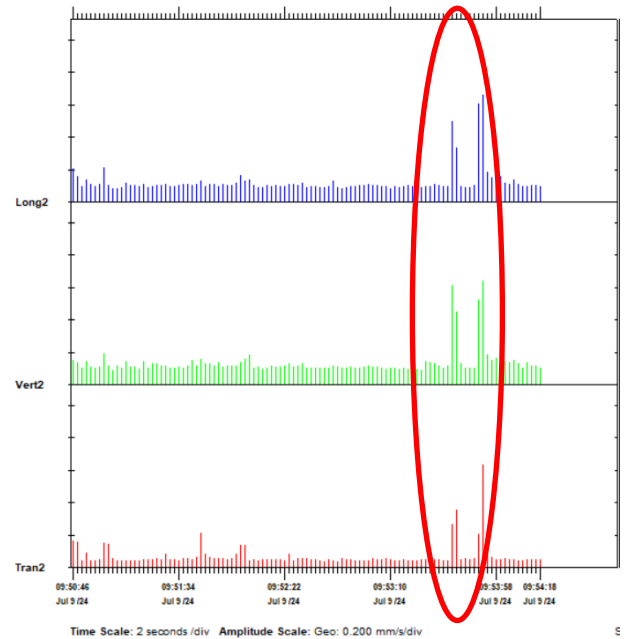
Appendix B – Vibration data

Minimate vibration monitor one and two (rock drop circled in red)

	Tran	Vert	Long	mm/s
PPV	0.512	0.670	0.757	
ZC Freq	17.7	N/A	28.8	Hz
Date	Jul 9 /24	Jul 9 /24	Jul 9 /24	
Time	09:53:50	09:53:50	09:53:38	
Sensor Check	Check	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	0.0	***	***	
Peak Vector Sum	0.869 mm/s on July 9, 2024 at 09:53:50			
N/A:	Not Applicable			

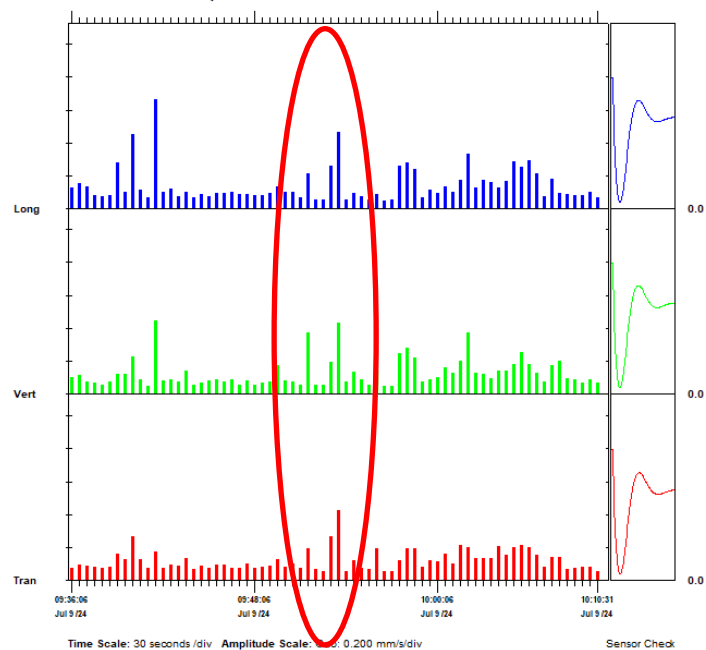


	Tran2	Vert2	Long2	mm/s
PPV	0.631	0.638	0.662	
ZC Freq	1.2	22.5	25.6	Hz
Date	Jul 9 /24	Jul 9 /24	Jul 9 /24	
Time	09:53:50	09:53:50	09:53:50	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.9	3.7	3.9	
Peak Vector Sum	0.861 mm/s on July 9, 2024 at 09:53:50			



Micromate vibration monitor (rock drop circled in red)

	Tran	Vert	Long	mm/s
PPV	0.426	0.441	0.662	
ZC Freq	31	79	>200	Hz
Date	Jul 9 /24	Jul 9 /24	Jul 9 /24	
Time	09:53:18	09:41:28	09:41:28	
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.5	7.3	Hz
Overswing Ratio	4.7	4.5	4.5	
Peak Vector Sum	0.769 mm/s on July 9, 2024 at 09:41:28			



Glen Isla Dune

Coastal Protection Project

Dear Glen Isla Place Neighbours,

We are writing to you on behalf of the Owners of the seven beachfront properties of Glen Isla Place; to advise you we are in the process of preparing a Resource Consent Application for a coastal protection project on the dune area of the Western Bay of Plenty District Council land fronting those Properties.

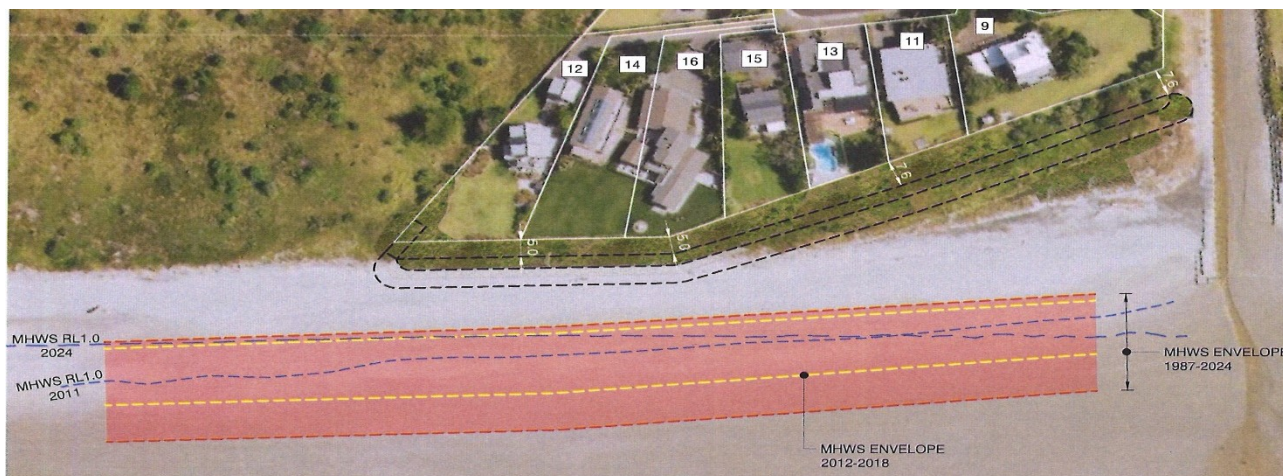
The purpose of this project is to provide long-term protection from coastal erosion at the site.

At completion of the works, the structure would be mostly below current ground level and the excavated sand would be recontoured over the structure to mimic the natural dune form. This will also enable enhancement of the dune environment and reserve area through permitting replanting of the areas over the buried wall with Indigenous dune varieties such as Spinifex and Pingyao.

- The proposal will not affect the public accessway beside Three Mile Creek leading to the beach.
- The dune habitat would be disturbed as little as possible to provide for the works.
- The timing of the works would be programmed to avoid the bird breeding season.
- The works are also located outside the CMA, or Coastal Marine Area, being above Mean High-Water Springs (MHWS).
- This MHWS position will assist having dry sand at high tide.

Please refer to the attached images over leaf for Location, Layout, as well as Cross Sections through both the Southern and Northern revetments.

The proposed layout and build for this protection project are seeking to achieve a result quite different to other parts of the Beach, in so far as the build will be mostly hidden. The Appearance and Visual Effect will be more akin to a natural Dune, as opposed to the Rocks on the beach.





COASTAL PROTECTION PROJECT
KEY PLAN



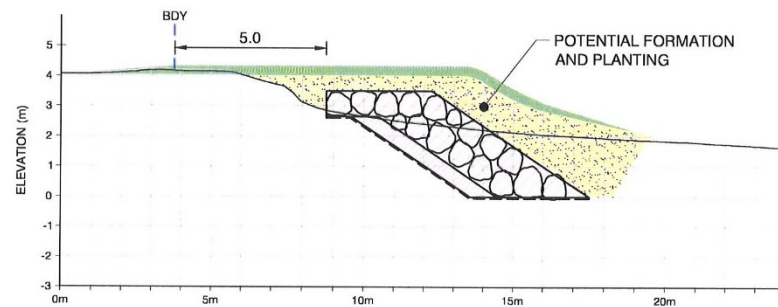
GLEN ISLA PLACE
WAIHI BEACH
SCALE 1:10000
DATE: 01.07.24
REV: -



COASTAL PROTECTION PROJECT LAYOUT

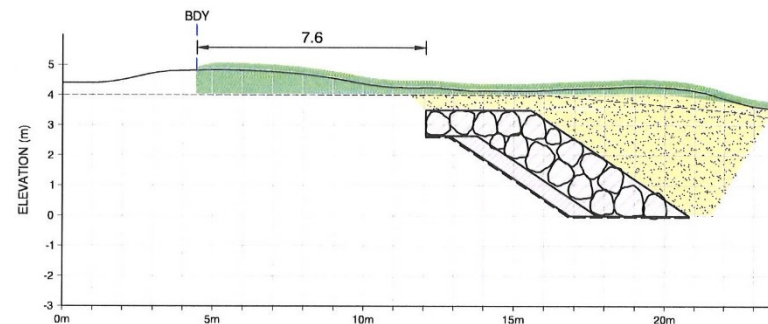


GLEN ISLA PLACE
WAIHI BEACH
SCALE 1:1000
DATE: 29.05.24



No 16 GLEN ISLA

SOUTHERN DUNE
PROTECTION OVERTOPPED WITH SAND AND PLANTED DUNE SPECIES.
LOWER LEVEL BACK FILLED



No 11 GLEN ISLA

NORTHERN DUNE
PROTECTION BACK FILLED & OVERTOPPED
WITH SAND AND PLANTED WITH DUNE SPECIES

COASTAL PROTECTION PROJECT **CROSS SECTIONS**



GLEN ISLA PLACE
WAIHI BEACH
SCALE: NTS
DATE: 18.07.24
REV: A

Background

The Glen Isla Sea Wall

In 1983, Glen Isla Place had a Council built Sea Wall constructed in front of our dune, extending the various sections of sea walls that had been built over the preceding 15 odd years to other beach frontage residential areas making up our community. Our new wall was located 20m seaward of the private property seaward boundaries. These various walls had fallen into disrepair by 2011 but the Glen Isla wall, as the last constructed, was still providing a good degree of protection to our dune. The wall and its rock back carpet, as well as 12-metre-long radial gabion basket rock groynes at 40 metre intervals along the beach, was taken out by the Council in 2011.



WBOPDC'S 2004 – 2011 Sea Wall Scheme

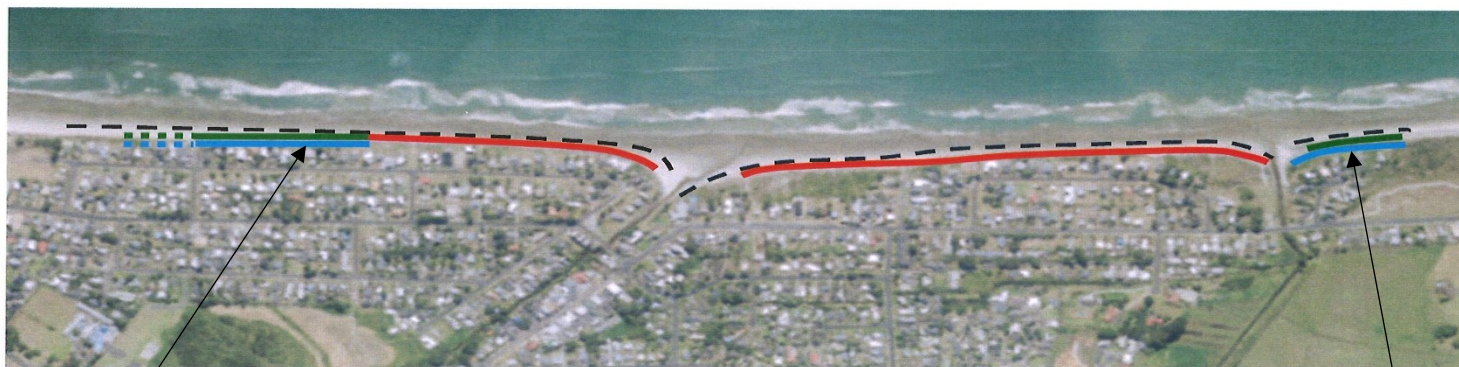
As part of the design and construction process for the WBOPDC's 2004-2011 sea wall scheme, to replace the then existing sea walls and ad hock protection at Waihi Beach with a 1.6 Kilometre rock revetment, the Glen Isla Place seaward frontage was downgraded from the Council's Coastal Engineers recommendation for a permanent revetment, with the rear of the wall located 5 metres off the private property boundaries, and was substituted with a **soft Enhanced with an Imported Sand and Planted Dune** concept, which was subsequently constructed in 2011.

This sand dune construction was entirely washed away, along with hundreds of plants, by a severe storm within 2-3 weeks of being finished. The same result occurred at the northern Shaw Road properties, that had also been downgraded to the "Enhanced Dune" model. Since that time 13 years ago, the Glen Isla Dune and Northern Shaw Road waterfronts have remained defenceless.

Key

- 1969-2011 Existing sea wall
- 2010-2011 Installed rock revetment wall
- 2011 Installed dune enhancement - Washed Away 2011
- 2025 Proposed new coastal protection works

(positions indicative, not to scale)



Shaw Road

SUMMARY OF COASTAL PROTECTION WAIHI BEACH 2024

Glen Isla Place

Gabrielle and Hale Storm Damage

You will be aware that because of the 2023 storms Hale and Gabrielle, the Glen Isla dune was substantially damaged, with the dune retreating up to 3 metres in the southern part. The Three Mile Creek sand sausage wall on the south bank behind No's 5 and 7 Glen Isla Place was also damaged at that time and was rebuilt in local rock by the Council, post Gabrielle without damage.



The Current Initiative

Post Gabrielle, the owners of the waterfront properties formed an Incorporated Society known as the Glen Isla Protection Society Inc., (GIPS for short), and this group worked with Western Bay of Plenty District Council on this erosion protection issue through 2023, which resulted in the Council approving the construction of the proposed Revetment on their land, subject to conditions, which included that the Owners of the seven property's would pay for the entire design, consenting and construction of the protection.

GIPS have assembled a highly regarded Consultant team who are guiding our project through the Process. They include the lead Planner, a Coastal Design Engineer, an Ecologist, A Landscape Architect, a Vibration and Noise Engineer, and an Arborist. The path forward from here will involve Resource Consent Applications to Western Bay of Plenty District Council and Bay of Plenty Regional Council. Once Consents are issued, we expect the construction process itself may take 4-5 months and likely to be in a post Easter period.

We are conscious of the issue Lorne Fell had in 2010/11 where his house at no. 7 was the subject of an insurance claim for damage following the use of the reserve on the north side of Three Mile Creek as an access way to the beach as part of the 2010/11 revetment construction process. With this background, we have engaged the services of a leading NZ Vibration and Noise Consultancy, Marshall Day Acoustics Limited to assist us in ensuring a methodology is adopted that avoids a repeat of this issue. A key decision on this aspect is there will be no rocks stockpiled on the Tree Mile Creek Reserve and there will be no Excavators running backward and forwards carrying Rock on that reserve. As we tested in the trial, our excavator(s) will be brought to site on a transporter and unloaded just above the beach and be driven to the Glen Isla Dune and work from that area.

Marshall Day designed a Monitored Vibration and Noise Trial to establish levels of vibration and noise in effecting the proposed works. This Trial was undertaken on Tuesday 9th July, with the assistance of Beach Contractors Limited and under the direction and supervision of Marshall Day. Marshall Day attended to setting up all the monitoring equipment to their requirements prior to starting the test. The test itself comprised individual tests for both movement of construction vehicles along the reserve, using an Excavator Transporter truck, carrying a 23.5 Ton Excavator, (both driving and unloading/reloading), as well as movement of a road legal, pneumatic tyred Tractor towing a Trailer Unit with a 20-ton load of rocks of the size we plan to use. Separately, we monitored the unloading of the trailer load of rocks onto the ground.

We have attached the Marshall Day Report to this document for your information. This report sets out where equipment was located including a Monitor adjacent to No.7's boundary on the Three Mile Creek walkway as that property is the closest house to the proposed revetment outside of the GIPS Group. The summary of the Trial was that the Vibration and Noise levels will comfortably comply with the District Plan Standards.

With the monitor at Lorne's boundary closest to the test area, the result was that the vibration levels at this location never exceeded 10% of the allowable Standard. Marshall Day advises that level will have reduced further between the boundary and the house, and further again when transferring from the ground into the house structure.

All construction activities will be very carefully managed to ensure there will be no physical effects on properties in the vicinity and that any disruption is minimised. We do not expect that any heavy vehicles associated with the construction will use the Glen Isla Place Cul de Sac

GIPS are contacting you as our Neighbours, to introduce the proposed project. If you would like to discuss any aspect of the project or to assist you with any other information you may request, we would be pleased to hear from you.

Kind Regards

Allan Fraser

On Behalf of the Glen Isla Protection Society Inc.

Mob. 021 925 482

Coastal Protection Project

Marshall Day Acoustics Report

Noise and Vibration Trial Summary

12 July 2024

Project:	Glen Isla Protection Society - Coastal Protection Project	Document No.:	Mm 001 r01		
To:	Allan Fraser	Date:	12 July 2024		
Attention:	Allan Fraser	Cross Reference:			
Delivery:	Email	Project No.:	20240399		
From:	Ayla Wesley	No. Pages:	3	Attachments:	Yes
CC:	Luke Faithfull				
Subject:	Noise and vibration trial summary				

Summary

We have measured noise and vibration levels from a trial of rock dropping and general construction activities near Glen Isla Place, Waihi Beach. The trial was to simulate the worst-case noise and vibration levels during the proposed construction of a rock revetment along the Glen Isla Place beachfront properties.

Our measurements indicate the revetment works will comply with the relevant noise and vibration limits in the Western Bay of Plenty (WBOP) Operative District Plan (District Plan).

Section 4C.1.3 of the WBOP District Plan sets out the noise and vibration limits

The District Plan outlines the noise and vibration limits.

In Section 4C.1.3.1, the District Plan states that ‘*construction noise shall not exceed the noise limits in, and shall be measured and assessed in accordance with the requirements of NZS 6803:1999 – Construction Noise*’.

Table 2 – ‘*Recommended upper limits for construction noise received in residential zones and dwellings in rural areas*’ says that the L_{Aeq} and L_{AFmax} upper limits are 75dB and 90dB respectively, for work carried out between 7:30am and 6:00pm on weekdays.

While the District Plan does not contain vibration limits¹, we have adopted German Standard DIN 4150-3:2016, taking a conservative approach to avoiding cosmetic building damage. The limits for short term (transient) events like a rock drop are:

- 5 mm/s peak particle velocity (PPV) for frequencies between 0 – 10 Hz
- 5 – 15 mm/s PPV for frequencies between 10 – 50Hz
- 15-20mm/s for frequencies ranging from 50 – 100Hz

This means that the limit will change depending on the frequencies generated by the rock drop. The most stringent limit is 5 mm/s PPV and this is the limit we have applied to the trial.

During the trial we measured at distances relevant to the actual revetment works

During the trial, we carried out noise and vibration measurements of a rock drop and general equipment movement on 9 July 2024 from 9:50 to 10:05 am. The weather was overcast (6 okta) with calm winds of approximately 0-1 m/s. The temperature was mild, at around 13°C.

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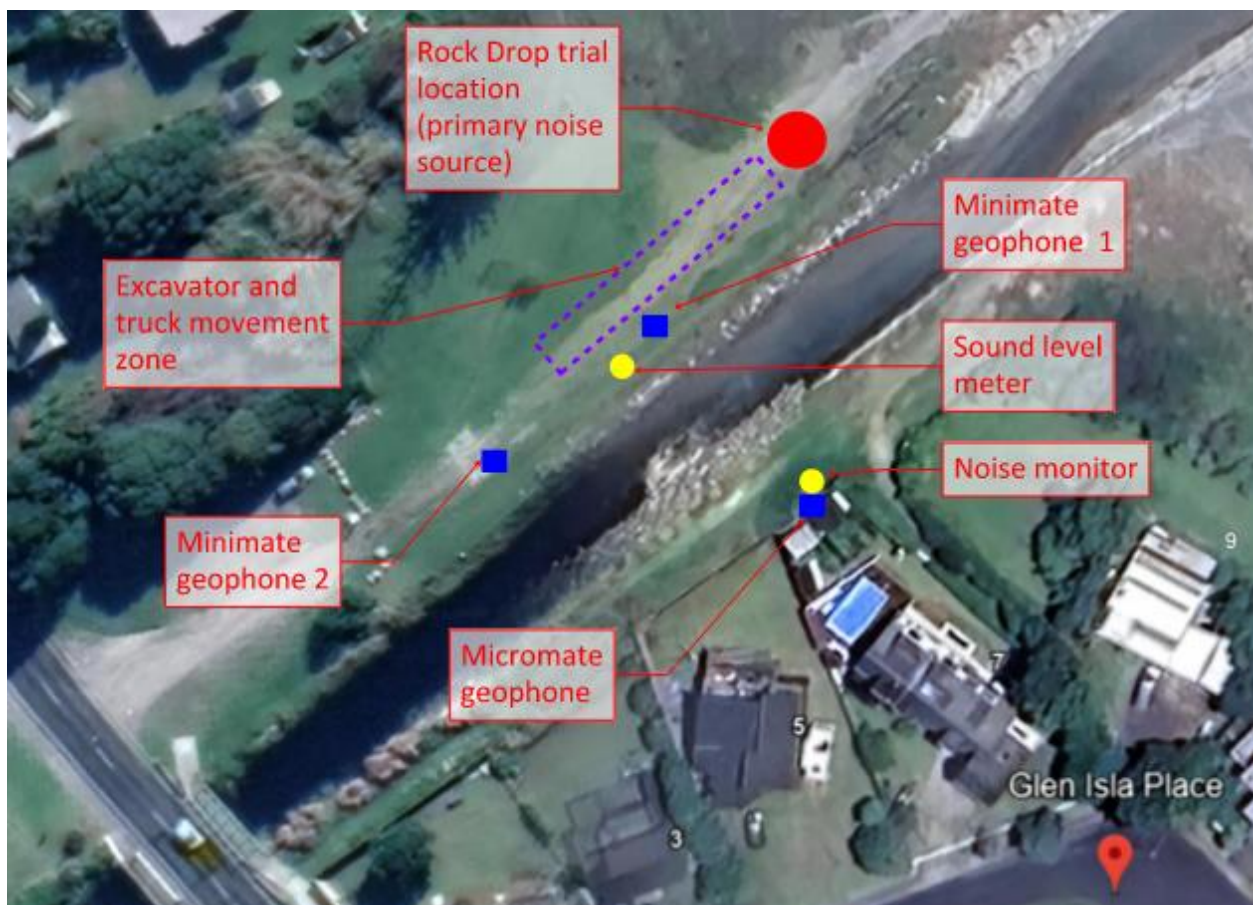
Beach Contractors Ltd operated the equipment they will use for construction activities associated with the proposed rock revetment structure and we measured it at relevant distances. The rock drop trial involved a tractor-trailer unit with several large rocks, tipping them onto the sand. The general equipment movement involved a 24t excavator (Hyundai 235 LCR-9) tracking back and forth. We measured this because we understand it was the subject of vibration damage complaints in the past.

We set up the Minimate vibration monitor with its geophones at 35m and 65m from where the rock drop took place. We also positioned the sound level meter at 35 metres. These positions match the distances the dwellings at 9 and 7 Glen Isla Place will be from the proposed revetment works.

We placed the Micromate vibration monitor in the ground just next to the boundary of 7 Glen Isla Place, and the noise monitor at 1 metre from the shed on that property. These units measured all trial activities, but the general equipment movement was most relevant based on historical issues.

Figure 1 shows an aerial photo of the trial area, with monitor locations and addresses.

Figure 1: Aerial photo showing trial area



The results indicate that noise and vibration levels during the revetment works will comply

Noise

During the rock drop, we measured noise levels of 72dB L_{Aeq} and 88 dB L_{AFmax} at 35 metres. These levels comply with the District Plan noise limits.

Appendix A shows the noise monitor data we captured at the 7 Glen Isla Place boundary (including 2.5 dB façade reflection off the shed). This shows 73 dB L_{Aeq} during the rock drop, and 60 dB L_{Aeq} during the other general works.

Note that we measured just the rock drop operation, which occurred for 45 seconds (from when the trailer started tipping to when the last rock hit the ground). This will be the noisiest part of the revetment works, but will only occur from time to time. Based on the other activities we measured during the trial (excavator works and general movement) we expect the average 15 minute noise level (specified by NZS 6803:1999) will be around 63 dB $L_{Aeq,15m}$. This readily complies with the 75 dB L_{Aeq} limit.

We were asked to predict the L_{Aeq} noise level at 20 metres (in case rock placement is needed closer than 35 metres). We estimate it would be 68 dB $L_{Aeq,15m}$, which also complies with the limits.

Vibration

During the rock drop, we measured vibration levels of 0.7 mm/s PPV and 0.6 mm/s PPV at 35 and 65 metres respectively. These values readily comply with the most stringent restrictions being the 5 mm/s PPV limit at 9 and 7 Glen Isla Place. We note that our measurements were on the ground, and as vibration transfers from the ground into a building structure, it loses energy. This means that any actual vibration levels on dwelling foundations themselves would be less than the recorded measurement.

The other activities (excavator works and general movement) generated around 0.2 – 0.4 mm/s PPV at the 7 Glen Isla Place boundary, which again readily complies with the limit. The rock drop generated 0.45 mm/s PPV (see circled area on the graph).

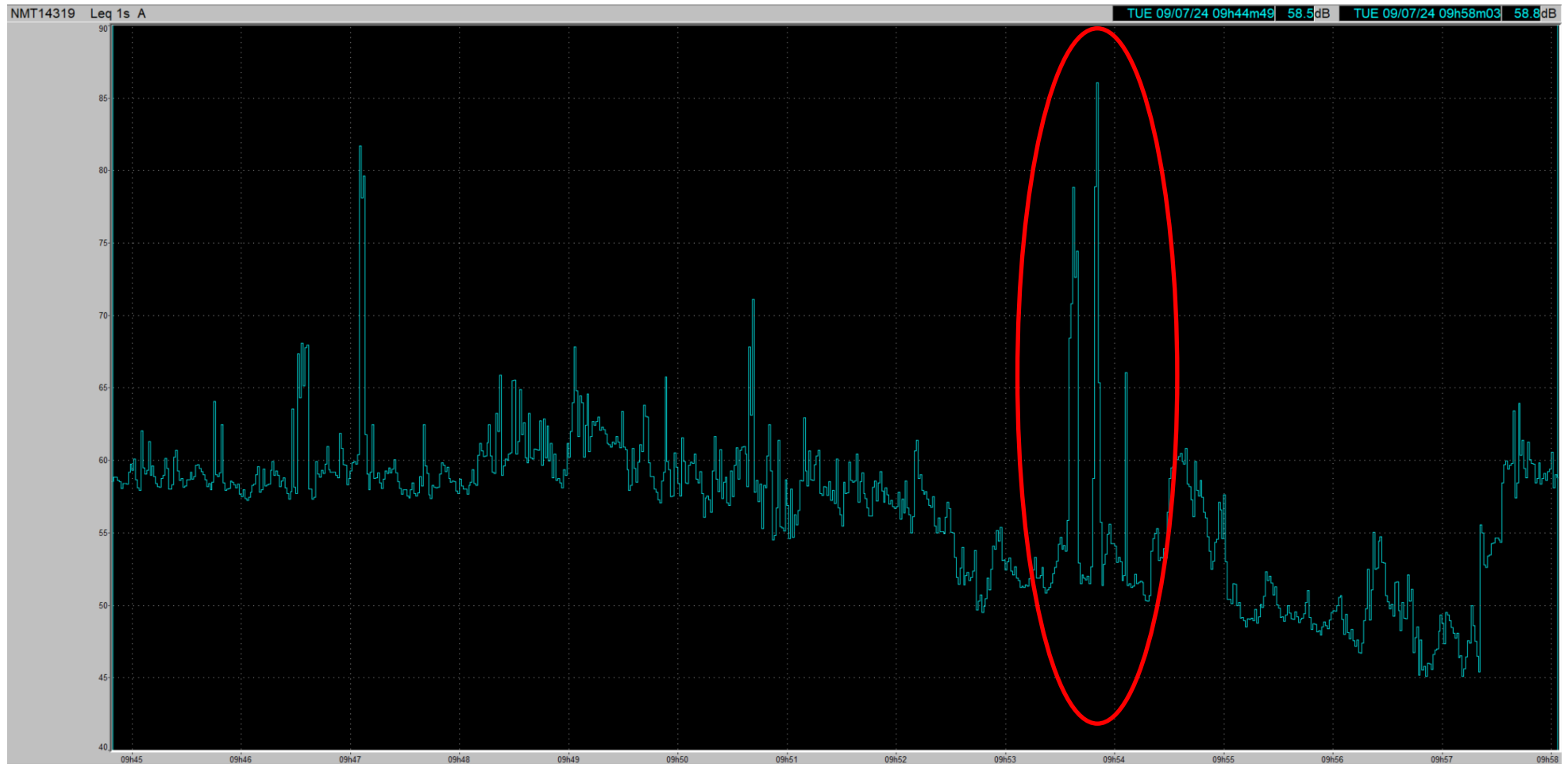
We also measured a peak of 0.66 mm/s PPV before the machinery mobilised. This was likely due to a neighbourhood dog that was running around the monitoring area, before we vacated for the measurements.

The graphs in Appendix B show our measured vibration levels, with the rock drop event indicated.

We were asked to predict the vibration level at 20 metres (in case rock placement is needed closer than 35 metres). We estimate it would be 0.9 mm/s PPV which also complies with the limits.

Appendix A – Noise data

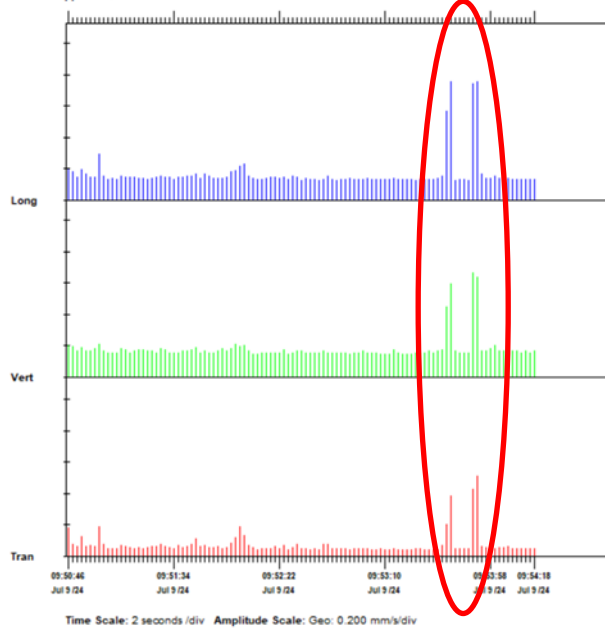
L_{Aeq} noise level measured at 7 Glen Isla Place (rock drop circled in red)



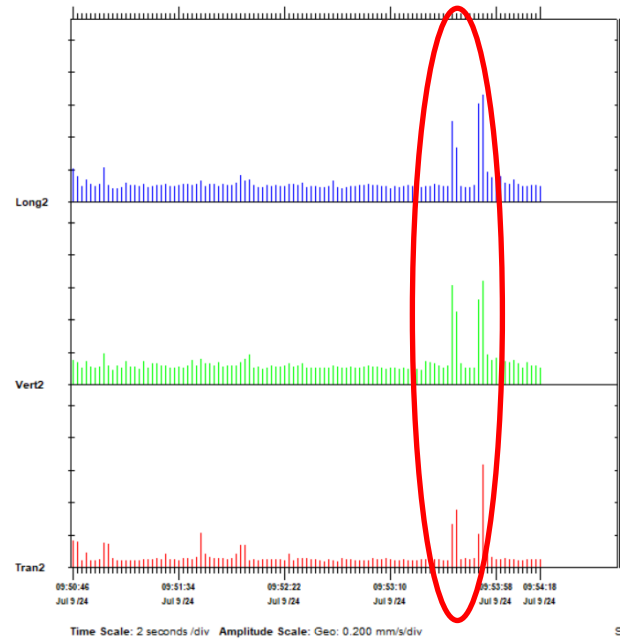
Appendix B – Vibration data

Minimate vibration monitor one and two (rock drop circled in red)

	Tran	Vert	Long	mm/s
PPV	0.512	0.670	0.757	
ZC Freq	17.7	N/A	28.8	Hz
Date	Jul 9 /24	Jul 9 /24	Jul 9 /24	
Time	09:53:50	09:53:50	09:53:38	
Sensor Check	Check	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	0.0	***	***	
Peak Vector Sum	0.869 mm/s on July 9, 2024 at 09:53:50			
N/A:	Not Applicable			

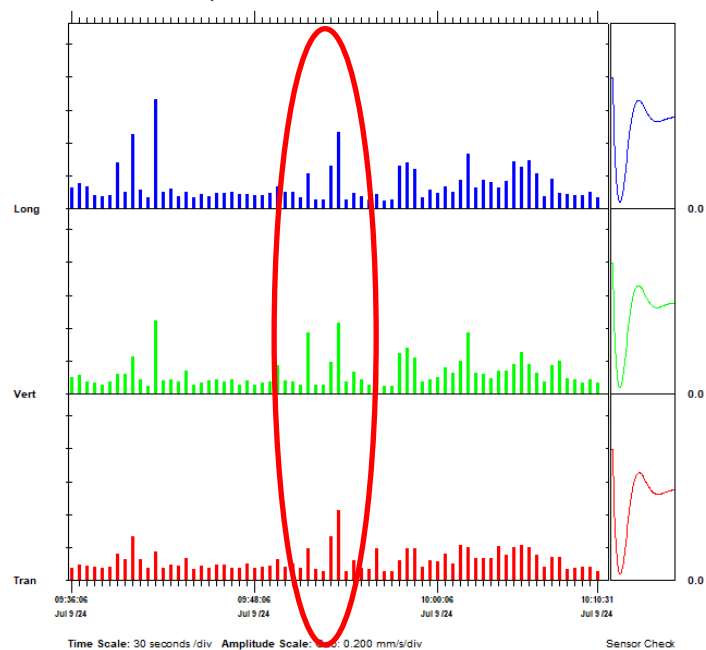


	Tran2	Vert2	Long2	mm/s
PPV	0.631	0.638	0.662	
ZC Freq	1.2	22.5	25.6	Hz
Date	Jul 9 /24	Jul 9 /24	Jul 9 /24	
Time	09:53:50	09:53:50	09:53:50	
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.9	3.7	3.9	
Peak Vector Sum	0.861 mm/s on July 9, 2024 at 09:53:50			



Micromate vibration monitor (rock drop circled in red)

	Tran	Vert	Long	mm/s
PPV	0.426	0.441	0.662	
ZC Freq	31	79	>200	Hz
Date	Jul 9 /24	Jul 9 /24	Jul 9 /24	
Time	09:53:18	09:41:28	09:41:28	
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.5	7.3	Hz
Overswing Ratio	4.7	4.5	4.5	
Peak Vector Sum	0.769 mm/s on July 9, 2024 at 09:41:28			



Glen Isla Dune

Coastal Protection Project

Additional Construction Information

6 AUGUST 2024

Dear Glen Isla Place Neighbours,

Following our communication with you on 20th July 2024, we are writing to provide you additional information related to the proposed coastal protection project on the Glen Isla dune.

In response to the 20th July document, we received queries from two neighbours and messages from others. Thank you all for your responses. The queries we received included:

- How the work would avoid the damage that was experienced by some houses following the 2010/2011 works
- How will the predominately buried rock revetment appearance will be maintained after storm events

As a result of the queries, we felt that there was some misunderstanding around the scope and location of the proposed construction works so we have provided additional information on the works and how we have worked closely with the project engineers and contractor to develop a methodology to mitigate any possible construction effects on neighbouring properties.

The key construction methodology areas that we have focused on are :

1. Understand the construction methodology used in the 2010/11 Western Bay of Plenty District Council's Erosion Protection project at The Loop, Shaw Rd etc. and the proximity of this works to neighbouring Glen Isla houses, which caused **reports of damage.**
2. Understand the methodology used for the 2023 protective rock wall construction in Three Mile Creek in front of 7 and 5 Glen Isla Place and the proximity of the works to neighbouring houses, which caused **no reports of damage.**
3. How the location of our project distances the build process from the neighbouring (non-beach front) houses and **how can we go further than the 2023 methodology to further reduce the chance of any damage.**

The following summarises our response to these key drivers.

Construction Effects Background

2010/11 Construction Work Reports of Damage

As outlined in our 20 August 2024 Glen Isla Dune Coastal Protection Project introduction document, we are very aware of reports of damage including at No. 7 Glen Isla Place resulting from the 2010 – 2011 works.

The likely cause of that damage was from:

- Firstly, the unloading of rocks from the delivering truck onto a stockpile on the grass of the Three Mile Creek Reserve across from no.7
- Secondly, the trafficking, over a long period of time, of the Three Mile Creek Reserve opposite no.7 by two heavy excavators (most likely on caterpillar tracks without suspension) possibly carrying a single rock at a time from the Three Mile Creek stockpile to the sea wall work area at The Loop etc. **Please refer over to attached Addendum A** for the proximity of rock stockpile and operating equipment to Glen Isla Place houses.

2023 Construction Work No Reports of Damage

We are also aware of the recently completed 2023 works to construct the protective rock wall in front of No's 7 and 5 Glen Isla Place at some 35m from No.7. We are not aware of any reports of damage to the adjoining properties (and nor is the contractor who performed the work) arising from that work, despite these works occurring much closer to No.7 than the 2010/11 works, and that rocks being delivered for the 2023 job were dropped into Three Mile Creek from a significant height off the Northern Bank of the creek.

Taking this experience into account, we decided at the beginning of our process that we would seek to adopt a different methodology than 2010/11 to address those concerns. **Please refer over to attached Addendum B** for the proximity of rock unloading and operating equipment to the Glen Isla Place houses.

Construction Effects Mitigation Adopted in Our Proposed Methodology

1. Avoid excavators driving over the Three Mile Creek reserve opposite No. 1, 3, 5 and 7

Our excavators will be brought to site on a transport truck which will back down toward the beach. The excavators will then unload and move seaward around the Three Mile Creek sandbag groynes, and up to the beach work area in front of the Glen Isla dune.

Excavators would then remain at the project work area until the project is finished and be removed through the same process in reverse.

The equipment to be used and its delivery methodology to the site is the same that has regularly been used by Beach Contractors about 12 times a year, for more than 12 years in undertaking dredging of Three Mile Creek. Neither Beach Contractors nor the owners I have talked to are aware of any claimed vibration or damage resulting from Beach Contractor's activity using this same excavation equipment and methodology.

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The effect of the excavator operating will be further mitigated due to the work area being substantially further away from neighboring houses than the 2023 works. **Again, please refer to attached Addendum C**

**2010/2011 THE LOOP WALL
INDICATIVE CONSTRUCTION METHODOLOGY AND
PROXIMITY TO RESIDENCES**

REPORTS OF DAMAGE AROSE

**SEMI TIPULATOR DUMPS ROCKS ON
COMPACTED GRASS RESERVE AREA**

**CATERPILLAR TRACKED
EXCAVATORS CARRYING
ROCKS TO BEACH ACROSS
COMPACTED GRASS TO SAND**

ADDENDUM A

2010/11 Indicative Methodology Illustration

Note: images examples only of indicative equipment, not photos of actual equipment used

**2023 THREE MILE CREEK PROTECTIVE ROCK WALL
INDICATIVE CONSTRUCTION METHODOLOGY AND
PROXIMITY TO RESIDENCES**

NO REPORTS OF DAMAGE



**PNEUMATIC TRACTOR/TIPULATOR
DUMPS ROCKS FROM RESERVE
DOWN CIRCA 4m INTO CREEK BED**



**CATERPILLAR TRACKED
EXCAVATORS MOVING ALONG
CREEK PLACING ROCKS TO WALL**



ADDENDUM B

2023 Indicative Methodology Illustration

Note: Images examples only of indicative equipment, not photos of actual equipment used



PNEUMATIC WHEELED TRACTOR AND TRAILER DELIVER ROCKS TO THE BEACH FRONT WORK AREA



CATERPILLAR TRACKED EXCAVATOR EXCAVATING SAND AND PLACING ROCKS

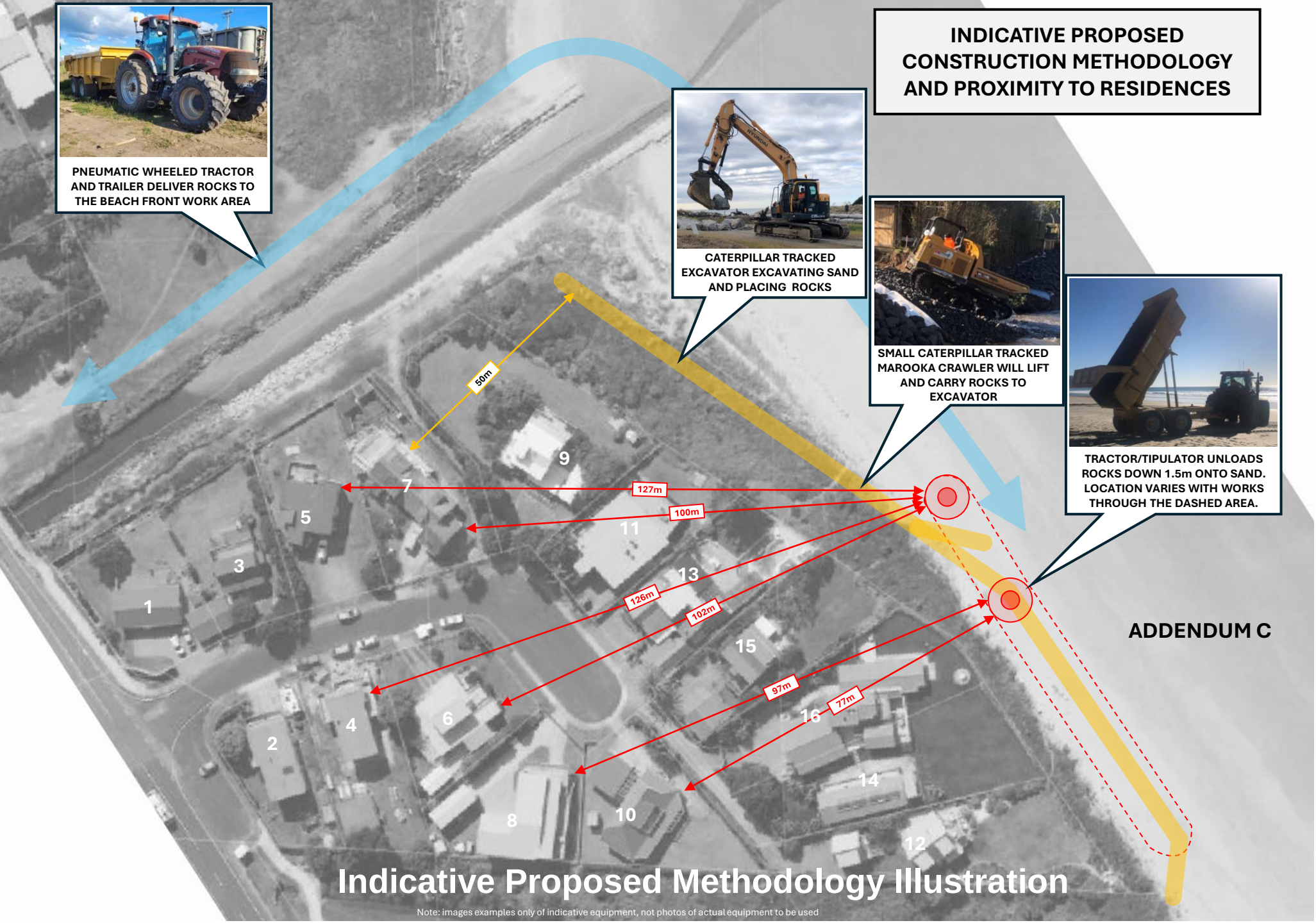


SMALL CATERPILLAR TRACKED MAROOKA CRAWLER WILL LIFT AND CARRY ROCKS TO EXCAVATOR



TRACTOR/TIPULATOR UNLOADS ROCKS DOWN 1.5m ONTO SAND. LOCATION VARIES WITH WORKS THROUGH THE DASHED AREA.

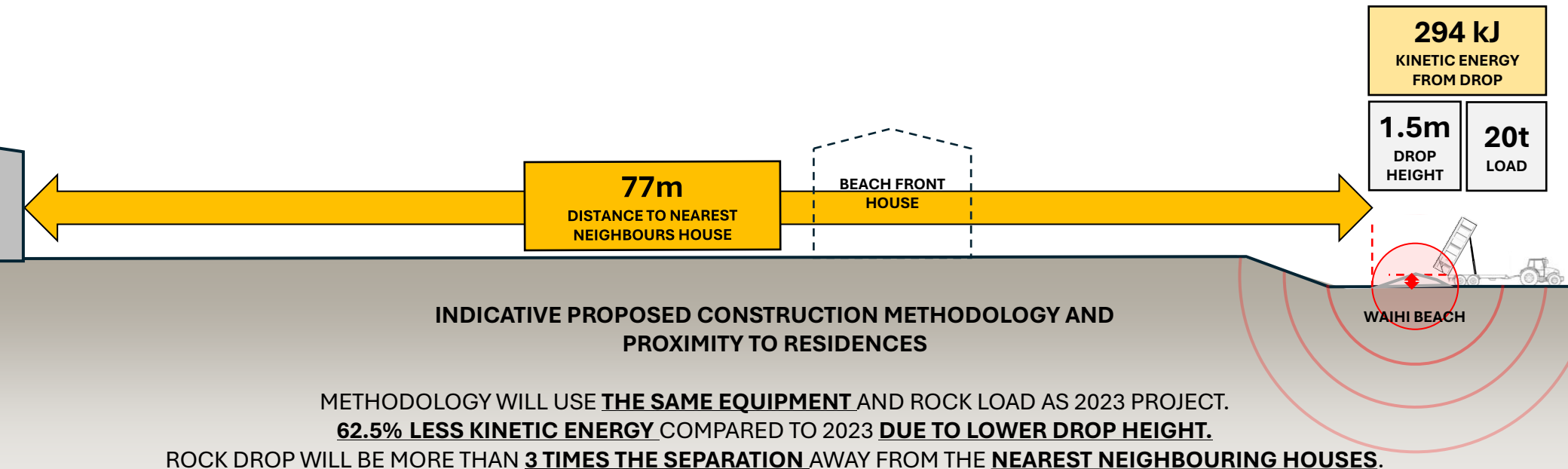
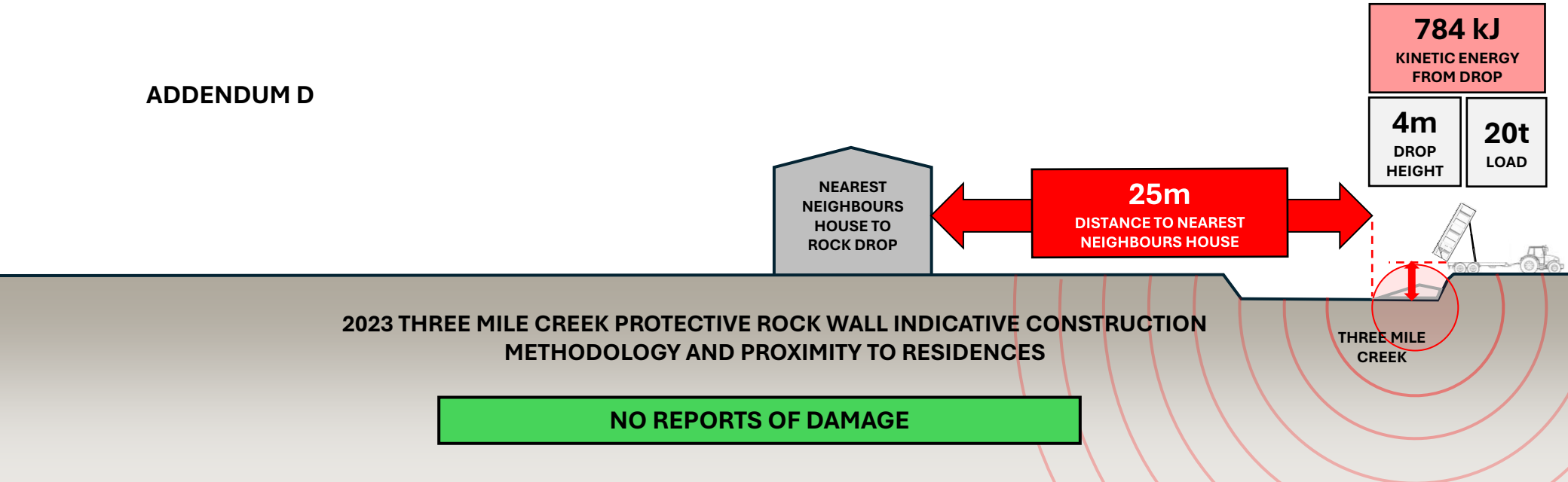
INDICATIVE PROPOSED CONSTRUCTION METHODOLOGY AND PROXIMITY TO RESIDENCES



Note: images examples only of indicative equipment, not photos of actual equipment to be used

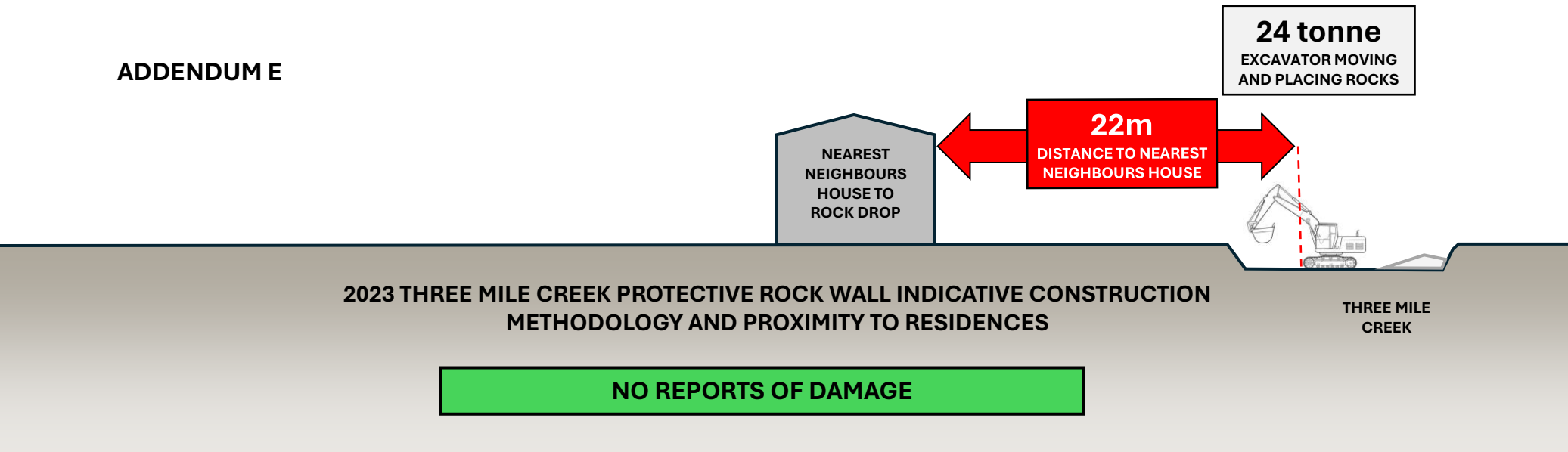
Indicative Section from Rock Drop to Nearest Neighbouring House

ADDENDUM D



Indicative Section of Excavator Working to Nearest Neighbouring House

ADDENDUM E



METHODOLOGY WILL USE **THE SAME EXCAVATOR EQUIPMENT** AS BOTH 2023 AND MONTHLY THREE MILE CREEK DREDGING.
ROCK MOVEMENT TO WORK FRONT PROPOSED BY **A 6 TONNE CRAWLER (75% LESS WEIGHT THAN EXCAVATOR)** TO LIMIT EXCAVATOR MOVEMENT.

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FEBRUARY 2023



FEBRUARY 2023



FEBRUARY 2023



JULY 2024



JULY 2024



JULY 2024



Glen Isla Dune

Coastal Protection Project

Additional Construction Information

14 AUGUST 2024

Dear Glen Isla Place Neighbours,

Following our communication with you on 20th July 2024, we are writing to provide you additional information related to the proposed coastal protection project on the Glen Isla dune.

In response to the 20th July document, we received queries from two neighbours and messages from others. Thank you all for your responses. The queries we received included:

- How the work would avoid vibration damage
- How will the predominately buried rock revetment appearance be maintained after storm events

As a result of the queries, we felt that there was some misunderstanding around the scope and location of the proposed construction works so we have provided additional information on the works and how we have worked closely with the project engineers and contractor to develop a methodology to mitigate any possible construction effects on neighbouring properties.

In our last correspondence we included a copy of the vibration test that was conducted on 9 July 2024 which showed that the vibration from the rock unloading at 35m will be **a small fraction of the industry standard allowable vibration** before damage could result. One neighbouring house is 77m from our rock unloading area and the rest are over 100m or more away.

In addition to this, the key construction methodology areas that we have focused on are :

1. Understand the construction methodology used in the 2010/11 Western Bay of Plenty District Council's Erosion Protection project at The Loop, Shaw Rd etc. and the proximity of this works to neighbouring Glen Isla houses, which caused **reports of damage**.
2. Understand the methodology used for the 2023 protective rock wall construction in Three Mile Creek in front of 7 and 5 Glen Isla Place and the proximity of the works to neighbouring houses, which caused **no reports of damage**.
3. How the location of our project distances the build process from the neighbouring (non-beach front) houses and **how can we go further than the 2023 methodology to further reduce the chance of any damage**.

The following provides further information on how our project addresses these matters.

Construction Effects Background

2010/11 Construction Work Reports of Damage

As outlined in our 20 August 2024 Glen Isla Dune Coastal Protection Project introduction document, we are aware of reports of damage including at No. 7 Glen Isla Place resulting from the 2010 – 2011 works.

The likely cause of that damage was from:

- Firstly, the unloading of rocks from the delivering truck onto a stockpile on the grass of the Three Mile Creek Reserve across from no.7
- Secondly, the trafficking, over a long period of time, of the Three Mile Creek Reserve opposite no.7 by two heavy excavators (most likely on caterpillar tracks without suspension) possibly carrying a single rock at a time from the Three Mile Creek stockpile to the sea wall work area at The Loop etc. **Please refer over to attached Addendum A** for the proximity of rock stockpile and operating equipment to Glen Isla Place houses during the 2010/11 Construction Work.

2023 Construction Work No Reports of Damage

We are also aware of the recently completed 2023 works to construct the protective rock wall in front of No's 7 and 5 Glen Isla Place at some 35m from No.7. We are not aware of any reports of damage to the adjoining properties (and nor is the contractor who performed the work) arising from that work, despite these works occurring much closer to No.7 than the 2010/11 works, and that rocks being delivered for the 2023 job were dropped into Three Mile Creek from a significant height off the Northern Bank of the creek.

Taking this experience into account, we decided at the beginning of our process that we would seek to adopt a different methodology than 2010/11 to address those concerns. **Please refer over to attached Addendum B** for the proximity of rock unloading and operating equipment to the Glen Isla Place houses during the 2023 Construction Work.

Construction Effects Mitigation Adopted in Our Proposed Methodology

1. Avoid excavators driving over the Three Mile Creek reserve opposite No. 1, 3, 5 and 7

Our excavators will be brought to site on a transport truck which will back down toward the beach. The excavators will then unload and move seaward around the Three Mile Creek sandbag groynes, and up to the beach work area in front of the Glen Isla dune.

Excavators would then remain at the project work area until the project is finished and be removed through the same process in reverse.

The equipment to be used and its delivery methodology to the site is the same that has regularly been used by Beach Contractors about 12 times a year, for more than 12 years in undertaking dredging of Three Mile Creek. Neither Beach Contractors nor the owners I have talked to are aware of any claimed vibration or damage resulting from Beach Contractor's activity using this same excavation equipment and methodology.

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2010/2011 THE LOOP WALL INDICATIVE CONSTRUCTION METHODOLOGY AND PROXIMITY TO RESIDENCES

CLAIMS OF DAMAGE AROSE

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COMPACTED GRASS RESERVE AREA

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NO REPORTS OF DAMAGE



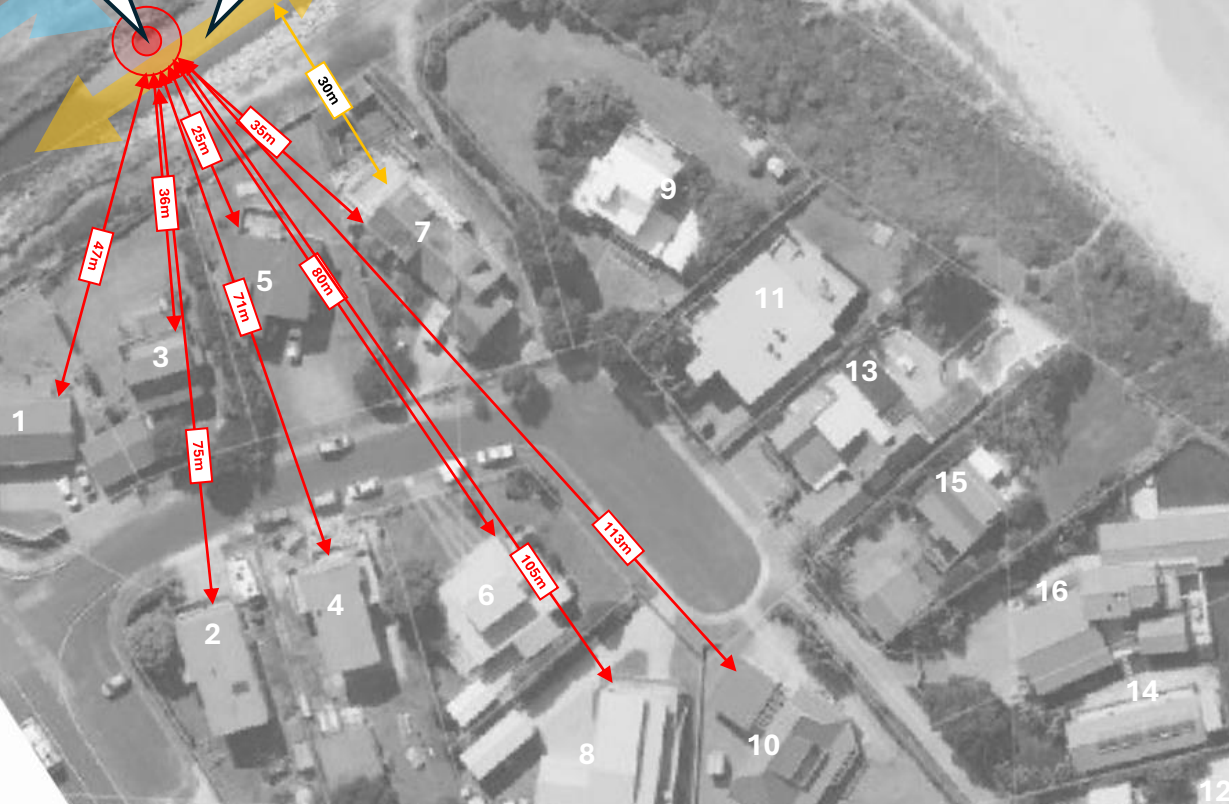
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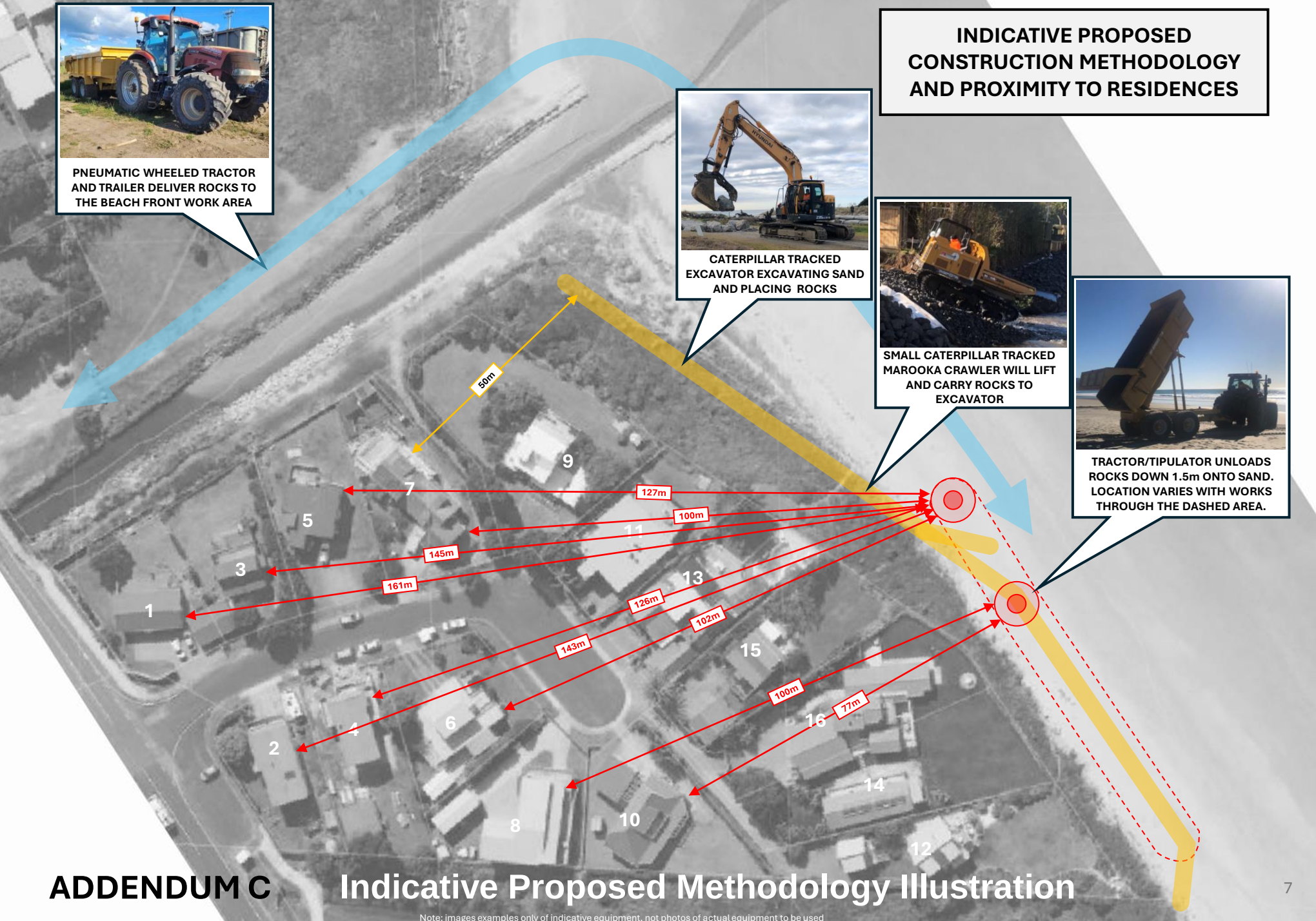


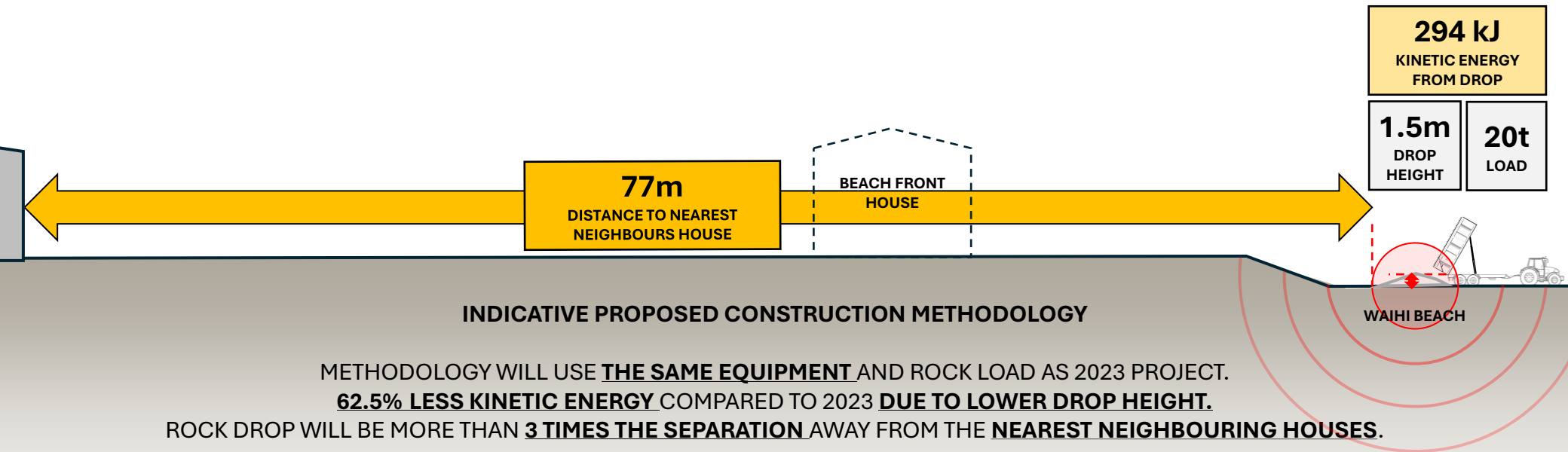
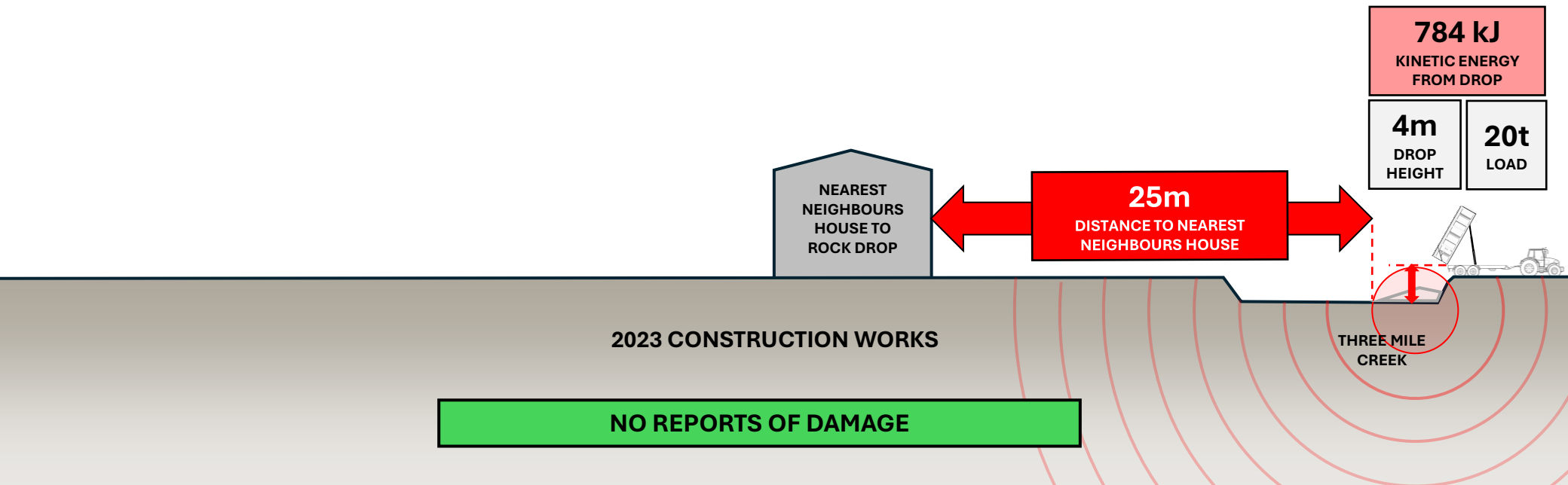
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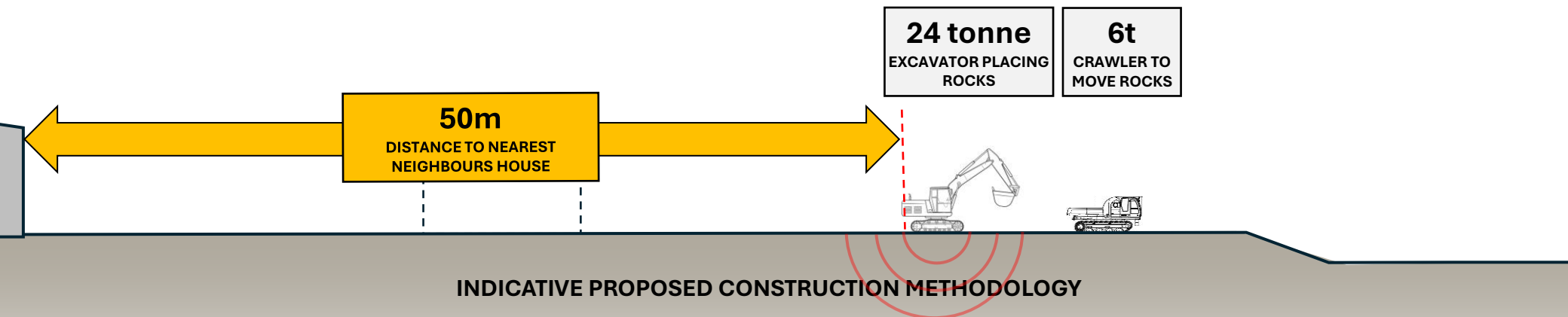
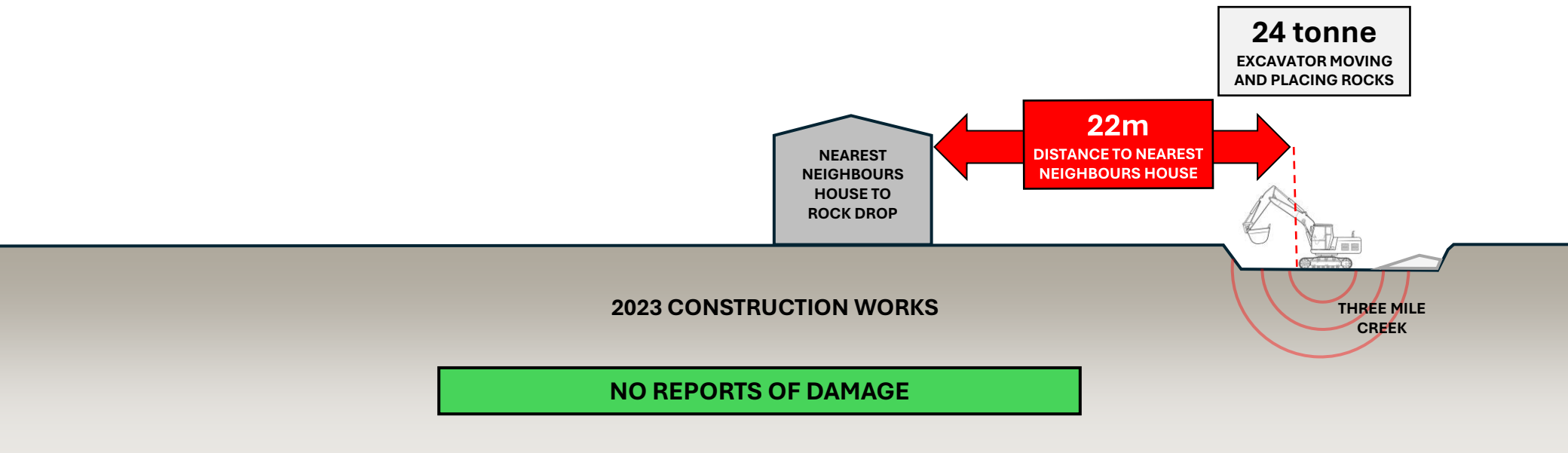


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FEBRUARY 2023



FEBRUARY 2023



FEBRUARY 2023



JULY 2024



JULY 2024



JULY 2024



Summary

In summary, the proposed Glen Isla Dune Protection Project will:

- Provide ongoing protection and rehabilitation of the Dune, including erosion protection, ecological security, replacement of much exotic vegetation species with indigenous sand trapping species, reestablish bird life.
- Provide a barrier between the greater Glen Isla subdivision and the sea which will assist all properties with matters such as resilience, current and future Insurance considerations, localised reputation, real estate values and resale liquidity etc.
- Be achieved without cost to the ratepayers or any of the neighbouring properties.
- Have insurances in place to cover the project and potential effects of the project

The design of the wall will:

- Be covered in sand other than after significant storm events, but will soon naturally be re-covered as has occurred since 2023
- Allow for possible sea level rise as part of the calculations
- Provide a barrier to possible increased bad weather events, courtesy of climate change
- Not hold water on the land-side, the wall will be permeable to rainwater draining to the sea
- Provide for end-plate effects

The construction of the wall will:

- Use the same equipment and load weight as the 2023 works to Three Mile Creek from which there were no reports of damage
- Drop the load from around 1/3 of the height that the 2023 load was dropped
- Drop the load more than 2 times further away from the nearest neighbour's house than occurred in 2023
- Use a light-weight crawler machine to transport rocks to the work-front where the excavator is not able to reach the drop point to avoid the need for the excavator to move around the work area more than needed to dig and place the rocks

Pre-Application Meeting
Glen Isla Place Coastal Protection works
Date: 3rd of April 2024 – 11:30am – 12:30pm
Athenree Room

Attendance:

Council: Joe Franklin (CS Planner, Notetaker), Bevan Hudson (Senior Consent Planner), Peter Watson (Reserves and Facilities Manager)

Applicant/Agent:

Luke Faithfull (Mitchell Daysh), Phil Mitchell (Mitchell Daysh), Craig Davis (Davis Coastal Consultants), Allan McKenzie Fraser (Property Owner – 16 Glen Isla Place), Philip Wade Cory-Wright (Property Owner – 15 Glen Isla Place)

Apologies:

n/a

Site: 95 Seaforth Road, Waihi Beach **Parcel:** 1000/295

Zoning: Rural with Reserve overlay (Three Mile Creek Reserve Management Plan 6.65)

District Plan Layers: Coastal Erosion Area – Primary Risk, Outstanding Landscape Feature s24 (Open Coastal Landscape Landward Edge Protection Yard)

Hazards: Coastal Inundation Area



Background

The Glen Isla Protection Society (GIPS) have engaged Mitchell Daysh and Davis Coastal Consultants to prepare application for a coastal protection structure on the foreshore and Reserve land owned by the Western Bay of Plenty District Council (WBOPDC) located at 95 Seaforth Road, Waihi Beach. The preliminary plans discussed at the meeting indicated the majority of the structure/revetment would be buried and span the beach frontages between 9 and 12 Glen Isla Place (7 properties). The preliminary plans which the applicant spoke to were not provided to WBOPDC given their preliminary nature.

Matters Discussed

Introduction

- The applicant's agents outlined the work that had been completed to date and an overview of the wider project team including ecologists and landscape architect.
- They provided an overview of historical protection works and their failings at and highlighted the current condition of the beach/dune area adjacent to the properties and erosion from previous weather events.
- Davis Coastal Consultants provided evidence of the MHWS mark showing the entire coastal protection structure is to be within the WBOPDC jurisdiction. The works would include access within the BOPRC jurisdiction. They indicated a meeting had been scheduled with BOPRC but this had been postponed by BOPRC.
- The agent outlined a number of options that were being considered for the coastal erosion structure with a final design yet to be confirmed.
- The agent identified that while in the early phase of developing the application, the approach is to reduce any effects from the proposal to the extent practicable.

Reserves and Facilities – Peter Watson

- WBOPDC have agreed in principle, through a Council resolution back in October 2023, that a coastal protection structure can be built on council reserve land subject to the relevant building and resource consents being obtained and the work being fully funded by GIPS.
- There is still the need to liaise with Regional Council with regional consenting requirements.
- A licence to occupy will need to be granted by WBOPDC for the structure.
- Public access needs to be considered. How will the adjoining residents access the beach.

Planning – Bevan Hudson

- Coastal protection works including groynes and sea walls within the Coastal Erosion Area – Primary Risk are a Discretionary activity.

- The application should include a robust notification assessment and, if possible, the written approval of any person considered to be affected.
- Consultation with local iwi should be undertaken. WBOPDC staff provided a copy of iwi contacts to the agent.
- WBOPDC identified the need to consider effects of noise and vibration.
- The applicant needs to demonstrate how construction traffic will access the site and safety when working on site and unloading rocks (Cones, spotters etc).
- Mitigation measures to ensure any adverse effects are minimised.

Actions

- Provide contacts for Kaupapa Māori Team.
- Provide a copy of the decision for the recent Matakana Island Coastal Erosion Structure (seawall).

Coastal Protection Project.
Glen Isla Dune, Waihi Beach.
LVA Appendix C - Graphic Attachments.

October 2024

Isthmus.

Land.
People.
Culture.
Isthmus.



Isthmus.

Document record				
Issue	Revision	Author	QA	Date
Draft	A	RA	BC	24.09.30
Draft	B	RA		24.10.09



Contents

01.	Existing Environment.	4
02.	Proposal.	8
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04.	Visual simulation.	18

01. Existing Environment.



Site photos - Glen Isla Dune, Waihi Beach. 2024.



View across the site looking north, from the site
(Council Reserve at the frontage of Gen Isla Place.)



View across the site looking south from close to Three
Mile Creek.



View across the site looking south from the site, north
end.



View across the site looking south from the beach, close
to Three Mile Creek (at the north end of the site).



View south towards the site from Waihi Beach close to the mouth of Three Mile Creek.

Glen Isla Dune, Waihi Beach.

Photo record 2023/2024.

Cyclone Gabrielle and dune recovery.



Images provided by the Glen Isla Protection Society (GIPS).

Context photos - Waihi Beach.

2024.



02. Proposal.

A wide-angle photograph of a coastal scene. In the foreground, a sandy beach with scattered seaweed leads up to a dune covered in dry, brownish grass. Behind the dune, several houses are visible. On the left, a house with dark grey siding and a gabled roof has a white balcony. To its right, a smaller house with a similar style is partially visible. Further right, a large, modern house with light-colored siding and a flat roof is prominent. Behind this house, a large, white, rectangular structure, possibly a pool or a covered patio, is visible. The sky is a clear, solid blue. The text '02. Proposal.' is overlaid in the top left corner in a large, white, sans-serif font.

PROVIDE TEMPORARY CLEAN WATER DIVERSION BUND INCLUDING EXISTING IMPERVIOUS WALLS

WALL RETURN EX STABILISED SAND

PROPOSED BURIED ROCK RIPRAP WALL

TEMPORARY FENCING TO PROTECT EXISTING VEGETATION (ECOLOGIST TO CONFIRM SETOUT)

PROPOSED LAYOUT
SCALE 1:1000

POTENTIAL EXPOSED WALL - 1% AEP STORM CONDITION
SCALE 1:1000

ELEVATION
SCALE 1:100

No.	REVISION DETAILS	DATE
1	RESOURCE CONSENT ISSUE	23.08.2024

DESIGN	DAVID COASTAL CONSULTANTS
DRAWN	SEAM SPITAL
CHECKED	JMA
DATE	AUGUST 2024
SCALE	VARIABLE AS SHOWN
CAD FILE	20240820-Glen Isla Beach Works

COASTAL PROTECTION PROJECT
GLEN ISLA DUNE
WAIHI BEACH

DAVIS COASTAL

COASTAL MANAGEMENT AND ENGINEERING
P.O. Box 185
Orewa
Phone: 09 428 0040
Mobile: 021 627 193
Email: coastal@daviscoastal.co.nz

DRAWING TITLE: PROPOSED LAYOUT

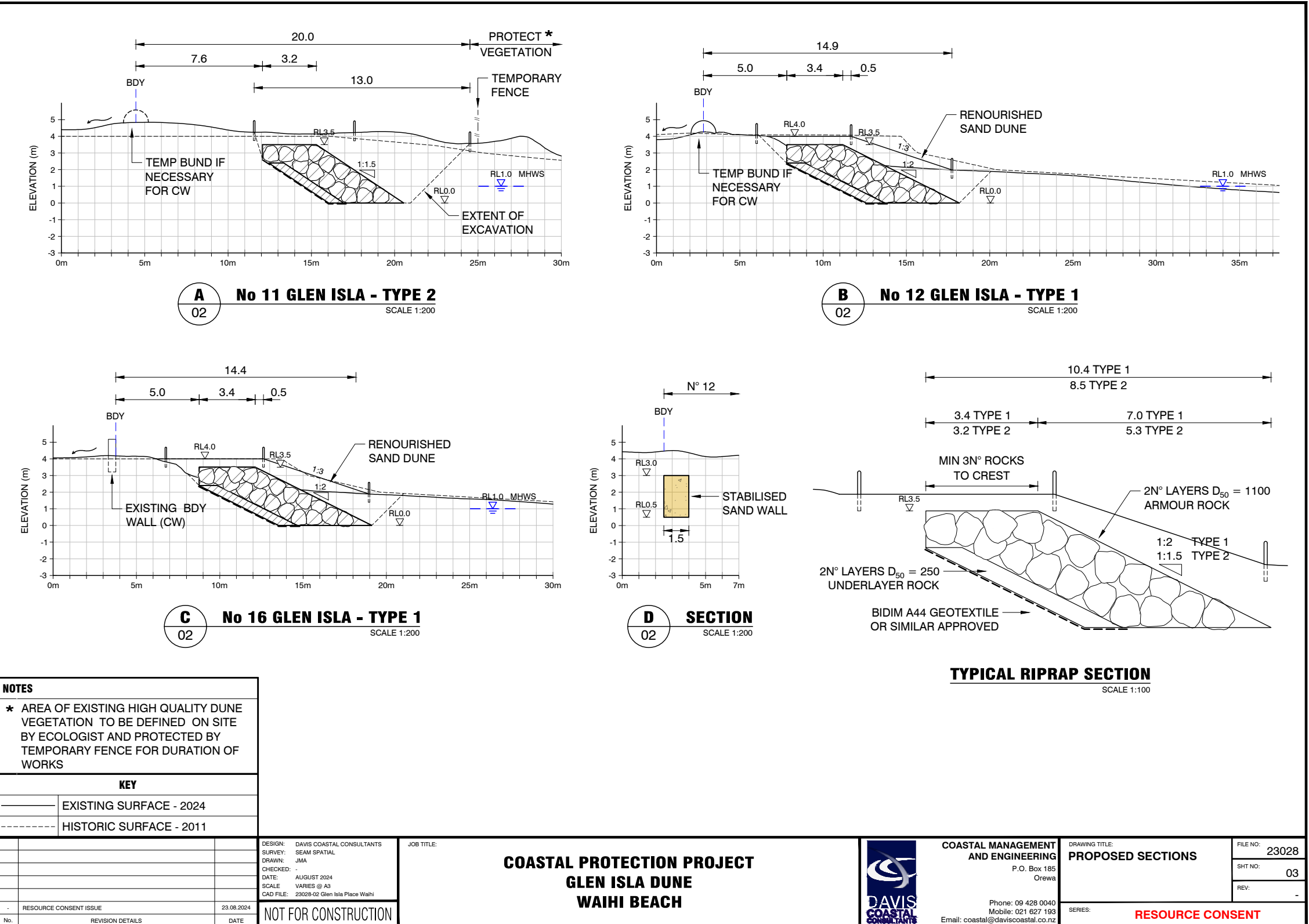
FILE NO. 230

SHT NO.

REV:

SERIES: RESOURCE CONSENT

Proposed structure - cross-sections.



03. Statutory Planning Maps.

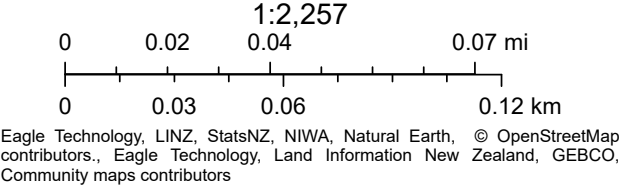


Bay of Plenty Regional Coastal Environment Plan.



13/08/2024, 11:51:15

- Environment - Coastal Environment Zone
- Environment - Indigenous Biological Diversity Area (IBDA) - B



Map Created from BOPRC Online Platform
Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors | Bay of Plenty Regional Council | Ben Lee - Environmental Planner | Bay of Plenty Regional Council (Barry Perryman) | Lynda Walter and Karen Greig, InSitu Heritage Ltd under contract to Environmen

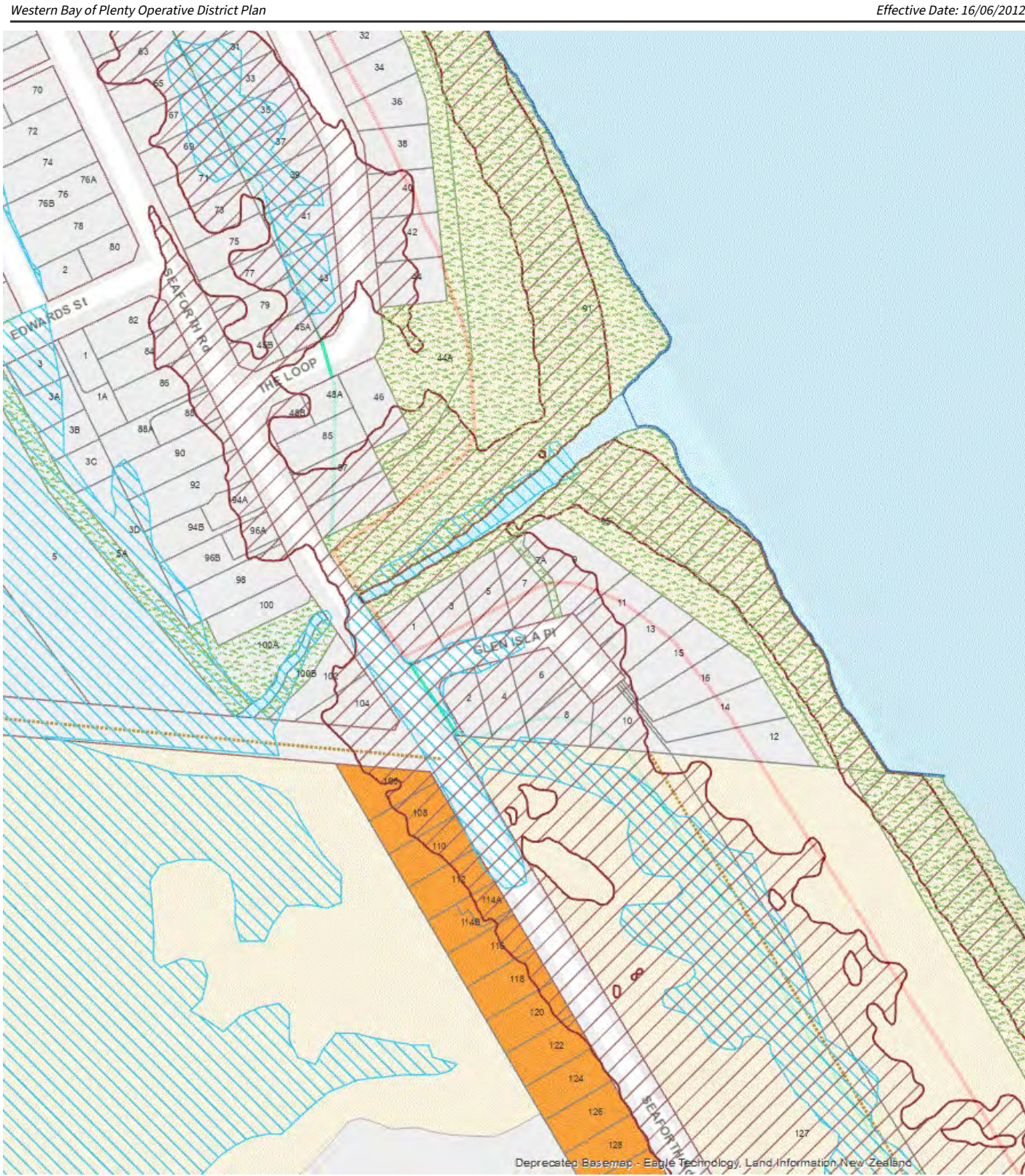
Western Bay of Plenty District Plan.

Outstanding Landscape Feature.



Western Bay of Plenty District Plan.

Zoning + Coastal Hazard Overlays.



04. Visual simulation.



N
Scale
1:400@A1 | 1:800@A3

Legend

- Camera Position
- Proposed Berried Rock Riprap Wall





**Viewpoint 1 -
Current State.**

Waihi beach, looking at Glen Isla dune from the south,



Isthmus.

Coastal Protection Project | Glen Isla Dune, Waihi Beach | October 2024

Original Photo RA | 50mm | DSLR Nikon D810 | 1112hrs 12 July 2024 | 1861432E 5854348N (NZTM)
Reading distance for correct scale: 400mm | Viewpoint Elevation: Approx 0m
Field of View Approximately 110 ° horizontal (across 2 x A3 pages) & 34 ° vertical

Isthmus.

Coastal Protection Project | Glen Isla Dune, Waihi Beach | October 2024



Viewpoint 1 - Proposed.

Waihi beach, looking at Glen Isla dune from the south,



Isthmus.

Coastal Protection Project | Glen Isla Dune, Waihi Beach | October 2024

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Field of View Approximately 110 ° horizontal (across 2 x A3 pages) & 34 ° vertical

Isthmus.

Coastal Protection Project | Glen Isla Dune, Waihi Beach | October 2024

Photosimulation Methodology Statement

- Photos were taken with a 50mm fixed lens on DSLR camera. Locations were fixed using a handheld GPS unit with accuracy of 5m. These points were cross referenced using the Auckland Council GIS information. Reference points in the landscape, such as trees and existing structures were also located to assist referencing of photo to digital model.
- A sequence of photos was taken from each viewpoint and stitched to form panoramas. Photos were overlapped by approximately 30% and edges cropped prior to stitching to eliminate edge distortion.
- A digital model was created. Computer images were generated within the digital scene from the same locations as the photos. The image was overlaid and aligned with the photo using key reference points and visual matching. (Photos were imported in RAW format to avoid degradation of the image, requiring resizing to match the computer image).
- The wire-frame was then switched off leaving the proposed activity in its correct location and scale relative to the photo. Lower parts of the proposed activity were erased using Photoshop software where they would be behind foreground items.
- The time and weather when the photo was taken was entered to the program in order to replicate lighting conditions.
- The completed photomontage is presented over two pages:
 - The photos are produced to replicate correct scale at the nominated reading distance (in this case 400mm).
 - Each photomontage is printed across two facing pages to illustrate a field of view of approximately 110° at a reading distance of 400mm. This approximates the field of human binocular vision. (But not peripheral vision which extends to approximately 200°)

Notes on use of Photosimulations:

- The Photosimulations are a useful tool but they cannot not precisely reproduce real life for the following reasons:
 - 2D Photography flattens an image compared to binocular vision.
 - Photography is static, whereas the human vision can scan and remember information.
 - Photographs are passive, whereas the eye seeks out detail.
 - The human eye can see more contrast than can be reproduced through photography.

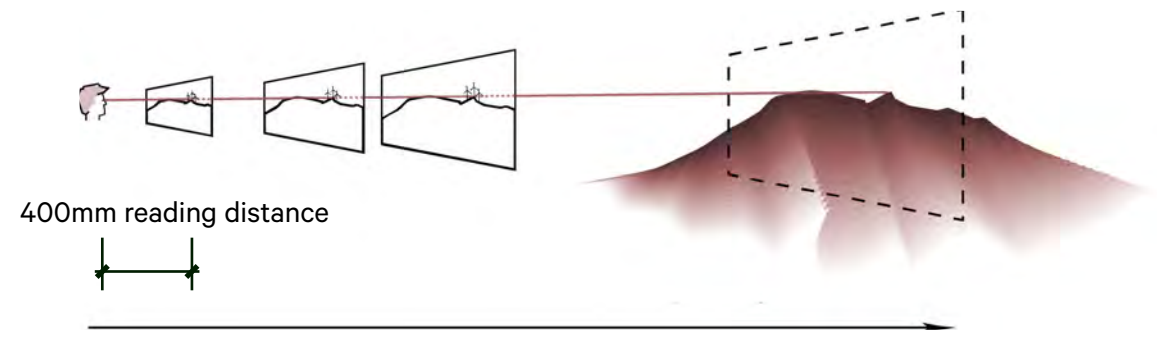


Figure 01: The relationship between reading distance and real life scale.

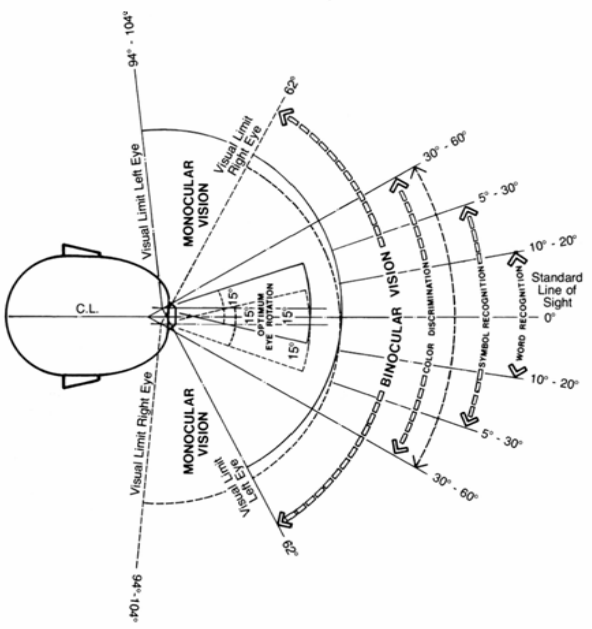


Figure 02: Binocular vision is approximately 124°. Field of view is approximately 110° across 2 x A3 pages at correct scale image for 400mm reading distance (vertical field of view is approximately 33°)

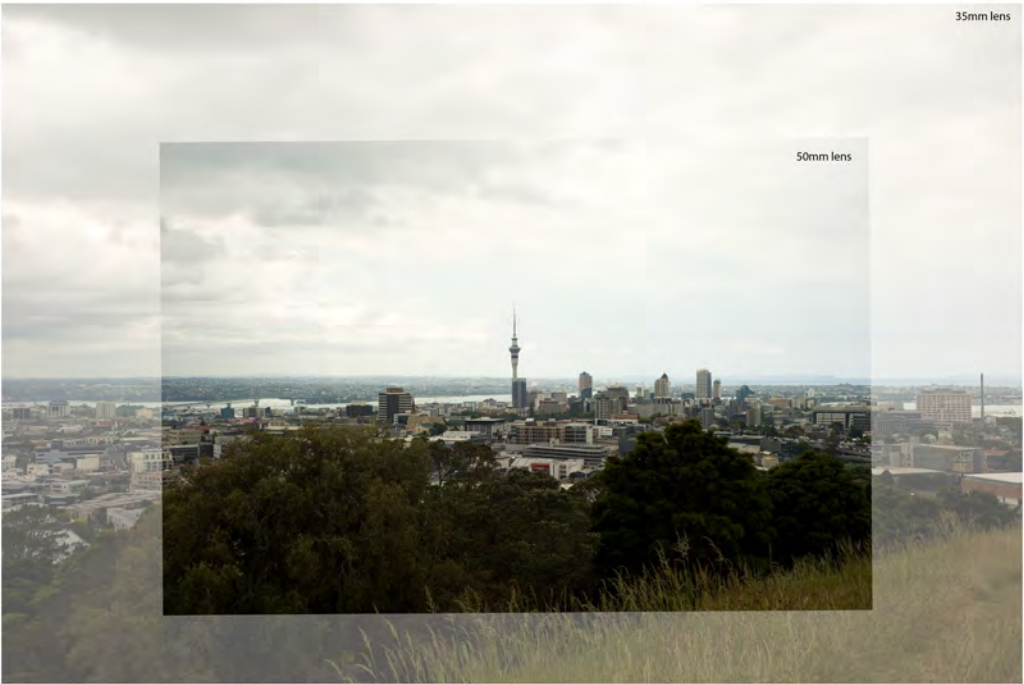


Figure 03: Comparison of 35mm lens and 50mm lens

Two images from the same location. With 35mm and 50mm lenses perspective is influenced by field of view, not by lens focal length. The overlaid portion is identical.

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Visual Simulation Methodology

Appendix B Statutory Framework

Natural Character, landscape and visual matters

New Zealand Coastal Policy Statement 2010

Objective 2

To preserve the natural character of the coastal environment and protect natural features and landscape values through:

- *recognising the characteristics and qualities that contribute to natural character, natural features and landscape values and their location and distribution;*
- *identifying those areas where various forms of subdivision, use, and development would be inappropriate and protecting them from such activities; and*
- *encouraging restoration of the coastal environment*

Policy 6 Activities in the coastal environment

(1) In relation to the coastal environment:

...

- (i) set back development from the coastal marine area and other water bodies, where practicable and reasonable, to protect the natural character, open space, public access and amenity values of the coastal environment; and*

....

Policy 13 Preservation of natural character

(1) To preserve the natural character of the coastal environment and to protect it from inappropriate subdivision, use, and development:

- (a) avoid adverse effects of activities on natural character in areas of the coastal environment with outstanding natural character; and*
- (b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on natural character in all other areas of the coastal environment; including by:*
- (c) assessing the natural character of the coastal environment of the region or district, by mapping or otherwise identifying at least areas of high natural character; and*
- (d) ensuring that regional policy statements, and plans, identify areas where preserving natural character requires objectives, policies and rules, and include those provisions.*

- (2) *Recognise that natural character is not the same as natural features and landscapes or amenity values and may include matters such as:*
- (a) natural elements, processes and patterns;*
 - (b) biophysical, ecological, geological and geomorphological aspects;*
 - (c) natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks;*
 - (d) the natural movement of water and sediment;*
 - (e) the natural darkness of the night sky;*
 - (f) places or areas that are wild or scenic;*
 - (g) a range of natural character from pristine to modified; and*
 - (h) experiential attributes, including the sounds and smell of the sea; and their context or setting*

Policy 14 Restoration of natural character

Promote restoration or rehabilitation of the natural character of the coastal environment, including by:

- (a) identifying areas and opportunities for restoration or rehabilitation;*
- (b) providing policies, rules and other methods directed at restoration or rehabilitation in regional policy statements, and plans;*
- (c) where practicable, imposing or reviewing restoration or rehabilitation conditions on resource consents and designations, including for the continuation of activities; and recognising that where degraded areas of the coastal environment require restoration or rehabilitation, possible approaches include:*
 - (i) restoring indigenous habitats and ecosystems, using local genetic stock where practicable; or*
 - (ii) encouraging natural regeneration of indigenous species, recognising the need for effective weed and animal pest management; or*
 - (iii) creating or enhancing habitat for indigenous species; or*
 - (iv) rehabilitating dunes and other natural coastal features or processes, including saline wetlands and intertidal saltmarsh; or*
 - (v) restoring and protecting riparian and intertidal margins; or*
 - (vi) reducing or eliminating discharges of contaminants; or*
 - (vii) removing redundant structures and materials that have been assessed to have minimal heritage or amenity values and when the removal is authorised by required permits, including an archaeological authority under the Historic Places Act 1993; or*

- (viii) *restoring cultural landscape features; or*
- (ix) *redesign of structures that interfere with ecosystem processes; or*
- (x) *decommissioning or restoring historic landfill and other contaminated sites which are, or have the potential to, leach material into the coastal marine area.*

Policy 15 Natural features and natural landscapes

To protect the natural features and natural landscapes (including seascapes) of the coastal environment from inappropriate subdivision, use, and development:

- (a) *avoid adverse effects of activities on outstanding natural features and outstanding natural landscapes in the coastal environment; and*
- (b) *avoid significant adverse effects and avoid, remedy, or mitigate other adverse effects of activities on other natural features and natural landscapes in the coastal environment; including by:*
 - (i) *natural science factors, including geological, topographical, ecological and dynamic components;*
 - (ii) *the presence of water including in seas, lakes, rivers and streams;*
 - (iii) *legibility or expressiveness—how obviously the feature or landscape demonstrates its formative processes;*
 - (iv) *aesthetic values including memorability and naturalness;*
 - (v) *vegetation (native and exotic);*
 - (vi) *transient values, including presence of wildlife or other values at certain times of the day or year;*
 - (vii) *whether the values are shared and recognised;*
 - (viii) *cultural and spiritual values for tangata whenua, identified by working, as far as practicable, in accordance with tikanga Māori; including their expression as cultural landscapes and features;*
 - (ix) *historical and heritage associations; and*
 - (x) *wild or scenic values;*
- (d) *ensuring that regional policy statements, and plans, map or otherwise identify areas where the protection of natural features and natural landscapes requires objectives, policies and rules; and*
- (e) *including the objectives, policies and rules required by (d) in plans.*

Bay of Plenty Regional Policy Statement

Objective 2

Preservation, restoration and, where appropriate, enhancement of the natural character and ecological functioning of the coastal environment.

Policy CE 2B: Managing adverse effects on natural character within the coastal environment

Preserve the natural character of the coastal environment and protect it from inappropriate subdivision, use and development by including provisions in regional and district plans, and when making decisions on resource consents to:

- (a) Avoid adverse effects of activities on the attributes that comprise natural character in areas of the coastal environment with outstanding natural character as identified in the maps and tables in Appendix I and J;*
- (b) Avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on the attributes comprising the natural character in all other areas of the coastal environment, recognising that areas identified in maps in Appendix I as having high or very high natural character can be especially sensitive to the adverse effects of inappropriate subdivision, use and development; and*
- (c) Recognise that open coastal water in the region is of at least high natural character.*

Policy CE 8B: Ensuring subdivision, use and development is appropriate to the natural character of the coastal environment

When assessing the effect of subdivision, use and development on the natural character of the coastal environment, particular regard shall be given to:

- (a) The level of natural character as shown in Maps in Appendix I, as described in Appendix J, and the level of protection to be afforded by Policy CE 2B;*
- (b) The criteria contained in Set 1 of Appendix F to further refine natural character for resource consents or site-specific mapping;*
- (c) Maintaining coastal margins in a natural state and protecting the natural values of beaches and dune systems, including their ability to reduce the impacts of coastal hazards such as tsunamis and storm surge;*
- (d) The appropriateness of the introduction or accumulation of man-made modifications recognising activities that are:*
 - (i) planned (consented, zoned or designated);*
 - (ii) provided for in reserve management plans; or*
 - (iii) identified in Appendix C, D and E; or (iv) lawfully established;*
- (e) The provisions of Customary Marine Title Management Plans;*

- (f) *Subject to Policy CE 2B avoiding significant adverse effects and avoiding, remedying or mitigating (including, where appropriate, through provision of buffers) other adverse effects on:*
- (i) *Visually, ecologically or culturally sensitive landforms, including ridgelines, coastal cliffs, beaches, headlands, and peninsulas and visually prominent public open space;*
 - (ii) *Estuaries, lagoons, wetlands and their margins (saline and freshwater), dune lands, rocky reef systems and areas of eelgrass and salt marsh;*
 - (iii) *Terrestrial and marine ecosystems;*
 - (iv) *Natural patterns of indigenous and exotic vegetation and processes that contribute to the landscape and seascape value of the area; and*
 - (v) *Regionally significant surf breaks and their swell corridors, including those at Matakana Island and the Whakatāne Heads;*
- (g) *Encouraging efficient use of occupied space through intensification and clustering of developments, rather than sprawling, sporadic or unplanned patterns of settlement and urban growth;*
- (h) *Setting buildings and structures back from the coastal marine area and other waterbodies where necessary, practicable and appropriate to protect natural character, open space, public access and amenity values of the coastal environment, while recognising some structures may have a functional need to be located in the coastal environment, for which a setback would be inappropriate.*

Objective 18

The protection of historic heritage and outstanding natural features and landscapes from inappropriate subdivision, use and development

Objective 19

The preservation of the natural character of the region's coastal environment (including coastal marine areas) wetlands, lakes and rivers and their margins

Policy MN 1B: Recognise and provide for matters of national importance

- (a) *Identify which natural and physical resources warrant recognition and provision for as matters of national importance under section 6 of the Act using criteria consistent with those contained in Appendix F of this Statement;*
- (b) *Recognise and provide for the protection from inappropriate subdivision, use and development of those areas, places, features or values identified in accordance with (a) in terms of natural character, outstanding natural features and landscapes, and historic heritage;*

(c)

Policy MN 3B: Using criteria to assess values and relationships in regard to section 6 of the Act

Include in any assessment required under Policy MN 1B, an assessment of:

- (a) Natural character, in relation to section 6(a) of the Act, on the extent to which criteria consistent with those in Appendix F set 1: Natural character are met;*
- (b) Whether natural features and landscapes are outstanding, in relation to section 6(b) of the Act, on the extent to which criteria consistent with those in Appendix F set 2: Natural features and landscapes are met;*
- (c) ...*

Policy MN 7B: Using criteria to assist in assessing inappropriate development

Assess, whether subdivision, use and development is inappropriate using criteria consistent with those in Appendix G, for areas considered to warrant protection under section 6 of the Act due to:

- (a) Natural character;*
- (b) Outstanding natural features and landscapes;*
- (c) Significant indigenous vegetation and habitats of indigenous fauna;*
- (d) Public access;*
- (e) Māori culture and traditions; and*
- (f) Historic heritage.*

Policy MN 8B: Managing effects of subdivision, use and development

Avoid and, where avoidance is not practicable, remedy or mitigate any adverse effects of subdivision, use and development on matters of national importance assessed in accordance with Policy MN 1B as warranting protection under section 6 of the Act.

[Appendix F – Criteria for assessing matters of national importance](#)

[Appendix G – Criteria applicable to Policy MN 7B](#)

[Appendix I - Coastal environment and natural character maps](#)

[Appendix J – Natural character attributes](#)

Bay of Plenty Regional Coastal Environment Plan

Objective 2

Protect the attributes and values of:

- (a) Outstanding natural features and landscapes of the coastal environment;*

and

- (b) Areas of high, very high and outstanding natural character in the coastal environment;*

from inappropriate subdivision, use, and development, and restore or rehabilitate the natural character of the coastal environment where appropriate.

Policy NH 1

In relation to the natural heritage of the coastal environment, activities may be considered appropriate if they contribute to the restoration and rehabilitation of natural heritage or cultural values associated with natural heritage (including kaimoana resources and cultural landscape features), or if:

- (3) They:*

- (a) Are compatible with the existing built environment and level of modification to the environment. This includes but is not limited to:*
 - i. Modification that is anticipated as a permitted or controlled activity in an operative District or City Plan; and*
 - ii. Urban development activities and associated provision of quality open spaces in Urban Growth Areas contained in the Regional Policy Statement where urban development has been provided for in that area in the relevant District or City Plan, and the development is consistent with the Urban and Rural Growth Management Policies (UG policies) of the RPS; and*
- (b) Are compact, and do not add to sprawl or sporadic development; and*
- (c) Have a functional need to be located in or near the coastal environment in general, or in or near a specific part of the coastal environment and no reasonably practicable alternative locations exist; and*
- (d) Are of an appropriate form, scale and design to be compatible with the existing landforms, geological features and vegetation or will only have temporary and short-term effects on such features; and*
- (e) Will not, by themselves or in combination with effects of other activities, have significant adverse effects on the natural processes or ecological functioning of the coastal marine area; or*
- (f) Involve the operation, maintenance, or upgrading of existing regionally significant infrastructure; and*

- (4) They will not have unacceptable adverse effects on the values and attributes of an Outstanding Natural Feature and Landscape (ONFL), an area of*

Outstanding Natural Character (ONC) or an Indigenous Biological Area A (IBDA A) identified in Policy NH 5;

Except that clauses (1)(a), (b), (d) and (e) of Policy NH 1 do not apply for the National Grid.

Policy NH 5

Adverse effects must be avoided on the values and attributes of the following areas:

- (a) Outstanding Natural Character areas (as identified in Appendix I to the RPS);*
- (b) Outstanding Natural Features and Landscapes (as identified in Schedule 3);*
- (c) Any Indigenous Biological Diversity Area A (as identified in Schedule 2, Table 1); and*

Adverse effects must be avoided on taxa that meet the criteria listed in Policy 11(a)(i) or (ii) of the NZCPS.

A summary of values and attributes for areas of Outstanding Natural Character is provided in Appendix J to the RPS. Values and attributes for Indigenous Biological Diversity Area A and Outstanding Natural Features and Landscapes are set out in Schedules 2 and 3 to this Plan respectively.

Policy NH 6

When assessing the extent and consequence of any adverse effects on the values and attributes of the areas listed in Policy NH 5 and identified in Schedules 2 and 3 to this Plan and Appendix I to the RPS:

- (d) Recognise the existing activities that were occurring at the time that an area was assessed as having Outstanding Natural Character, being an Outstanding Natural Feature and Landscape or an Indigenous Biological Diversity Area A;*
- (e) Recognise that a minor or transitory effect may not be an unacceptable adverse effect; Recognise the potential for cumulative effects that are more than minor;*
- (f) Have regard to any restoration and enhancement of the affected attributes and values, and*
- (g) Have regard to the effects on the tangata whenua cultural and spiritual values of ONFLs, working, as far as practicable, in accordance with tikanga Māori.*

Policy NH 7

Consider providing for subdivision, use and development proposals that will adversely affect the values and attributes associated with the areas listed in Policy NH 5 where:

- (a) After an assessment of a proposal in accordance with Policy NH 6, transient or minor adverse effects on the attributes and values are found to be*

acceptable; or

(b) The proposal:

- (i) Relates to the operation, maintenance, or protection of existing regionally significant infrastructure or upgrading regionally significant infrastructure provided that the scale and intensity of any long term adverse effects of the proposal are the same or similar as those arising from the existing infrastructure; or*
- (ii) Relates to the construction, operation, maintenance, protection or upgrading of the National Grid; or*
- (iii) Relates to the provision of access to offshore islands, or use and development, as set out in Schedule 15 to this Plan; or*
- (iv) Relates to the operation, maintenance and protection of an existing River Scheme or Land Drainage Scheme; or*
- (v) Relates to the continuation of a use that was lawfully established on or before 22 June 2014, provided there has been no change to the scale and significance of effects associated with an activity; or*
- (vi) Provides for the restoration or rehabilitation of indigenous biodiversity, natural features and landscapes or the natural character of the coastal environment in a manner that maintains or enhances the values and attributes associated with the areas listed in Policy NH 5; or*
- (vii) Provides for public walking, cycling or boating access to and along the coastal marine area in a manner that maintains or enhances the values and attributes associated with the areas listed in Policy NH 5.*

Policy NH 8

Significant adverse effects must be avoided, and other adverse effects avoided, remedied or mitigated, on the values and attributes of:

- (a) Any Indigenous Biological Diversity Area B (as identified in Schedule 2, Table 2); and*
- (b) Natural features and natural landscapes (including seascapes) in the coastal environment that are not listed as outstanding in Schedule 3.*

Policy NH 9

Significant adverse effects on natural character in areas that are not identified as outstanding in Appendix I to the RPS are to be avoided, and other adverse effects avoided remedied or mitigated.

Policy NH 19

The guidelines contained in Schedule 4 Management Guidelines for Natural Features and Landscapes should be considered during the development of a proposal to undertake an activity in the coastal environment unless more specific provisions apply in a relevant district or city plan. These guidelines will be taken into account during the consideration of resource consent applications to undertake activities in the coastal marine area.

Policy NH 20

Subdivision, use and development in the coastal environment should consider the use of design techniques, materials and colours that assist in avoiding significant adverse effects on natural character values and attributes. Markers or high visibility materials may be required to provide for safety where relevant. Development in the coastal environment may require set-back from beaches and sand dunes to avoid significant adverse effects on natural character.

Policy NH 21

Planting associated with remediation or mitigation of effects on natural heritage should use appropriate native species, and give preference to the use of eco-sourced native plants. The introduction of exotic plants into areas of Outstanding Natural Character (as identified in Appendix I to the RPS) or an Indigenous Biological Diversity Area A is inappropriate. The introduction of exotic plants into an Indigenous Biological Diversity Area B (as identified in Schedule 2 of the Plan), is inappropriate except where consistent with Policy BS 1.

Policy NH 23

In the consideration of resource consents, maintain identified view shafts of the outstanding natural features and landscapes identified in Schedule 3 Outstanding Natural Features and Landscapes.

Policy NH 24

To maintain or enhance natural heritage values by encouraging landowners and the community to:

- (a) Maintain or improve water quality in wetlands, estuaries and harbours, while recognising that wetlands themselves are natural water filtering systems;*
- (b) Maintain or improve the hydrological regime, including enhancing water quantity and flows, providing for flood retention, connectivity and fluctuations of water levels;*
- (c) Maintain or improve aquatic and terrestrial indigenous biodiversity;*
- (d) Maintain or enhance cultural values;*
- (e) Maintain or enhance amenity values;*
- (f) Retain natural landforms;*

- (g) *Covenant or otherwise protect significant landscape and natural character areas; and*
- (h) *Enhance ecological interconnections that are necessary to sustain indigenous species, including migratory routes.*

Policy CH 10

Require any new hard protection structures to be:

- (a) *Located landward of the coastal marine area, where the primary purpose of the structure is to protect private property;*
- (b) *Designed and constructed by a suitably qualified and experienced professionals;*
- (c) *Designed to avoid as far as practicable any adverse effects on beach amenity and natural character, and to ensure public access to and along the coastal marine area is not restricted, and enhanced where practicable;*
- (d) *Designed to incorporate the use of ‘soft’ protection options, such as beach re-nourishment and planting, where practical;*
- (e) *Designed to withstand coastal processes, including the potential effects of sea level rise, in accordance with the projections set out in Policy CH 5;*
- (f) *Designed to avoid any significant adverse effects at either end of the structure or on neighbouring land; and*
- (g) *Subject to a management plan which as a minimum outlines long-term responsibilities for the structure, including anticipated maintenance methods, timing and funding over the design life of the structure, and the thresholds for any adaptation actions that may be required over 100 years.*

Schedule 4 – Management guidelines for natural features and landscapes

S4.2 DUNELANDS

S4.2.1 Natural Character

Guidelines:

- (a) *Protect natural duneland landforms from inappropriate use and development.*
- (b) *Protect and enhance existing wetlands as part of the duneland visual continuum.*
- (c) *Discourage the installation of aerial utilities and service corridors on dunelands and spits.*

Explanation/Principal Reasons

Dunelands have a characteristic landform pattern which is a typical visual component of the natural character of the coastal environment. Duneland wetlands are an important, sensitive element within the duneland continuum, deserving special protection. The flat character of dunelands and their typical flat plains hinterland means that there is little immediate visual backdrop and generally few opportunities for the visual integration of structures, including aerial utilities.

S4.2.2 Foredunes

Guidelines:

- (a) Protect foredunes from subdivision and development.*
- (b) Protect foredunes from intensive pastoral farming and forestry landuses (note that this guideline does not apply to duneland which is landward of the foredune).*
- (c) Explanation/Principal Reasons Foredunes are particularly sensitive components of the coastal environment. They are prone to rapid degradation and require protection to retain their natural character. Their characteristic landform pattern is an important visual component of the coastal environment.*

S4.2.3 Backdunes

Guideline:

- (a) Protect backdunes and spits from visually inappropriate subdivision, use and development.*

Explanation/Principal Reasons

Degraded dunelands can be rehabilitated through the sensitive planting of appropriate native species. The establishment of good intact vegetative cover on dunelands improves their stability as well as their visual integrity.

Bay of Plenty Regional Natural Resources Plan

IM O2 (Objective 10)

Stewardship of natural resources which:

- (a) Sustains the life-supporting capacity of soil, water and ecosystems.*
- (b) Maintains, and where appropriate, protects cultural, ecological, amenity, natural character and landscape values through management practices that avoid, remedy or mitigate adverse effects.*

IM P7 (Policy 31)

To promote the adoption of the stewardship of soil and water resources, ecosystems, and cultural, amenity, natural character and landscape values.

LM 01 (Objective 9)

Land use and land management practices are appropriate to the environmental characteristics and limitations of the site, and avoid, remedy or mitigate adverse effects on the life-supporting capacity of soil resources, the receiving environment and heritage values.

Western Bay of Plenty District Plan (Operative)

The area is identified an Outstanding Landscape Feature (Natural Feature/Landscape - S24 - Open Coastal Landscape Landward Edge Protection Yard).

Chapter 5 – Natural Environment

5.2.1 Objectives

3. *Preservation of the natural character of the [District's](#) coastal environment (including the coastal marine area), rivers, lakes, and their margins.*

5.2.2 Policies

9. *The adverse effects of inappropriate subdivision, use and [development](#) on the natural character of the coastal environment, [wetlands](#), rivers, lakes, and their margins should be avoided. Where avoidance is not practicable, such effects should be appropriately remedied or mitigated.*

Chapter 6 - Landscape

6.2.1 Objectives

The unique visual quality and character of the [District's](#) outstanding natural features, landscapes and [viewshafts](#) are protected from inappropriate subdivision, use and [development](#).

6.2.2 Policies

1. *Within areas identified as being outstanding natural features and landscapes, landscape character should be protected and enhanced by managing the adverse effects of inappropriate land use and [development](#) activities.*

6.6.1.3 Within Identified Natural Features and Landscapes [Matters of Discretion]

- a. *The extent to which the development will maintain, enhance, or avoid adverse effects on, the integrity of the landform and skyline profile. Factors that will be considered include:*
 - (a) *Reflectivity standards relating to the colour and finish of buildings/structures (see British Standard BS 5252);*
 - (b) *The height of buildings/structures taking into account the*

surrounding landscape;

- (c) Whether building form or works positively respond to the natural landform contour;*
 - (d) The extent of landform modification and whether the finished landform appears natural;*
 - (e) The ability to mitigate effects through landscape planting using native plant species within a timeframe not exceeding five years;*
 - (f) The guidelines identified in the 'WBOPDC Landscape Review – Assessment of Landscape Management Requirements for the Tauranga Harbour Margins and Wairoa River Valley' by Boffa Miskell (October 2008). In particular, the management objectives and descriptions of landform elements on pages 32 and 35 and recommended planning methods for rural areas (plains/river flats, rolling hills/slopes, scarp/cliff and plateau) on page 36.*
- b. The extent to which native vegetation removal can be avoided having regard to the nature and scale of the proposed activity. For subdivision and buildings/structures, native vegetation should not be removed except where there is no alternative for building/structure location or access. Subdivision should locate house sites and access outside existing stands of native vegetation.*
 - c. The extent and location of earthworks having regard to the nature and scale of the proposed activity. For subdivision and buildings/structures, earthworks shall generally not exceed that required for the building(s)/structure(s), vehicle access and turning, and outdoor living court(s).*
 - d. The ability to retain a natural appearance following site earthworks and vegetation removal. All disturbed ground should be contoured to be sympathetic to the natural landform and revegetated with species appropriate to the context and use of the site.*
 - e. The extent of proposed planting on re-contoured slopes steeper than 1 in 4.*
 - f. The extent of visual effects of any works and network utilities.*
 - g. The extent to which Significant Ecological Features within the visual landscape are avoided, maintained or enhanced (See Section 5).*
 - h. The extent to which the location and design of access tracks and roads follow the natural contours, minimise any cut at ridgelines, and mitigate any impact by regrassing/planting. Work should take account of weather and planting times.*
 - i. The extent to which new lot boundaries and fencing follows natural ground contours. Fences should not be located on the top of ridgelines and where*

practical should be incorporated into the landform feature within the lot. Water courses, areas of native bush and wetlands should not be dissected by subdivision or development.

- j. The extent to which production forestry is in general accordance with any applicable industry code of practice. Particular regard shall be given to the following matters:*
 - i. Avoiding geometric and unnatural shapes and unnatural orderliness;*
 - ii. Attention to the shape and line of the production forest to blend into the landscape;*
 - iii. Avoiding disruption to the skyline;*
 - iv. Avoiding vertical lines that divide a landscape;*
 - v. Oversowing clear-felled areas with grasses or replanting as soon as possible after felling;*
 - vi. Avoiding areas of high visual profile, particularly around the Tauranga Harbour margin (excluding Matakana Island) and the Wairoa River valley.*

Chapter 8 – Natural Hazards

8.2.1 Objectives

- 2. Protection of the existing natural character of the coastal environment and other natural features having recognised ecological, landscape or other significance to the [District](#).*

8.2.2 Policies

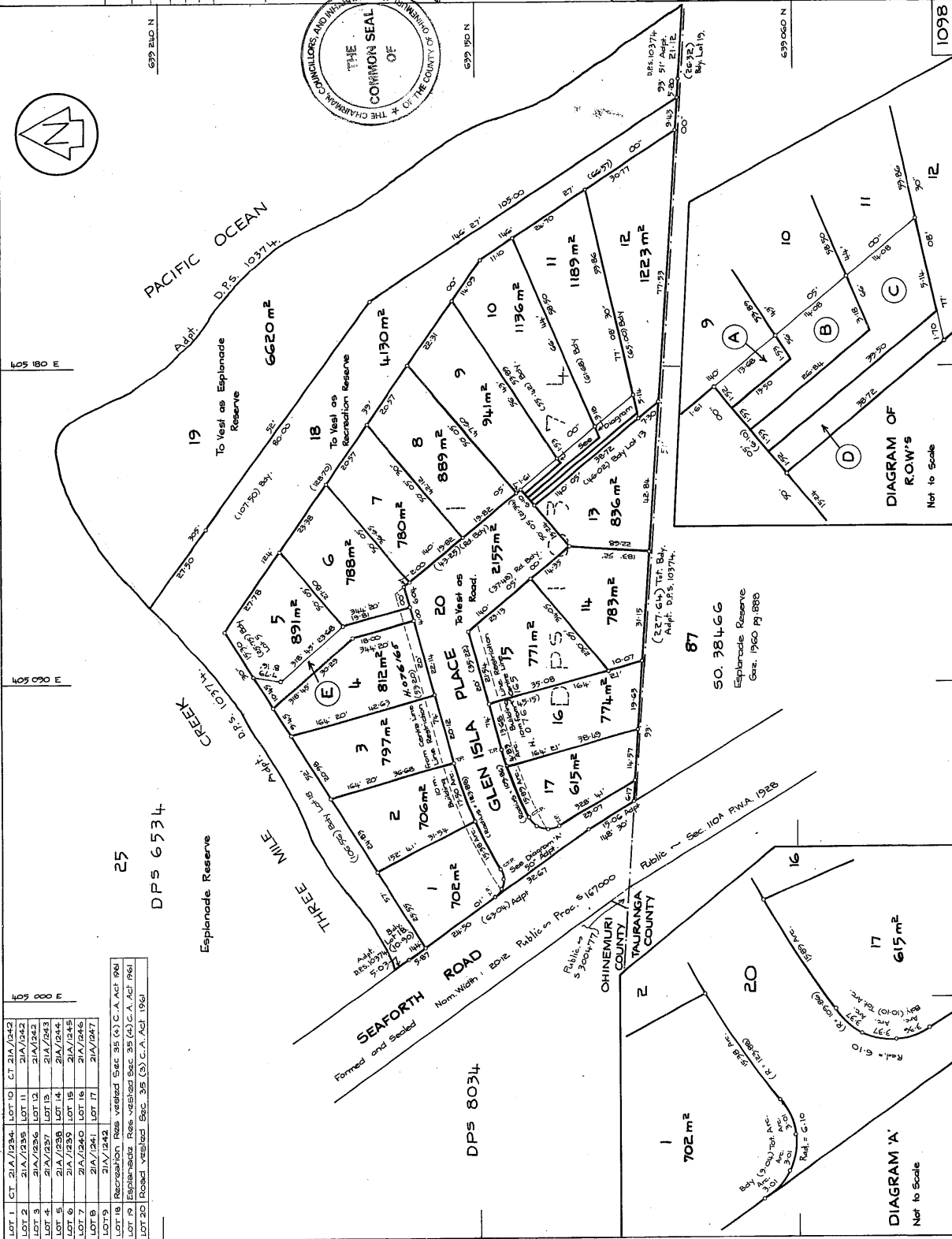
- 5. Ensure that where hazard protection works are necessary their form, location and design are such as to avoid or mitigate potential adverse environmental effects.*
- 7. Encourage the conservation and enhancement of natural features such as sand dunes and [wetlands](#) which have the capacity to protect existing developed land.*

Chapter 18 – Rural

18.2.1 Objectives

- 5. Maintain the rural character and amenity values associated with the low density rural environment.*
- 6. Protection and enhancement of ecological, landscape, cultural, heritage and other features located in the rural environment which are of value to the wider community.*

LOT 1	CT 21A/1234	LOT 10	CT 21A/1242
LOT 2	21A/1235	LOT 11	21A/1243
LOT 3	21A/1236	LOT 12	21A/1244
LOT 4	21A/1237	LOT 13	21A/1245
LOT 5	21A/1238	LOT 14	21A/1246
LOT 6	21A/1239	LOT 15	21A/1247
LOT 7	21A/1240	LOT 16	21A/1248
LOT 8	21A/1241	LOT 17	21A/1249
LOT 9	21A/1242		
LOT 18 Recreation Res. vested Sec 35 (3) C.A. Act 1961			
LOT 19 Esplanade Res. vested Sec 35 (3) C.A. Act 1961			
LOT 20 Road vested Sec 35 (3) C.A. Act 1961			



APPROVED B. Wilson

OWNER _____

MEMORANDUM OF EASEMENTS

Letter	Purpose	Serv. Ten.	Dom. Ten.
A	Right of Way	PT Lot 9	Lots 10, 11 & 12
B	Right of Way	PT Lot 10	Lots 9, 11 & 12
C	Right of Way	PT Lot 11	Lots 9, 10 & 12
D	Right of Way	PT Lot 12	Lots 9, 10 & 11
E	Right of Way	PT Lot 5	Lots 13-17 (Grantee: Chinemuri County Council)

I, Mervyn Wilfred Barker, County Clerk of the Chinemuri County Council hereby certify that the subdivision shown hereon complies with the provisions of the Operative District Scheme and that copies were given on the 15th day of August 1975 to the Registrar of Land and the Registrar of Deeds. The easements shown hereon being duly granted or reserved.

15/12/1975
COUNTY CLERK

Doc No 2616
& H. 07/165

Total Area 2,7538 ha.
Comprised in CT. 121/515 All.

I, Trevor Claude Davies, of Paeraea, Registered Surveyor and holder of an annual practicing certificate hereby certify that this plan has been made from surveys executed by me or under my direction; that both plan and survey are correct and have been made in accordance with the regulations under the Surveyors Act 1966.

Dated at Paeraea this 1st day of December 1975 Signature T. Davies

Field Book S. 239 p. 56-60. Traverse Book 500 p. 240-249
Reference Plans 50, 9310, 908, 9334, 128, 10374, DPS 8034.

Examined T. Davies of Paeraea, District Land Registrar

Approved as to Survey T. Davies
Chief Surveyor

Deposited this 25th day of August 1975
15/12/1975

File 100
Received 3.2.76
Instructions D PS22035

LAND DISTRICT SOUTH AUCKLAND

SURVEY BLK. & DIST. 1 KATIKATI NORTH S.D.

NZMS 177 SHEET NO. N. 53

LOCAL AUTHORITY CHINEMURI COUNTY

Surveyed by HOGAN AND DAVIES

Scale 1:750 Date OCTOBER 1975

LOTS 1-20 BEING SUBDIVISION OF LOT 1 DPS 10374
BEING PT WAHI No. 5 BLOCK.

MEMORANDUM OF EASEMENTS			
Letter	Purpose	Survey	Donor
A	Right of Way	PT Lot 9	Lots 10, 11 & 12
B	Right of Way	PT Lot 10	Lots 9, 11 & 12
C	Right of Way	PT Lot 11	Lots 9, 10 & 12
D	Right of Way	PT Lot 12	Lots 9, 10 & 11
E	Right of Way	PT Lot 5	Lots 13-17 Onionium County Council

1. Mervyn Wilfred Barker, County Clerk of the Onionium County Council hereby certify that the subdivision shown hereby complies with the provisions of the Operative District Scheme and that consent was given on the 12th day of February 1975.

Subject to the easements set out in the Memorandum herein being duly granted or consented.

in favour of
COUNTY CLERK
15/12/1975

Doc H076166
& H.076165

Total Area 2.7538 ha.
Comprised in CT. 124/315 All.

1. Trevor Claude Davies of Paeroa Registered Surveyor and holder of an annual practicing certificate hereby verify that this plan has been made from Surveys executed by me or under my direction; that both plan and Surveys are correct and have been made in accordance with the regulations under the Surveyors Act 1966.

Signed at Paeroa this 1st day of December 1975 Signature *T. C. Davies*

Field Book S. 239, p. 56-60. Traverse Book 500, p. 250-259.

Reference Plans 50, 955-10, 506, 533, 573, 1037A, DTS 805H, 50, 506A.

Examiner *[Signature]* Correct *[Signature]*

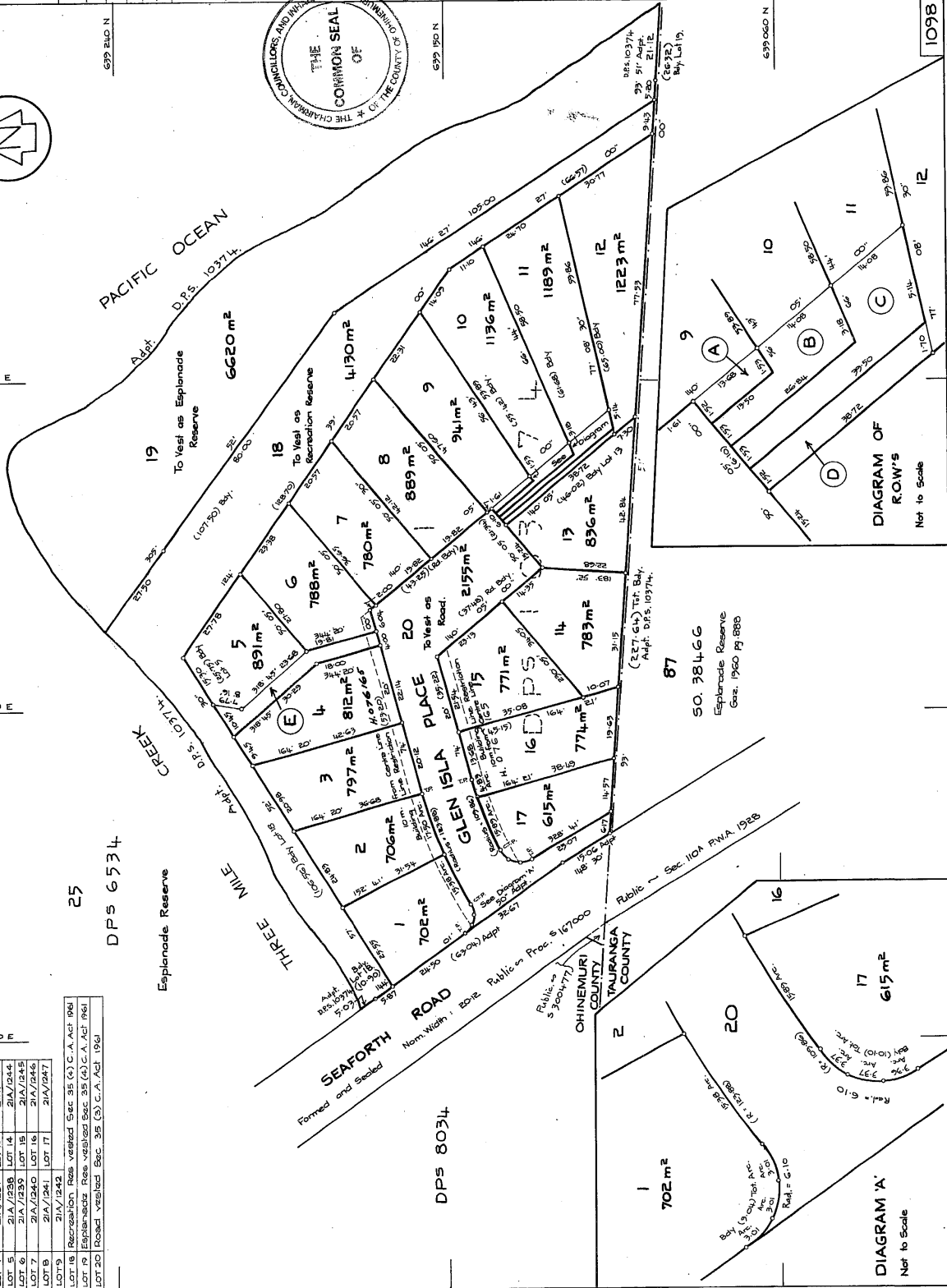
Approved as to Survey *[Signature]* Chief Surveyor

25.5.76 Deposited this 26th day of August 1976 *[Signature]*

File No. District Land Registrar

Received 3.2.76 Instructions

D PS22035



LAND DISTRICT SOUTH AUCKLAND
SURVEY BLK. & DIST. 1 KATIKATI NORTH S.D.
NZMS 177 SHEET No. N. 53

Coastal Protection Project

for

Glen Isla Protection Society



Assessment of Coastal Processes



Rev B

October 2024

Job Ref: 23028

P.O. Box 185

Orewa

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1.0 Introduction

The Glen Isla Protection Society (“GIPS”) comprise a group of beachfront homeowners at 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place, Waihi Beach. Their properties, located south of “Three Mile Creek”, adjoin an approximately 200m stretch of unarmoured coastline, subject to coastal erosion.

Following a series of large erosion and storm events, including Cyclone Gabrielle, the GIPS propose to construct a buried revetment structure, supplemented with dune nourishment and replanting. The intent is to protect the backshore from further erosion, and future-proof this land for the effects of sea-level rise.

To support the necessary resource consent applications, GIPS have instructed Davis Coastal Consultants prepare a report on the effects of the proposed structure on the coastal process environment.

This report assesses the potential effect of the proposal on coastal processes, including in relation to future coastal erosion risk, in accordance with current best practice methodologies. It includes consideration of the effects of climate change over at least a 100-year timeframe.

A further report by Davis Coastal Consultants (Engineering Design Report – October 2024) sets out the design philosophy and assumptions and calculations undertaken as part of the wall and dune development for this project.

1.1 Definitions

Within this report terminology for the intertidal and tidal area is consistent with those defined in the Resource Management Act:

Coastal Marine Area – CMA – *“means the foreshore, seabed, and coastal water, and the air space above the water -*

(a) of which the seaward boundary is the outer limits of the territorial sea:

(b) of which the landward boundary is the line of mean high water springs...”

Common Marine and Coastal Area – CMCA – *“means the marine and coastal area other than –
(a) specified freehold land located in that area; and
(b) any area that is owned by the Crown...”*

Mean High Water Springs – MHWS – *“the average of the heights of each pair of successive high waters during that period of about 24 hours in each semi-lunation (approximately every 14 days) when the range of tides is the greatest”*

Foreshore – *“means any land covered and uncovered by the flow and ebb of the tide at mean spring tides and, in relation to any such land that forms part of the bed of a river, does not include any area that is not part of the coastal marine area”*

Backshore – All land above Mean High Water Springs

2.0 Description of Existing Environment

2.1 Location

Waihi Beach is a coastal township located on the east coast of the North Island at the northern extent of the Bay of Plenty Region. It is an open coast beach, situated approximately 10km east of the inland town of Waihi. The site is directly south of Three Mile Creek (Figure 2.1a), and extends south from the creek along approximately 200m of coastline, seaward of properties 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place.

The Reserve, located between the private properties and the adjacent CMA, is described as Reserve Lot 18 DPS 22035 and Esplanade Reserve Lot 19 22035. The wall structure is to be entirely located outside the CMA. The wall extents are shown below (Figure 2.1b).



Figure 2.1a: Waihi Beach

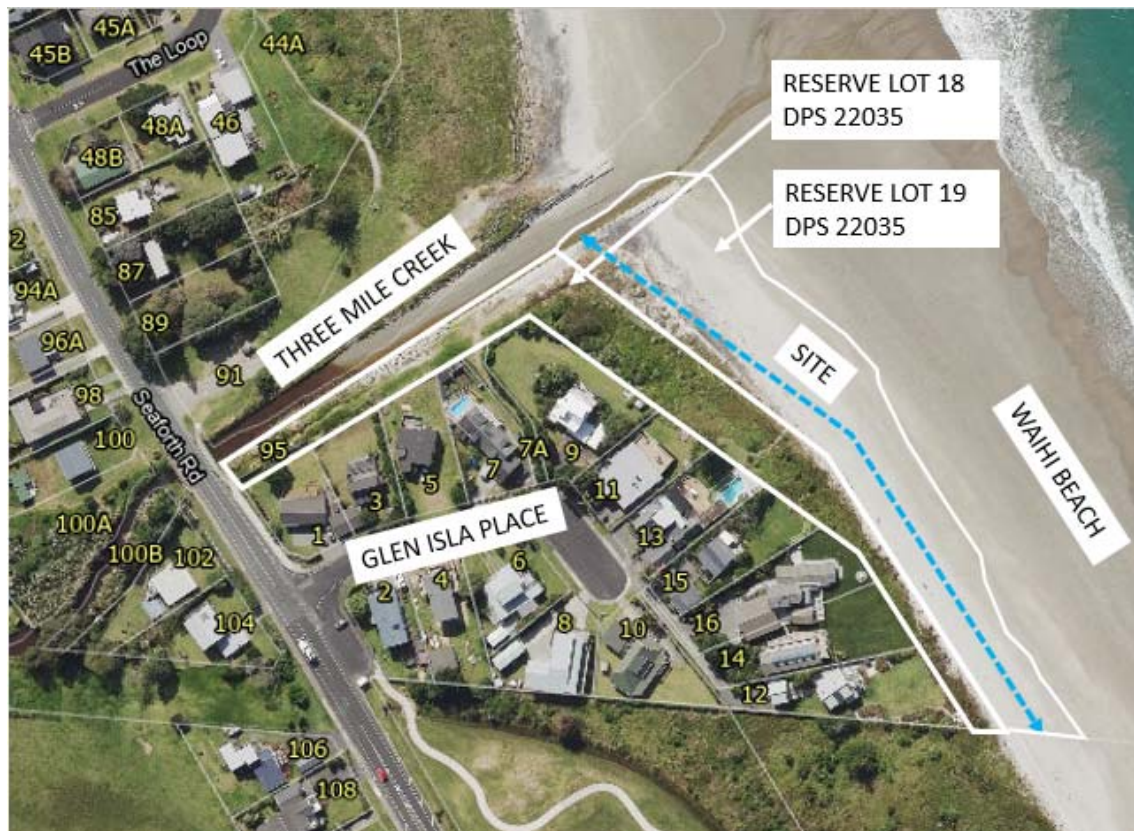


Figure 2.1b: Site adjacent to Three Mile Creek, Waihi Beach

2.2 Wider Morphology

Waihi Beach is a 10km long, open-coast barrier beach orientated north-east. Two creeks (Two Mile Creek and Three Mile Creek) discharge through the dune system onto the coast, and small dune systems characterise the foreshore where there is no development. Three Mile Creek is a man-made stormwater outlet through the dune system, which is discussed further in Section 3.4. Extensive residential development has resulted in properties in close proximity to the coastal margin for much of the central and northern beach. The coastline continues to the south and terminates at the Bowentown barrier spit. The spit is welded to outcropping rock structure that forms the northern headland to the Tauranga Harbour, an approximately 220km² large tidal estuary system (Figure 2.2a).

The deposition of the beach and dune sediments that make up this open coast beach began following stabilisation of sea-level to present level between 6500 – 7500 years ago, with an onshore movement of sediments from the adjacent continental shelf. This resulted in

progradation of the beach face over time such that relic dune ridges are visible much landward of the existing coastline, evidence of a historic shoreline position. The natural dune system is clearly visible in aerial images, and is shown below on a historic aerial from 1942 prior to development of the central and southern coastline (Figure 2.2b). Holocene age paleo-frontal dunes sit approximately 50m-100m behind the present dune system which is intersected by older, more stabilised, transgressive, and parabolic dunes at central and south Waihi Beach. The dune ridge system has been modified through development on Waihi Beach. In most places, a strip of natural dune remains between development and the beach.



Figure 2.2a: Wider plan of Waihi Beach

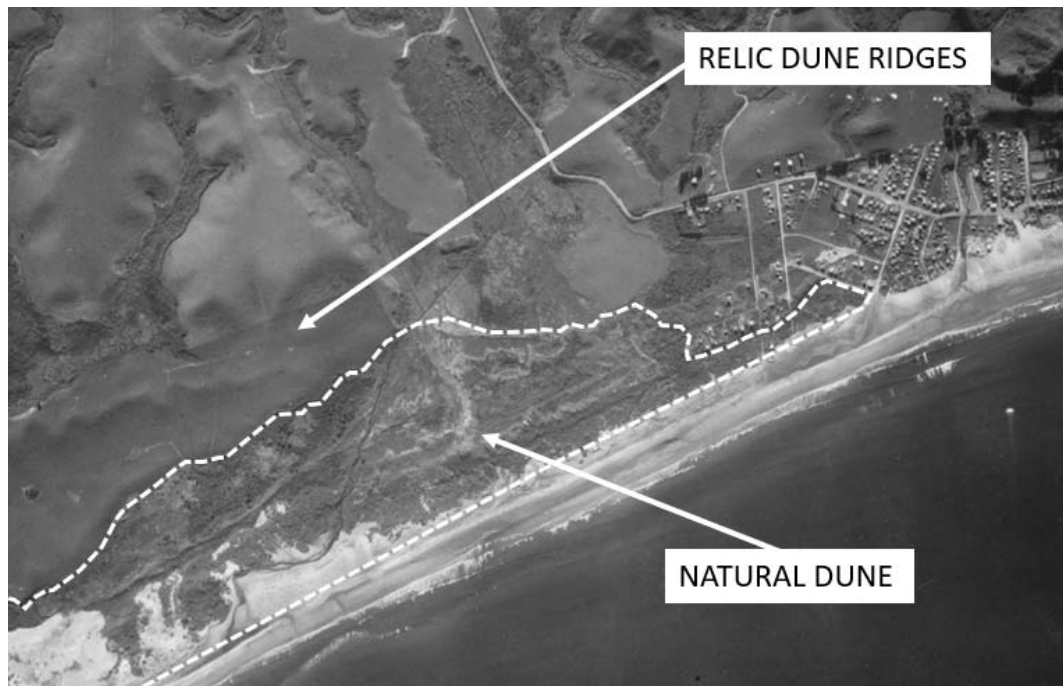


Figure 2.2b: 1942 Aerial of Waihi Beach – Retrolens.co.nz

2.3 Site Description

The site is located towards the centre of Waihi Beach, along a stretch of coastline characterised by a gently sloping intertidal area (approximately 1:17) which rises slowly to an unarmoured, narrow, vegetated bank. The site is part of a development on the seaward side of Seaforth Road, bound by Island View Reserve at its southern extent and a training groyne to the Three Mile Creek river channel and outlet at the northern extent (Figure 2.3). The GIPS properties are located landward of the narrow frontal dune, at an elevation of approximately Relative Level (RL) 4, and the original dwellings were all built between 1970-1990. Grassed lawn, comprising the modified back dune zone, typically separates the buildings from the frontal dune and such back dune as remains. However, the frontal dune is subject to episodic storm erosion and this was particularly evident during the series of large storm events including Cyclone Gabrielle in February 2023.

The current vegetated extent of the back dune system at the site is approximately 20m wide, closest to the channel outlet, and narrows to approximately 4-5m wide towards 12 and 14 Glen Isla Place. The remaining vegetated dune has been described in more detail in the Ecology Report but generally comprises a small number of isolated trees at the landward section with

more ground cover species at the seaward extent. At the northern end of the site, the dune slopes from RL4.5 at the crest to the beach face at RL3 at approximately 1:16. At the southern extent of the site, the dune slopes more steeply at 1:4 from RL4.5 to RL3 towards a sandy beach, approximately 100m wide.



Figure 2.3: Features of the site

2.4 Geology

The underlying geology of the site is shown in the 1:50,000 Geological Map published by GNS (Figure 2.4). The Map describes the sediments of the Waihi Beach area as Holocene wind-blown dune deposits of the Kariotahi Group, that are *“loose to poorly consolidated, quartzofeldspathic and mafic-rich dune sands and associated facies”*. Directly inland of Waihi Beach are Late Pleistocene stable (windblown) dune deposits (light yellow), Late Miocene to Middle Pleistocene Rhyolitic River deposits (dark yellow), and Holocene River deposits (white). It is assumed the more recent Holocene River deposits have been deposited over the underlying Late Miocene to Middle Pleistocene Rhyolitic River deposits and Late Pleistocene windblown dune deposits.

The northern end of the barrier beach is bound by andesitic and dacitic material of the Coromandel Volcanic Zone and the southern end is bound by rhyolitic material of the Coromandel Volcanic Zone at the northern headland to the Tauranga Harbour.

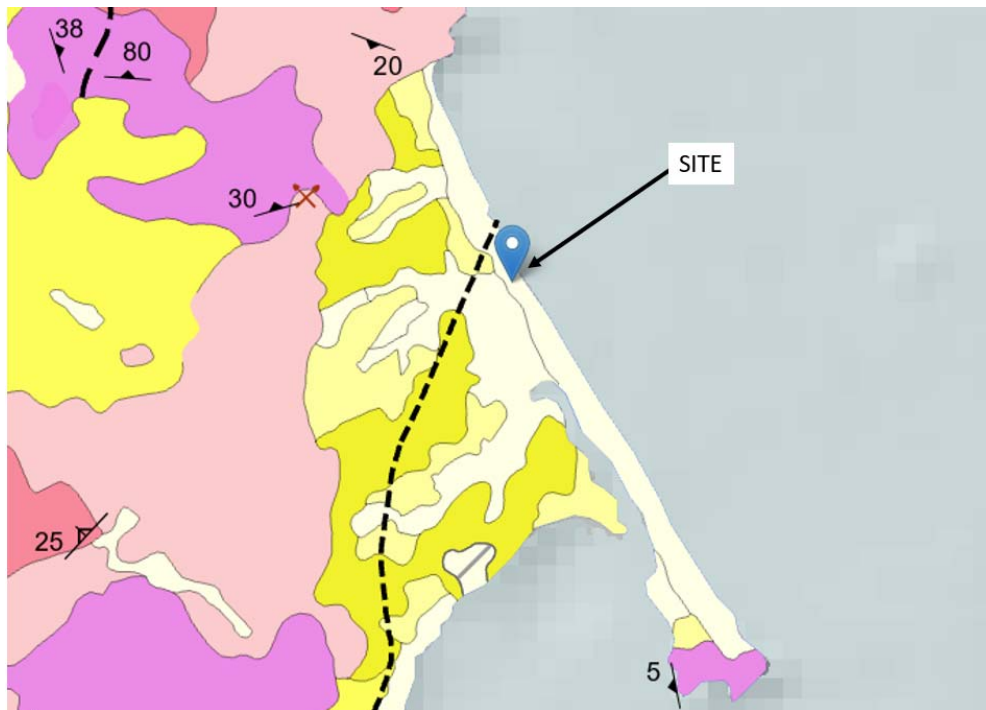


Figure 2.4: Excerpt from Geology Map by GNS showing site geology

3.0 Coastal Processes

3.1 Astronomical Tide

Tidal information is published online by LINZ, who provide Standard Port data for Tauranga. This is the best available data on the likely tidal range at the site. Data published online by LINZ is in terms of Chart Datum (**CD**). A topographic survey of the site is in terms of New Zealand Vertical Datum 2016 (**NZVD-2016**), and all existing beach monitoring data is in terms of Moturiki Vertical Datum 1953 (**MVD-53**). These two datum have been related to CD at Tauranga through a common relationship to LINZ BM BC84. This gives a conversion factor of $NZVD = CD - 1.16$, and $MVD = CD - 0.97$.

Accordingly, the tidal information has been expressed in terms of CD and RL to MVD-53 and NZVD-16 below (Table 3.1).

Existing work has been undertaken by Davis Coastal Consultants (Memorandum – Location of Mean High Water Springs, 28 March 2024, Appendix C) to determine MHWS for the purposes of the CMA boundary. This has been agreed with the Bay of Plenty Regional Council (“**BOPRC**”). RL 1.0 (**MVD-53**) was adopted in that reporting and is adopted here also.

Datum	HAT	MHWS	MHWN	MLWN	MLWS	MSL
Tauranga CD (m)	2.17	1.92	1.64	0.55	0.21	1.11
Tauranga NZVD-16 (RL)	1.0	0.8	0.5	-0.6	-1.0	0
Tauranga MVD-53 (RL)	1.2	1.0	0.7	-0.4	-0.8	0.2

Table 3.1: LINZ predicted tide levels at Tauranga

3.2 Storm Tide

During storm events water levels become higher due to lower atmospheric pressure and the effect of onshore wind energy “pushing” water towards the coast and up harbours in an effect called storm surge. Storm tides can be defined as tides that include the effects of storm surge and these represent the highest range of water levels experienced in coastal regions in decadal

time scales. There are also other oceanic driven variations in the water level that affect extreme tidal levels that are captured in the tidal record.

The Bay of Plenty Regional Council commissioned NIWA in 2019 to develop a hydrodynamic model of the Tauranga Harbour, calibrated to tidal data and observations at numerous locations throughout the Harbour. The model outputs included some locations near the southern headland of the Bowentown Spit, at the Katikati Entrance to the Harbour (Figure 3.2). Whilst the exact location of model output site '92' is difficult to discern from the figures provided there are no other model outputs on the open coast, and it is assumed this is inside the upper estuary arm that runs behind the Bowentown Spit. Sites '95' or '96' are therefore considered most likely to represent open coast water levels, in the absence of wave effects, as they will have least additional amplification due to the shallow inner waters of the estuary.



Figure 3.2: Model Output sites – NIWA, 2019

The simulated 1% and 2% extreme storm tide levels modelled by NIWA for both sites are shown below (Table 3.2). The levels provided in the reporting are relative to MVD-53, and these have been converted to NZVD-16 (-0.2) for comparison with the local topographic survey. The modelled locations are approximately 7km southeast from the site. Additional modelling is also available for previous NIWA work (1997) which produced storm tide levels at Moturiki Island,

approximately 30km to the south-east. These are also shown below. There is good agreement between Site 96 just inside the Harbour entrance and the open coast site. Accordingly, these are adopted.

	MVD-53	
Model Output Site	1% AEP	2% AEP
Site 95	2.12	1.91
Site 96 (adopted)	1.98	1.78
Moturiki Island (1997)	1.99	1.78

Table 3.2: Predicted Annual Exceedance Probability for Mount Maunganui (ex NIWA, 2017)

3.3 Wave Climate

The Waihi Beach coastline is an open coast beach, and as is typical on the east coast of the North Island, is affected by sub-tropical lows and by systems originating in the tropics moving south towards New Zealand as tropical or ex-tropical cyclones.

Information on the wave climate at the site has been obtained from MetOceanView, who have a publicly accessible website where data from their wave model ('**MSL SWAN**') is available. The nearest available model location to the site is located 600m offshore from the site. This data is shown below (Table 3.3a).

As expected, the northeasterly wave direction is shown to be the most frequent for the modelled location, comprising 97.5% of the wave record. The record shows waves of 0-1.0m 73% of the time. Waves larger than this are rarer, with waves at 1.0-2.0m comprising 27% of the record. Waves in the 2 – 2.5m range are highly infrequent, being 0.2%, and no counts of waves above 2.5m were recorded at this location.

Direction	0 – 0.5m	0.5 – 1.0m	1.0 – 1.5m	1.5 – 2.0m	2.0-2.5m
N	<0.1%	<0.1%	0%	0%	0%
NE	26.8%	43.7%	18.7%	8.1%	0.2%
E	0.4%	0.9%	0.3%	<0.1%	0%
S	<0.1%	0%	0%	0%	0%

SW	<0.1%	<0.1%	0%	0%	0%
W	0.6%	<0.1%	0%	0%	0%
NW	<0.1%	<0.1%	0%	0%	0%

Table 3.3a: Wave data for Waihi Beach (cords: 175.9583, -37.4150, app.metoceanview.com)

Additional work has also been undertaken by NIWA (2013) in relation to extreme waves, which have been modelled for 10 year and 100 year Annual Return Interval (**ARI**) for Waihi Beach. These values are shown below (Table 3.3b). The extreme wave heights below have been used to determine the appropriate nearshore wave for design of the structure. Wave modelling was also undertaken by RoyalHaskoning DHV (**RHDHV**) as part of work further north on the Coromandel coastline for Thames Coromandel District Council. That work quotes a 1% Annual Exceedance Probability (**AEP**) for the offshore easterly wave per Table 3.3c below).

ARI	10year ARI	100year ARI
Extreme wave height (m)	4.6	5.3

Table 3.3b: Waihi Beach extreme wave heights (NIWA, 2013)

Wave height (H_{sig})	Peak Period (T_p)
5.37	11.3

Table 3.3c: East Coast (ERA5) output for 1% AEP water level – joint probability wave height and period (RHDHV, 2021)

3.4 Three Mile Creek and Groyne Morphology

One of the key morphological aspects of the site, that separate it from a typical open coast barrier beach, is the location of the outlet of Three Mile Creek immediately north of the site (Figure 3.4a). The creek runs through a culvert under Seaforth Road, and then within a rock-lined channel approximately 10m wide, for a length which varies but is approximately 85m to the southern bank and 115m to the northern bank. The armouring then transitions to geotextile sand containers forming training groynes at both sides of where the outlet pushes through the foredune. The north and south groynes, terminate approximately 160m and 170m, respectively from Seaforth Road, on the intertidal foreshore.



Figure 3.4a: Armouring to 3 Mile Creek

Typically, the location that a watercourse exits through a dune system is associated with greater dune fluctuation and, on average, a retreated shoreline. There is often significant loss of the adjacent dunes due to channel wander and beach lowering of the outlet channel. The wander is caused by wave driven beach sediment transport dominating the stream transport at most flow regimes. The wandering channel can directly erode the dunes on either side.

In addition, lowered beach level associated with the channel, allows larger waves closer to the dune line and less dissipation of swash, and these factors exacerbate dune erosion adjacent to the watercourse. The flowing watercourse then provides a ready mechanism to transport eroded material from the base of dune. At Three Mile Creek, this recess in the dune line is clear from direct observation but also readily observed from aerial photography and topographic survey.

Historical Cadastral and Survey plans, geomorphologic considerations and reported local history all indicate that the Three Mile Creek is an artificial man made and artificially maintained stormwater outlet through the dunes. One of the most obvious indicators of this, is that even

with the increased piped flow to the outlet through the establishment of urban infrastructure, it still requires groynes and manual clearing (typically monthly and after storm events) to maintain flow. If the groynes and manual clearing of the channel did not occur the channel would block and become closed. It is reported (Tonkin and Taylor December 2012) that it was constructed *“circa 1930’s to drain the backshore area, to provide for farming and residential development of the area.”*

To summarise, a watercourse was created to discharge public storm water and wastewater at Three Mile Creek and that discharge results in a retreated dune line and additional risk of erosion to the adjacent properties; namely the Glen Isla Place properties. Since the installation of the groynes the retreat of dune toe at the outlet has become less pronounced but can still be readily identified (see Figure 3.4b). Similarly, the risk of further erosion around the outlet has been decreased by the installation of the groynes but it is still higher than the surrounding beach.

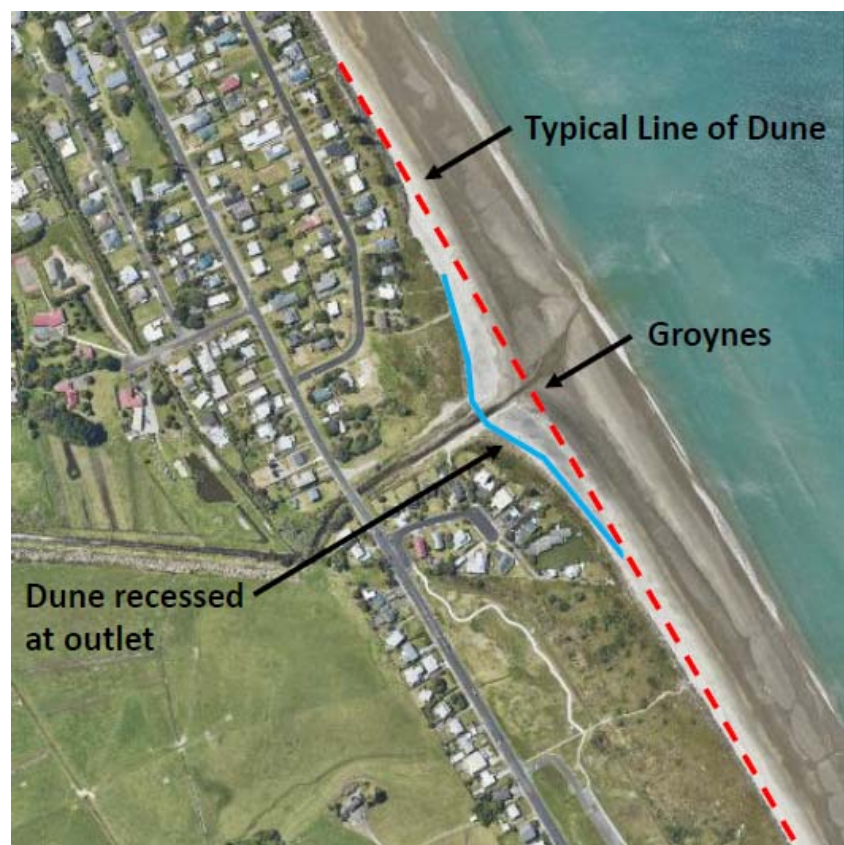


Figure 3.4b: Indicative dune line at TMC outlet

Since construction of the groynes, sand has tended to accumulate on the southern side of the southern groyne, indicative of a net northerly longshore transport of sediment (at least in the

period since construction was undertaken in 2011). This is highlighted by the progradation of the dune line to the south side of the southern groyne. The first image below (Figure 3.4c) from 2024, has marked out the approximate edge of the existing dune vegetation. This same line is compared with an image from 2003, pre-groyne construction, and shows a much more retreated dune line, clearly affected both by migration of the river channel but also significantly lower sediment levels.



Figure 3.4c: Dune line post groyne construction



Figure 3.4d: Dune line pre-groyne construction

3.5 *Historic Beach Changes – Historic Aerials*

Inspection of historic aerials can provide a useful tool to make qualitative assessment of historic coastline changes. Historic images were obtained as far back as 1948, with common repeated features between images used to georectify and align the images. The geo-rectified images are attached as Appendix B, and delineations from 1948, 1963, 1975, 1982, 1986, 1999, and 2024 are overlaid on the 2024 aerial below (Figure 3.5a).

The most visible ‘line of vegetation’ has been mapped and trends in the coastline positions are described below for the 76 year period. In general, the coastline at the site, directly in front of Glen Isla Place, appears to be dominated by river mouth processes. As noted above the variation in the river mouth position can lead to a retreated dune line, however despite the periodic fluctuations of the river clearly influencing the dune vegetation, in general, the coastline has prograded significantly over the period since 1948. It is hypothesised that Three Mile Creek represents a reasonable sediment source to the beach system, which has assisted as in input to the sediment budget at the site.

The 1948 coastline is the most retreated on record, with accretion of 35-70m occurring between this and 1963, some 2-5m/yr. The shoreline has seen much less change since this point, with relatively constant accretion continuing to occur, at least in front of the site, through to 1999. The 2024 shoreline picks up the nearly unprecedented retreat that occurred in the extreme weather events in Jan-Feb 2023, and is approximately 3-5m landward of the 1999 coastline. Due to the length of time between these subsequent measurements there will be some fluctuation that is not captured by this record, but the accounts of the storm events indicate that Cyclone Gabrielle was likely responsible for a large part of the retreat that occurred.

Comparatively, the shoreline further south of the site has a less modified backdune and, being further from the river mouth, is dominated by open-coast processes. The 1963 shoreline was one of the more seaward positions in the record, and coastal erosion, although relatively slow at approximately 0.2m/yr, is present between 1963-1986.



Figure 3.5a: Historic coastlines overlaid on 2024 aerial

The most recent work by the WBOPDC (T&T, 2015) to define the coastal erosion hazard to Waihi and Pukehina, undertook analysis of the long-term shoreline trends from these historic shorelines. This calculated trends along the shoreline at 5m intervals using proprietary software. The data at the site is shown below (Figure 3.5b), which indicates accretion, as per the work above, with the colour key indicating this to be in the order of 0.25 – 1.5m/yr across the site.



Figure 3.5b: Long-term regression rate (T&T, 2015)

Another aspect of the beach changes that are evident in the historic aerial record, is the significant effect that dune restoration has had on the beach system. In the older aerals (see Figure 3.5c), access to the beach from the growing development was poorly controlled, and dune vegetation was disrupted as indicated by the presence of dune tracks. The dune system has been significantly altered by subdivision development. This is evident at Glen Isla Place which was developed on the dune system. The dune system further south has also been altered with the landward half appearing to have been grassed and more formally maintained for recreation and access between 1975 and 1982 (Figure 3.5d).

A coastal restoration programme, run by Coast Care, has been working on restoring and protecting dunes within the Bay of Plenty since 1994. Their work includes dune replanting and community education on access at Waihi Beach. The introduction of dune stabilisation species, such as *Spinifex* and *Pīngao*, helps mitigate erosion and natural dune repair is improved as sand is trapped and built up by these species during accretionary periods between storm / erosion events. The extent of healthy and relatively stable foredune systems present at Waihi Beach, are due in large part to the efforts of this community volunteer organisation.



Figure 3.5c: Historic aerial showing man-made dune tracks and subdivision development 1975



Figure 3.5d: Historic aerial showing reduced dune size and Glen Isla Place subdivision 1982

3.6 Beach Monitoring Data – MHWS Analysis

Waihi Beach has reasonable monitoring data for approximately 30 years (CCS49 and CCS50), and a limited amount of older data going back over 45 years (CCS49). The locations of monitoring data are shown below (Figure 3.6a). This data was obtained and analysed by Davis Coastal Consultants in a separate, appended, memorandum (Appendix C), which defines the envelope of MHWS fluctuation in the historic data, primarily to resolve the location of the CMA boundary with respect to the proposed structure.

The analysis of the two long term profiles (CCS49 and 50) and comparison of these with the three additional shorter term profile records (S1-S3) allowed the plotting of the width of the historic excursion of MHWS, onto the beach seaward of the site at Glen Isla Place, in order to demonstrate the position that MHWS has occupied over the last 30-35 years (Figure 3.6b).



Figure 3.6a: Monitoring profiles in relation to the site

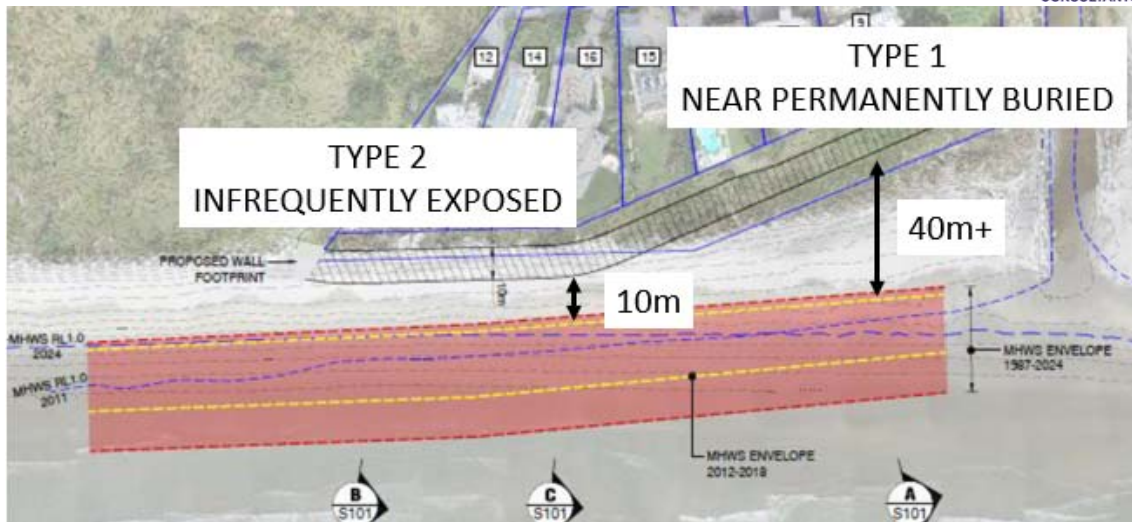


Figure 3.6b: Historic range of MHWS in relation to the site

3.7 Short Term Erosion / Shoreline Fluctuations

As an open ocean beach with predominately shore parallel wave approach, and a healthy dune system, erosion typically comprises storm cut of the dune and beach lowering for long lengths of coast. Eroded sand moves primarily across shore, to be deposited in intertidal and subtidal bars, before moving back onshore in periods of rebuilding associated with lower wave energy.

Erosion is (storm) event based and part of ongoing natural fluctuation. The fluctuations occur on various timescales from twice-daily tidal changes through seasonal variations to very long pan decadal cycles and extreme storm events. These various fluctuations are not cumulative and as long as there is adequate sediment, the shoreline will recover an equilibrium position.

The monitoring data captures the full extent of beach fluctuations over the monitoring period. The RL3.0 contour is well above the area of tidal interaction and changes at this level tend to represent the storm driven erosion and dune rebuilding. The excursion data for the RL 3.0 contour south of the site (CCS49) (Figure 3.7) clearly shows the extreme extent of the 2023 retreat, noting that the beach was monitored prior to the Cyclone Hale/Gabrielle sequence of cyclones. The RL 3.0 excursion north of the site (CCS50) also shows strong retreat though this period but interestingly shows greater retreat in 2011.

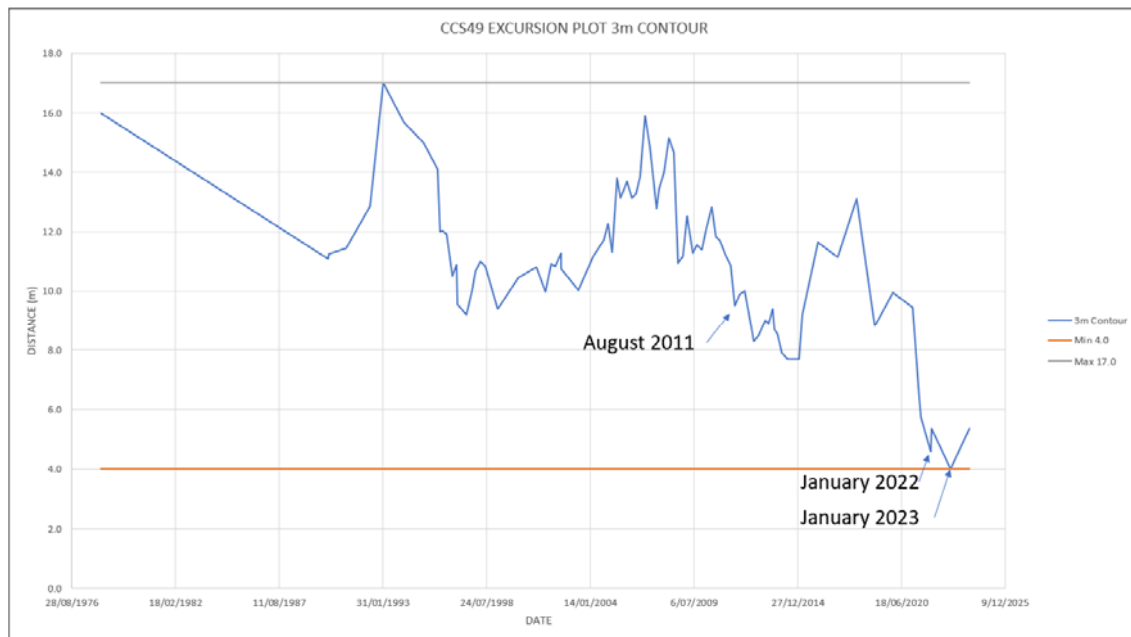


Figure 3.7: RL3.0 Excursion CCS49

3.8 Future Erosion Hazard – Probabilistic Analysis

Overlaying these short-term fluctuations can be slow, long-term trends associated with a slow net loss of sediment or net sea level rise creating a retreating shoreline position. At Glen Isla there has been long term accretion associated with changes in the Three Mile Creek Outfall. Either side of the Creek, small net retreats tend to dominate. These are predicted to increase with Climate Change driven sea level rise.

The WBOPDC report¹ uses both monitoring data from the beach monitoring profiles, and historic aerial analysis, to undertake a probabilistic analysis of the future shoreline retreat at each monitoring profile across Waihi and Pukehina. The underlying recession occurring at each profile location was reviewed, then future recession due to sea-level rise was determined using a Bruun analysis. An allowance for short-term retreat and regression of the dune to a stable angle of repose was also allowed for.

With reference to the profile locations above (Figure 3.6a), CCS50 is approximately 500m to the north of the site and displays no clear linear regression trend for the record (Table 4-2, TnT,

¹ Tonkin & Taylor, 2015, Coastal Protection Areas Re-assessment Stage Two

2015). CCS49 is approximately 650m to the south, and into the area where regression of the beach is indicated in the historic aerial analysis. This profile shows linear regression of -0.1m/yr.

The report, which was prepared in 2015, used the following values for sea-level rise (Table 3.8a).

Timeframe	Min (m)	Mode (m)	Max (m)
2065	0.19	0.29	0.39
2115	0.45	0.77	1.1

Table 3.8a: Adopted future sea-level rise values, TnT (2015)

The coastline was divided into cells, with the subject site being 'Site 1G'. For each cell, component bounds influencing the Coastal Erosion Hazard Zone (**CEHZ**) were defined and then adopted. Probability distributions for each parameter were generated, with the 2065 p66% (66% probability of exceedance) and the 2115 p5% adopted as the CEHZ for the coastline. The plotted CEHZ lines are shown below for the coastline in the vicinity of the site (Figure 3.8).

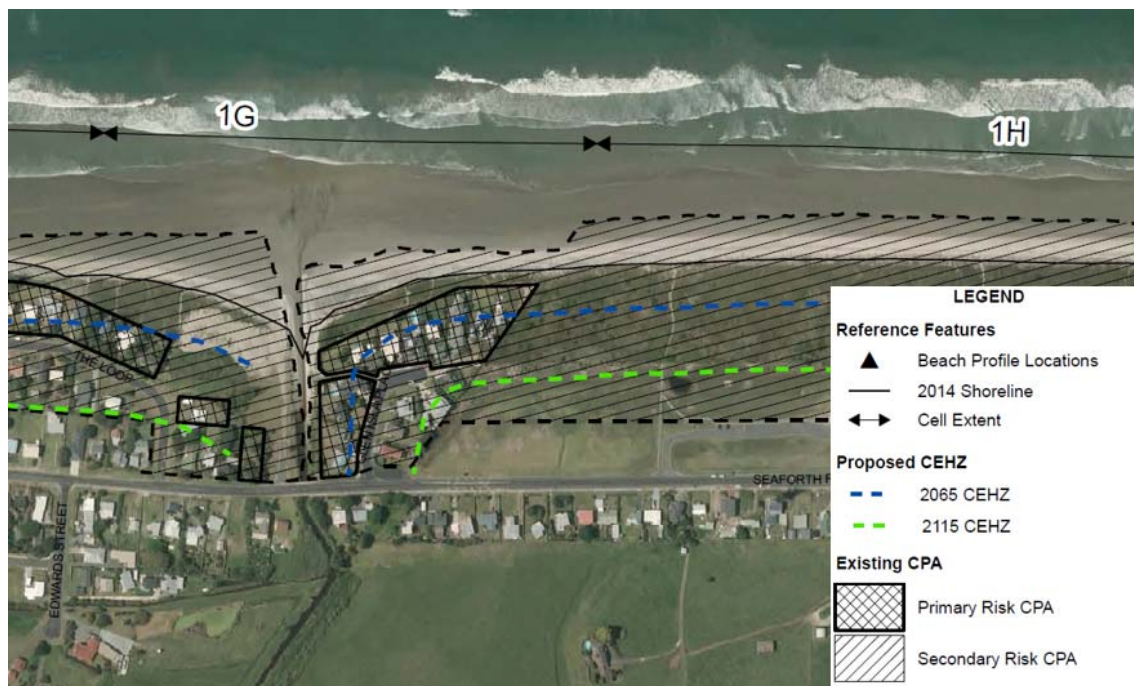


Figure 3.8: Plotted CEHA 2065 and 2115

The adopted values per that report for the subject Cell are set out below (Table 3.8b). The report notes that these lines have been offset from the ‘most recent dune toe’ (2014 survey data) and represent the landward boundary of the coastal erosion hazard extent including storm cut and regression of the dune to a stable profile. It also notes in relation to the subject cell that:

“Inlet cells at Waihi Beach have man-made structures influencing the fluvial processes...the shoreline adjacent to the inlets/streams have been stabilised by groyne structures. We have largely ignored the structures in these two locations and taken into account the historical shoreline fluctuations when setting the CEHZ baseline”

CEHZ2065	-18
CEHZ2115	-54

Table 3.8b: Adopted CEHZ values

3.9 Sea-Level Rise – Updated Projections

There are two sources of guidance for sea-level rise allowances and the most up-to-date data. The MfE document “Coastal Hazards and Climate Change Guidance” released in 2024 provides precautionary relative sea-level rise allowances recommended for coastal planning and policy, before a Dynamic Adaptive Pathways Planning approach is implemented. For ‘land-use planning controls for existing coastal uses and assets’ a timeframe to 2130 is specified, with the ‘medium confidence SSP-8.5M based RSLR projection that includes the relevant VLM rate for the local and/or regional area’.

In addition to projections of sea-level rise, a relatively recent addition to the future sea-level rise risk scenario is the potential for vertical land movement (**VLM**). This is where the land at the coast can be slowly changing in elevation (up or down), and in the case of sea-level rise risk, if the ground is sinking lower (due to subsidence) the rising sea-level can reach higher and further inland. With respect to the most recent data, the NZ Sea Rise programme has released location specific sea-level rise projections out to the year 2300 for every 2 kilometres of coastline, which is available in an online tool.

Estimates of local VLM rates (mm/year up or down) for the period of 2003 – 2011 are also available in the online tool. Despite the relatively short period of measurement, the potential

for subsidence of the land to increase the effect of sea-level rise in the future needs to be considered.

The Intergovernmental Panel on Climate Change (IPCC) previously used Representative Concentration Pathways (RCP) to represent plausible climate futures. These potential future scenarios were focused on a radiative forcing of warming that could be reached by 2100, going from RCP 2.6 – 8.5. The latest (6th) IPCC Assessment Report (published 2021-2022) shifted to a new core set of future representative scenarios, based on Shared Socio-economic Pathways (SSPs). The new SSP's offer five different narratives of how the world may evolve in the future, that also combine the RCP's, related to increases in global mean temperature.

The closest mapped location on the NZ Sea Rise online tool to the subject site is located approximately 520m northwest of the site along the coastline (Site 1712) (Figure 3.9a). Being a project adjacent to the coastal margin, it is reasonable to use the most conservative SSP5-8.5 scenario (assuming ongoing fossil fuel development and negligible mitigation), and this is consistent with the most recent MfE (2024) guidance.

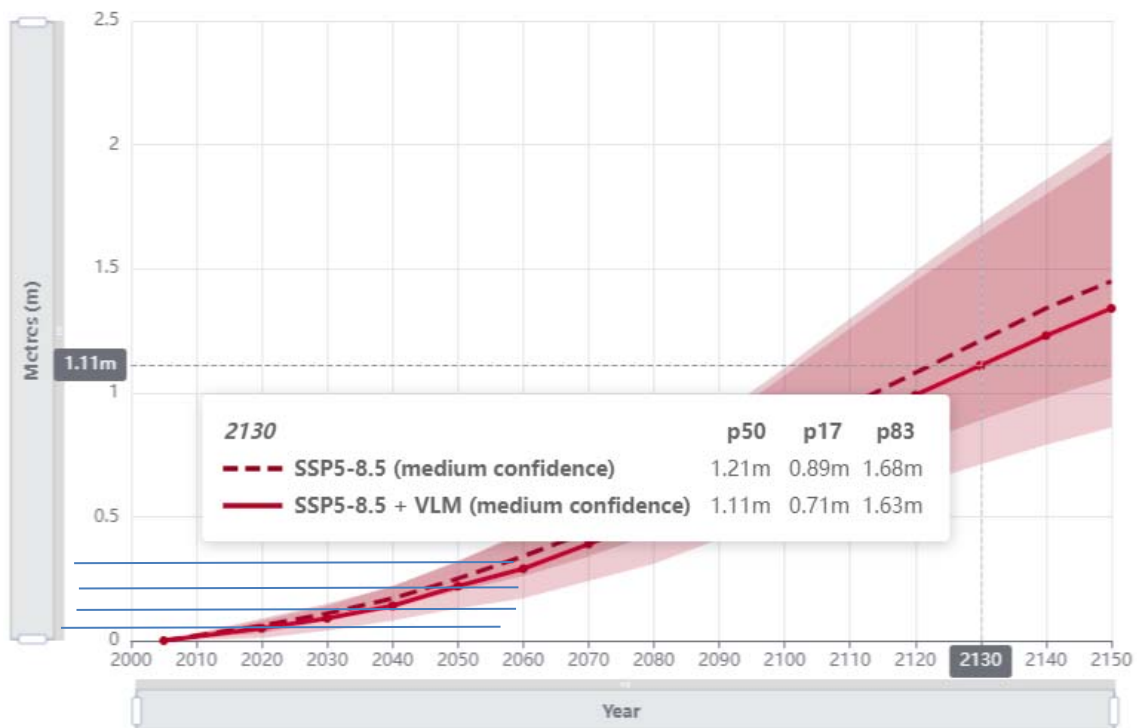


Figure 3.9a: Sea-level rise and VLM to 2130 – SSP5-8.5 scenario, Site 1712

The predicted effective sea-level rise depends both on the projected timeframe, the future scenario, and the probability within each scenario. The most probable value, i.e., the p50, is considered the most appropriate potential future rise to consider. The considered sea-level rise values over the 30-year, 50-year, and 100-year timeframes are summarised below (Table 3.9). Allowance for VLM actually reduces the sea-level rise allowance by 0.1m over the 100-year timeframe. This brings the future sea-level rise allowance to the same as that allowed for as the 'max' value in the region-wide work, for 2115 (see Table 3.8a above).

Sea Level Rise + Vertical Land Movement (30 – 100 years)			
Shared Socio-Economic Pathway	30yrs (m)	50yrs (m)	100yrs (m)
SSP5-8.5	0.34 (0.3)	0.55 (0.6)	1.21 (1.2)
SSP5-8.5 +VLM	0.29 (0.3)	0.49 (0.5)	1.11 (1.1)

Table 3.9: Sea-level rise and VLM to 2130 – Site 1712

3.10 Sea Level Data

A record of the mean sea level between 1974 – 2018 from NIWA for the Moturiki tide gauge, is shown below (Figure 3.10). The gauge is located at Moturiki Island, outside the Tauranga Harbour.

The total increase in sea level over the period measured at the gauge is approximately 170mm, giving an average increase of 3mm/yr. However, sea-level stayed relatively consistent for the period between 1974 – 1990, and only really started to increase in the period 1993 – 2023. The rate at which this more recent rise has occurred depends on where the 'start' point is taken for the calculation. Based on the graph below which takes the 'average' level (of 1.05) between 1974 – 1993 as the start point, this increase over the period of 30 years to 2023 is 5mm/yr. This period in which 5mm/yr sea-level rise has been observed matches the higher quality data in the monitoring period.

When considering a 30 - 50-year timeframe, irrespective of the SSP used, there is future sea-level rise of approximately 0.1m/decade or 10mm/yr, twice that captured in monitoring.

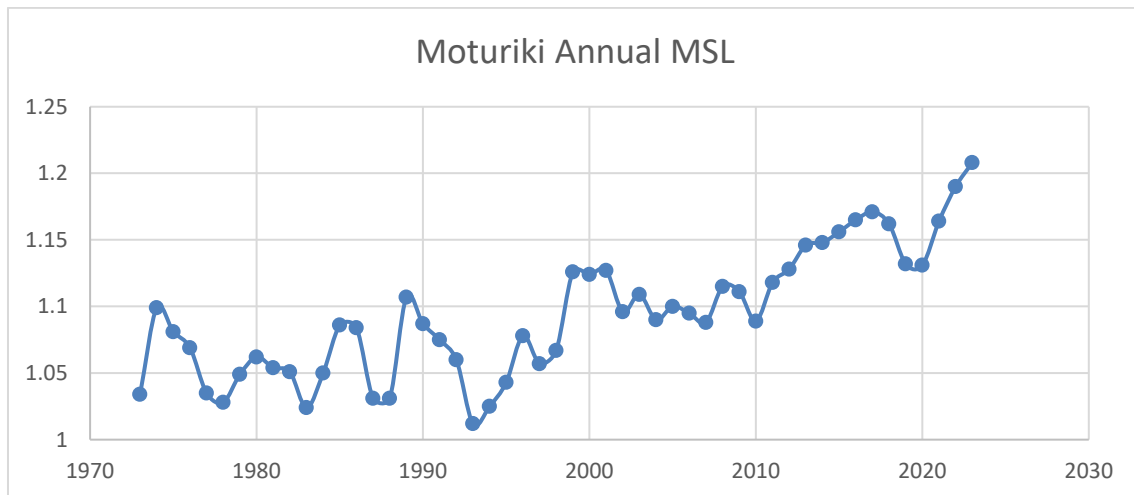


Figure 3.10: Moturiki annual mean sea level up to 2023

3.11 Future Beach Position in Relation to Structure

Long-term shoreline retreat as defined by the WBOPDC CEHZ line has been adopted as set out in Section 3.8 above. In order to assess how this may affect the buried wall and assess the extent of future exposure, the progress of the future retreat was modelled by translating the beach slope landward.

The beach profile, as defined by 2011 LIDAR survey, was assumed to retreat by translating horizontally to meet the erosion hazard predictions (Figure 3.11). The retreating beach profile results in a progressively lowering beach in front of the wall structure. The profiles will vary over time and retreat will tend to be episodic. However, the retreat model provides a “typical” section and will tend to show the trend and represent an “average” condition of the beach over time.

The beach profile was assumed to translate horizontally at a uniform rate between present day and the design CEHZ lines. The future beach positions have been modelled every decade, and these are then used in the Design Report to review the performance of the structure over time.

A uniform rate of retreat is used in design consideration. Given sea level rise is accelerating this will overpredict retreat in the first 20-30 years.

As set out in Section 3.10 during the monitoring observations over the last 30 years there has been sea level rise of 5mm per annum. This sea level rise does not appear to have resulted in

the extent of shoreline retreat predicted by the probabilistic analysis. This is consistent with assumptions of uniform retreat overpredicting the wall exposure and effects in the next 20-30 years.

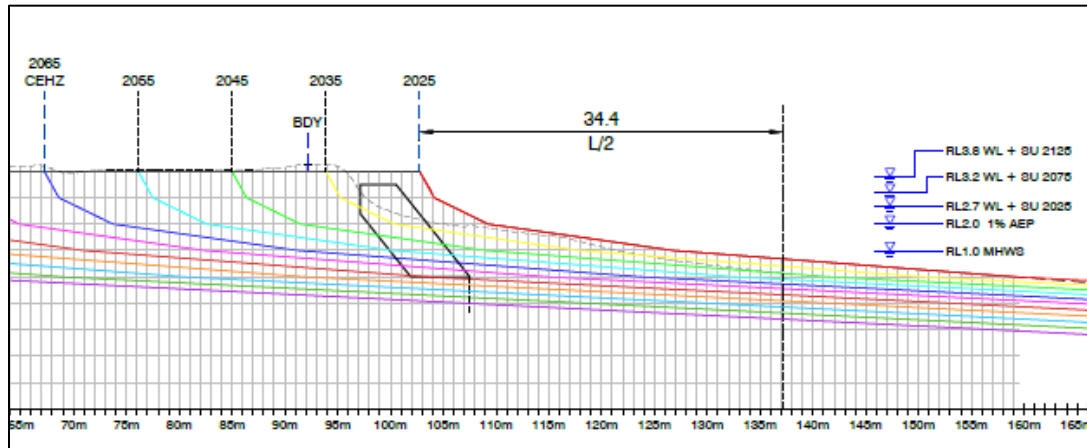


Figure 3.11: Beach Retreat

4.0 Proposal

The proposed solution is detailed more extensively in the standalone Design Report by Davis Coastal Consultants. Key aspects of the solution are summarised below. It is proposed that a buried rock revetment be constructed along approximately 200m of back and foredune area at the site, located immediately south of Three Mile Creek, Waihi Beach. Using sand excavated from the footprint of the revetment, a dune will be constructed over the wall face and planted with native dune binding species.

The revetment is continuous over the frontage of seven beach front properties from 12 Glen Isla Place to number 9 Glen Isla Place. It is proposed that the structure is located in the Three Mile Creek Reserve which is vested in the WBOPDC (Figure 4.0a). The southern end of the structure is seaward of 12 Glen Isla Place, with the landward side approximately 5m from the private property boundary. The structure continues to the north parallel to the boundary until a change of direction of the boundary midway through 16 Glen Isla Place. From this point, the structure is aligned such that it extends north to be 7.6m from the boundary at the existing large Norfolk Pine near the boundary of 11 and 13 Glen Isla Place. This 7.6m is the distance recommended by the Arborist to ensure the proposed construction would not damage the Norfolk Pine. From this point the wall extends further north angling closer into the property boundaries, such that the wall is approximately 6.5m from the boundary at the northern end of 9 Glen Isla Place.



Figure 4.0a: Layout Plan of rock revetment

The crest level is to be approximately RL 3.5 to ensure the structure is buried beneath approximately 0.5m of sand (Figure 4.0b). Footing depth will be at approximately RL 0.0, approximately mean sea level. Where the structure is more likely to interact with future coastal processes, for a length of 100m it has been termed a 'Type 1' and will have a face slope no steeper than 1:2, a double armour layer ($D_{50}=1100$) and a double underlayer ($D_{50}=250$), with a minimum three armour stone width crest. Where the wall returns further landward, for a length of 92m, it has been termed a 'Type 2', where the only differing design detail is a steeper face slope at 1:1.5.

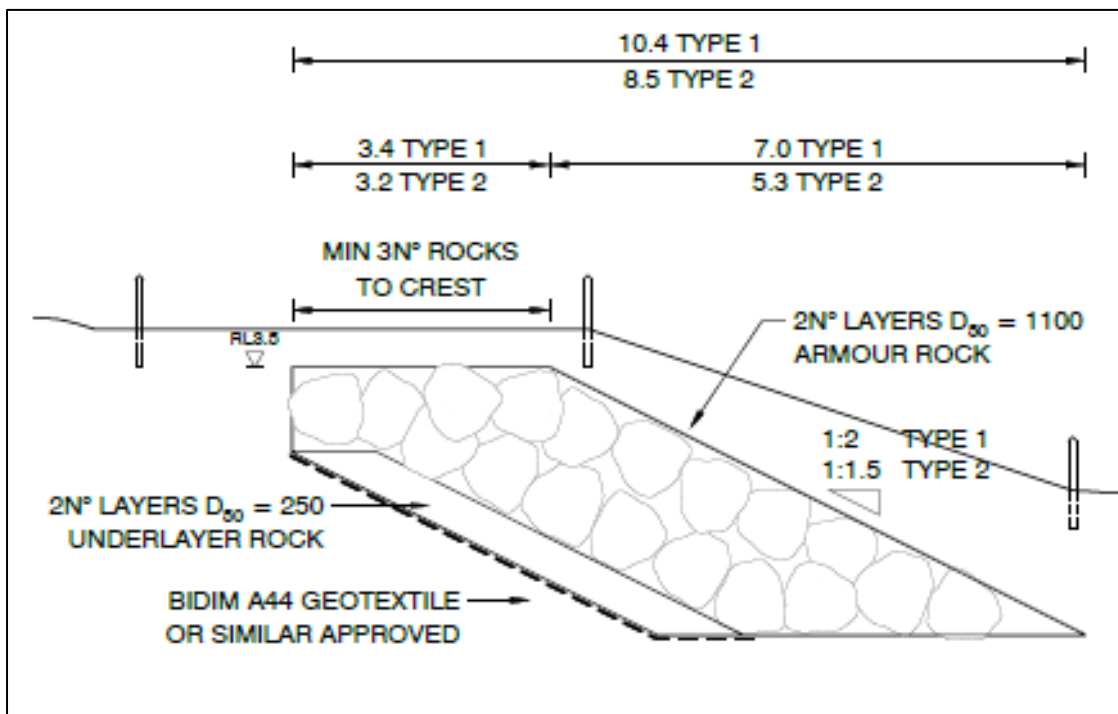


Figure 4.0b: Typical section

5.0 Potential Effects of Wall

5.1 Coastal Hazards

Coastal inundation occurs as a result of extreme high-water levels from a combined storm event characterised by a strong onshore wave climate, low barometric pressure and extreme tides. The 1%AEP extreme water level is RL 2.0, as set out in Section 3.2. Adopting the guidance provided by MfE for future sea-level rise, design inundation levels assume a 1.2m allowance for sea level rise over the next 100 years, giving a maximum water level of RL3.2. The sites are above RL4.0 and not considered at risk from inundation.

The structure has not been designed to prevent overtopping, and potential inundation of the backshore. The properties have not been inundated previously but may become affected by overtopping when the structure is more exposed. The relative elevation of the backshore, landward situation of the structure and planted foredune will help prevent overtopping and inundation in coming decades. The energy dissipation of the vegetation and sand loss at the foredune will work to prevent over topping until the structure is more fully exposed in 20 -30 years' time. Given the short duration of storm events leading to the potential overtopping events and the well recessed dwellings, overtopping will primarily lead to management issues of the land at the crest of the structure. Overtopping water will flow generally back through the permeable armour layers of the structure. A geotextile barrier beneath the structure will prevent the progressive loss of fines that would lead to structure failure.

Future coastal erosion, as set out in Section 3.8, will be limited by the backstop wall structure, and will therefore not affect the backshore area. However, there is potential for the wall to have effects on the surrounding coastline and this is addressed Sections 5.2 and 5.3 below

5.2 Review of Literature and Common Concerns

The effects of a seawall on the foreshore and sandy shorelines in particular have been the subject of much debate. A lot of claims have been made of the effects and these have sometimes been poorly informed. The long-term processes occurring at the location and the adequacy of wall design have sometimes been interpreted as indications of effects caused by the seawall. For example, a long-term loss in sediment supply may cause long term retreat of a

coastline over many years, possibly decades. If in response to the initial “erosion” of the coastline a seawall is built, the seawall is likely:

- to be ineffective at preventing ongoing lowering of the beach
- to fail from being undermined or from being subject to increasing loading as water depth and wave height increase due to the loss of shore in front of the wall
- to be considered by some as the cause, or part of the cause, of the erosion.

A properly designed seawall that has been designed for the future foreshore level addresses these issues.

Pilkey and Wright (1988) use the terms passive and active erosion of the beach to distinguish between the perceived versus real natural and anthropogenic causes, respectively. The terms passive and active erosion can also be used to differentiate between effects of the wall being in place and potential effects of the wall interacting with incident coastal processes.

Passive effects:

- Loss of sediment to the system because it is trapped behind the seawall
- Occupying space on the beach profile preventing use of part of the beach

Active effects:

- Beach lowering in front of the wall, profile steepening
- End effects caused by rips, groyne effects swash deflection or concentration
- Over topping
- Increased sediment transport

Effects of seawalls have been relatively intensively investigated and the Coastal Engineering Manual (USACE 2008) provides a summary of literature reviews and findings as per the precis below.

Dean (1987) examined nine commonly expressed concerns about seawalls and adjacent beaches as summarised in Table 6.1 below. Using conservation of sediment mass, laboratory and field data and the theory of sediment transport the conclusions from the analysis were that:

- a) Concerns that were probably **False** (or Unknown) were;
- profile steepening (6)

- delayed beach recovery after storms (5)
- increased longshore transport (8)
- sand transport far offshore (9)
- increase in long-term, average erosion rate (3)

b) Concerns that were probably **True** were;

- frontal effects (toe, scour, depth increase) (1)
- end-wall effects (flanking) (1)
- blockage of littoral drift when projecting into surf zone (groin effect) (4)
- beach width fronting armour likely to diminish (2)

Kraus (1988) reviewed over 100 references (laboratory, field, theory, and conceptual studies) to make a thorough examination of the literature. Kraus and McDougal (1996) examined 40 additional papers. In general, these extensive literature reviews agreed with Dean (1987) regarding which concerns were probably false and which many are true.

Trapped Sand

It has been suggested (Dean 1987) that a reason for both erosion in front of a seawall and erosion of adjacent unarmoured beachfront is that the sand trapped behind the wall removes active sediment from the beach system. The volume of sediment trapped behind a seawall depends upon its position on the beach, crest elevation and length. Weggel (1988) defined six types of seawalls depending on their location on the beach and water depth at the toe. At one extreme (Type 1) the wall is located landward of the limit of storm wave runup to have zero impact. At the other extreme (Type 6) walls are located seaward of the normal breaker line. Types 2-5 lie in between and are said to have increasing effects on coastal sediment processes as the type number increases. The type of a wall may change during beach erosion as the beach profile alters. A wall well back in the envelope of beach profile positions will remain a Type 1 or 2 where further forward in the profile may become a Type 3-4 during periods of low beach level and high tide during a storm surge.

A Wall Trap Ratio WTR has been defined (Equation 1 below) comparing the volume of sand behind the wall with the total volume of sand in the active profile at the wall location. Especially in a Type 1 or 2 wall, the fraction of sand behind the wall is insignificant when compared to the larger active volume suggesting the passive effect will be negligible.

$$\text{WTR} = \frac{\text{Volume of Sand trapped behind the wall}}{\text{Total Volume of Sand in the profile}} \quad (1)$$

Groyne Effect

If the seawall extends seaward into a zone of the beach where waves are causing littoral transport of sediment along the beach, sediment can be trapped “upstream” of the wall. In effect the wall becomes a groyne and by trapping sand causes downstream effects. The effect has been reported (Tait and Griggs (1991), Toue and Wang (1990)) and can be readily observed on seawalls seaward of surrounding areas. Typically, unless associated with large reclamations, the groyne effect is limited by the upstream sink being small and rapidly filled allowing transport to recommence. With well retreated, shore parallel walls such as that proposed, this groyne effect is not relevant to the Glen Isla situation.

Beach lowering in front of wall

Beach profile change, toe scour during storms and nearshore bar differences have been attributed to seawalls. Conventional wisdom has been that these impacts were due to wave reflection. Substantial study in both the field and laboratory (Kraus and McDougal (1996), Barnett and Wang (1998) and Moody and Madsen et al (1995) concluded that reflection is not a significant factor in profile change or toe scour. In the field, toe scour is more dependent on local, sediment transport gradients and the return of overtopping water (through permeable revetments or beneath walls) than a result of direct, cross-section wave action. Their conclusions also negate the common perception that sloping and permeable surfaces produce less effects than vertical, impermeable walls.

Plant (1990), Plant and Griggs (1992), McDougal, Sturtevant, and Komar (1987) observed rip currents at interior sections and at the ends of armoured sections. These rip currents were attributed to wave overtopping, return flows and elevated beach water tables during storms. It was concluded that this mechanism may be more responsible for end-of-wall, flanking effects than the sand trapping theory of Dean (1987).

A number of studies (Griggs et al. (1997) Basco et al. (1997) (Everts, Battley, and Gibson 1983) et al) have concluded that no significant long-term effects were revealed or that there was never evidence of flanking effects after storms on adjacent beaches.

In general, Basco et al. (1997) have confirmed all the conclusions of Dean (1987), Kraus (1988) and Kraus and McDougal (1996) except the end-wall flanking effect.

5.3 Assessment of Effects of Glen Isla Coastal Seawall

5.3.1 Potential Effects at Glen Isla

Given a 30-year envelope of beach position it is possible to locate any armouring at the landward extent of the defined envelope of historical beach change. The structure will provide a backstop position, where it will protect the backshore from erosion in storm events. It will then only be rarely exposed as a result of extreme events. Between such events, sand on the profile will establish to historic equilibrium levels and the structure will become buried again. When exposed, Type 1 or 2 (ref Weggel 1988 above) “frontal effects” and beach lowering etc will only occur to a limited extent, for a short time during the storm event.

Similarly, given a lack of protrusion onto the surf zone and shore parallel alignment, and the far larger adjacent shore-perpendicular structures of the Three Mile Creek Groynes, the proposed wall will not act as a groyne trapping sand, and will not affect longshore sediment movement on Waihi Beach.

Even in the advent of shoreline retreat the beach lowering and groyne effects will be less than minor. The potential for end effects remains the largest potential effect of the wall and this is discussed below.

5.3.2 Potential End of Wall Effects

While during storm events only the upper wall may be exposed, due to limited interaction of the structure with coastal processes, end effects will be negligible. However, during a very large storm event or following beach retreat due to sea level rise when the wall is providing coastal protection as designed, consideration of potential end effects is warranted.

The primary mechanisms by which this would be likely to occur would be through either

- a) Rip currents and differential head
- b) Deflection of Swash

c) Sediment lock-up

Rip currents / Differential head

The cause of rip currents within surf beaches is the subject of much study and some conjecture. The case of rip currents high on the beach face, where the actions are primarily of swash not wave action, is atypical of most rip currents. Swash moving up the beach impacting on a wall face will gain elevation when compared to swash moving up the unarmoured adjacent beach face. The figure below is based on a sloping structure (Figure 5.3.2a) but the effect is similar for a vertical structure.

For example, if the beach is at 1:10 and the wall at 1:2 when the water has flowed 1m past the toe of the wall the water elevation of swash on the wall will be 500mm, while the water elevation on the beach will be 100mm. This is a simplified illustration of the actions for explanation. Greater turbulence and potentially permeability of the wall will change the parameters, but the principle holds and the situation creates a differential of head. The net differential in head will create a component of flow in a shore parallel direction towards the end of the wall. The accelerated greater volume of flow preferentially scours the adjacent unprotected bank causing additional scour at the end of the wall. Similarly, a greater return current is created, scouring the foreshore in a rip current type action.

Similarly, if overtopping of the wall were to occur and concentrate returning flows these could create a scouring “rip” current. Overtopping flows will tend to percolate back through the very permeable upper armour layers and so this will not occur.

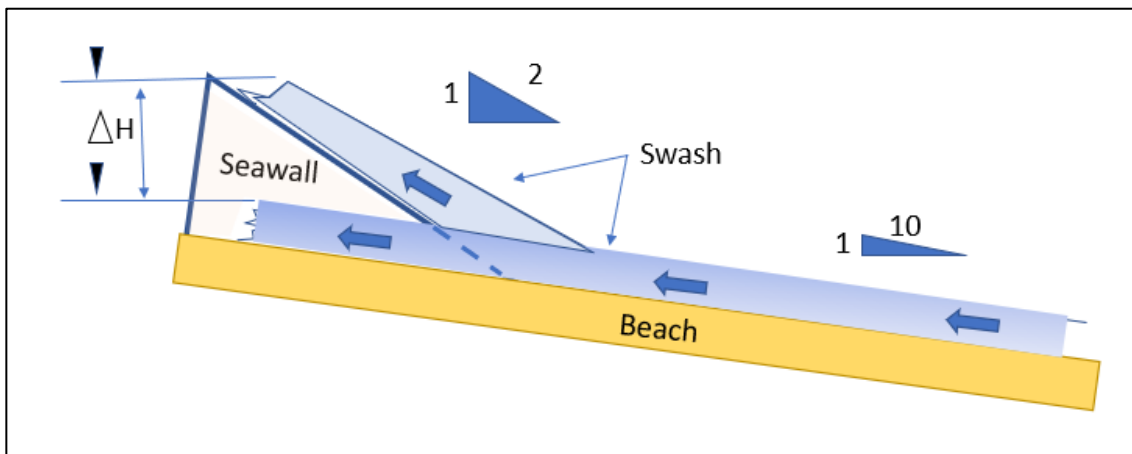


Figure 5.3.2a: Head differential at wall end

The creation of differential head would require the swash to be passing well past the wall ends. This will only occur when the general dune line has retreated landward of the wall. This would represent a more severe storm than so far recorded in the monitoring record or a large long-term retreat due to sea level rise. In either event the extent of additional scour is likely to be very limited in extent of affected coast and severity of erosion. The effects would only endure for the particular storm and then the adjacent beach recover with the surrounding dunes.

South of the wall is an Esplanade Reserve where the temporary retreat of a dune in a natural, if slightly exacerbated, manner is unlikely to cause effects beyond a slightly more eroded area, in the order of 2-5m for a length of coastline of 5-15m. The dune replanting work proposed within the proposal would tend to help the adjacent dune recover and mitigate the effects. To the north of the proposed wall is Three Mile Creek and the groyne structure which would not be affected at all. The lowering of the Creek channel causes preferential wave action acting within the channel and no end appreciable effects of the northern end of the wall would be created.

Any adverse effects of the proposed wall on adjacent areas due to rip currents/differential head are expected to be negligible.

Deflection of swash and wave energy by end of wall

This is a special or localised case of a wall being at an angle to the beach face. Where swash acts on the face of the wall it is deflected and channelled along the wall face to the adjoining bank. The return current then also tends to scour more as described above. The alignment of the

structure as landward as possible, and dune building proposed, will limit the potential for the wall to interact with wave processes and generate these effects.

The subject wall will deflect some incoming wave energy along its length where it is angled away from the beach to the north will. However, due to the length of this return, and the distance the wall returns significantly landwards into the Reserve, any deflected swash and wave energy will have ample room to dissipate on the progressively rising foreshore. There will be a gap between the two built structures that could notionally be breached by erosion to threaten the structure end. However, the end of the structure is so far landward this is extremely unlikely and impossible without very significant beach retreat. If in coming decades this became a real risk, the gap could be readily bridged. At that time, the groyne heads will have been lost and significant rework of the groynes would be required. The Three Mile creek channel would remain with intact armour, even after the loss of the groynes, as there are still minimal wave effects on the upper channel structures due to sea level rise. It is therefore anticipated that the northern flank will be protected. On balance, it is highly unlikely, even under conditions of future sea-level rise, there will be appreciable issues between the wall end and the river training structure at this location.

The southern wall end, as the seaward-most portion of the structure, is most likely to interact with incoming wave energy. Waihi Beach is orientated more or less directly towards the north-east, and waves would need to have more of a northerly component to deflect swash to the southern end of the structure. The MetOcean wave climate data (Section 3.3) shows that waves from the north are negligible in the record, with waves from the north-east comprising almost the entirety of the record (98%), and these waves will tend to approach the structure shore perpendicular.

In this location the offshore contours tend to be relatively even, regular and shore parallel (Figure 5.3.2b). Waves approaching at an angle will tend to refract towards shore normal, which is also normal to the wall alignment at the southern end. If some storm scour does occur at the southern wall end (Figure 5.3.2c), it will be localised and small scale due to the position of the wall high on the beach profile, and shore parallel angle of the wall. Any potential effect would be temporary and not cumulative. The area to the south is vegetated dune, without potentially damaging pedestrian access. This, in combination with the dune planting proposed, will ensure

that the dune recovers relatively quickly between storms. There are not any assets or structure within the relevant area of Island View Reserve that would be at potential risk from end effects.



Figure 5.3.2b: Bathymetry contours offshore from Waihi



Figure 5.3.2c: Potential scour at southern wall end

Sediment lock-up

A potential cause of end effects of a seawall on sandy beaches is that sand behind the wall is “unavailable” or separated from beach processes. This decreases the sand volume available for natural variation in the shoreline. In this case, with a retreated structure line over a very short length of beach relative to the beach length, and very large volumes of sand available in the dunes and foreshore, the “unavailable” sand in this case is negligible and will have no discernible effect on the beach.

Conclusion

The structure is outside the area of typical interaction with coastal processes. This reduces the likelihood of occurrence of much of the potential negative effects associated with seawall structures. Potential short-term lowering of the beach level during storm events and minor additional storm scour at the southern end cannot be totally discounted. The wall has been designed to address this. There are not any structures within Island View Reserve potentially affected and any scour is likely to be transient. There will not be end effects on Three Mile Creek at the northern end.

5.3.3 Potential Exposure of Buried Structure

The proposed location of the southern end of the structure is such that over the 30-year period of monitoring records the upper layer (1-1.5m) of structure would have only been exposed once over that time. This would have been during the recent Gabrielle/Hale set of storms. It is predicted at current sea level, that the structure is likely to be exposed no more than once every 5-10 years. Such exposure would only be the top 1.0-1.5m of the wall which is expected to be quickly re-buried by natural processes. The recovering of the structure will be assisted through the replanting of a healthy dune system, as part of the proposal.

Given the minimal retreat evidenced by monitoring over the last 30 years and that sea level rise over the last 20-30 years (100mm) is of a similar order to that expected over the next 30 years (200mm), we would expect relatively slow retreat over that time frame. This will result in the

rare exposure of the wall and natural re-establishment of the dune in front of the wall. Additional storminess associated with climate change may tend to expose the wall more often.

However, as set out in Section 3.11 above, it has been assumed the beach will progressively retreat due to Climate Change driven sea level rise. This analysis has been undertaken in more detail in the Design Report however, the conclusions are set out below (Table 5.3.3).

Time	Wall Exposure
0-10 years	Wall buried, 1-2 possible exposures of upper 1-1.5m
10-20 years	Top of 1m wall exposed for long periods. During storms upper 1.5-2.0m exposed during storm events greater than any that have occurred in the last 20 years.. Wall covers back up but upper meeting exposed
20-30 years	Upper 2-3m of face of wall exposed at all times. High tide may reach structure in large storm events.
30-40 years	MHWS at base of wall. Access in front may become limited for 1-2hr around high tide
40-50 years	High tide at wall. Scouring during storm events may threaten toe and remedial to toe may be required. Over topping may require raising wall crest.
50 -100 years	With beach retreat and sea level rise as predicted, significant upgrade may be required on the wall including increase in outer armour size which could be overlayed on the outer face. Foundation would need to be lowered or improved. Over topping may require raising wall crest.

Table 5.3.3 – Wall Exposure

5.3.4 Potential Effects on Public Access

In addition to access along the sandy foreshore as tide levels allow, there is also an existing public access arrangement through a pedestrian walkway off Glen Isla Place, and beach access both sides of Three Mile Creek to access the foreshore (Figure 5.3.4a).

At current sea level, public access along the high tide beach will be unaffected by construction of the wall, except for very short-term effects following a 1%AEP storm or similar. During and within days of the extreme storm event, within two hours of high tide, public access may be limited. High tide beach will rapidly return by natural processes.



Figure 5.3.4a: Public access to foreshore from Glen Isla Place and Seaforth Road

Over time, the MHWS envelope will move landward with rising sea-level, and potentially recession of the backshore. As a consequence, there will be times in the future, over the lifetime of the structure, that it is located within the MHWS envelope and water will be at the face of the wall, limiting access along the shoreline at high tide. Based on the predicted long term retreat rate MHWS will be at the face of the wall in 30 years.

However, there are numerous examples of extensive sections of seawall already present on Waihi Beach, for example approximately 500m of wall at Shaw Road (Figure 5.3.4b), where water levels are present at the seawall face already. Ongoing sea-level rise and profile lowering at these locations will result in deeper waters at the wall face.

Given these existing limitations on access at high tide on Waihi Beach, and that the Glen Isla Dune proposal is set back in the dune environment to the extent possible such that it does not

restrict access at current sea-level, the proposed location of the structure is considered the best practicable option and will not contribute significant public access issues on the wider beach.



Figure 5.3.4b: Seawall at Shaw Road – water at wall

5.3.5 Effect of Retreating Beach Profile on Proposed Wall

Shoreline retreat due to sea level rise is poorly understood and accordingly conservative assumptions are made using standardised procedures to predict potential retreat. The existing studies at Waihi Beach, indicate significant retreat, in the order of 50m landward, over the 100-year time frame.

Assuming shoreline retreat due to Sea Level rise occurs in line with predictions, the lowering of the beach profile in front of the wall will increase wave height and loading on the wall. Rock armour is designed by assuming that there will be a level of damage during the design storm event. Typically, the acceptable damage level is set at 2 which is the start of damage. Complete wall failure is level 8. In 40-50 years, some slightly higher damage, level 3, may occur in the design storm. The level of damage would require simple maintenance following the 100%AEP Event.

In the 50–100-year period increased storm damage may require further work at the wall toe and an increase in outer armour size which could be overlayed on the outer face. The design of the wall is readily adaptable to any future requirements.

6.0 Conclusion

The properties of the Glen Isla Protection Society, adjacent to the coastal margin, are at risk from coastal erosion and a buried backstop wall with dune nourishment and planting is proposed. This report analysed the coastal process environment of Waihi Beach, and discusses the potential effect of the wall on the coastal process environment.

The solution proposed has consistent materiality with other armouring present extensively at Waihi Beach. However, by situating the proposed structure markedly landward and enhancing the natural dune the proposal will have markedly less impact.

At current sea levels the proposed wall would only be exposed by a storm event greater than any that has occurred in the last 20-30 years. During this period the effects of the sea wall on the surrounding dune environment will be negligible, with positive benefits provided due to the dune enhancement.

The analysis indicates that over a 30-50 year period, assuming beach retreat associated with sea level rise, the wall will become progressively more exposed. If the wall is to become exposed it will be crucial to protect the backshore and adjacent residential development. During this time the effects will comprise temporary lowering of the beach during and immediately after storm events and temporary minor additional erosion of the dune adjacent to the southern wall end. This erosion is likely to be in the order of 2-5m on a 5-15m length of shoreline and will not put any structure or infrastructure at risk. It may be no worse than, and difficult to discern from, dune erosion elsewhere on the natural coastline.

Based on the assessment undertaken the structure is considered to have less than minor potential effects on the coastal process environment of Waihi Beach, and the proposal will provide positive benefits through dune enhancement.

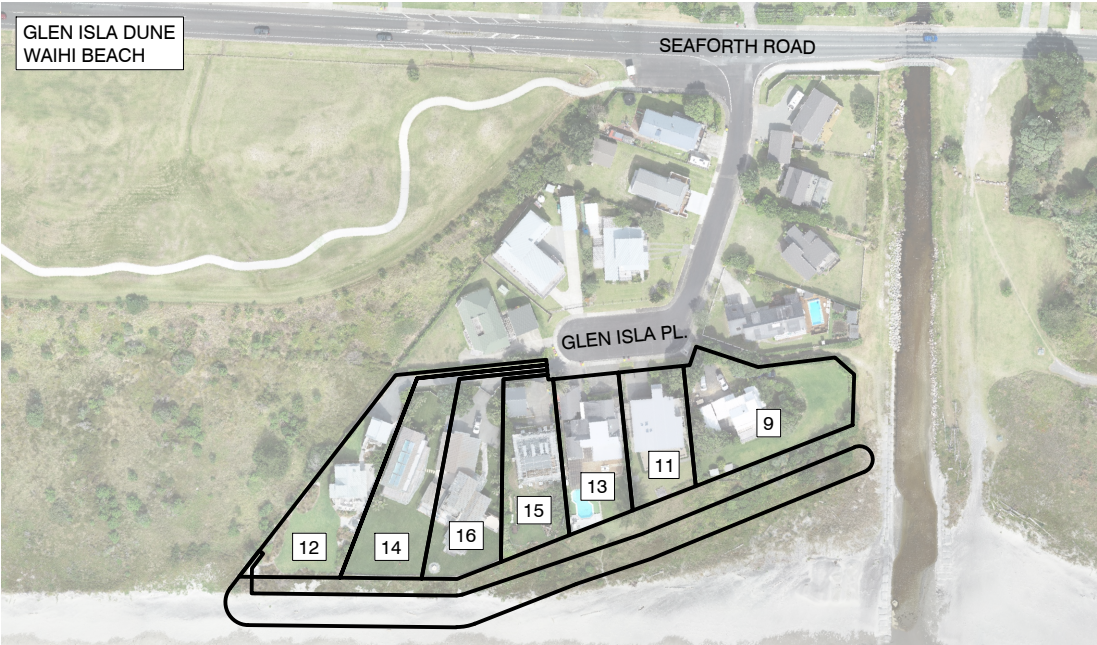
Appendix A
**Design Drawings – Buried
Backstop Wall**

COASTAL PROTECTION
PROJECT
GLEN ISLA DUNE

FOR
GLEN ISLA PROTECTION SOCIETY

PREPARED BY
DAVIS COASTAL
CONSULTANTS

RESOURCE CONSENT



DRAWING SCHEDULE			
NO	TITLE	REV	DATE
01	DRAWING SCHEDULE AND LOCATION PLAN	A	10.10.24
02	PROPOSED LAYOUT	-	23.08.24
03	PROPOSED SECTIONS	-	23.08.24

			DESIGN: DAVIS COASTAL CONSULTANTS
			SURVEY: SEAM SPATIAL
			DRAWN: JMA
			CHECKED: -
			DATE: OCTOBER 2024
			SCALE: NTS
			CAD FILE: 23028-02 Glen Isla Place Waihi
A	RESOURCE CONSENT ISSUE	10.10.2024	NOT FOR CONSTRUCTION
-	RESOURCE CONSENT ISSUE	23.08.2024	
No.	REVISION DETAILS	DATE	

JOB TITLE:

COASTAL PROTECTION PROJECT
GLEN ISLA DUNE
WAIHI BEACH



COASTAL MANAGEMENT
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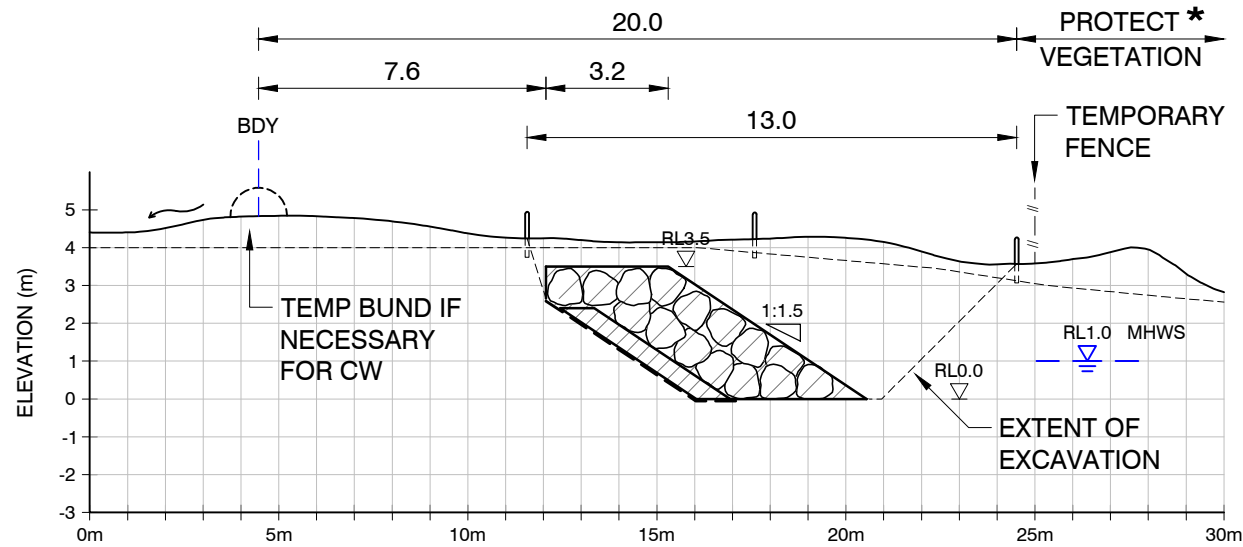
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DRAWING SCHEDULE AND
LOCATION PLAN

SERIES:
RESOURCE CONSENT

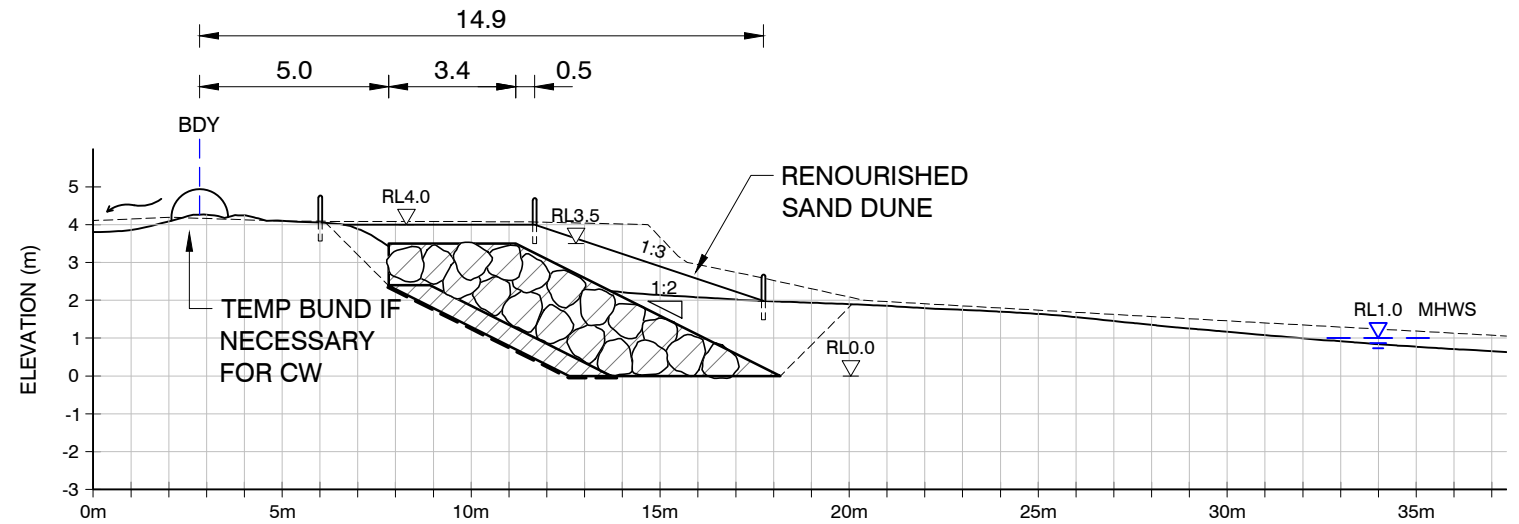
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SHT NO: 01

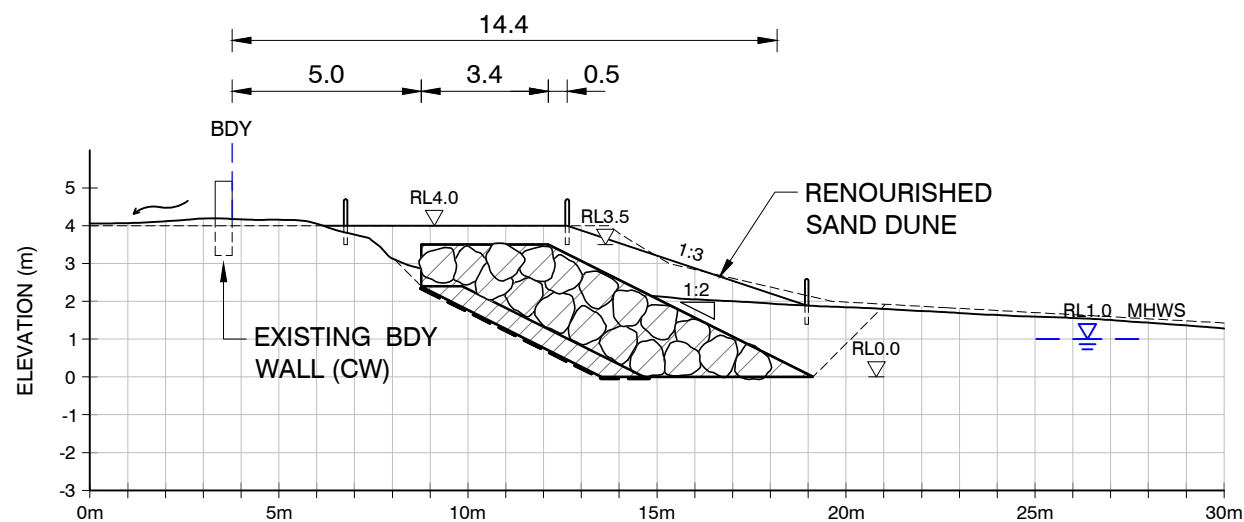
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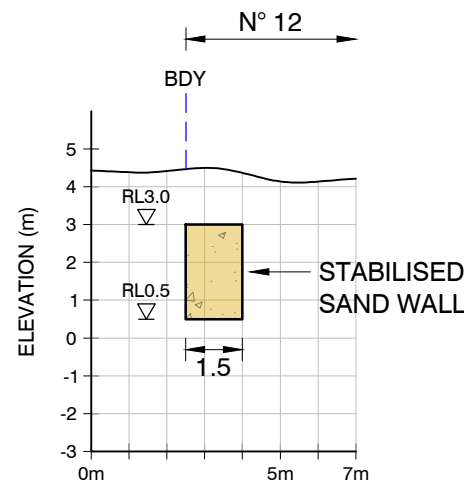
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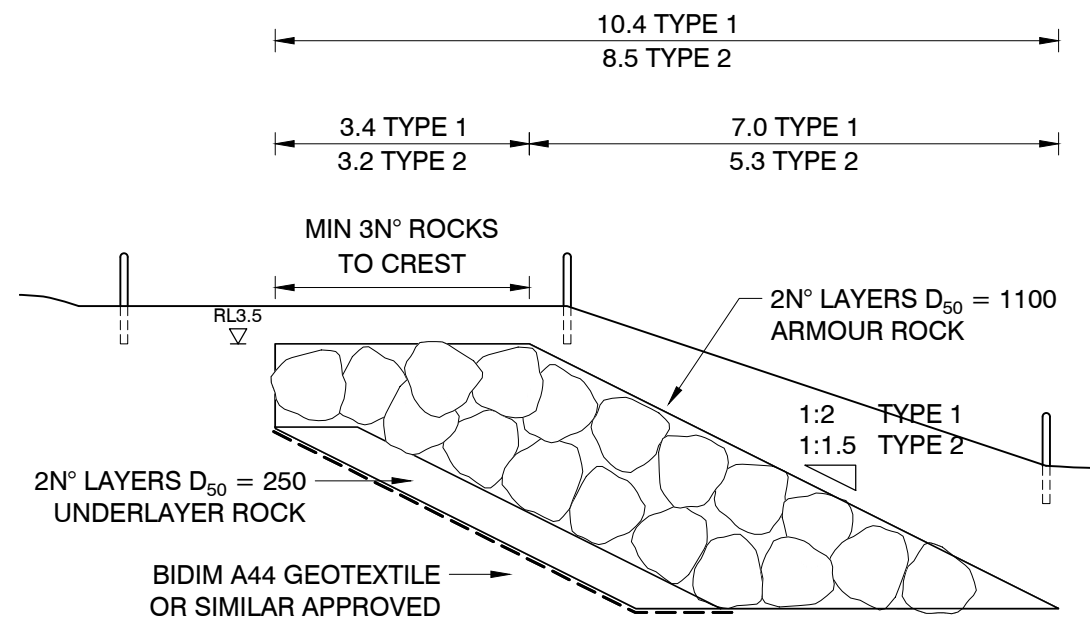
B
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SCALE 1:200



C
02 **No 16 GLEN ISLA - TYPE 1**
SCALE 1:200



D
02 **SECTION**
SCALE 1:200



TYPICAL RIPRAP SECTION
SCALE 1:100

NOTES

- * AREA OF EXISTING HIGH QUALITY DUNE VEGETATION TO BE DEFINED ON SITE BY ECOLOGIST AND PROTECTED BY TEMPORARY FENCE FOR DURATION OF WORKS

KEY

—	EXISTING SURFACE - 2024
- - - - -	HISTORIC SURFACE - 2011

No.	REVISION DETAILS	DATE
-	RESOURCE CONSENT ISSUE	23.08.2024

DESIGN:	DAVIS COASTAL CONSULTANTS
SURVEY:	SEAM SPATIAL
DRAWN:	JMA
CHECKED:	-
DATE:	AUGUST 2024
SCALE:	VARIES @ A3
CAD FILE:	23028-02 Glen Isla Place Waihi
NOT FOR CONSTRUCTION	

JOB TITLE:

COASTAL PROTECTION PROJECT GLEN ISLA DUNE WAIHI BEACH



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DRAWING TITLE:
PROPOSED SECTIONS

SERIES:

RESOURCE CONSENT

FILE NO: 23028
SHT NO: 03
REV: -

Appendix B **Historic Aerial Analysis**



	1948 Shoreline
	1963 Shoreline
	1975 Shoreline
	1982 Shoreline
	1986 Shoreline
	1999 Shoreline
	2024 Shoreline















Appendix C **MHWS Analysis**



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Our Ref: 23028
Rev. B

28 March 2024

Mr Allan Fraser
Glen Isla Place
Waihi Beach

Dear Mr Fraser,

Memorandum – Location of Mean Highwater Springs Glen Isla Place, Waihi Beach

1.0 Introduction

In the context of investigating the provision of erosion control measures at Glen Isla Place, Waihi Beach, we have undertaken an analysis of the position of Mean High Water Springs (MHWS) at the site.

Mean High Water Springs (MHWS) is specified as the jurisdictional boundary between “Land” and the “Coastal Marine Area” (sea) in the Resource Management Act (RMA). The District Plan defines the Planning Rules and Consent requirements for Activities landward of this line. The Regional Coastal Plan has the same function seaward of this line.

Definition of this boundary was usefully explained by Professor J. Hannah of University of Otago to the Planning Tribunal (Falkner v Gisborne District Council Decision A82/94) as *“a two-stage process: determining the vertical height of the mean high water springs level, and then projecting that height on to the shore profile to determine the horizontal location of the mean high water springs contour.”*

The boundary can be envisaged as a flat plane at the level of MHWS intersecting with the sloping shoreline (Figure1). We have used this two-stage process to determine MHWS at the site.

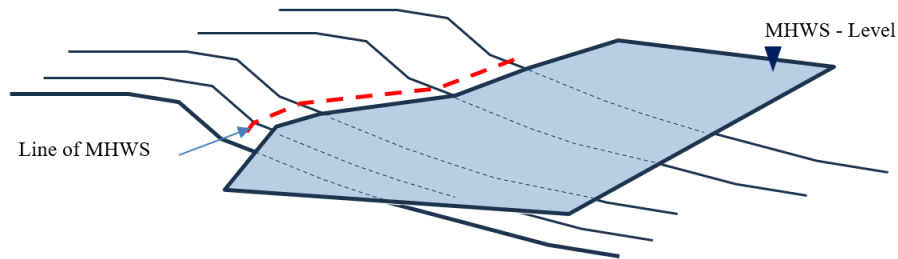


Figure 1 – Depiction of MHWS Calculation

2.0 Vertical Height of MHWS

MHWS is a statistic of the variable level of the high tide. It is typically interpreted as an average water level of spring tide.

There are multiple definitions of MHWS. A traditional maritime definition of MHWS (and MLWS) is provided by LINZ as *“The average of the levels of each pair of successive high waters, and of each pair of low waters, during that period of about 24 hours in each semi-lunation (approximately every 14 days), when the range of the tide is greatest (spring range).”* This definition was expected to be exceeded by approximately the 12% highest tides.

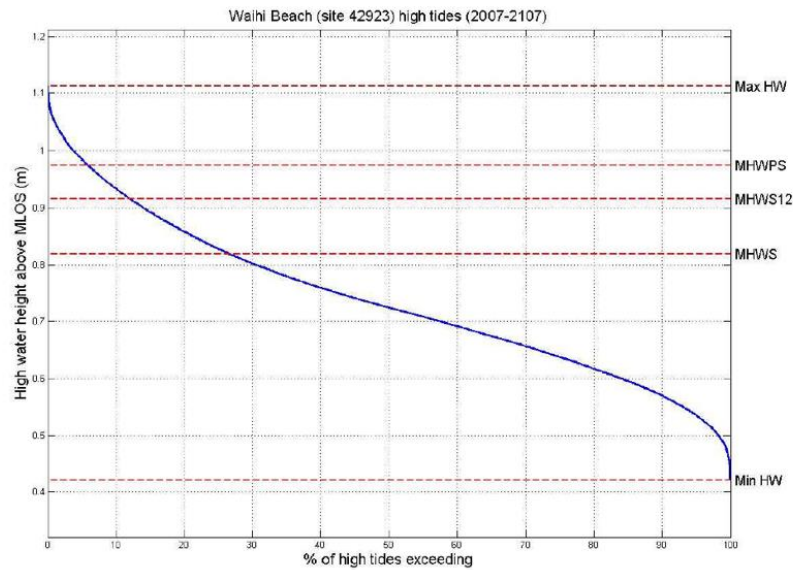
A mathematical algorithm (Equation 1) has often been used to calculate MHWS. It takes the primary harmonic Sun and Moon components of tide and combines the maxima of these to define high tide. In recent years, issues with this producing a representative MHWS in New Zealand, particularly in the upper South Island, led to inclusion of a third (N_2) harmonic component (Equation 2). The N_2 component accounts for changes in tidal height due to the variation in distance between the moon and earth resulting from the elliptical lunar orbit. The component is at its maximum when the moon is at its closest point or perigee and the resulting tidal statistic often defined as the Perigean Mean High Water Spring (MHWSP).

$$MHWS = MLOS + A(M_2) + A(S_2) \quad (1)$$

$$MHWSP = MLOS + A(M_2) + A(S_2) + A(N_2) \quad (2)$$

With the advent of more sophisticated computer modelling and longer-term tidal monitoring to provide calibration, tidal exceedance curves have been developed. These curves show the frequency that all high tide levels occur. A figure for MHWS is then defined as level that only a given percentage of tides exceed. Typically, because of the traditional expectation that 12% of tides were greater than MHWS the height exceeded by 12% of tides is provided from the exceedance curve (MHWS12). The height exceeded by only 10% of high tides (MHWS10) is also another relatively common measure. NIWA have been at the forefront of this work in New Zealand and in 2006 provided a report for the Bay of Plenty Regional Council (BOPRC) detailing tidal calculation methods and modelling tidal levels in the Region. They produced an exceedance curve for Waihi Beach (Figure 2).

The exceedance curve for Waihi, reproduced from the 2006 report, shows the maximum tide is RL1.1 and all high tides are between RL 0.4 and RL1.1. The level of the traditionally defined MHWS is approximately RL 0.8 and the MHWSP is approximately RL1.2. (Table 1) These levels are all given relative to the *“Mean Level of the Sea (MLOS)”*. They are set out in Table 1 below along with conversion to levels in respect to the Moturiki Vertical Datum 1953 (MVD1953). The Moturiki Datum is typically used in topographical survey data for the area.



High-tide exceedance curve for **Waihi Beach** relative to MLOS (which will vary). Annotation descriptors are given in the text above

Figure 2 – High Tide Exceedance for Waihi Beach ex NIWA 2006

Statistic	Level (m) Relative to MLOS	Level (m) Relative to MVD1953
Maximum High tide	1.1	1.2
MHWS10	0.9 (0.93)	1.0
MHWS12	0.9 (0.916)	1.0
MHWS	0.8	0.9
Minimum High tide	0.4	0.5

Table 1 – Summary of High tide Statistics ex NIWA 2006

Both Case law and published reporting on tidal determination, highlight the need for pragmatism in determining MHWS. There is no correct or definitive value that can be specified. However, there is only a 300mm difference between a traditional value of MHWS and the maximum highest tide expected (excluding sea level rise). Between all the MHWS statistics quoted in the NIWA report there is less than a 200mm difference. This difference is largely theoretical and relevant primarily to the mathematical model.

On an open coast such as Waihi, tidal height is overlain by an active wave environment and the tide acts on a dynamic changing beach. In this context, the difference in level between the various definitions becomes less significant.

For the purposes of defining MHWS for this matter we have adopted the value adopted by NIWA in their specialist report to BOPRC on this matter, which is exceeded by only approximately 10 % of tides. The adopted value by the NIWA report to one decimal place is RL1.0 MVD1953.

MHWS = RL1.0 MVD1953

This value has the benefit of being a contour that is readily and often plotted in a number of historic and contemporary studies and plans. It therefore provides a practicable and useable value. The contours on some topographical mapping, including the GIS mapping used by the BOPRC website, expresses contours and height in NZVD2016. Table 2 shows the offset of 0.3 between the data. Where the GIS shows a RL1.0 contour based on NZVD2016, the line of MHWS will be 0.3m above this.

	MVD1953	NZVD2016
MHWS	1.0	1.3
1.0 Contour on WBOPRC GIS	0.7	1.0

Table 2 – Comparison of RL1.0 in MVD and NZVD

3.0 Location of MHWS Line at Glen Isla Place

In order to locate the line of MHWS on site we must determine where the beach is at the level of RL1.0 or the location of the RL1.0 contour. This RL1.0 contour is the line MHWS.

However, the level of the beach varies due to many drivers on differing times scales. This includes diurnal tidal changes, seasonal and storm event changes as well as longer term changes from longer weather patterns. Changing weather patterns can be associated with El Nino/ La Nina cycles over many years and pan-decadal patterns have also been defined. In combination with these fluctuations, changes in the beach drivers such as a change in sediment supply, change in local control points (river outlets, headlands), sea level rise or man-made effects can also create changes in the beach profile.

As previously mentioned, there is an accepted need for pragmatism in determining MHWS. The location chosen may depend on the accuracy required for the task at hand and practicable measures such as site features which provide some consistency in determining the jurisdictional boundary.

For the purposes of determining the jurisdictional planning boundary at this site, we have investigated the range of locations that the line of MHWS has been in over time and related this to the proposed location of any potential works. The over-arching philosophy is to maintain our works landward of any reasonable depiction of MHWS so that the work is firmly on Land and not within the Coastal Marine Area.

Waihi Beach has reasonable monitoring data for approximately 20 years, and a limited amount of older data going back over 30 years. This monitoring tends to show a generally stable beach, but this may be influenced by human interventions.

There are long term monitoring sites (Figure 3), CS49 and CS50, 400-600m each side of the site, that have 37-year and 34-year records, respectively. A set of three profiles at the Glen Isla site were monitored for 6 years between 2012 and 2018. This is understood to have been some short-term monitoring in relation to the drainage outlet of Three Mile Creek.

The data is mapped as beach cross sections or profiles, as Figure 4 and Attachment 1. From this record of profiles an envelope of profiles can be determined. This envelope provides a cross-section area of within which the beach profile has fluctuated.



Figure 3: Monitoring Locations

A useful tool in determining the location of MHWS over time is to map the “excursion” of the RL1.0m contour over time. This maps the horizontal distance from a fixed monitoring point to the RL1.0m contour. As more sand builds up on the beach and the beach builds seaward, the RL1.0 contour moves seaward. In times of storm erosion and beach retreat the beach lowers and the RL1.0 contour moves closer to the shore, landward.

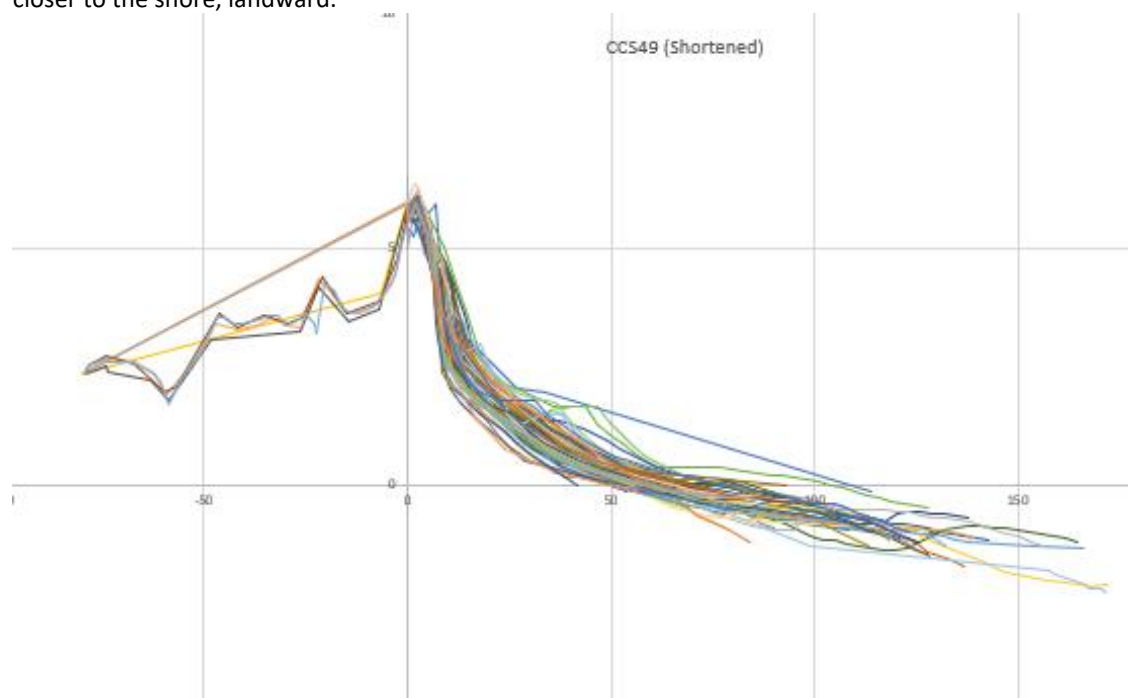


Figure 4: CS49 Profile Data

We mapped Excursions for all five profiles (Figures 5 and 6 and Attachment 1). As would be expected, there was greater variability and a greater range of excursion of the MHWS mark on the profiles that had been monitored over a longer time frame when compared to the profiles monitored for only six years. In order to determine the applicability of the wider range of movement to our site, which was adjacent to profiles only monitored over a short timeframe, all profiles were compared over similar 6-year timeframe to compare fluctuations at the sites.

Over the similar six-year period (2012-2018) the long-term monitoring sites (CS49 and CS50) behaved similarly to S1, S2 and S3. The range of excursion was 17m +/-1m at all profiles. Table 3 provides the maximum and minimum excursion information for the MHWS contour. Over the 6-year time period the minimum excursion was within 1m of that monitored over the 30year timeframe. The majority of the larger range of excursion in the longer record depicts a higher level of sand on the beach and a more seaward line of MHWS.

It was therefore extrapolated that S1-S3 would behave similarly to CS49 and CS50 over longer time frames and it was reasonable to assume the range of excursion documented at CS49 and CS50 would have been present at the site over that time. As the minimum excursion represents the "most eroded" of landward location of the beach although the 30-year period minimum was within 1m of the 6-year minimum, it was assumed that the long-term excursion was 2m further landward than the six-year figures.

This width of excursion was then mapped in Plan onto the beach seaward of Glen Isla as the area in which MHWS has been located over the last 30-35 years. (Figure 7 Attachment 2)

It is assumed that work landward of this area, and so landward of MHWS for the last 30 years is therefore outside the Coastal Marine Area and under the Jurisdiction of the District Plan and Terrestrial Consent Authority, Western BOPDC.

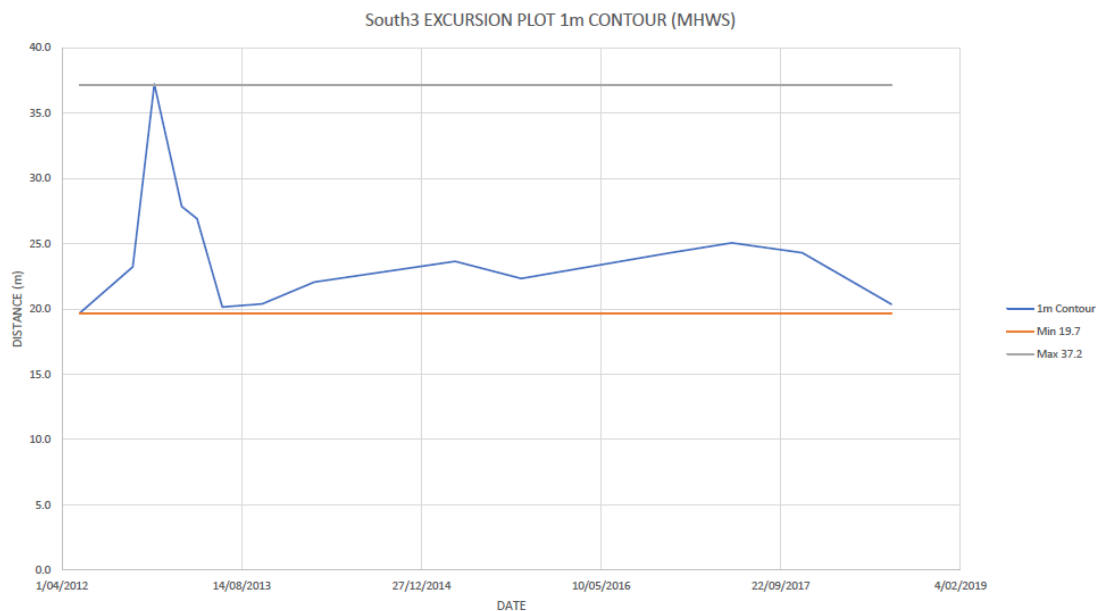


Figure 5 – Excursion of RL1.0m contour (MHWS) 2012-2019 Glen Isla Place

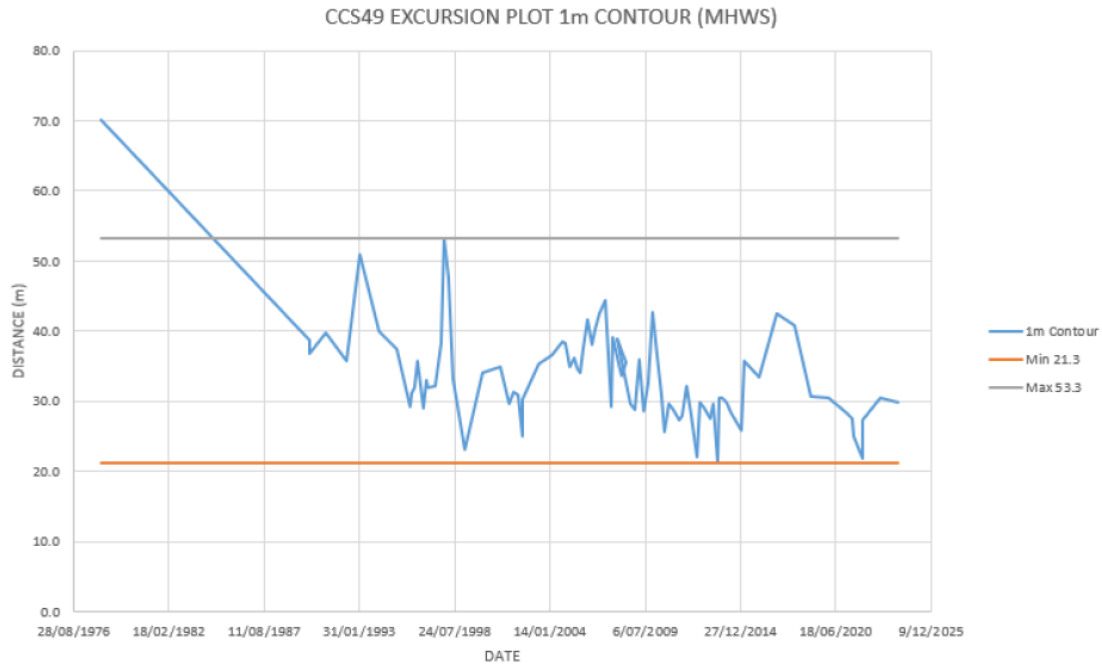


Figure 6 – Excursion of RL1.0m contour (MHWS) 1987-2024 CS49

MONITORING PROFILE EXCURSION RANGE - FULL PERIOD						
Profile	Duration			Excursion		Range
			years	min	max	m
CS49	1987 -	2024	37	21	53	32
CS50	1990 -	2024	34	47	71	24
N	2012 -	2018	6	15	33	17
S1	2012 -	2018	6	46	62	16
S2	2012 -	2018	6	25	43	18
S3	2012 -	2018	6	20	37	17
MONITORING PROFILE EXCURSION RANGE - 2012-2018						
Profile	Duration			Excursion		Range
			years	min	max	m
CS49	2012 -	2018	6	21	33	17
CS50	2012 -	2018	6	48	67	19
N	2012 -	2018	6	15	33	17
S1	2012 -	2018	6	46	62	16
S2	2012 -	2018	6	25	43	18
S3	2012 -	2018	6	20	37	17

Table 3 – Excursion Range of MHWS

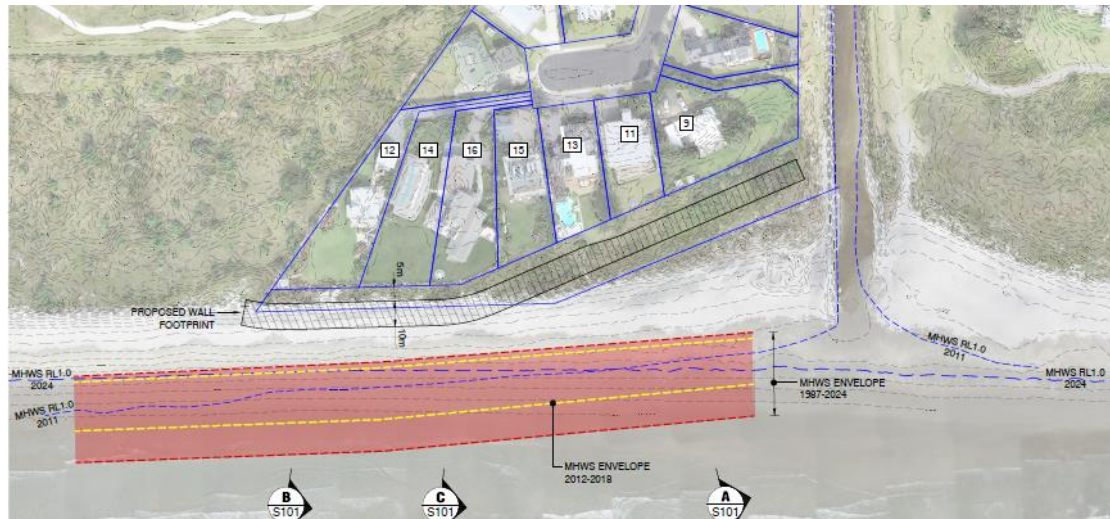


Figure 7 – Plan Showing Historic Range of MHWS 30+ years

4.0 Sea Level Rise

The location of MHWS is likely to migrate landward with rising levels due to Climate Change. Accepted theory is that as the water level increases the average location of the shoreline is likely to also migrate shoreward.

This is at odds with the longer-term processes such that estuaries tend to infill and barrier bar beaches tend to migrate seaward over long-term sea-level rise. Again, the quantum of sea level rise is relevant. Within a typical design time frame (50Y) sea-level rise is likely to be in the order of 0.5m and shoreward translation of 5m for a 1:10 Beach. This will be insufficient to make the proposed works within the CMA. We therefore consider that the structure is within an area of District Council Jurisdiction for construction of any erosion protection.

5.0 Conclusion

The location of MHWS has been considered on the site in order to determine Consent requirements of any proposal to address erosion issues for the properties on Glen Ilsa Place, Waihi. A level of pragmatism and judgement is required when determining the location of MHWS.

In this case, a detailed study and modelling of the height of MHWS has been undertaken by NIWA in 2006 and adopted by the Regional Council. The height of MHWS at Waihi Beach provided by that report and adopted for this exercise is RL1.0 (MVD53).

We have utilised the monitoring data of beach level over a period of over 30 years and plotted where this line of MHWS would have been due to beach fluctuation over that time. A median or mean location would seem a reasonable representation of MHWS at the site. However, we have adopted the most landward position that MHWS has been within that 30 year+ period and ensured all proposed work is outside this line.

Yours sincerely,

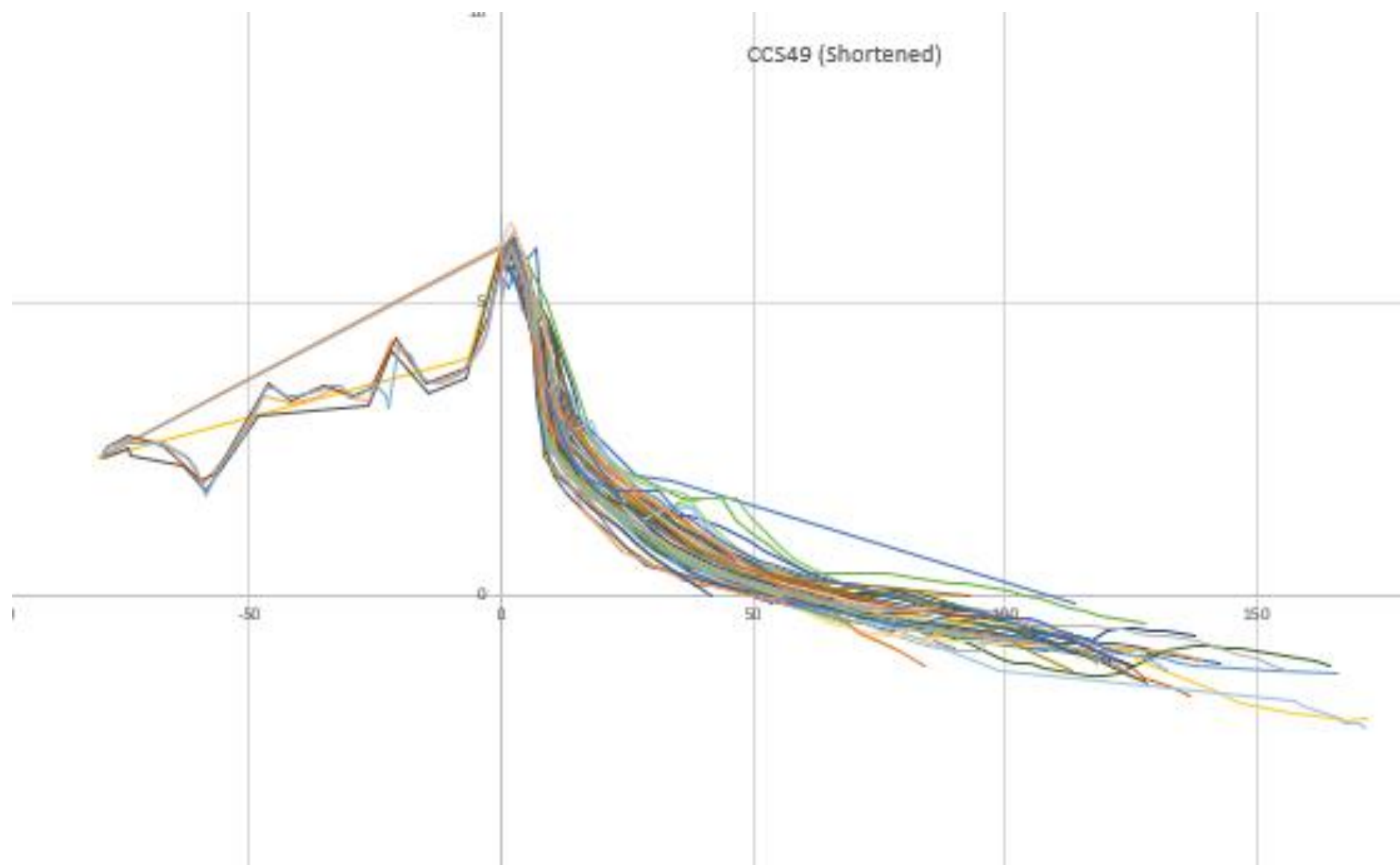


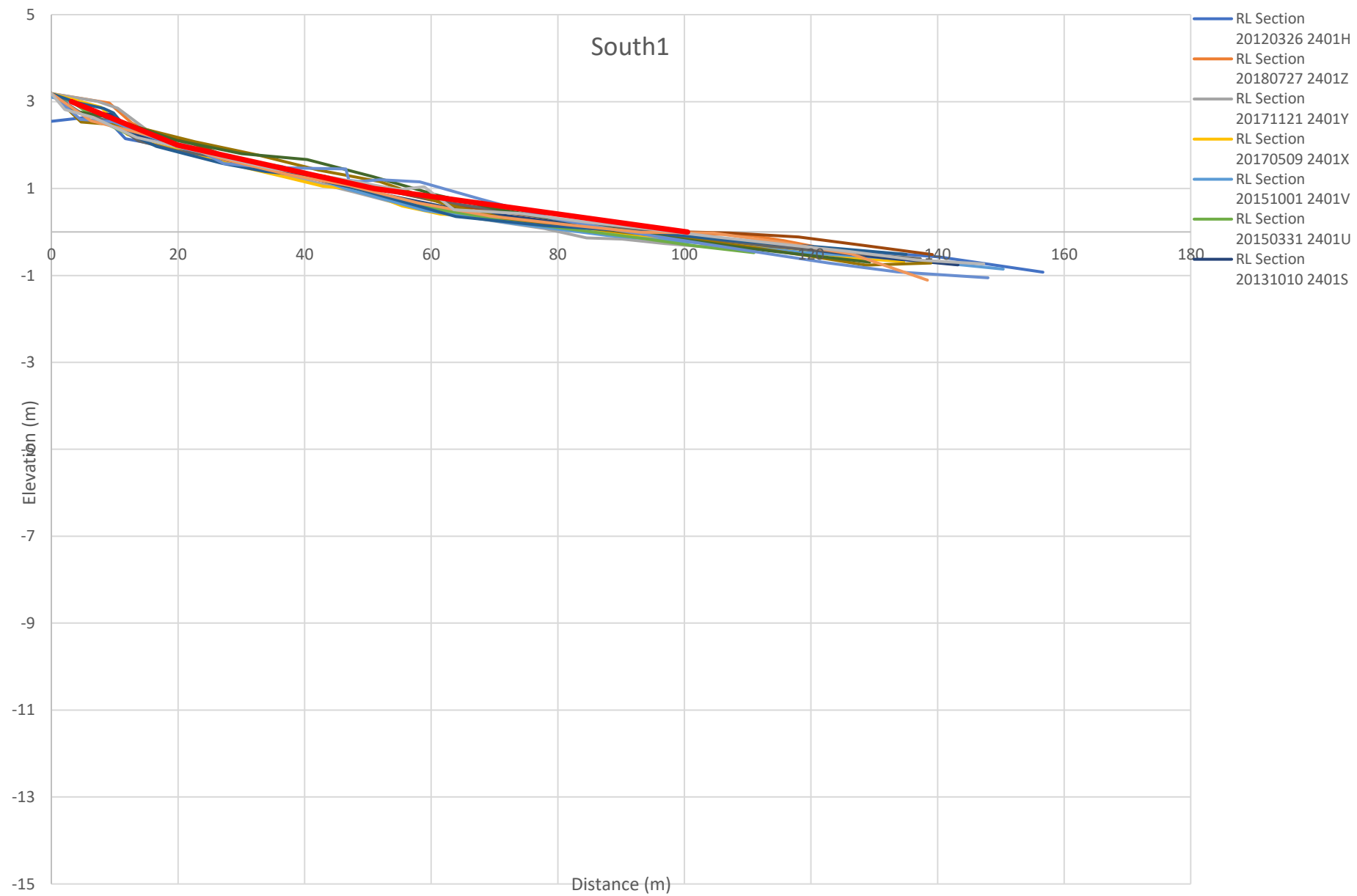
Craig Davis
BE, CPEng, IntPE(NZ), CMENZ

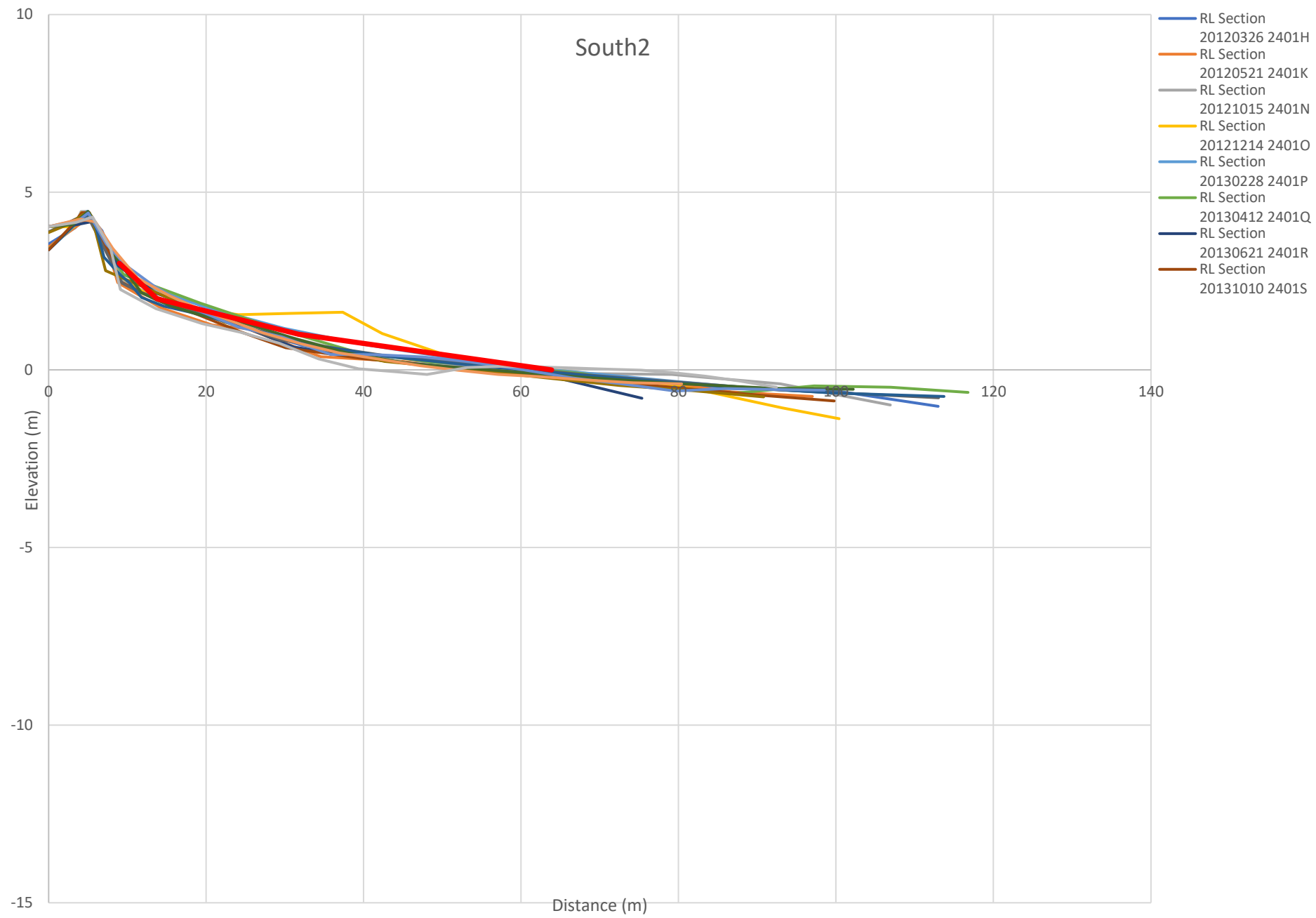
ATTACHMENT A

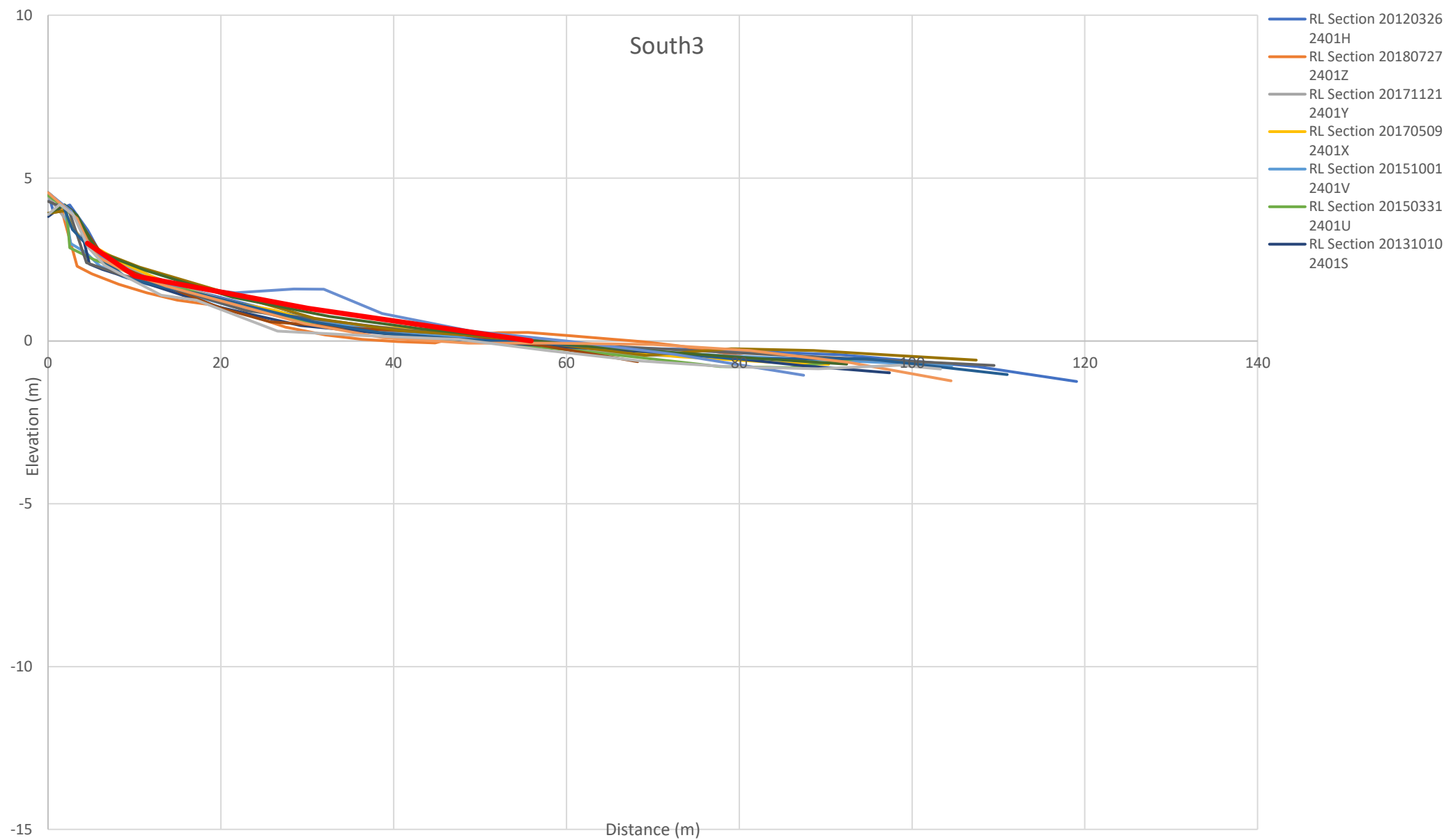
Monitoring Profiles and Excursion Data Plots

CCS49 (Shortened)

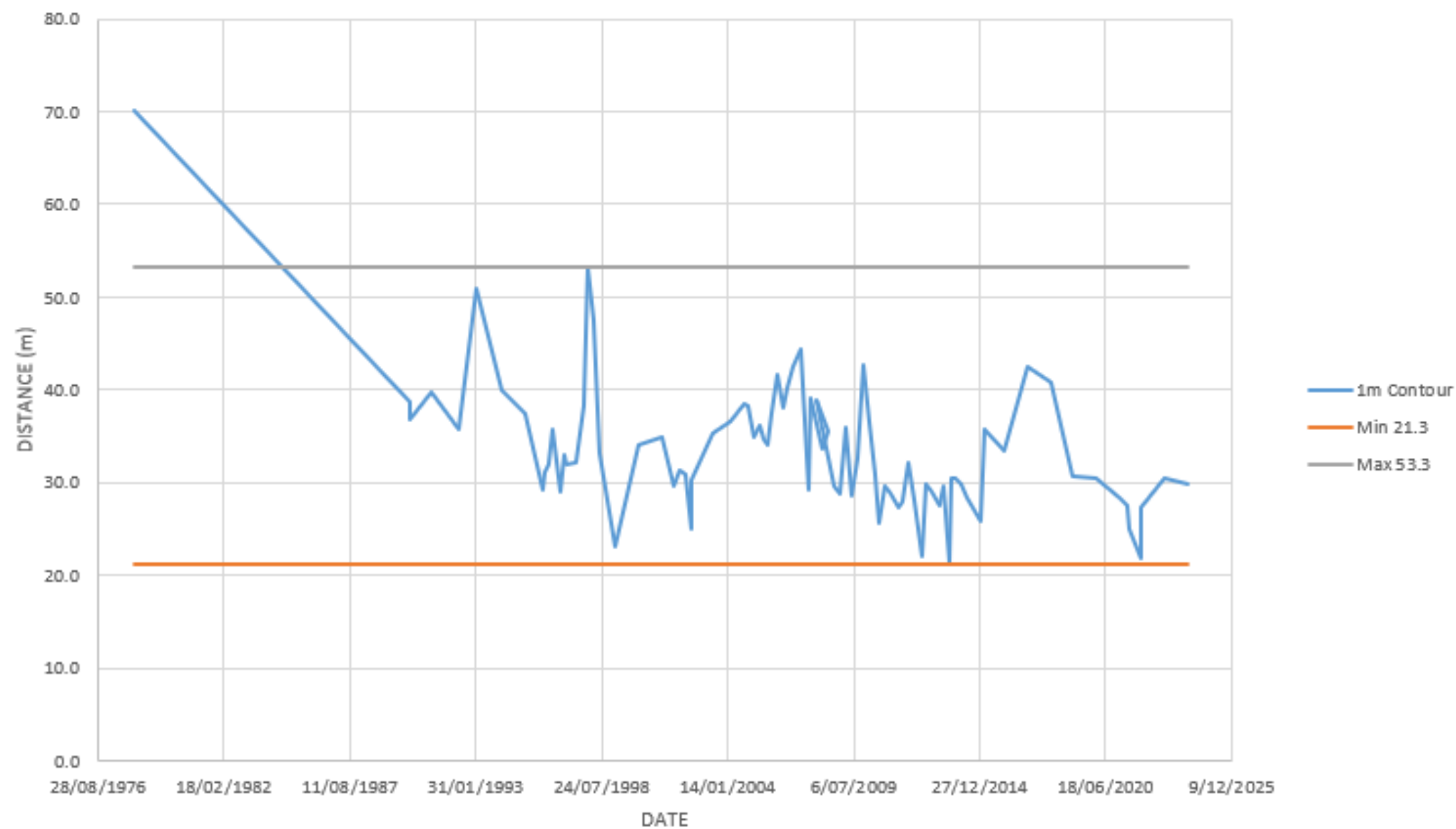




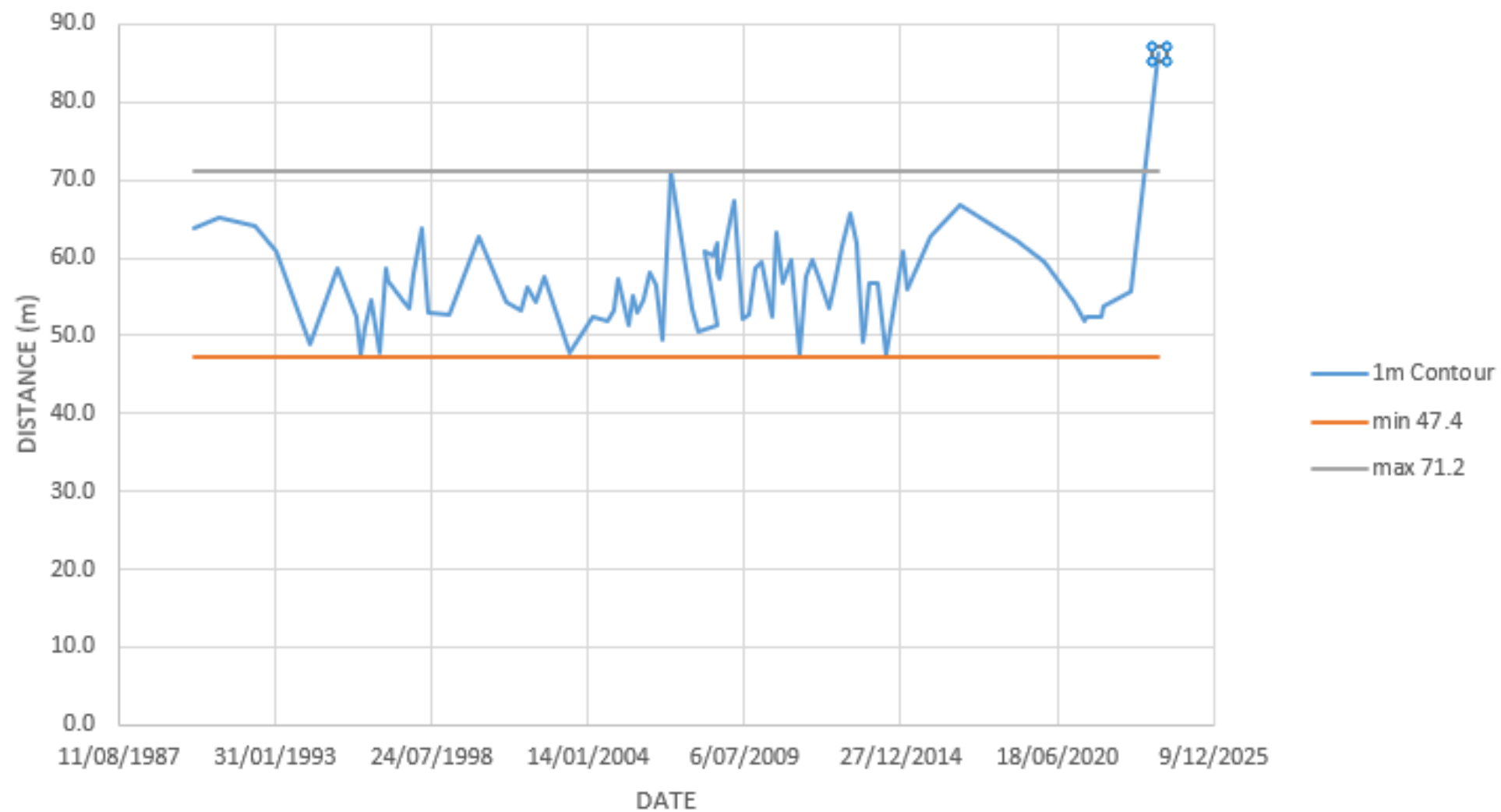




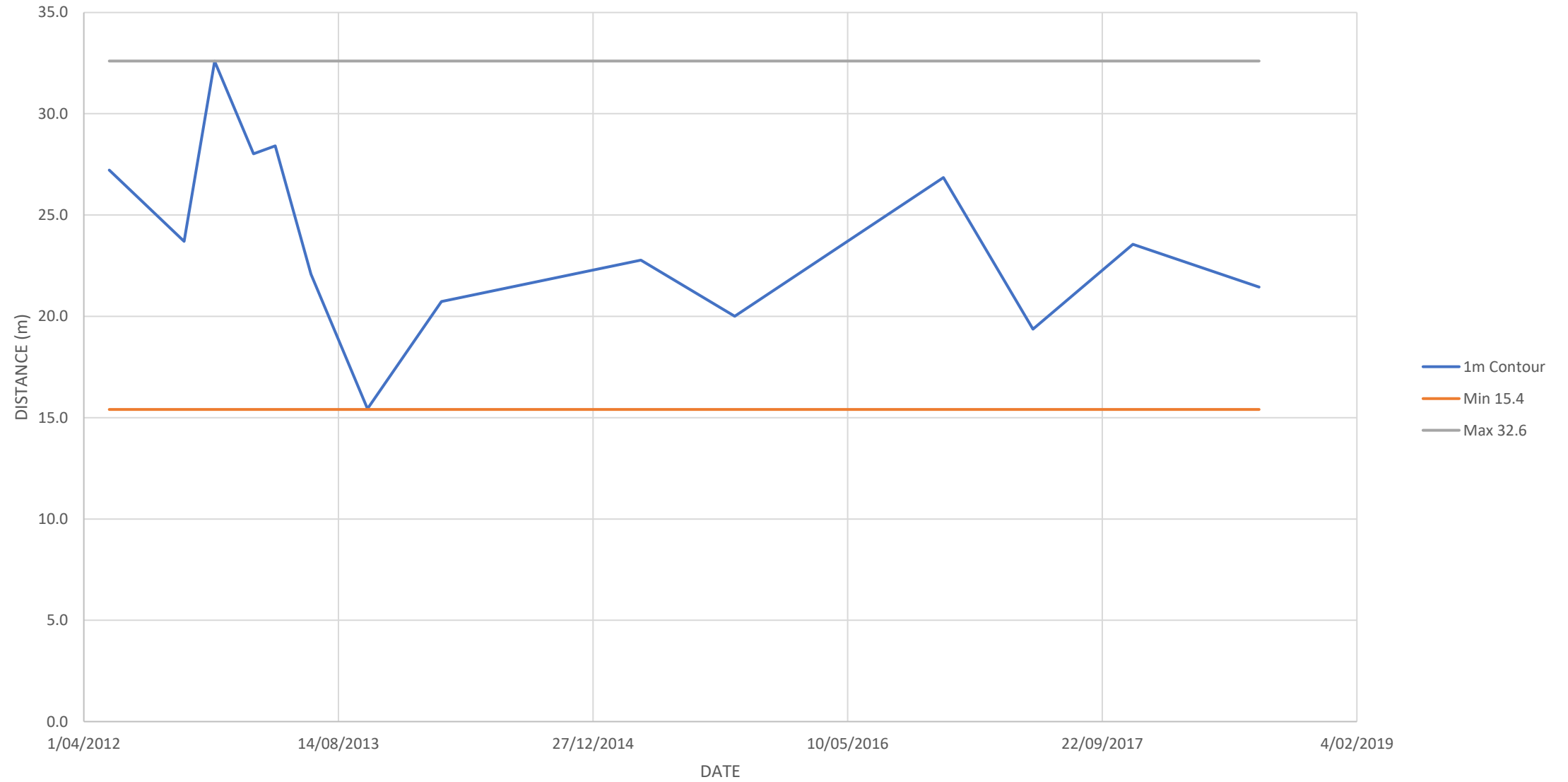
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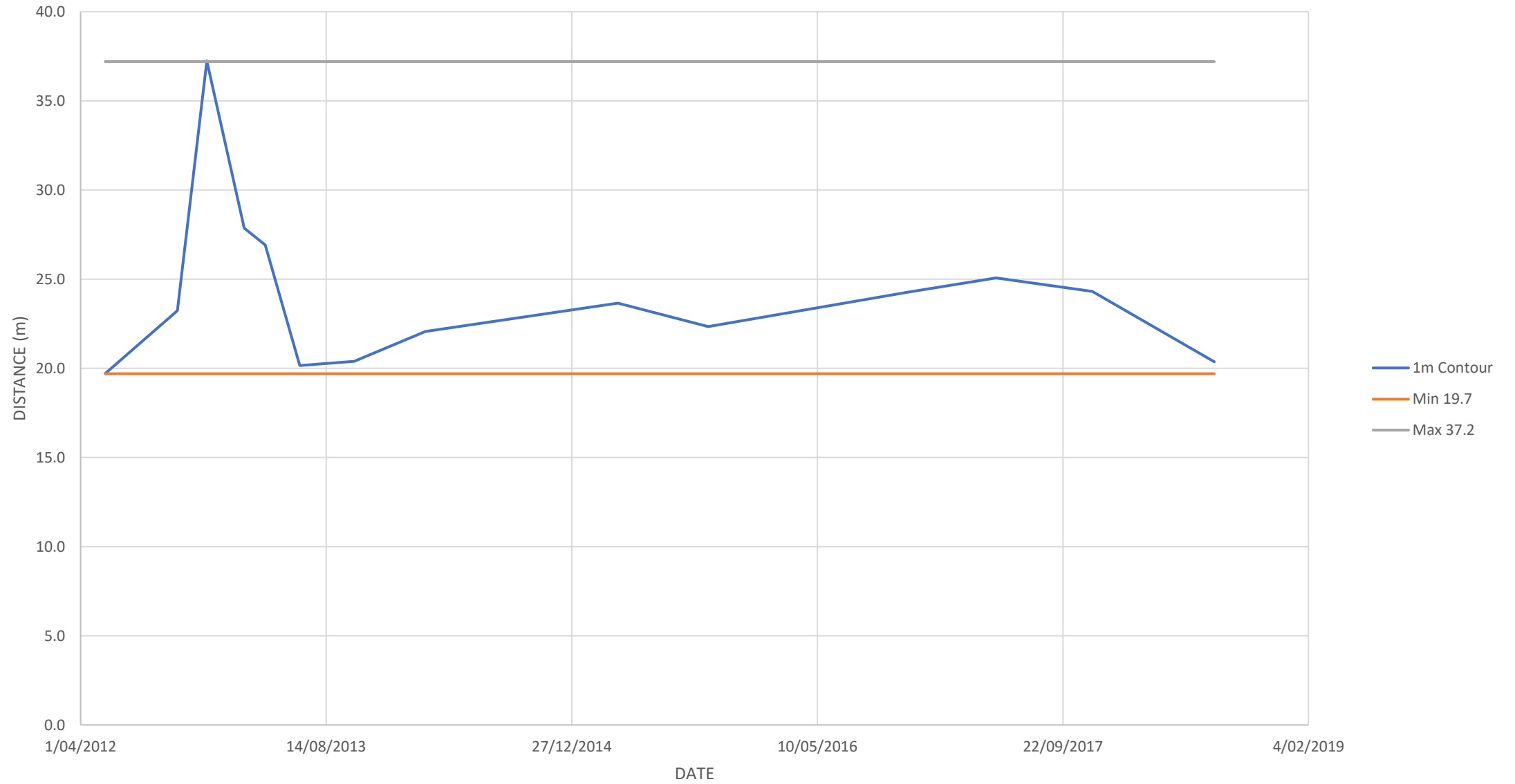
CCS50 EXCURSION PLOT 1m CONTOUR (MHWS)



North 1 EXCURISON PLOT 1m CONTOUR (MHWS)

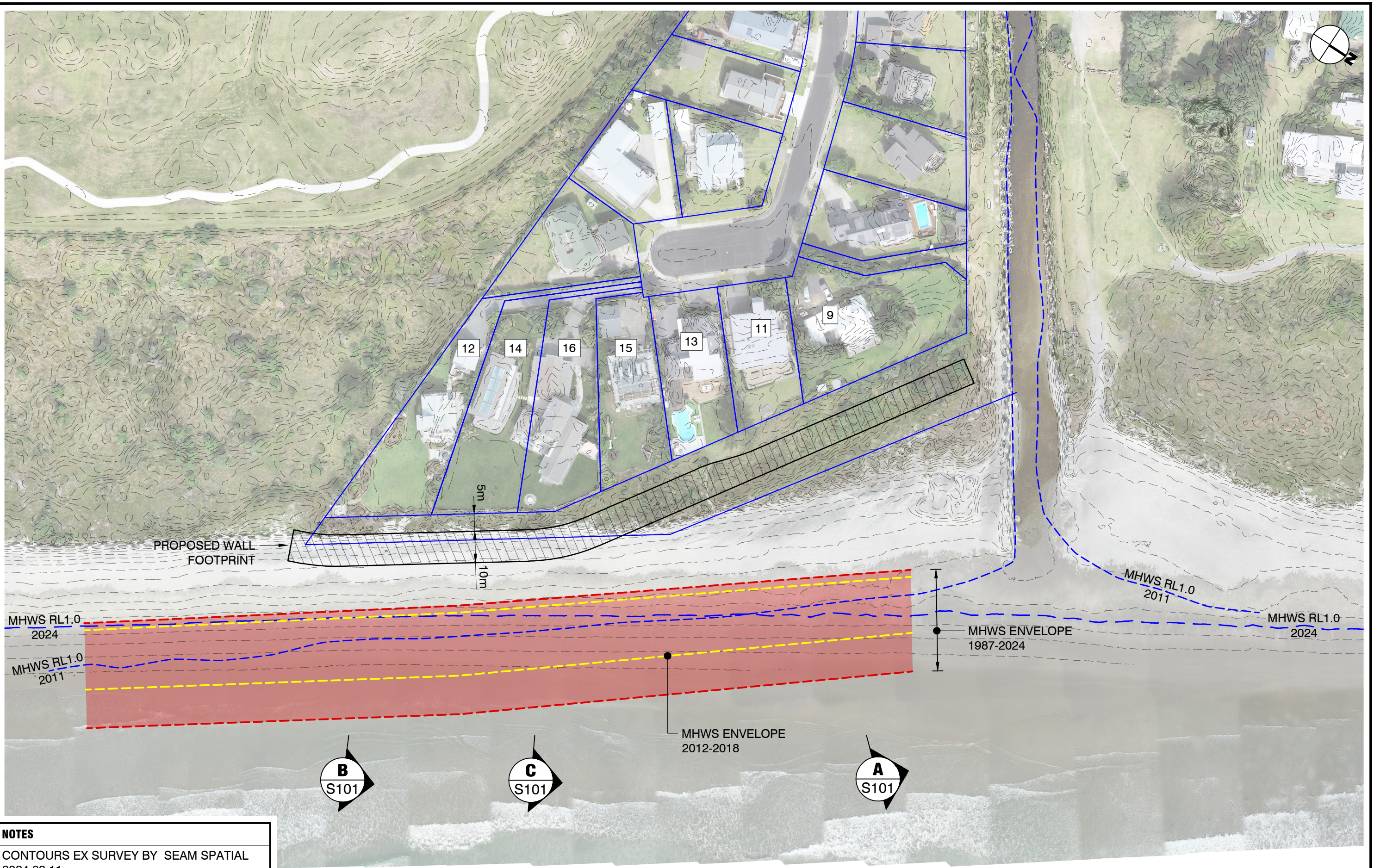


South3 EXCURSION PLOT 1m CONTOUR (MHWS)



ATTACHMENT B

Site Plan Showing Historic Extent of MHWS over 30+ years



NOTES
CONTOURS EX SURVEY BY SEAM SPATIAL
2024.03.11

-	PRELIMINARY ISSUE	03.04.2024
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DESIGN: DAVIS COASTAL CONSULTANTS
SURVEY: SEAM SPATIAL
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SCALE: 1:1000 @ A3
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JOB TITLE:

GLEN ISLA EROSION PROTECTION OPTIONS



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DRAWING TITLE:
PROPOSED WALL LAYOUT

SERIES:
PRELIMINARY

FILE NO: 23028
SHT NO: S100
REV: -

Coastal Protection Project
Glen Isla Dune - Waihi Beach

ASSESSMENT OF
LANDSCAPE AND VISUAL EFFECTS

11 October 2024

Isthmus.

Client Name: **Glen Isla Protection Society Incorporated.**

Project Name: **Coastal Protection Project, Glen Isla Dune – Waihi Beach**

Document Name: **Assessment of Landscape and Visual Effects**

Document Status: **Final**

Date: **11 October 2024**

IGL Reference: **5034/ C2**

Author: **Rose Armstrong, Brad Coombs**

QA Review: **Brad Coombs**

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Appendices:

Appendix A: LVA Assessment Methodology; Definitions and NZILA ratings scale (TTatM)

Appendix B: Statutory Framework – relevant provisions

Appendix C: Graphic Attachments

1.0 EXECUTIVE SUMMARY

- 1.1 The Glen Isla Protection Society Incorporated (“GIPS”) proposes to construct a buried coastal protection structure (“the structure”) at the coastal dune frontage of Glen Isla Place – just south of Three Mile Creek at Waihi Beach. The structure is proposed to be located within the Three Mile Creek Reserve,¹ seaward of properties 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place.
- 1.2 The dune frontage at Glen Isla Place is subject to ongoing erosion from natural coastal processes and has sustained considerable damage at times from large storm events (including Cyclone Gabrielle in 2023). The structure is proposed to protect the Reserve land and adjacent properties from further erosion, and future-proof this land from the effects of sea-level rise.
- 1.3 At completion, the proposed structure will be buried/covered with sand and planted with indigenous dune species. The new structure will be vested with the Western Bay of Plenty District Council (“the District Council”).
- 1.4 As the site is located within the Coastal Environment, the New Zealand Coastal Policy Statement (“NZCPS”) applies.² Effects on natural character and natural landscapes and features in the coastal environment are key considerations.
- 1.5 The site has not been identified in any statutory planning documents as having Outstanding, Very High or High natural character values.
- 1.6 The site is within an Outstanding Natural Feature (“ONF”) overlay in the Western Bay of Plenty District Plan (“the District Plan”). The overlay extends across the coastal edge along Waihi Beach.³
- 1.7 This report provides an Assessment of Landscape and Visual Amenity Effects (“LVA”) for the proposal. It includes assessment of effects on the natural character of the site and its immediate surroundings.
- 1.8 Refer to Graphic Attachments in **Appendix C** for a visual simulation of the completed proposal (using a viewpoint on Waihi Beach).

¹ The Reserve is covered by the Three Mile Creek Reserve Management Plan, administered by the Western Bay of Plenty District Council.

² Refer to Appendix B for the relevant objectives and policies of the NZCPS.

³ ONF S24 - Open Coastal Landscape Landward Edge Protection Yard. The District Plan identifies that the ONF contains “all land adjoining the open coastline, zoned Rural and within 100m of MHWS”. No other specific characteristics or values are identified in the District Plan for the ONF.

Existing Environment

Context

- 1.9 Landscape values at Waihi Beach are closely aligned with the coastal location and its natural character.
- 1.10 Existing natural character within the Waihi Beach area is characterised by the broad open beaches and dune systems. While the beach and dune systems retain a relatively natural profile in places, residential development and erosion protection works have altered the profile along parts of the coastal edge.
- 1.11 There is approximately 1.3km⁴ of rock revetment along the landward edge of Waihi Beach to the north of the Glen Isla Place site,⁵ and groynes have been installed at Three Mile Creek, adjacent to the site to the north.⁶ The coastal protection works reduce natural character at the coastal edge, although recent works (such as near the Flat White Café), have included the use of new planting integrated with sand ‘push ups’ over rock revetment, and this has provided visual softening of the edge protection and a more “naturalised” appearance.

Site

- 1.12 Landscape characteristics at the site contributing to the values of ONF S24 will derive from the site’s natural character (as summarised below). In addition, the site will contribute landscape values associated with the potential for access along the coastal edge.⁷
- 1.13 The site contributes to the natural character of Waihi Beach through its naturalised dune landform and planting. There have been modifications undertaken at the Glen Isla dune in the past to provide coastal protection for residential development; and the site is seen as part of an existing modified context (with other structures visible close to the site, including coastal protection structures at Three Mile Creek).
- 1.14 The site is not identified as an area of Outstanding, Very High or High natural character in statutory planning documents. This is consistent with the observed character.

⁴ As measured in the Engineering Design Report (Davis Coastal Consultants, October 2024).

⁵ This occurs at the frontages of The Loop and parts of Shaw Road.

⁶ Regular maintenance work occurs within Three Mile Creek to remove accreted sand. The removed sand is deposited near the Glen Isla dune, just to the south of the Three Mile Creek groynes.

⁷ Currently there is no formed public access through the reserve at the Glen Isla dune, although the existing width of the reserve in front of the GIPS properties provides for this, should the District Council wish to provide it. The GIPS proposal does not include provision of a public accessway.

Effects of the Proposal

Natural Character

- 1.15 At completion of the project the effect on natural character at the site is assessed as **Moderate-High positive**. The proposal will provide a naturalised sand dune form with more extensive indigenous planting than currently exists.
- 1.16 Should erosion cause parts of the structure to become visible in the future,⁸ there will be a reduction in natural character at the south end of the site. Over the next (approximately) 20-year period, the adverse effect will be temporary, until the sand dune face is re-established through ongoing natural processes.⁹ Beyond 20 years the structure is likely to become increasingly exposed due to effects from climate change.
- 1.17 If exposed, (either in the short or long term), the structure would be seen with planting retained to the north and top parts of the dune (at areas protected by the structure). It would be seen as part of a modified context which includes other structures close to the site; and would be visually consistent with other areas of rock revetment to the north of the site along Waihi Beach.
- 1.18 In the long term, the structure will ensure a higher-quality coastal edge (providing a “naturalised” appearance of rock revetment seen together with planting), than would be likely to occur with the (future) effects of climate change.

Landscape

- 1.19 Landscape effects relating to the potential for public access are assessed as **High positive**. The proposed location of the structure will prevent the potential future loss of public access along the coast.
- 1.20 The proposal will be consistent with characteristics and values in near-by parts¹⁰ of ONF S24, and will avoid adverse effects on the characteristics contributing to values of the ONF.¹¹

⁸ Erosion could occur from large storm events and (in time) from the effects of climate change and related sea-level rise. Refer to section 5.0 “The Proposal” for further details.

⁹ Refer to the photos provided at Graphic Appendix C to the LVA, which document this recovery process at the Glen Isla dune, after erosion caused by Cyclone Gabrielle in 2023.

¹⁰ At Three Mile Creek and the coastal edge north of Three Mile Creek (where there are existing coastal hazard protection structures).

¹¹ NZCPS Policy 15a requires that development proposals “avoid adverse effects of activities on outstanding natural features and outstanding natural landscapes in the coastal environment.”

Visual Amenity

- 1.21 Private views of the site will be limited to views from the adjacent dwellings on Glen Isla Place (the applicants). The main public views will be from Waihi Beach; and from parts of Three Mile Creek Reserve just north of the site.
- 1.22 In views from Waihi Beach effects on visual amenity are assessed as **Moderate-High positive**. The increased visual amenity will result from views of enhanced and more extensive areas of naturalised indigenous planting.
- 1.23 Effects in views from Three Mile Creek to the north of the site are assessed as **Neutral**. Views will be of new planting at the northern end of the site and the change will be less discernible.

Construction

- 1.24 Temporary construction effects are assessed as **Low adverse** and are considered to be appropriately minimised by the proposed timing of works and construction methodology.

Statutory

- 1.25 The proposal is considered to be consistent with the relevant statutory provisions. It will preserve the natural character of the coastal environment; protect natural features and landscapes of the coastal environment from inappropriate subdivision, use and development; and promote restoration or rehabilitation of the natural character of the coastal environment.

Recommendations

- 1.26 The LVA includes recommendations relating to detailed planting and the sourcing and selection of rock. (Refer to section 12.0 “Recommendations”). The effects ratings provided in the LVA assume inclusion of the recommendations.

2.0 INTRODUCTION

- 2.1 This report (the “LVA”) sets out the assessment of the natural character, landscape and visual amenity effects (including temporary effects from construction), arising from the proposed coastal hazard protection structure (“the structure”) at the coastal frontage of Glen Isla Place, Waihi Beach.
- 2.2 GIPS¹² proposes to locate the structure inside the Three Mile Creek Reserve at the dune frontage of private properties 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place (listed from north to south). The purpose of the structure is to protect the Reserve land and adjacent properties from further erosion, and future-proof this land from the effects of sea-level rise and coastal hazards.
- 2.3 The proposed structure is a rock revetment wall, with two main sections. The northern section is to be buried within the existing dune; and the southern section is to be located at the face of the existing dune and covered with sand at completion to present a naturalised dune frontage to the beach. New planting with dune species is proposed to all disturbed areas and with supplementary planting landwards of the structure in some places.
- 2.4 Refer to section 5.0 of this report (“The Proposal”), for more detailed information on the proposal (as relevant to this assessment); and to the graphic attachment **Appendix C** for a visual simulation of the completed proposal (as seen from Waihi Beach near the south end of the proposal site).

Background

- 2.5 The coastal dune frontage to Glen Isla Place, just south of Three Mile Creek on Waihi Beach, has been subject to erosion from wave action, and has sustained significant damage at times from large events, such as Cyclones Gabrielle and Hale. The 2024 shoreline now occurs at approximately 3-5m landward of the 1999 coastline. Cyclone Gabrielle is considered responsible for a large part of this retreat.¹³
- 2.6 In 2023, GIPS met with the Western Bay of Plenty District Council (“the District Council”) to put forward a proposal to protect the dune with a rock revetment. GIPS tabled a proposed

¹² The Glen Isla Protection Society Incorporated.

¹³ Refer to Coastal Protection Project for Glen Isla Protection Society, Assessment of Coastal Processes, Davis Coastal Consultants, October 2024. (Refer also to the photos included at **Appendix C**, which show the Glen Isla Dune in 2023 after Cyclone Gabrielle).

design in a document entitled “Waihi Beach – Waterfront Erosion Protection”,¹⁴ which the Council’s Operations and Monitoring Committee voted to support.¹⁵

- 2.7 The 2023 proposed rock revetment¹⁶ included a northern section buried within existing dune, and a southern section of exposed (visible) rock revetment,¹⁷ facing Waihi Beach. Subsequent design updates (completed for this application) have enabled provision of the southern section of the revetment with a forward-sloping sand face towards the beach, with new planting proposed over and at the top of the new face.
- 2.8 Refer below to section 5.0 “The Proposal”, for further details of the updated design, prepared for this application.

3.0 ASSESSMENT APPROACH AND METHODOLOGY

- 3.1 The assessment follows best practice as set out in Te Tangi a te Manu, (“TTatM”), the Aotearoa Landscape Assessment Guidelines (2022) adopted by Tuia Pito Ora, the New Zealand Institute of Landscape Architects (“NZILA”).
- 3.2 The assessment focuses on the long-term natural character, landscape and visual amenity effects of the proposal, and the temporary natural character, landscape and visual amenity effects arising from construction of the proposal.
- 3.3 The LVA uses the identification of areas of Outstanding, Very High and High Natural Character and Outstanding Natural Features and Landscapes (ONFL) in the regional and local planning documents, and provides further assessment to identify site specific characteristics and values at the Glen Isla dune. (Refer to section 4.0 “Existing Environment”).
- 3.4 The LVA methodology uses an approach whereby effects on natural landscape and natural features (the characteristics of which will contribute to both landscape and natural character values) are considered under the heading of Natural Character and are not considered again under the heading of Landscape. The approach is taken to avoid “double-counting” of effects. In this assessment, landscape effects are considered in terms of “urban” landscape characteristics (relating to potential for public access along the coastal edge).

¹⁴ Refer to the AEE for the 2023 proposal, which includes the earlier (2023) Waterfront Erosion Protection proposal.

¹⁵ GIPS met with the District Council’s General Manager Infrastructure Group and Reserves and Facilities Manager, on 8th September 2023; ahead of meeting with the Council’s Operations and Monitoring Committee on 31 October 2023 – at which time the committee voted to support the proposal.

¹⁶ As supported by the Council.

¹⁷ Running from No.12 to No.15 Glen Isla Place.

- 3.5 The assessment has included visits to the site and surrounding context on 5 April 2024 and 12 July 2024. The report authors have undertaken previous site visits for the adjacent Council erosion protection projects and are familiar with the site and its' context.
- 3.6 Refer to **Appendix A** for detailed information on the assessment approach and methodology; and for information on the 7-point ratings scale and definitions of natural character and landscape used in the assessment (taken from TTatM).
- 3.7 **Appendix A** includes an explanation of the NZILA 7-point ratings scale in relation to effects-based terminology used under the Resource Management Act 1991 ("RMA").

Assumptions

- 3.8 The effects ratings provided in this LVA assume the inclusion of recommendations made in section 13.0 of the LVA.

Reference Documents

- 3.9 This assessment has considered the following documents and drawing sets:
- Coastal Protection Project, Glen Isla Dune Waihi Beach - Construction Methodology Statement and Drawing Set 23028 (Sheets 1-4, Plans and Sections); Davis Coastal Consultants, October 2024;
 - Coastal Protection Project for Glen Isla Protection Society, Assessment of Coastal Processes, Davis Coastal Consultants, October 2024;
 - Coastal Protection Project for Glen Isla Protection Society, Engineering Design report, Davis Coastal Consultants, October 2024;
 - Glen Isla Dune, Coastal Protection Project, Ecological Assessment; BlueGreen Ecology Ltd, 19 August 2024.

4.0 EXISTING ENVIRONMENT

- 4.1 Refer to the graphic attachment **Appendix C** for photos of the existing environment (site and context).

Context

- 4.2 The site is located at Waihi Beach. Waihi Beach is a coastal settlement in the Western Bay of Plenty at the base of the Coromandel Peninsula and north of the northern entrance to the Tauranga Harbour. The settlement is well established, containing a mixture of traditional baches and recent beach house development. The street fabric and layout of Waihi Beach is aligned parallel to the beach, taking advantage of the spectacular coastal views available.
- 4.3 The profile of Waihi Beach is generally very flat, with a broad intertidal zone offering a deep open beach at low tide, and a narrow beach against the fore dune and existing coastal erosion structures at high tide.
- 4.4 Landscape values at Waihi Beach are closely aligned with the coastal location and the natural character of the area.

Natural character

- 4.5 Existing natural character within the Waihi Beach area is characterised by the broad open beaches and dune systems. Inland areas of the back dunes from Bowentown Heads to northern Waihi Beach have generally been domesticated to some degree, by fencing and management in pasture, draining of wetlands, and subdivision and development for residential use.
- 4.6 At Waihi Beach, while the beach and dune systems retain a relatively natural profile in places (with the broad sweep of the beach generally intact and including an open intertidal zone through to a remnant foredune system), natural elements and processes within the coastal environment have been impinged upon where development has been carried out up to, and within the fore dune.
- 4.7 In places the foredune has been significantly compromised by development including residential development and associated accessways and coastal protection works. Residential buildings (including multi-storey dwellings) are built to the crest of the foredune in places, leaving little or no natural buffer between built development and the natural coastal dune edge.

- 4.8 Foredune areas include a mixture of both natural, and planted exotic vegetation and this provides some vegetative context to the developed crest of the foredunes. However, there is now virtually no dynamic indigenous vegetation (and fauna) covered dune system left along Waihi Beach. Weed species cover is now dominant, and areas of spinifex and pingao are small and scattered.¹⁸
- 4.9 The hardening of the coastal edge at Waihi Beach (as described above) has disrupted the natural process of coastal erosion of the fore dune, and the corresponding dune building process, and has resulted in a tension between dynamic coastal erosion processes, and the static seaward residential boundaries, which are within the erosion zone.
- 4.10 To manage the erosion risks, there has been a history of coastal protection works along Waihi Beach, and various ad-hoc structures have been installed in the past, including timber wall.
- 4.11 Work has been completed between 1993-2011 to remove the ad-hoc protection structures and provide improved coastal hazard protection structures. In some locations (such as near the Flatwhite café), this has included new naturalised dune plantings with sand ‘push ups’ over rock revetment, which has provided visual softening of the edge protection and a more “naturalised” appearance.
- 4.12 Rock revetments (installed in 2010-2011) now extend along the coastline for approximately 1.3km¹⁹ to the north of the site - along the frontage of parts of Shaw Road and the frontage to The Loop. Groynes (constructed with geotextile bags) were installed at Three Mile Creek (adjacent to the north end of the site) in 2009, to reduce erosion around the stream mouth and enable sand and dune development adjacent to the groynes (including along the Glen Isla frontage).²⁰ Ongoing maintenance is carried out to remove accreted sand from the Creek, with removed sand placed at the base of the northern end of the Glen Isla dune.
- 4.13 Adjacent to Glen Isla Place to the south is reserve land which extends from the coastal edge through to Seaforth Road.²¹ This provides a much deeper natural dune landform edge to the

¹⁸ Glen Isla Dune, Coastal Protection Project, Ecological Assessment; BlueGreen 19 August 2024; page 4.

¹⁹ As measured in the Engineering Design Report (Davis Coastal Consultants, October 2024).

²⁰ Since completion of the work sand has built up on either side of the Creek, but this effect doesn’t extend to the southern end of the Glen Isla dune. Widening of the dune has mainly been towards the northern end, immediately adjacent to the groynes, as described in the coastal processes assessment for the proposal. (Refer to Coastal Protection Project for Glen Isla Protection Society, Assessment of Coastal Processes, Davis Coastal Consultants, October 2024.)

²¹ This comprises WBoP District Council reserve at the coastal edge, and Department of Conservation (DoC) reserve landward of that, (Island View Recreation Reserve), extending through to Seaforth Road, and including grassed areas behind the natural coastal-edge dunes.

beach than exists at the Glen Isla dune;²² and results in a difference in landscape and natural character to the coastal edge to the immediate south of the site, as experienced from the beach. With no views from the beach of development at the top of the coastal dune edge, the coastal edge south of the site is perceived as more highly natural (until development starts to occur again further south along Broadway Road).

- 4.14 Overall, while the beach and dune systems retain a relatively natural profile in places at Waihi Beach, residential development and erosion protection works have altered the profile along parts of the coastal edge. The natural process of coastal erosion of the foredune, and the corresponding dune building process has been disrupted in areas; and the distribution of natural elements, including indigenous coastal flora has been altered and degraded by development, including residential building at/close to foredune areas, and the historical erosion protection works.
- 4.15 There are no areas of Outstanding, Very High or High natural character identified²³ at the coastal edge of Waihi Beach between Orokawa Bay and Island View.

Site

- 4.16 The site is located immediately south of Three Mile Creek and comprises sand dune at the coastal frontage of properties at (from north to south) 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place.
- 4.17 The coastal dune edge at the site is dynamic – with changes occurring over time from ongoing natural coastal processes. The coastal processes report for the proposal²⁴ notes “relatively constant accretion continuing to occur, at least in front of the site, through to 1999. The 2024 shoreline picks up the nearly unprecedented retreat that occurred in the extreme weather events in Jan-Feb 2023 and is approximately 3-5m landward of the 1999 coastline.”²⁵

²² At Glen Isla Place frontage the dune form extends landward from the beach for a distance between approximately 5 – 25m. At the reserve land to the south of Glen Isla Place the natural dune landform is approximately 80-90m wide/deep landward of the beach. This is much closer to the normal depth of a natural dune landform of 50-100m.

²³ Natural character for the Waihi area is mapped in the Bay of Plenty Regional Policy Statement.

²⁴ Coastal Processes Assessment, Davis Coastal Consultants, October 2024.

²⁵ The report notes that Cyclone Gabrielle was likely responsible for a large part of the retreat that occurred. Refer to Coastal Protection Project for Glen Isla Protection Society, Assessment of Coastal Processes, Davis Coastal Consultants, October 2024; Page 20.

- 4.18 The following image (taken from the Coastal Processes Assessment) shows the historic shoreline at the site.



Historic coastlines overlaid on 2024 aerial (Figure 3.5a from the Coastal Processes Assessment, Davis Coastal Consultants, October 2024).

- 4.19 There have been past modifications to the Glen Isla dune to provide coastal protection, including a seawall. Work was undertaken at the dune in 2011, (as part of the coastal protection works along Waihi Beach), which included removal the old seawall and grading to form a new, naturalised dune - with new planting. (The dune enhancement was washed away by a severe storm within a few weeks of completion).
- 4.20 The Glen Isla dune currently presents a sand face to the beach, with mixed vegetation on its upper portions. Vegetation occurs to (roughly) the upper half of the dune face and across the top areas as these extend landward towards private properties. Dune species are generally confined to the area between the dune front (subject to erosion) and the boundaries of private properties, where lawn is typically established to the edge of the reserve. The current vegetated extent of the back dune system at the site is approximately 20m wide, closest to Three Mile Creek, and narrows to approximately 4-5m wide towards 12 and 14 Glen Isla Place.²⁶
- 4.21 The dune vegetation has been described in detail in the Ecological Assessment but is predominantly low and contains a mix of species – including exotic species. There is a high

²⁶ Coastal Protection Project for Glen Isla Protection Society, Assessment of Coastal Processes, Davis Coastal Consultants, October 2024, page 9.

value area of spinifex vegetation in the northern foredune. Indigenous plants are most prominent in the north in the area of the foredune including beach bind weed, spinifex, pingao and in the very south where pohuehue on the terrace and spinifex along the erosion scarp face are notable (but no pingao). Otherwise, knobbly club rush and pohuehue are the common native dune plants throughout. The majority of the back terrace and terrace slope is covered in exotic species, many considered weed species.²⁷

- 4.22 There is a large Norfolk Pine between the properties at 11 and 13 Glen Isla Place (on private property outside the reserve), and this is prominent in views from the beach and reserve.
- 4.23 The dwellings on Glen Isla Place are set back from the beach²⁸ and are a mix of single and two-storey dwellings. While not dominant on the beach experience, they are easily seen at the top of the dune, including from the beach (where they are seen above/behind the low dune planting). In places, boundary fencing can be seen from the beach at the landward edge of the reserve and project area/site.
- 4.24 There are informal access tracks across the dune / through the site, between the beach and the beach-front properties on Glen Isla Place.²⁹
- 4.25 Public access along the coastal edge at the Glen Isla Dune is provided by the beach. While the site is located within reserve land, public access is limited by the unmanicured, vegetated nature of the back dune area and there is currently no formalised accessway through this part of the reserve. The existing width of the reserve in the vicinity of the site provides sufficient room for public access, should access along the beach become unavailable – for example due to high tides / storm events.
- 4.26 The site is zoned Rural in the District Plan but does not exhibit characteristics which would be typically associated with a rural area or rural character - such as wide, open areas of pasture and/or agricultural uses and livestock.

Outstanding Natural Feature Overlay

- 4.27 The site is within an Outstanding Natural Feature (ONF – S24 Open Coastal Landward Edge Protection Yard) overlay in the District Plan – which extends along the Waihi Beach

²⁷ Glen Isla Dune, Coastal Protection Project, Ecological Assessment; BlueGreen 19 August 2024; page 11.

²⁸ The dwellings on Glen Isla Place have varied set back from the beach – ranging between approximately 40m and 68m.

²⁹ Formal public access to the beach is provided from Seaforth Road and off Glen Isla Place, along the southern bank of Three Mile Creek. There is access along both sides of Three Mile Creek to the foreshore.

land/coast edge. The District Plan identifies that “the area contains all land adjoining the open coastline, zoned Rural and within 100m of MHWS.” No other specific characteristics or values are identified in the District Plan for ONF S24.

- 4.28 Landscape characteristics and values at the site which contribute to the ONF will be closely aligned with and derive from its natural character (as summarised below).
- 4.29 There will be further values at the site associated with the potential for public access (should the Council wish to provide this at some point in the future).

Natural character evaluation - baseline

- 4.30 Key site characteristics contributing to natural character (as experienced from the beach/coastal edge) are:
- A dynamic coastal edge, with changes to the dune occurring from ongoing natural coastal processes (in particular weather events such as storms);
 - Naturalised sand-dune landform – with a natural appearance to the dune, but noting that past landform modifications have occurred to the dune;
 - Naturalised planting on upper portions of the dune-face (facing the beach) and across top parts through to the landward edge of private property boundaries. Vegetation includes a mix of predominantly low-growing indigenous and exotic plantings. There is an area of high-value indigenous vegetation on northern parts of the dune, (spinifex and pingao), and occurrence of some weed species in other parts. Some exotic / amenity plantings are visible from the beach – including large and prominent exotic species (Norfolk Pine);
 - Existing views of dwellings and structures at the top of /behind the dune (housing, fencing, garden/pergola-type structures, private accessways/paths). Some of the two-storey dwellings (where these are closer to the beach) appear as taller than the dune height (in views from the beach) and this increases their prominence in relation to the dune feature;
 - Exposed, wind-blown/eroded character to lower portions of the dune face, where wave action occurs and planting has not established – which is expressive of ongoing coastal processes;

- Ongoing natural patterns and processes have been interrupted at the site with the earlier coastal protection works at and near the site, and the establishment of residential development adjacent to/at the top rear parts of the dune.
- 4.31 Overall, the site contributes to the natural character of Waihi Beach through its naturalised dune landform and planting. The site’s natural character is lowered by the dune modifications undertaken to provide coastal protection for residential development; the exotic and residential/amenity plantings present on the dune (and visible from the beach); and the clear views of dwellings and associated structures (fencing and garden structures) at the top of the dune.
- 4.32 The site is not identified as an area of Outstanding, Very High or High natural character in statutory planning documents. This is consistent with the observed character at the site.

5.0 THE PROPOSAL³⁰

- 5.1 GIPS proposes to construct a buried rock revetment (“the structure”) along approximately 200m of the back and foredune area at Waihi Beach, immediately south of Three Mile Creek and inside the Three Mile Creek Reserve.³¹
- 5.2 The proposed structure will be continuous over the frontage of seven beach front properties (Nos. 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place). At the north end, the structure will be buried within existing (reinstated) dune area, with new planting to all disturbed areas and supplementary planting landwards of disturbed areas in some areas. At the south end, the structure will be topped and faced with sand to present a new dune face to the beach, with sand placed to integrate the new form into existing natural dune contours to the south. New planting will be provided to the top and face of the new dune form, and at the south end of the new dune, to integrate it into the adjacent natural dune.
- 5.3 The landward edge of the rock revetment will vary slightly in distance from the private property boundaries – being approximately 5m from the boundary at the south end, 7.6m in middle (to protect a Norfolk Pine between properties No.11 and No.13 Glen Isla Place), and 6.5m from the boundary of No.9 Glen Isla Place, at the northern end of the structure. The following graphic (taken from the Construction Methodology Statement), shows the

³⁰ Refer also to the detailed Description of the Proposal provided in the AEE.

³¹ The reserve is vested with the Western Bay of Plenty District Council.

proposed alignment of the structure. (Refer also to **Appendix C** for additional plans and cross-sections for the proposal).



Layout of rock wall (Figure 2.0a from the Construction Methodology Statement, Davis Coastal Consultants, October 2024; page 7).

5.4 Key components of the proposed structure relevant to this assessment are as follows:³²

Vegetation removal

- Removal of existing vegetation is required for construction of the structure. The extent of clearance will be limited as much as practicable, and in principle will comprise the footprint of the structure plus any sloping sides to the trench where that area is currently vegetated:
 - Clearance will be more limited at the southern end of the proposed structure (seaward of properties 12-16 Glen Isla Place - where the structure will be located at and slightly landward of the existing dune face). Clearance is anticipated in this area to 1m landward of the rear of the structure (calculated as approximately 70m²);³³
 - More extensive clearance will be needed at the northern end of the structure, (9 – 15 Glen Isla Place), due to the extent of excavation needed to place the structure below

³² As taken from the Construction Methodology Statement for the proposal prepared by Davis Coastal Consultants (October 2024).

³³ As calculated by the project ecologists. Refer to the ecology report: Glen Isla Dune, Coastal Protection Project, Ecological Assessment; BlueGreen 19 August 2024; page 18.

the existing ground level of the dune. An approximate width of 13m has been defined for vegetation removal (calculated as comprising approximately 1,820m²).³⁴

- In total, (as calculated above), it is anticipated there will be a need for vegetation removal over approximately 1,900m² of the site.
- There will be no vegetation removal in the area of high-value Spinifex and Pingao vegetation identified by project ecologists at the northern end of the site. The area will be marked out and fenced off prior to work commencing.
- Vegetation removed will include existing exotic species within the project footprint.³⁵



Indicative area of vegetation requiring removal (Figure 5.0a from the Construction Methodology Statement, Davis Coastal Consultants, October 2024; page 10)

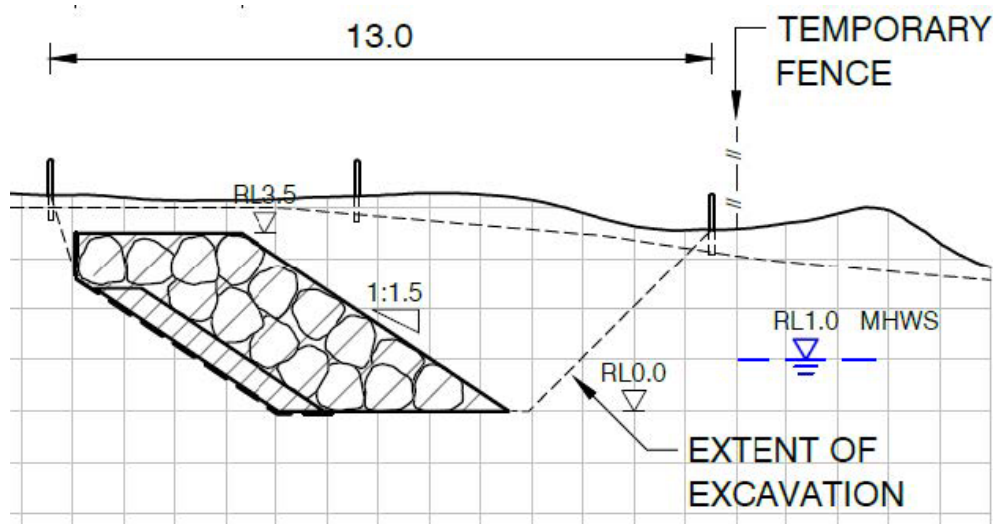
Earthworks

- Excavation of the existing dune landform is proposed to construct and locate the structure inside the existing dune landform:
 - For southern parts of the structure less excavation will be needed, due to the proposed structure being located at and slightly seawards of the existing dune face.

³⁴ As calculated by the project ecologists. Refer to the ecology report: Glen Isla Dune, Coastal Protection Project, Ecological Assessment; BlueGreen 19 August 2024; page 18.

³⁵ There is currently a mix of exotic species through the site, described in ecology reporting for the project as a “dense tangled exotic cover” in places, and including agapanthus, yucca and pampas. (Refer to Existing Environment, below, for further details).

- For northern parts more excavation will be required, due to the placement of the structure below existing ground level. Excavation to a width of approximately 13m is proposed in this northern area.
- Excavated sand will be used to bury the completed structure. At the northern section the excavation trench will be re-filled and sand reestablished to meet the adjacent contours along the length of the section. At the southern section the structure will be topped and faced with sand, with shaping to integrate the new dune form into the adjacent existing natural dune contours. Refer also to Site Rehabilitation, below.
- At completion (after placement of sand over the rock structure) the top of the dune will be at approximately RL 4.0, which will be approximately 2m above the toe of the dune on the beach.

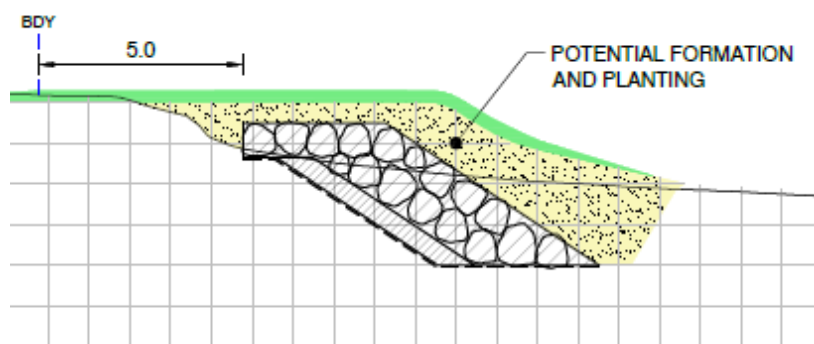


Indicative excavation to place wall (Figure 5.0b from the Construction Methodology Statement, Davis Coastal Consultants, October 2024; page 10).

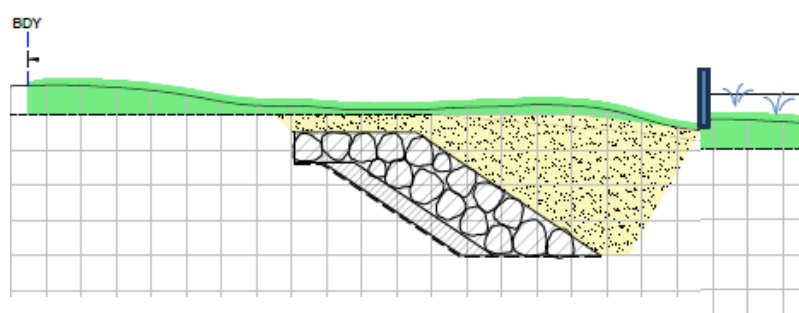
Inclusion of an engineered structure

- A rock revetment wall will be constructed within and at the face of the existing dune landform. As previously described, the northern section of the structure will be buried within existing dune; and the southern section will be constructed at the seaward face of the existing dune and topped and faced with sand contoured to integrate with the surrounding natural dune environment.

- The structure will be designed in accordance with accepted design guidelines (CIRIA C683) and will include a slope no steeper than 1:1.5.³⁶
- Rock is to be sourced from a local Waihi Beach quarry.³⁷ Selection is to include rocks with a weathered appearance (as possible) and a variety of sizes to ensure a more naturalistic appearance to the revetment (should rocks become exposed after a large storm event, and over time from sea level rise³⁸).



Completed Southern Wall section (Figure 7.1 from the Construction Methodology Statement, Davis Coastal Consultants, October 2024; page 13).



Completed Northern Wall section (Figure 7.2b from the Construction Methodology Statement, Davis Coastal Consultants, October 2024; page 15).

³⁶ Detailed design of the structure is yet to be completed (and will be completed in the next project stages – following consent).

³⁷ The structure will be constructed out of Andesite, which is understood to have been supplied for the majority of the work on the current Waihi Beach structures at Shaw Road and The Loop (as noted in the Engineering Design Report (Davis Coastal Consultants, October 2024); paragraph 4.6 Structure Materials).

³⁸ Coastal engineers calculate there could be 1-2 possible exposures of upper 1-1.5m of the structure (at the south end), in the ten years after completion of the structure. Rocks would become exposed temporarily and would become covered with sand again from accretionary periods between storm events. Refer to Appendix C of the LVA for photos which document this occurring at the site after Cyclone Gabrielle. In the long-term (after 20-30 years), coastal engineers calculate that “the structure may be exposed at all times in large storm events high tide may reach wall”. Refer to Table 5.3.3 “Wall exposure” in the Assessment of Coastal Processes, (Davis Coastal Consultants, October 2024). The table provides calculations of the extent of likely exposure over time (Table 5.3.3 Wall exposure.)

Site rehabilitation

- A minimum of 0.5m of sand will be spread over the upper wall crest and battered down at approximately 1:3 to meet existing ground level over the full length of the southern section.
- Disturbed dune areas will be re-vegetated with a mix of indigenous fore- and back-dune species, using a species mix recommended by BlueGreen Ecology.³⁹ In some areas new supplementary planting will be included landward of the disturbed areas.⁴⁰
- The development of a detailed revegetation plan is proposed to ensure that all disturbed vegetation is replaced with appropriate native species.⁴¹ The planting plan will include mixing/integration of species across the different planting areas (back of dune/top of dune/dune face), to provide a naturalistic appearance to the new planting (as recommended in section 13.0 of this report).
- Where necessary, wind fences may be established along face of new planting and at dune crest to minimise wind-blown sand to back dune areas and to protect plants while they are establishing. If required, these will be removed once planting is established.
- Planting will be timed for spring or autumn as practicable.

Construction Phase

Timing/Duration and Work Hours

- Work will be kept to within 7.00 am to 5.00pm Monday to Friday (working hours) to the extent practicable. Work will not be undertaken at night or once daylight becomes unsuitable. However, the work is tidally and storm dependent and work may continue outside working hours for up to three days a week every two weeks. This may include

³⁹ A recommended revegetation plant mix is included in the ecology report for the project and includes lower dune species such as Muehlenbeckia, grasses and rushes. Refer to Glen Isla Dune, Coastal Protection Project, Ecological Assessment; BlueGreen 19 August 2024; page 22.

⁴⁰ Refer to Appendix C for the proposed (high-level) planting plan. A detailed planting plan is proposed in the next project stages.

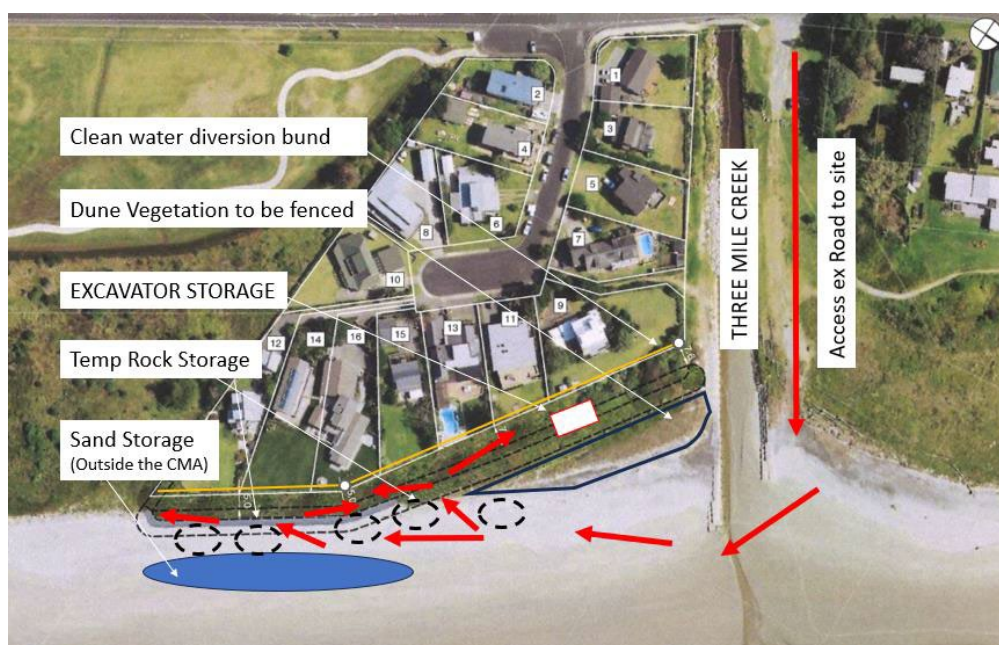
⁴¹ This has been recommended by BlueGreen Ecology (refer to Coastal Protection Project, Glen Isla Dune – Waihi Beach, Ecological Assessment; BlueGreen 19 August 2024. The recommendation is supported by this LVA. Refer also to section 13.0 of the LVA “Recommendations”.

Saturday working outside school holiday periods. No work will take place before 6am or after 8pm.

- The project is expected to be undertaken between the months of April 2025 and November 2025. It is anticipated that the entire project will be completed in 4 months, however a specified project duration of 6 months is proposed between the dates of April – November (inclusive), to allow for inclement weather and unforeseen issues. Work will not be undertaken at Easter or other Public Holidays.

Site access

- The primary construction access for delivery of machinery and rock spalls will be through the Council Reserve at 100 Seaforth Road (the northern side of Three Mile Creek). Rock delivery will be through the Reserve and along the beach seaward of the groynes at Three Mile Creek, passing across the mouth of the creek which is identified as CMA.
- During rock placement for wall construction, access to the southern section will be directly from the beach. The excavator will sit seaward of the working face, above the Mean High Water Springs line, and place rock. Access to the northern section will be along the wall alignment. The contractor is to maintain fencing along this alignment to ensure no damage to vegetation occurs outside the specified access way.



Indicative access through Reserve and excavator storage (Figure 3.0a from the Construction Methodology Statement, Davis Coastal Consultants, October 2024; page 10).

Stockpiling/storage of plant on site (refer to the above graphic).

- Delivery of the excavator will occur through the Seaforth Road reserve access at the start of the project. It will then be left on site for the duration of the project, outside the CMA, within the construction footprint.
- Selected rock will be stored at the quarry and delivered to site on an “as required” basis, such that stockpiling on site is minimised as much as is practicable. There may be temporary piles of rock in order to maintain efficient construction operation, but it is anticipated that rock piles will be almost completely removed daily.
- Areas where rock is temporarily stock-piled on site will have a heavy gauge geotextile placed before rock delivery and this will be held in place by suitably sized rocks. Following completion of rock delivery to any temporary stockpile location the geotextile under that location and all rock chips and fragments on the beach will be removed and disposed of off-site.
- Excavated sand will be stored at the site outside the CMA.

Construction method

- In parts where there will be tidal and ground water effects, the structure is to be constructed in sections of a length able to be backfilled with (at a minimum) geotextile and first underlayer in a single tidal cycle.

6.0 PLANNING FRAMEWORK

- 6.1 There is a raft of statutory provisions relevant to this LVA contained in national, regional and local statutory planning documents. Excerpts of relevant provisions⁴² are attached as **Appendix B.**
- 6.2 The site is located within the Coastal Environment,⁴³ so the NZCPS is relevant.
- 6.3 Overall, and in summary, the aim of the provisions is to preserve the natural character of the coastal environment; to protect natural features and landscapes of the coastal environment from inappropriate subdivision, use and development; and to promote restoration or rehabilitation of the natural character of the coastal environment – in line with the

⁴² Provided by Mitchell Daysh.

⁴³ As defined in the Bay of Plenty Regional Coastal Environment Plan ("Coastal Plan").

requirements of the RMA and the NZCPS (particularly Policies 13, 14 and 15 – as set out in **Appendix B**).

- 6.4 Key planning matters (as relevant to this LVA) relating to the regional and local statutory planning documents are summarised below. Refer also to the planning maps included in the graphic attachment **Appendix C** (and to the more detailed provisions set out in **Appendix B**).
- 6.5 It is noted that while the landward extent of the CMA is not mapped in the regional or local planning maps, this has been determined and mapped for the project by Davis Coastal Consultants.⁴⁴

Bay of Plenty Regional Policy Statement ("RPS")

- 6.6 The RPS includes criteria for the identification and assessment of values of significance, and objectives and policies relating to natural character, and natural features and landscapes.
- 6.7 Appendix F relates to criteria for assessing matters of national importance in the Bay of Plenty, including natural character, and natural features and landscapes.
- 6.8 Appendix I identifies and Appendix J describes areas of Outstanding, Very High or High Natural Character. The site is not within any of these identified areas.

Bay of Plenty Regional Natural Resources Plan ("Regional Plan")

- 6.9 Under the Regional Plan the proposed structure (inside the reserve land) is located in "Sand Dune Country" and "Erosion Hazard Zone".

Bay of Plenty Regional Coastal Environment Plan ("Coastal Plan")

- 6.10 Under the Coastal Plan the site (and the adjacent private properties on Glen Isla Place) are located within the "Coastal Environment".
- 6.11 The site falls within Indigenous Biological Diversity Area B.⁴⁵
- 6.12 The site is not identified within an Outstanding Natural Landscape or Feature ("ONFL") under the Coastal Plan.

⁴⁴ Refer to Memorandum – Location of Mean Highwater Springs, Glen Isla Place, Waihi Beach; Davis Coastal Consultants 28 March 2024.

⁴⁵ Refer to the Ecology report for further details on this. Vegetation in the area will contribute to natural character.

Western Bay of Plenty Operative District Plan (“District Plan”)

- 6.13 An Outstanding Natural Feature (“ONF”) is identified over the site (and other parts of the coastal edge along Waihi Beach) in the District Plan. This is ONF S24 Open Coastal Landscape Landward Edge Protection Yard. The District Plan identifies that the ONF contains “all land adjoining the open coastline, zoned Rural and within 100m of MHWS”. No other specific characteristics or values are identified in the District Plan for the ONF.
- 6.14 The site is located in Council Reserve/Esplanade Reserve in the District Plan, which is zoned Rural. The adjacent properties on Glen Isla Place are located in the Residential Zone.
- 6.15 The site and adjacent Glen Isla Place residences are identified as being in Coastal Erosion Areas, and partly within with the Coastal inundation Area.
- 6.16 The site forms part of a Local Purpose Esplanade and Recreation Reserve (Three Mile Creek) under the District Plan.

Three Mile Creek Reserve Management Plan

- 6.17 The Reserve Management Plan for Three Mile Creek includes policies to manage the recreation reserve, including in relation to maintenance of coastal protection structures, coastal access and neighbourhood recreation; and relating to enhancing pedestrian linkage, and to “maintain enhancement and maintenance where public recreation, amenity and natural character values are not adversely affected”.

Proposal Activity status

- 6.18 The proposal requires resource consent from both the Western Bay of Plenty District Council (“WBOPDC”) and Bay of Plenty Regional Council (“BOPRC”) as a **discretionary activity**.⁴⁶

7.0 VISUAL CATCHMENT/VIEWING AUDIENCE

- 7.1 There will be no private views of the site except from the adjacent dwellings on Glen Isla Place (the applicants). Public views will therefore be the most pertinent consideration for this LVA.
- 7.2 Main public views of the site and proposal will be from:

⁴⁶ As advised by Mitchell Daysh Limited.

- Waihi Beach – with most frequent and closest views of the site gained from beach areas in front (seaward) of the Glen Isla dune and to the north and south of the dune;
- Three Mile Creek Reserve (adjacent to the site to the north) – with views of the north end of the proposal likely for recreational users of this area – from just north of the Creek and from around the mouth.

7.3 Public views from within or landward of the site will be limited because the public are discouraged from walking on/in sensitive dune areas.⁴⁷

7.4 The following graphic shows the site with the surrounding areas gaining views (as described above).



Visual simulation

7.5 A visual simulation has been completed for the proposal to assist in understanding effects, and this is shown at **Appendix C**. The simulation uses a viewpoint on Waihi Beach near the south end of the proposal site.⁴⁸

⁴⁷ As understood from Mitchell Daysh.

⁴⁸ The visual simulation includes a small area of enhancement planting proposed to the immediate south of the site frontage, on the adjacent natural dune face, to integrate the new Glen Isla dune into the adjacent existing dune to the south. The extra planting is proposed in addition to the planting proposed at/on the Gen Isla dune.

8.0 NATURAL CHARACTER EFFECTS

- 8.1 The following provides an assessment of effects of the proposal on the characteristics and qualities which contribute to the existing levels of natural character at the site.
- 8.2 Natural character effects can arise from changes to existing natural landscape and features, and changes to the “balance” between natural/naturalised, and built/constructed, as the result of a proposal.
- 8.3 The natural characteristics and qualities contributing to natural character at the site are outlined in the baseline assessment (refer to section 4.0 “Existing Environment”).

Landform

- 8.4 Landform at the site is already modified from past erosion protection works.
- 8.5 At completion the proposal will appear as a naturalised, sand dune form and the rock structure will not be visible. (Refer below to Structures).
- 8.6 At the south end of the site, the new dune will appear closer to the sea (as the toe of the new dune will move seawards from the existing dune toe). This will re-establish the dune on approximately the alignment of the 2011 dune face.⁴⁹
- 8.7 The new dune form will appear well-integrated into natural landform to the north and south, with the proposed placement of sand and revegetation.

Structures

- 8.8 The proposal will include a new structure at the site, which will affect the balance of “natural” to “built” components.⁵⁰ However, at completion the new structure will not be visible. At the north end of the site, the existing dune landform will be reinstated with the structure buried inside the existing dune. When viewed from the beach, the south end of the site will present as a planted dune face.

⁴⁹ As noted in the Coastal Processes Assessment (Davis Coastal, October 2024), paragraph 4.10.

⁵⁰ Noting that there have been coastal erosion protection structures installed (and removed) at the site previously – refer to section 4.0 “Existing Environment”.

- 8.9 Should parts of the structure become visible due to erosion from a large storm event⁵¹ or (in the longer-term) due to the (future) effects of climate change,⁵² there will be a change to perceptions of the dune as “unmodified” i.e, unbuilt, and a corresponding lower level of natural character at the south end of the site (compared to a planted sand dune face). However, the dune form would still appear as “naturalised” as the exposed structure would be seen together with planting retained around it.⁵³ Further, the exposed structure would be seen as part of a modified context, with other clearly visible structures at and immediately around the site - including buildings, garden structures, fencing at the top of the dune, and other coastal protection structures.⁵⁴ This will reduce the significance of any reduction in perceptions of natural character at the Glen Isla dune from views of exposed structure. The site is part of an existing modified context.
- 8.10 The proposed use of locally-sourced, weathered rock and varying sizes of rocks/boulders for parts of the revetment at risk from exposure will assist to avoid an overly engineered appearance, should the structure become exposed in some areas.
- 8.11 Exposure of the structure from a large storm event in the next 20 years would be temporary, as sand would build back onto the structure with deposits from ongoing natural processes.⁵⁵
- 8.12 Beyond 20-30 years the structure is likely to become increasingly exposed due to the effects of climate change. In this scenario planting at the top and landward of the dune will be protected by the new revetment structure – ensuring a higher-quality coastal edge in the long term. The exposed structure would be visually consistent with other existing areas of exposed rock revetment along Waihi Beach (to the north of the site).

⁵¹ Erosion from a large storm event would be likely to occur only at the south end of the site. The north end of the structure will be buried within the existing dune, back from the existing dune front. Refer to Appendix C for a plan showing the extent of the structure at risk from exposure. Coastal engineers calculate there could be 1-2 possible exposures of upper 1-1.5m of the structure (at the south end), in the ten years after its completion. Rocks would become exposed temporarily and would become covered with sand again from accretionary periods between storm events. At 10-20 years the top of 1m wall could be exposed for long periods during storms, with the upper 1.5-2.0m exposed. The structure would become covered again but with the upper meeting exposed. Refer to Assessment of Coastal Processes, (Davis Coastal Consultants, October 2024), Table 5.3.3 Wall exposure.

⁵² Over time it is likely that the structure will become increasingly exposed due to the effects of climate change. Beyond 20-30 years the structure may be exposed at all times in large storm events high tide may reach wall. Refer to Assessment of Coastal Processes, (Davis Coastal Consultants, October 2024), Table 5.3.3 Wall exposure.

⁵³ Planting would remain at northern parts of the site, and at the top of the dune in southern parts – with these areas protected by the new rock revetment.

⁵⁴ To the north of the site at Three Mile Creek, and further north along the beach/land edge.

⁵⁵ This process is shown in the photos of the Glen Isla Dune included at Appendix C. The photos were taken in 2023 after Cyclone Gabrielle, and again in 2024 to document the recovery of the dune. Refer also to Table 5.3.3 in the Coastal Processes Assessment (Davis Coastal, October 2024), which outlines the extent to which this recovery process is expected to occur over time.

Vegetation

- 8.13 The Ecological Assessment has found that that the proposal will avoid adverse effects on high-value vegetation and overall, and with the recommended revegetation will result in a net ecological benefit at a local scale.⁵⁶
- 8.14 The proposed new planting will increase perceptions of the dune's natural character, with more extensive planting visible than currently exists, and with removal of the visible exotic weeds and provision of a consistent cover of naturalised indigenous species. The proposed detailed planting plan will provide a planting pattern which avoids "bands" or "lines" of species across the dune (as recommended in this report), and this will assist to provide a naturalised appearance to new planting.
- 8.15 Should the structure become visible due to erosion, it will be surrounded by plantings in parts where the structure is not likely to become exposed, such as to the north; and in areas protected by the structure (such as top parts and landward of the structure).
- 8.16 If enhanced dune planting along the southern dune-face is lost to erosion from a large storm event, plants will be likely to re-establish on the face over time with new sand deposits⁵⁷ from on-going natural processes and the natural spread of plants from the top of the dune.

Natural patterns and processes

- 8.17 The coastal erosion processes which currently threaten properties adjacent to the site are natural processes themselves, which contribute to the natural character of the area.
- 8.18 The natural erosion and rebuilding pattern has been previously modified at the site with past hazard protection works at the dune. This has also occurred extensively and consistently along the Waihi Beach frontage, including close to the site to the north (at Three Mile Creek and northwards of Three Mile Creek).
- 8.19 Naturally occurring dune vegetation patterns at the site have been extensively modified with exotic species present, and with existing dune planting confined to an area between erosion-prone frontage, and landward private property boundaries (which are dominated by grassed lawn and with amenity/exotic plantings).

⁵⁶ Glen Isla Dune, Coastal Protection Project, Ecological Assessment; BlueGreen 19 August 2024; Executive Summary.

⁵⁷ Estimated as likely to occur for up to 20 years. Refer to Table 5.3.3 in the Coastal Processes Assessment.

- 8.20 While the proposal will alter the outcome of the natural erosion and dune re-building process at the site,⁵⁸ the process itself will be ongoing. The construction of the proposed structure will reduce the impact of the natural process on the dune, and on planting on the dune. The proposal will allow naturalised indigenous dune vegetation patterns to establish at the dune, protected by the new structure.

Conclusions – Natural Character

- 8.21 Overall, at completion of the project (providing a naturalised dune landform with planting) the effect on natural character at the site is assessed as **Moderate-High positive** (with the inclusion of recommendations in this report). There will be a net ecological benefit at the local scale⁵⁹ and removal of exotic weeds; and perceptions of natural character will increase particularly at the south end with a higher-quality coastal edge and new planting visible across the full extent of the dune.
- 8.22 There will be no change to the visibility of residential structures (houses, garden structures, fencing) at the top of the dune.
- 8.23 Should erosion cause the structure to become visible in the future, there will be a reduction in natural character at the south end of the site. Over the next (approximately) 20 year period, the adverse effect will be temporary, until the sand dune face is re-established through ongoing natural processes. Beyond 20 years the structure is likely to become increasingly exposed due to effects from climate change.
- 8.24 If exposed, the structure would be seen with planting retained to the north and top parts of the dune, (protected by the structure). It would be seen as part of a modified context which includes other clearly visible structures adjacent to the site (dwellings at the top of the dune and groynes at Three Mile Creek); and would be visually consistent with other areas of rock revetment wall to the north of the site along Waihi Beach.
- 8.25 Planting at the top and landward of the dune will be protected by the new revetment structure – ensuring a higher-quality coastal edge in the long term (compared to the edge which would be likely to result from the effects of (future) climate change and sea-level rise).

⁵⁸ That is, it will prevent substantial erosion of the dune.

⁵⁹ As assessed in the Ecological Assessment (Blue Green Ecology, August 2024).

9.0 LANDSCAPE EFFECTS

- 9.1 Landscape effects will be influenced by changes to existing natural/naturalised features at the site (and with these contributing the ONF identified at the site⁶⁰ - refer above to “Existing Environment”).
- 9.2 Changes to natural characteristics and qualities (such as vegetation and natural landform) are dealt with above under the heading of natural character (as these contribute to both landscape and natural character values). To avoid repetition and “double-counting” of effects (as outlined under Methodology, at **Appendix A**), this section considers effects on urban landscape values (which at this site will relate to the potential for public access along the coast).
- 9.3 There is currently no formed public access along the frontage of the GIPS properties and the site is not used regularly by the public, given that there are other existing formed accessways to the beach and it is possible to walk along the beach.
- 9.4 The proposed location of the structure will prevent the potential future loss of public access along the coast, particularly during high-tide events of from (future) changes from climate change. While the proposal will not comprise a change to existing access through the site, avoidance of potential future loss of access is positive.⁶¹

Conclusions – Landscape

- 9.5 Landscape effects relating to the potential for public access are assessed as **High positive**. The proposed location of the structure will prevent the potential future loss of public access along the coast.
- 9.6 The proposal will be consistent with characteristics and values in near-by parts of the ONF⁶² and will avoid adverse effects on the characteristics contributing to values of the ONF overlay.⁶³

⁶⁰ The ONF is identified in the District Plan and contains “all land adjoining the open coastline, zoned Rural and within 100m of MHWS.” No other more specific characteristics or values are identified for the ONF in the District Plan.

⁶¹ The maintenance and enhancement of public access to and along the coastal marine area is a matter of national importance under section 6 of the RMA.

⁶² At Three Mile Creek and the coastal edge north of Three Mile Creek (where there are existing coastal hazard protection structures).

⁶³ NZCPS Policy 15a requires that development proposals “avoid adverse effects of activities on outstanding natural features and outstanding natural landscapes in the coastal environment.”

10.0 VISUAL AMENITY EFFECTS

Views from Waihi Beach

- 10.1 At completion, the proposal will provide views of a naturalised sand dune with planting. The new dune form will include a naturalised appearance from the new planting and species mix proposed. It will appear well integrated into natural landform to the north and south, with the proposed placement of sand and new planting.
- 10.2 At the south end of the site more planting will be visible than currently exists – as planting will cover the dune face above the beach. This will increase visual amenity at this part of the site.
- 10.3 From the beach the dune will be seen further seawards than the existing dune. The new dune will be aligned more closely with the dune alignment which existed in 2011, prior to the significant erosion which occurred with Cyclone Gabrielle.
- 10.4 If parts of the structure become exposed due to erosion, the structure will be seen with planting at the top of the dune, (in areas protected by the structure), and on northern parts (where there is less at risk of substantial erosion), and this will provide visual amenity in views from the beach.
- 10.5 It is expected that, for approximately 20 years following completion of the structure, exposure of the structure from large storm events will be temporary, until natural processes re-build the sand dune and vegetation over the structure.
- 10.6 It is expected that the structure will become increasingly exposed over time due to the effects of climate change. If exposed in the future, the structure will be seen with areas of retained planting (at the top of the dune, protected by the structure), will be seen as part of a modified context which includes other structures, and will be visually consistent with other area of rock revetment along Waihi Beach.
- 10.7 Planting at the top and landward of the dune will be protected by the new revetment structure – ensuring a higher-quality coastal edge (and provision of visual amenity from this) in the long term (compared to the likely edge resulting from the (future) effects of climate change).
- 10.8 Effects on visual amenity in views from the beach are as assessed overall as **Moderate-High positive**.

Views from Three Mile Creek Reserve (north of the site)

10.9 Views of the site from the reserve along Three Mile Creek (from areas just north of the site including around the mouth of the Creek), are unlikely to be noticeably changed. At completion of the proposed work the dune form at the north end of the site will be reinstated, and there will be views of plantings across the Glen Isla dune, similar to existing views. The indigenous character of planting will be increased, but this may not be strongly apparent in views from along Three Mile Creek, due to distance.

10.10 Effects are as assessed as **Neutral**.

11.0 CONSTRUCTION PHASE EFFECTS

11.1 There will be temporary effects on natural character, landscape and visual amenity from earthworks and from storage of plant and materials during the construction period.

11.2 Overall, effects will be minimised by the proposed construction methodology and timing. Stockpiling of rock and sand on the beach will be minimised by the proposed staged construction, with rock delivered in an “as needed” basis and anticipated to be almost completely removed (used) on a daily basis. Sand will be excavated, stored and backfilled within a single tidal cycle.

11.3 The work is proposed to be undertaken from April to November – when there will likely be fewer people using the beach than in summer. Access along the beach past the site will remain unaffected.

11.4 Additionally, the site is located away from private residences (other than those belong to members of GIPS – the applicants). Access to the site will be temporarily obstructed during the construction of the structure.

Conclusion – construction effects

11.5 Overall, construction effects on natural character, landscape and visual amenity will be temporary in nature and are assessed as **Low adverse** for the local community. Adverse effects have been minimised through the proposed programme and methodology; and will be further limited due to the location of the site away from private properties.

11.6 Public access along the coastal edge will not be affected by the construction phase.

12.0 RECOMMENDATIONS

12.1 It is recommended that:

- A detailed planting plan is provided for the proposed revegetation of the site, with confirmation of plant placement on the ground by an ecologist or landscape architect prior to planting, to ensure that a naturalised appearance to new planting is achieved immediately following the planting, with species located in naturalised groupings and any appearance of “bands” or “lines” of particular species avoided.
- Rock is sourced from a local Waihi Beach quarry, and with a variety of sizes selected to ensure a more naturalistic appearance to the revetment (should rocks become exposed after a large storm event or over time due to the effects of climate change). For parts of the structure at risk from erosion/exposure, rocks with a weathered appearance should be used (as possible).

13.0 ASSESSMENT AGAINST THE STATUTORY FRAMEWORK

13.1 The proposal meets the relevant⁶⁴ objectives and policies of the NZCPS and related provisions in the regional and local statutory planning documents. The proposed structure will be consistent with existing characteristics and values of the ONF identified at the coastal edge of Waihi Beach and will not will not generate adverse effects on the attributes/characteristics contributing to values of the ONF. The proposal will not generate significant adverse effects on the attributes contributing to the natural character of the site and its more immediate surroundings at Waihi Beach.

14.0 EFFECTS RATINGS SUMMARY

14.1 The following table (refer to the following page) provides a summary of natural character, landscape, visual amenity and construction effects assessed in this report. Inclusion of the LVA recommendations is assumed in the effects ratings.

⁶⁴ Relating to natural character and landscape matters.

Summary of Effects Ratings

Effect	Rating
Natural Character	Moderate-High positive
Landscape	High positive
Visual Amenity:	Waihi Beach: Moderate-High positive Three Mile Creek Reserve (north of the site): Neutral
Construction (temporary)	Low adverse

Isthmus

October 2024

Appendix A: Definitions, NZILA Ratings Scale; LVA Methodology.

LVA Approach and Methodology

The following sets out the approach and methodology used in this assessment of effects.

Approach

Natural Character

Refer below to Definitions, for the definition of natural character used in this assessment.

This assessment considers that natural character is a “type” of character, contributing to the overall landscape character of an area. Natural features (such as vegetation or natural landforms) and the qualities and characteristics they include contribute to both the natural character and landscape character of an area.

Assessment of effects from the proposal on existing natural features (such as vegetation and natural landforms) is provided in this report under the heading of natural character and is not considered again within the assessment of landscape effects. This is to avoid repetition and assessment ‘double up’ in effects ratings (i.e. effects on natural landscape and natural features are considered once, rather than under both headings of Natural Character, and Landscape).⁶⁵

Natural character includes both natural science matters and perceptual matters.⁶⁶ As such, effects on ecology and habitat will contribute to overall natural character effects. The effects ratings in this assessment include consideration of findings from ecology specialists,⁶⁷ to reach a conclusion on the overall level of natural character effects from the proposal.

Landscape

The assessment of landscape effects in this report focuses on effects on urban aspects of the landscape. Effects on natural landscape and features are considered under the heading of Natural character (for the reasons outlined above, under the heading Natural Character).

For this site, potential landscape effects will relate to public access to/along the coastal edge.

⁶⁵ Te Tangi a te Manu, the NZILA landscape assessment guidelines, (2022), outline that assessment methodology should be tailored to the needs of each assessment. The approach for this assessment recognises that at this site landscape character is closely linked to natural character, and is adopted to avoid “double-counting” of effects on existing natural features (such as vegetation).

⁶⁶ As outlined in Te Tangi a te Manu, the Aotearoa New Zealand Landscape Assessment Guidelines (2022) adopted by Tuia Pito Ora, the New Zealand Institute of Landscape Architects (NZILA).

⁶⁷ This is in line with best practice as outlined in Te Tangi a te Manu, the landscape assessment guidelines provided by Tuia Pito Ora, the New Zealand Institute of Landscape Architects.

Visual Amenity

The assessment of visual amenity effects considers effects on both natural character (including the natural landscape) and urban landscape, as both aspects of landscape contribute to the views and features that people value.

Cultural matters

Cultural landscape values relating to the project area are part of overall landscape values.⁶⁸ We note that as landscape architects, we are unable to assess cultural values without input from mana whenua.

Construction (temporary effects)

These are considered as temporary effects arising from construction activities and the establishment of temporary works or storage areas and not present at the end of the construction period.⁶⁹

Assessment Methodology

The methodology used to consider potential natural character, landscape, visual amenity and construction effects of the proposal has followed best practice guidance set out in Te Tangi a te Manu, and has included the following:

- Review of the proposal plans and documents, including relevant planning provisions;⁷⁰
- A desk-top evaluation of the proposal's visual catchment, including identification of the locations and audiences likely to gain views of the site and proposal;
- Site visits to understand the site and context, and the visual catchment. Photos were taken (from publicly accessible locations), to understand views of the proposal likely to be gained by surrounding audiences;
- Evaluation of the site and context, including consideration of the existing levels of natural character and the characteristics and qualities which contribute to that;

⁶⁸ As outlined in Te Tangi a te Manu, the assessment guidelines provided by Tuia Pito Ora, the New Zealand Institute of Landscape Architects (NZILA).

⁶⁹ Where the duration of an effect extends beyond the construction period, that is considered under the assessment of natural character, landscape or visual amenity effects (as appropriate).

⁷⁰ As provided by Mitchell Daysh, the project planning team.

- An outline of the proposal and identification of components likely to generate long-term/permanent and temporary natural character, landscape and visual effects;
- An assessment of the effects of the proposal on the existing natural character, landscape and visual amenity at the site (including effects on the immediate surrounding context);
- An assessment of the temporary effects on natural character, landscape and visual amenity effects from construction of the proposal (temporary effects from temporary work areas and activities); and
- Recommendations and Conclusions.

In line with the NZILA assessment recommended best practice methodology, a 7-point scale (as set out below) has been used to rate the effects:

Very Low / Low / Moderate-Low / Moderate / Moderate-High / High / Very High

Effects relate to both nature and extent – that is, qualitative matters. The 7-point scale is used to provide a summary rating of effect, as a useful tool of analysis. For the purpose of decision making and to confirm appropriate mitigation recommendations, the ratings provided need to be considered alongside the qualitative description of the effects.

Effects may be adverse, neutral, or positive.

Definitions & Explanations – Te Tangi a te Manu

This assessment uses the following definitions/explanations of **natural character** and **landscape**, taken from Te Tangi a Te Manu, Aotearoa New Zealand Landscape Assessment Guidelines (July 2022), as recently updated by Tuia Pito Ora, New Zealand Institute of Landscape Architects (NZILA):

Natural Character

“Natural character is the distinct combination of an area’s natural characteristics and qualities, including degree of naturalness.”

“Natural character is an outcome of physical environment and perception. Perception is influenced by what we know of an area’s natural characteristics and qualities (including input from natural sciences) and how we experience them.”

Naturalness

“Naturalness” is a measure of the actual and apparent modification from a fully natural state.”

Natural character is a type of character – the distinct combination of an area’s natural characteristics and qualities. Naturalness is an attribute of that natural character.

As a measure of the extent of modification present, *naturalness* is quantitative.

As a distinct combination of natural characteristics and qualities, (including naturalness), the consideration of natural *character* is qualitative.

This assessment considers the specific character coming out of the combination of characteristics and qualities (biophysical and perceptual), including the naturalness/degree of modification in the area.

Landscape

“Landscape embodies the relationship between people and place. It is the character of an area, how the area is experienced and perceived, and the meanings associated with it.”

Landscape is an integrating concept. While landscape draws strands from diverse sources (natural



sciences, humanities, cultural perspectives), it is perceived and experienced as a unified phenomenon. It is an integrated whole. It is more than a summary of data – the whole is greater than the sum of the parts.

Landscapes have physical, associative, and perceptual dimensions.

Amenity Values

The RMA defines “amenity values” as “those natural or physical qualities and characteristics of an area that contribute to people’s appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.”

NZILA Ratings Scale

The 7-point rating scale recommended by Tuia Pito Ora, the New Zealand Institute of Landscape Architects, is as follows:

Very Low / Low / Low-Moderate / Moderate / Moderate-High / High / Very High

The scale is used to assess the existing levels of naturalness in an area (refer above to Natural Character), as part of a natural character assessment.

It is also used to rate effects on landscape values from development proposals.

Effects can be adverse, neutral, or positive.

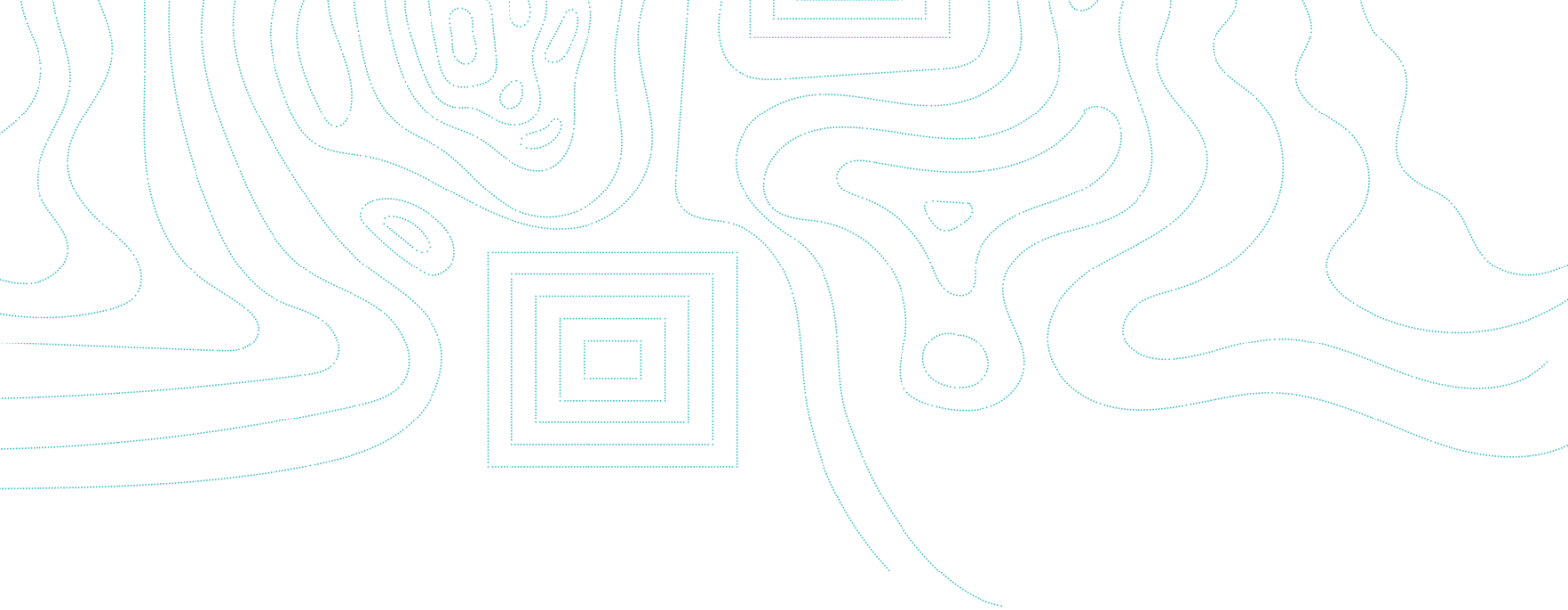
The following provides a comparison of the relationship between the NZILA 7-point rating scale, and RMA terminology, as set out in the NZILA assessment guidelines, Te Tangi a te Manu:



Glen Isla Dune - Coastal Protection Project

Ecological Assessment

Prepared for Glen Isla Protection Society Incorporated
19 August 2024



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Executive Summary

GIPS¹ proposes to establish a reinforced dune system, consisting of an approximately 195m-200m long buried erosion protection structure, dune recontouring and dune replanting, on land adjacent to 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place.

BlueGreen Ecology Ltd have undertaken ecological survey of the area to determine its values and what effects such works might have.

Three vegetation assemblages are evident on site

1. Northern spinifex foredune;
2. Central exotic terrace; and
3. Southern pohuehue terrace.

The assessment considers the following as the outcomes with respect to value, significance and the NZCPS (2010).

ASSESSMENT	NORTHERN SPINIFEX FOREDUNE	CENTRAL EXOTIC TERRACE, HOLLOW & RISER	SOUTHERN POHUEHUE
Ecological value	High	Negligible	Low
Significance	Yes	No	Yes
NZCPS Policy 11	Policy 11(a)(i), (iii) Policy 11(b)(i), (iii)	-	Policy 11(b)(i), (iii)

The most valuable feature (i.e. the northern spinifex foredune) has been, through the design process, avoided.

That level of adverse effect is allowable under the NZCPS policy 11(b) and is consistent with the requirements of effects management under the NPS IB.

Overall, the remediation / mitigation solution recommended, being the revegetation of the covered wall after installation with appropriate native dune plants for at least the areas stipulated in this report, will result in a net ecological benefit at a local scale.

¹ The Glen Isla Protection Society Incorporated ("GIPS") which comprises the owners of beach front properties located at 9 and 11-16 Glen Isla Place, Waihi Beach.

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1.0 Introduction

Over the last 40 odd years, the portion of Waihi Beach coast south of “Three Mile Creek” has been identified as being subject to coastal erosion risk and a number of coastal erosion treatments have been implemented to varying levels of success. Most recently in 2011, dune enhancement planting was washed away within 2-3 weeks of completion.

Following further erosion of the coastal dune area and adjacent reserve land during Cyclone Gabrielle, GIPS² proposes to establish a reinforced dune system, consisting of an approximately 195m-200m long buried erosion protection structure, dune recontouring and dune replanting, on land adjacent to 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place. This land, legally described as Lot 18 DPS 22035 and Lot 19 DPS 22035, is owned and managed by the Western Bay of Plenty District Council (“**WBOPDC**”) as Council Reserve land.

The structure and its placement followed a workshop where BlueGreen Ecology proffered opinions as to what aspects of the environment should be avoided, that effects should be contained to the reserve, that specific species recognition and life stage habitat use should be considered and that the restoration of the feature post installation should result in a better than now condition in terms of representative coastal indigenous dune habitat.

GIPS proposes to install the coastal protection structure on the WBOPDC Reserve land, landward of the Coastal Marine Area, as shown in Figure 1. The purpose of the coastal protection structure is to protect and maintain the dune habitat / reserve land and the private properties located at 9, 11, 13, 15, 16, 14 and 12 Glen Isla Place located behind the dune system. The coastal protection structure will be a rock riprap wall, approximately 195-200m long, approximately 12-13m wide and 3.5m tall subject to final design. It will be setback from the property boundary with 12, 14 and 16 Glen Isla Place by 5m. The setback will increase to approximately 7.6m at the Norfolk Pine between No 11 and 13 Glen Isla Place, per arborist guidance, and then decrease towards the northern end to 6.5m.



Figure 1: Location of proposed coastal protection structure at Glen Isla Place, Waihi Beach.

² The Glen Isla Protection Society Incorporated (“**GIPS**”) which comprises the owners of beach front properties located at 9 and 11-16 Glen Isla Place, Waihi Beach.

1.1 Site Context

With the onset of European settlement came the stabilisation of the dunes and replacement of the vegetation with exotic species and wetlands to allow for different production systems.

The Waihi dunes and foreshore saw more substantive influence following the 1894 gold prospecting days. From then until 1898 claims were pegged out and registered and gold bearing lodes were uncovered. About this time there was an amalgamation of interests and the Waihi Beach Gold Mining Company was formed and registered in Auckland, the object being to exploit the Treasure Island and other reefs known to exist in the area. These works and people had a profound early impact on the dunelands and foreshore.

The typical habitat conditions of more modern times is reflected in the botanical survey of Athenree Dunes by Beadel (1992), where she recorded 46 taxa along the dunes near the end of the heads (Bowentown). Of those plant taxa, 16 were exotic and included: Agapanthus, marram grass, climbing asparagus, banksia, sea rocket, ice plant, pampas grass, Japanese honeysuckle, tree lupin, phoenix palm, Monterey pine, gorse, purple groundsel.

The prominent native components of the dune recorded by Beadel (1992) included: oioi, knobby club rush, shore bindweed, sand sedge, sand coprosma, taupoata, pikao, sand wind grass, shore lobelia, ngaio, karo, bracken, native beach spinach, pohuehue, and a few common shrubs. In 1992 there remained several at risk and threatened species: *Metrosideros tomentosa*, *Ficinia spiralis* (pingao / pikao), sand coprosma (*Coprosma acerosa*).

There is now virtually no dynamic indigenous vegetation (and fauna) covered dune system left along Waihi Beach, even despite some areas being vested as DOC and Council Reserves; it has been reduced in size, coverage and has increased stability.

Weed species cover is now dominant and areas of spinifex and pingao are small and scattered. They are related to localised storm baring of frontal dune areas and areas of targeted active planting. Pohuehue remains the most prominent indigenous sand community species remaining with lesser amounts of knobbly club rush.

The site of interest to this report is that fore and hind dune immediately south of what is locally known as Three Mile Creek and north of the Island View recreational reserve (Figure 2).



Figure 3: Map of the BOP-RCEP Schedule 2 site relative to the Project site (red dashed line) – the yellow line indicates the 'Coastal Environment' boundary.

2.0 Methods

2.1 Ecological Data

Ecological information was obtained through a desktop search of the literature and relevant database (e.g. OSNZ atlas, NZ amphibians and reptiles atlas, eBird, iNaturalist).

In addition, a site visit was conducted in April 2024 during which the following was undertaken:

- A vegetation / habitat survey was based on aerial and ground pre-visit photographs to establish if a plot-grid based, transect based or a walked descriptive approach would be best suited to understanding the community mosaic. These processes determined that given the limited width and length and heterogeneity of plant assemblages a walked descriptive mapping and recording taxa approach would be best suited. Species lists and estimates of cover of the prominent taxa were made in areas of different character.
- One hour was spent searching woody debris and other potential refugia for lizards and macroinvertebrates.
- All native avifauna observed while on site were also recorded, however no formal avifauna surveys were conducted.

2.2 Ecological Impact Assessment

The methods used to undertake this assessment are consistent with the EIANZ guidelines for undertaking ecological impact assessments (Roper-Lindsay et al., 2018), whereby ecological values are assigned (refer to Table 1 for species, Table 2 for terrestrial communities) and the magnitude of effects identified (Table 3) in order to determine the overall level of effect of the proposal (Table 4).

For the purpose of this assessment, we have determined the magnitude of effect at the local scale; that being the 52 ha of dune vegetation in the Waihi Beach dune system (i.e. Athenree Reserve and Island View Reserve), which includes 4 ha of front dune pohuehue. Furthermore, the following thresholds have been applied to each magnitude level to represent the proportion of loss (text italicised and bolded in Table 3):

- Very High - 70% loss of the community assemblage;
- High – 40-70% loss of the community assemblage;
- Moderate – 15-40% loss of the community assemblage;
- Low – 1-15% loss of the community assemblage; and
- Negligible - <1% loss of the community assemblage.

According to Roper-Lindsay et al. (2018), the overall level of effect (Table 4) can then be used to guide the extent and nature of the ecological management response required (including, to the extent necessary following an effects management hierarchy assessment, the need for biodiversity offsetting):

- Very High adverse effects require a net biodiversity gain.³
- High and Moderate adverse effects require no net loss of biodiversity values.
- Low and Very Low effects should not normally be a concern. If effects are assessed taking impact management developed during project shaping into consideration, then it is essential that prescribed impact management is carried out to ensure Low or Very Low effects.

Table 1: Criteria for assigning ecological value to species (Roper-Lindsay et al., 2018).

ECOLOGICAL VALUE	SPECIES CLASSIFICATION
VERY HIGH	<i>Nationally Threatened</i> (Nationally Critical, Nationally Endangered, Nationally Vulnerable, Nationally Increasing ⁴) species found in the ZOI ⁵ either permanently or seasonally.
HIGH	Species listed as <i>At Risk – Declining</i> found in the ZOI either permanently or seasonally.

³ Though when ecological compensation is required because biodiversity offsetting is not possible, the principles of no-net-loss or net-gain do not apply (Maseyk et al., 2018).

⁴ Nationally Increasing is category that was devised by DOC (Michel, 2021) in 2021 to resolve a problem that would arise if the population of a taxon assessed as At Risk Recovering A should stabilise. Threatened – Nationally Increasing is assigned to “Small population that have experienced a previous decline (or for which it is uncertain whether it has experienced a previous decline) and that is forecast to increase >10% over the next 10 years or 3 generations, whichever is longer” (Rolfe et al. 2021). Thus, while such a threat category is not identified in Roper-Lindsay et al. (2018), we have included it along with all other *Threatened* classifications in to the Very High ecological value category.

⁵ Roper-Lindsay et al. (2018) define the Zone of Influence (ZOI) as “the areas/resources that may be affected by the biophysical changes caused by the proposed project and associated activities.”

ECOLOGICAL VALUE	SPECIES CLASSIFICATION
MODERATE	Species listed as any other category of <i>At Risk</i> (Recovering, Relict, Naturally Uncommon) found in the ZOI either permanently or seasonally; or Locally (ED) uncommon or distinctive species.
LOW	Nationally and locally common indigenous species.
NEGLECTIBLE	Exotic species, including pests, species having recreational value.

Table 2: Assigning overall value to areas (refer to Appendix 1 for the matters to be considered for terrestrial and freshwater communities) (Roper-Lindsay et al., 2018)

VALUE	DESCRIPTION
NEGLECTIBLE	Area rates Very Low for three matters listed in Appendix 1 and Moderate, Low or Very Low for remainder.
LOW	Area rates Low or Very Low for majority of assessment matters listed in Appendix 1 and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.
MODERATE	Area rates High for one matter listed in Appendix 1, Moderate and Low for the remainder, or Area rates Moderate for two or more assessment matters Low or Very Low for the remainder Likely to be important at the level of the Ecological District.
HIGH	Area rates High for two of the assessment matters listed in Appendix 1, Moderate and Low for the remainder, or Area rates High for one of the assessment matters, Moderate for the remainder. Likely to be regionally important and recognised as such.
VERY HIGH	Area rates High for three or all of the four assessment matters listed in Appendix 1. Likely to be nationally important and recognised as such.

Table 3: Criteria for describing magnitude of effect (Roper-Lindsay et al., 2018)

MAGNITUDE	DESCRIPTION
VERY HIGH	Total loss of, or very major alteration, to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether; AND/OR <i>Loss of a very high proportion of the known population or range of the element / feature.</i>
HIGH	Major loss or major alteration to key elements/ features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR <i>Loss of a high proportion of the known population or range of the element / feature.</i>
MODERATE	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that post-development character, composition and/or attributes will be partially changed; AND/OR <i>Loss of a moderate proportion of the known population or range of the element / feature.</i>
LOW	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances/patterns; AND/OR <i>Having a minor effect on the known population or range of the element / feature.</i>

MAGNITUDE	DESCRIPTION
VERY HIGH	Total loss of, or very major alteration, to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether; AND/OR <i>Loss of a very high proportion of the known population or range of the element / feature.</i>
NEGLECTIBLE	Very slight change from existing baseline condition. Change barely distinguishable, approximating to the “no change” situation; AND/OR <i>Having a negligible effect on the known population or range of the element / feature.</i>

Table 4: Criteria for describing the level of effect (Roper-Lindsay et al., 2018)

LEVEL OF EFFECT		ECOLOGICAL AND / OR CONSERVATION VALUE				
		Very High	High	Moderate	Low	Negligible
MAGNITUDE	Very High	Very High	Very High	High	Moderate	Low
	High	Very High	Very High	Moderate	Low	Very Low
	Moderate	High	High	Moderate	Low	Very Low
	Low	Moderate	Low	Low	Very Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low	Very Low
	Positive	Net gain	Net gain	Net gain	Net gain	Net gain

2.3 Ecological Significance Assessment

We will test the ecological features of the Project site against the Bay of Plenty Regional Policy Statement (BOP-RPS) Appendix F Set 3 (Indigenous vegetation and habitats of indigenous fauna) significance criteria (listed in Appendix 2 of this report). We note that as ecologists we are unable to assess the last three criteria of Appendix F Set 3, those being: Māori, Historical and Community.

2.4 New Zealand Coastal Policy Statement

While the Project site lies within ‘IBDA B1 Central Waihi Beach’ which was identified as triggering NZCPS Policy 11(b) matters, we will test the ecological features of the Project site against the NZCPS Policy 11 matters (listed in Appendix 3 of this report).

3.0 Site Survey Results

3.1 Vegetation

The area for the proposed erosion protection installation is the unmanicured dune front edge beyond the GIPS property boundaries (9, 11, 13, 15, 16, 14 and 12 Glen Isla Place) running from the Three Mile Creek sand bagged retention, true right bank, south to the

Island View esplanade reserve (Figure 1). It is a terrace and slope to a dune depression and dune hump in the north, and a terrace to an erosion scrape in the southern half (Figure 5).

While the substrate is predominantly sand, there is minor soil development in the inland portion. The area of vegetated foreshore beyond the properties is 190m long, 6m wide at its southern narrowest end and 40m wide at its widest in the northern end, but predominantly around 10m wide (0.19ha).

There are four discernible vegetation patterns, those being: loose dune with spinifex, dune hollow (or low points) with grasses and herbaceous cover, terrace and slope taller herbs, grasses and scrambling vines, and shrub / trees (Figure 4). There are a small number of species common throughout and make up the majority of the cover, and then there are less abundant specific plants that occur in clusters in only a few areas or are occasionally throughout.

A series of representative site photos are provided in Appendix 4 which illustrate these vegetation communities, with a complete list of the vegetation species recorded presented in Appendix 5.

The primary character of the habitat is formed by kikuyu grass, pohuehue, daisy (*Dimorphotheca*), treasure flower (*Gazina* sp.), orache and agapanthus. It is a dense tangled exotic cover.

The sandy foredune is dominated by spinifex with scattered pingao but also the exotics yucca and pampas, hairs tail and hawksbeard.

The northern dune hollow is a mix of kikuyu grass, hairs tail, daisy, hawksbeard, lotus and pohuehue.

Rising up the slope, pohuehue is prominent but daisy, pigs ear, kikuyu, bushy asparagus and agapanthus grow through it.

The southern half, beyond the spinifex foredune, is the erosion dune scarp and terrace. The eroding scrap has sea rocket, exotic ice plant, pohuehue and kikuyu behind which is a greater number of knobby club rush than found elsewhere.

Shrub and tree components at the back of the terrace include Sydney golden wattle, karo, Australian ngaio, spindle tree and Norfolk pine.

The profile of the hind and foredune give rise to hydrology differences and disturbance histories and so the vegetation communities. These profiles are illustrated below in Figure 5 along with their corresponding prominent vegetation assemblage.

Indigenous plants are most prominent in the north in the area of the foredune including beach bind weed, spinifex, pingao and in the very south where pohuehue on the terrace and spinifex along the erosion scarp face are notable (but no pingao).

Otherwise, knobbly club rush and pohuehue are the common native dune plants throughout. However, the great majority of the back terrace and terrace slope is exotic species covered, many considered serious weed species.



Figure 4. Vegetation community map of the site.

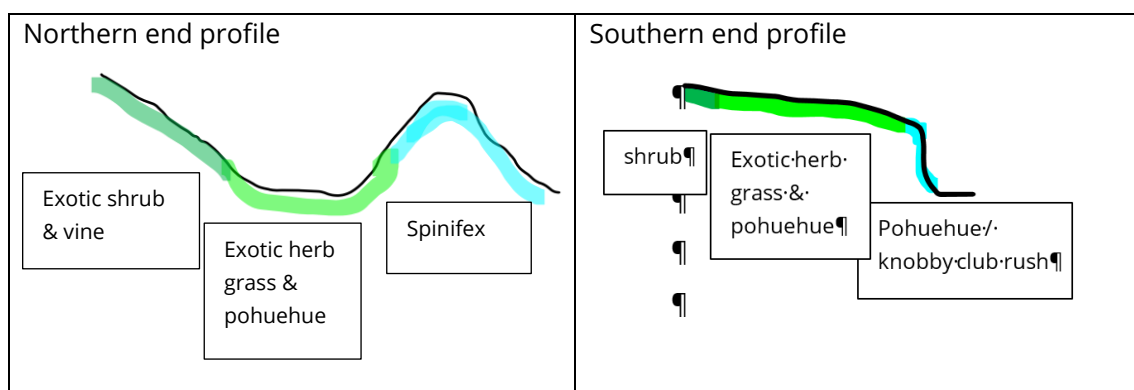


Figure 5. Cross section profiles and corresponding vegetation assemblages.

3.2 Avifauna

The terrestrial vegetation at the Project site does not provide habitat for any 'Threatened' or 'At Risk' avifauna species. However, the intertidal zone, creek mouth and areas of exposed sand above MHWS provide potential foraging and roosting habitat for a number of native coastal and shorebirds (listed in Table 5 below), including several 'Threatened' or 'At Risk' species.

During the site visit, no native birds were recorded on the vegetated dune system, while several species (variable oystercatchers, black-backed gull and red-billed gull) were observed on the water's edge. We note that the site visit was undertaken at a time of year that was outside of the avifauna breeding season and as such it could not be determined if species such as the dotterels or variable oystercatcher breed at the creek mouth.

Table 5: Native coastal and shorebird species for which the coastal margin adjacent to the site may provide potential habitat

SPECIES		NZ THREAT CLASSIFICATION ⁶
Variable oystercatcher	<i>Haematopus unicolor</i>	At Risk - Declining
Red-billed gull	<i>Larus novaehollandiae scopulinus</i>	At Risk - Declining
White-fronted tern	<i>Sterna striata</i>	At Risk - Declining
Banded dotterel	<i>Charadrius bicinctus bicinctus</i>	At Risk - Declining
Northern NZ dotterel	<i>Charadrius obscurus aquilonius</i>	Threatened – Nationally Increasing
Black-backed gull	<i>Larus dominicanus</i>	Not Threatened
White-faced heron	<i>Egretta novaehollandiae</i>	Not Threatened
Pied stilt	<i>Himantopus h. leucocephalus</i>	Not Threatened
Paradise shelduck	<i>Tadorna variegata</i>	Not Threatened
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>	Not Threatened

3.3 Herpetofauna

Based on species' distribution and habitat preferences described in the NZ reptile atlas database⁷, it is possible that Waihi Beach dunes provide habitat for the species listed in Table 6. Copper skink and shore skink were both recorded on Matakana Island (Shaw 2011).

While neither copper nor shore skink were found during the manual search of potential refugia during the April 2024 site visit, it is possible that they are present in very low abundance.

Table 6: Lizard species potentially inhabiting the Waihi Beach dune system

SPECIES		NZ THREAT CLASSIFICATION ⁸	DISTRIBUTION	HABITAT PREFERENCE
Shore skink	<i>Oligosoma smithi</i>	At Risk - Declining	Coastal North Island: west coast north of Muriwai Beach, east coast north of Gisborne, and on many islands.	On or near shoreline in open habitats with driftwood, rocks, mat-forming vegetation or piles of seaweed
Copper skink	<i>Oligosoma aeneum</i>	At Risk - Declining	Widespread throughout North Island	Close to the high-tide line in coastal situations.
Plague skink	<i>Lampropholis delicata</i>	Introduced & Naturalised	North Island	Open areas, such as suburban gardens, grassland and industrial

⁶ Robertson et al. (2021)

⁷ <https://www.doc.govt.nz/our-work/reptiles-and-frogs-distribution/atlas/>

⁸ Hitchmough et al. (2021)

SPECIES		NZ THREAT CLASSIFICATION ⁸	DISTRIBUTION	HABITAT PREFERENCE
				sites, with adequate cover (logs, stones, grass, etc)

3.4 Macroinvertebrates

The site does not provide suitable habitat for katipo spider (*Latrodectus katipo*). While there were larger woody debris scattered on the site (Figure 6), the vegetation in which they sat was exotic and dense and there were few suitable habitat items. A search of the available wood debris did not reveal any katipo. The greatest potential for katipo resides in the spinifex foredune area although there is little woody debris, in the absence of likely effects we did not search the spinifex stem bases of the foredune.

A search of the larger woody debris (Figure 6) items in the likely area of effect resulted in isopods (slaters), exotic spiders, and a large sand scarab beetle larvae (*Pericoptus truncatus*, ngungutawa) (Figure 7).



Figure 6: Woody debris habitat item.



Figure 7: *Pericoptus truncatus* (ngungutawa) larva

4.0 Ecological Values, Significance & NZCPS Policy 11

We have assessed the ecological value, significance and NZCPS Policy 11 criteria for the following three vegetation assemblages which comprise the Project site:

4. Northern spinifex foredune (400m²);
5. Central exotic terrace, hollow and riser slope (2430 m²); and
6. Southern pohuehue (175m²).

The result of the ecological values and significance assessments are provided in Table 7 and Table 8 respectively.

Table 7: Project site ecological values assessment

VALUE ASSESSMENT MATTER	NORTHERN SPINIFEX FOREDUNE	CENTRAL EXOTIC TERRACE, HOLLOW & RISER	SOUTHERN POHUEHUE
Representativeness ⁹	Yes, High.	No, very low.	Yes, moderate.

⁹ Representativeness does not consider a pre-1840 vegetation assemblage and structure. We consider how representative this vegetation cover is to Beadel's (1992) assessment of the best dune area in Waihi (Athenree Dune Reserve).

VALUE ASSESSMENT MATTER	NORTHERN SPINIFEX FOREDUNE	CENTRAL EXOTIC TERRACE, HOLLOW & RISER	SOUTHERN POHUEHUE
Rarity / distinctiveness	Yes-Moderate, Pingao is At Risk-declining but few present, and the habitat is naturally uncommon (Wiser et al 2013).	No, very low.	No, low.
Diversity and pattern	Yes-Moderate, related to pattern and typical diversity.	No-Very low, despite high number of species, but that richness is exotic weeds.	Yes -Low, diversity and pattern are at the low end of typical.
Ecological context	Low, isolated and limited in size and effect as resource, refugia and passage roles.	Low, still provides a corridor between south and Three Mile Creek.	Low, as part of the vegetated corridor.
Value summation	High	Negligible	Low

Table 8: Project site significance assessment

SIGNIFICANCE ASSESSMENT MATTER ¹⁰	NORTHERN SPINIFEX FOREDUNE	CENTRAL EXOTIC TERRACE, HOLLOW & RISER	SOUTHERN POHUEHUE
Representativeness⁹			
Indigenous vegetation or habitat of indigenous fauna contains associations of indigenous species representative, typical or characteristic of the natural diversity of the region or any relevant ecological districts.	Yes	No	Yes
Rarity or distinctive features			
Indigenous vegetation or habitat of indigenous fauna supports an indigenous species or associations of indigenous species threatened or rare nationally, regionally or within the relevant ecological district.	Yes, dunes (Wiser et al 2013)	No	No
Indigenous vegetation or habitat of indigenous fauna can contribute to the maintenance or recovery of a species threatened Noor rare nationally, regionally or within the relevant ecological district.	No	No	No
Indigenous vegetation or habitat of indigenous fauna is distinctive, of restricted occurrence, or at the limits of its natural distribution range, or has developed as a result of factors such as natural geothermal activity, historical cultural practices, altitude, water table, or soil type.	No	No	No
Indigenous vegetation or habitat of indigenous fauna is significantly reduced in area and is degraded but retains key natural ecosystem functions (for example hydrology) and has a high potential for restoration.	Yes	No	Yes
Diversity and pattern			
Indigenous vegetation or habitat of indigenous fauna contains a high diversity of indigenous ecosystem or habitat types, or changes in species composition, reflecting the existence of diverse natural features (for example landforms, soil types or hydrology), or communities along an ecological gradient.	No	No	No

¹⁰ As noted in Section 2.3, we have not considered the matters of Māori, Historical and Community in this current significance assessment.

SIGNIFICANCE ASSESSMENT MATTER ¹⁰	NORTHERN SPINIFEX FOREDUNE	CENTRAL EXOTIC TERRACE, HOLLOW & RISER	SOUTHERN POHUEHUE
Naturalness			
Indigenous vegetation or habitat of indigenous fauna is in a natural state or healthy condition or is in an original condition.	Yes	No	No
Ecological context			
Indigenous vegetation or habitat of indigenous fauna contributes to the ecological viability of adjoining natural areas and biological communities, by providing or contributing to an important ecological linkage or network or providing a buffer from adjacent land uses.	No	No	No
Indigenous vegetation or habitat of indigenous fauna provides habitat for indigenous species at key stages of their life cycle	No	No	No
Viability and sustainability			
Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape and has the capacity to maintain its ecological viability over time.	Unlikely	No	No
Indigenous vegetation or habitat of indigenous fauna supports intact habitats and healthy functioning ecosystems.	No	No	No
Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape to resist changes initiated by external agents.	Yes	No	No
Significant	Yes	No	Yes

With regard to NZCPS Policy 11, we have determined that the 'Northern spinifex foredune' triggers the following criteria:

- Policy 11(a)(i) due to the presence of pingao (*At Risk*).
- Policy 11(a)(iii) due to sand dunes being natural rare ecosystems.
- Policy 11(b)(i) being an area of predominantly indigenous vegetation in the coastal environment;
- Policy 11(b)(iii) being an indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification.

We have also determined that the 'Southern pohuehue assemblage' triggers the following NZCPS Policy 11 criteria:

- Policy 11(b)(i) being an area of predominantly indigenous vegetation in the coastal environment.

A summary of the ecological values, significance and NZCPS Policy 11 assessments for the Project site community assemblages is provided in Table 9 and illustrated in Figure 8.



Figure 8: Areas that are considered as significant (as per the regional plan criteria) and that meet NZCPS policy 11(b) only (orange – southern pohuehue) or both NZCPS policy 11(b) and (b) (red – northern spinifex foredune).

Table 9: Summary of the ecological values, significance and NZCPS Policy 11 assessments for the site.

ASSESSMENT	NORTHERN SPINIFEX FOREDUNE	CENTRAL EXOTIC TERRACE, HOLLOW & RISER	SOUTHERN POHUEHUE
Ecological value	High	Negligible	Low
Significance	Yes	No	Yes
NZCPS Policy 11	Policy 11(a)(i), (iii) Policy 11(b)(i), (iii)	-	Policy 11(b)(i), (iii)

5.0 Proposed Construction Methodology

The following construction methodology has been proposed and provided by Davis Coastal Consultants and is illustrated in section 7.2a of the Construction Methodology Statement (September 2024).

In the south (in front of properties 12, 14 and 16; see Figure 9 below), approximately one meter of the existing foredune between the open beach and the property boundary is

likely to be removed; this equates to approximately a 1m width by a length of approximately 70m (total = $\sim 70\text{m}^2$). Trenching then occurs to an lower RL and the wall will be constructed on a geotextile through the placement of rock material in the cleared area in the trench. The rock wall is then covered in sand (see section 7.1 of the construction statement).

Then north of this section the wall instalment begins to be trenched as it travels towards Three Mile Creek, changing from 7.6 m seaward of the property boundaries to avoid the Norfolk pine roots, to 6.5m at the north end to avoid the northern spinifex foredune (see Figure 9). This variance allows the trenching and works to avoid in total the northern spinifex foredune area. A path of around 140m and 13m wide (1820m^2) is required. The proposal is to dig out a trench in the northern two-thirds, place a hard substrate armour wall in the trench on a geotextile and back fill and cover that wall to reform a sand dune on top (refer to Figure 10). Then plant appropriate native dune system vegetation into all the disturbed areas (see section 7.1 and Figure 7a of the construction statement).



Figure 9: Construction footprint (Source: Davis Coastal Consultants)

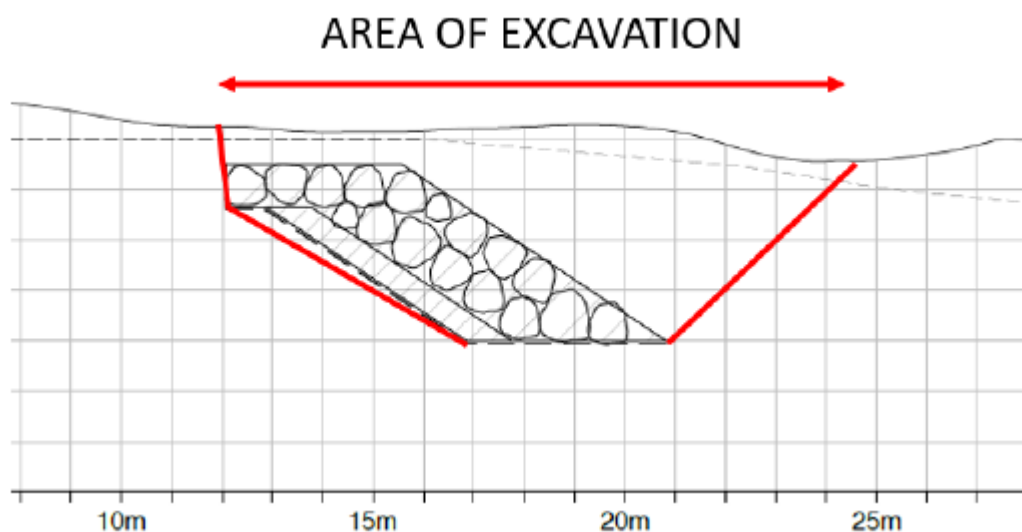


Figure 10: Proposed construction method (Source: Davis Coastal Consultants)

6.0 Ecological Effects Assessment

As identified above (Section 5.0), the construction methodology has been designed to avoid effects on the northern spinifex foredune. As such, no assessment of effects is required for this vegetation community assemblage. The following assessment considers the remaining two assemblages (i.e. southern pohuehue and central exotic terrace, hollow and riser slope).

The proposed structure and construction footprint will result in the loss of 0.007 ha of the southern pohuehue vegetation. This represents a loss of 0.17% of that vegetation community assemblage at the local scale (i.e. 4 ha as identified in Section 2.2 above), i.e. a Negligible magnitude of effect.

Therefore, based on the Low ecological value of this vegetation assemblage (refer Table 9), and a Negligible magnitude of effect, the overall level of effect on southern pohuehue will be **Very Low** at the local scale. As this level of effect is not considered a significant adverse effect, it is consistent with the NZCPS Policy 11(b) directive as any adverse effects, albeit Very Low, can be further remedied and mitigated.

The proposed structure and construction footprint will result in the loss of 0.2425 ha of various exotic dune vegetation located in the central exotic terrace, hollow and riser slope. This represents a loss of 0.5% of the Waihi Beach dune vegetation (i.e. 52 ha as identified in Section 2.2 above), i.e. a Negligible magnitude of effect.

Therefore, based on the Negligible ecological value of this vegetation assemblage (refer Table 9), and a Negligible magnitude of effect, the overall level of effect on the central exotic terrace, hollow and riser slope vegetation community will be **Very Low** at the local scale. As this level of effect is not considered a significant adverse effect, it is consistent with the NZCPS Policy 11(b) directive as any adverse effects, albeit Very Low, can be further remedied and mitigated.

7.0 Effects Management Hierarchy

The National Policy Statement for Indigenous Biodiversity ("NPS IB") (2022) section 3.10 directs Councils to manage effects on Significant Natural Areas, and the southern pohuehue community is significant (Table 8).

Arguably the central terrace, hollow and riser slope is largely exotic, but there is pohuehue and some few other native dune species present, and the area as a whole is recognised in Schedule 2 of the BOP-REC as an IBDA. However, as we concluded (Table 8) the area does not meet the significance test and so is not SNA.

We note that that area is proposed to be revegetated regardless of the significance of the habitat as it is good sense and practice to revegetate areas covered in sand after the works to minimise continued erosion and retain the sand cover.

Where sites meet the SNA definition, NPS IB (section 3.16) directs Councils to require the application of the effects management hierarchy (such as the southern pohuehue). The hierarchy for the management of effects is outlined in Table 10. This process follows the

effects management hierarchy as described in Roper-Lindsay et al. (2018) and Maseyk et al. (2018).

Table 10: Effects management hierarchy and terminology (Maseyk et al., 2018)

EFFECTS MANAGEMENT HIERARCHY	DEFINITION
1) Avoidance	To modify a project proposal to prevent any environmental damage or loss of an ecological or environmental feature or function.
2) Remediation	To reverse or stop any environmental damage.
3) Mitigation	To alleviate, or to abate, or to moderate the severity of something (environmental damage), and typically occurs at the point of impact.
4) Biodiversity offset	A measurable conservation outcome resulting from actions designed to compensate for residual, adverse biodiversity effects arising from activities after appropriate avoidance, remediation, and mitigation measures have been applied. The goal of a biodiversity offset is to achieve no-net-loss, and preferably a net-gain, of indigenous biodiversity values.
5) Environmental compensation	Non-quantified biodiversity benefits are offered to compensate for biodiversity losses. The compensation actions may benefit different biodiversity to that lost (out-of-kind compensation), including biodiversity of lesser conservation concern than that lost. Compensation is not quantified or balanced with losses and may involve subjective decision-making subject to socio-political influences.

Usually Very Low level effects (such as at the southern Pohuehue) need not in all circumstances be addressed as there is not considered to be any residual adverse effect as a result of the disturbance.

However, in a scheduled indigenous coastal vegetation area recognised as fitting NZCPS policy 11(b) – such as the Project site - and where the BOP-RPS seeks preservation and restoration of the ecological functions of the coastal environment (objective 2) and no further reduction in SNA (albeit very small) or other indigenous biodiversity (as does the NPS IB (2022)) then some form of ecological remediation / mitigation is warranted (for the southern pohuehue area).

In this circumstance, regardless of the effects management regime, we note that where the installed wall is recovered in sand, then it is also necessary to stabilise the sands and retain a sand dune, as opposed to having an exposed stone wall, and so a need to revegetate the sand.

We consider that the impacts on the southern pohuehue/knobbly club rush area requires remediation while the wider site requires mitigation to preserve the natural character and ecological functioning.

Because of the construction methodology and a reasonable possibility that the proposed sand cover of the southern portion of the wall will not persist for long, we consider it likely that the remediation of the pohuehue-knobbly club rush area (70m²) will need to be in the trenched wall section. Thus, the trench back fill and potentially areas landward need to provide at least 140 m² (the doubling of the affected area to accommodate the lag between loss and regenerated assemblage). The remaining area of clearance because of the works (between 1300m²-2075m²) should be planted with a spinifex-pingao mix seaward and a coastal shrub/ other species mix landward. Recommended species for those areas are listed below. While we advocate for the revegetation of the southern section, we do not recommend that area's use for the mitigation components of the effects.

Overall, with this remediation / mitigation work, the long-term outcome, we assess, as being a net ecological benefit of the site and at a local scale.

We recommend the following species mix as appropriate for the site:

Revegetation plant mix

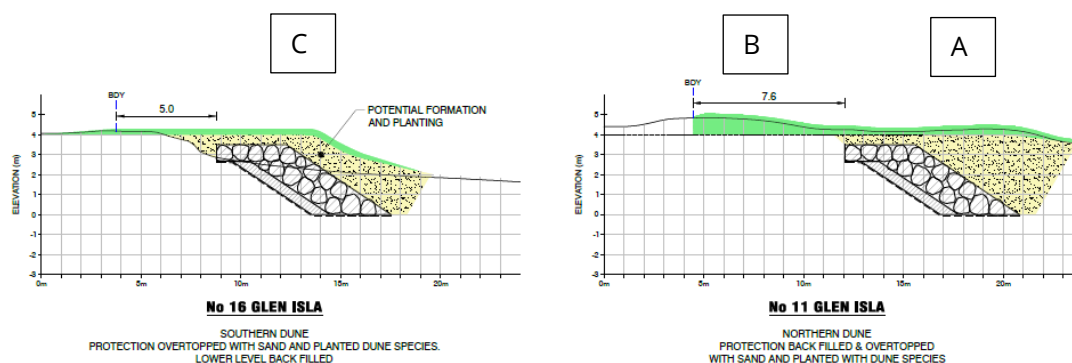


Figure 11. Davis Coastal Limited's diagrams of the installed resultant surfaces for revegetation.

A - Sands over the wall and towards the northern spinifex - loose sand:

- Spinifex/Kowhangatara (*Spinifex sericeus*) -85%
- Pingao (*Ficinia spiralis*), (10%)
- Sand tussock (*Poa billardierei*) (5%)

B -Landward from inner wall edge to property boundary (where distributed)

- Pimelea villosa
- Oioi (*Apodasmia similis*) – hollows
- *Carex Testacea*, under trees and taller shrubs
- Sand coprosma (*Coprosma acerosa*)
- NZ ice plant (*Disphyma australe*) -micro sited
- Knobby club rush (*Ficinia nodosa*) - throughout
- Pohuehue (*Muehlenbeckia complexa*)

C -southern dune area

- Spinifex/Kowhangatara (*Spinifex sericeus*)
- NZ ice plant (*Disphyma australe*) -micro sited
- Knobby club rush (*Ficinia nodosa*) - throughout
- Pohuehue (*Muehlenbeckia complexa*)

It is recommended that a detailed revegetation plan should be required by a condition of consent and seek to replace all disturbed vegetation with appropriate native species (as listed above) and to get secure cover to the disturbed area and at a density of 0.5m spacing for grasses, herbs and small shrubs and 1m spacing for all else.

8.0 Conclusion

Three vegetation assemblages are evident on site

7. Northern spinifex foredune (400m²);
8. Central exotic terrace, hollow and riser slope (2430 m²); and
9. Southern pohuehue (175m²).

The assessment considers the following as the outcomes with respect to value, significance and the NZCPS (2010).

ASSESSMENT	NORTHERN SPINIFEX FOREDUNE	CENTRAL EXOTIC TERRACE, HOLLOW & RISER	SOUTHERN POHUEHUE
Ecological value	High	Negligible	Low
Significance	Yes	No	Yes
NZCPS Policy 11	Policy 11(a)(i), (iii) Policy 11(b)(i), (iii)	-	Policy 11(b)(i), (iii)

The most valuable feature (i.e. the northern spinifex foredune) has been, through the design process, avoided.

The other two areas will be impacted to a variable level but conservatively the magnitude of impact on either at a local Waihi Beach scale is Negligible and so the level of effect in total Very Low (less than minor).

That level of adverse effect is allowable under the NZCPS policy 11(b) and is consistent with the requirements of effects management under the NPS IB.

Overall, the remediation / mitigation solution recommended, being the revegetation of the covered wall after installation with appropriate native dune plants for at least the areas stipulated in this report, will result in a net ecological benefit at a local scale.

9.0 References

- Beadel, S. 1992. NZ Plant Conservation Network published species lists. Species list for Athenree Reserve.
- de Lange, P., Jeremy R. Rolfe, John W. Barkla, Shannel P. Courtney, Paul D. Champion, Leon R. Perrie, Sarah M. Beadel, Kerry A. Ford, Ilse Breitwieser, Ines Schönberger, Rowan Hindmarsh-Walls, Peter B. Heenan and Kate Ladley. 2018. Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series 22*. Department of Conservation, Wellington. 82 p,
- Hitchmough, R.A.; Barr, B.; Knox, C.; Lettink, M.; Monks, J.M.; Patterson, G.B.; Reardon, J.T.; van Winkel, D.; Rolfe, J.; Michel, P. 2021: Conservation status of New Zealand reptiles, 2021. *New Zealand Threat Classification Series 35*. Department of Conservation, Wellington. 15 p.
- Maseyk, F. J. F., Ussher, G. T., Kessels, G., Christensen, M., & Brown, M. (2018). *Biodiversity offsetting under the Resource Management Act: A guidance document*. Prepared for the Biodiversity Working Group on behalf of the BioManagers Group.
- Michel, P. (2021). Amendment to the New Zealand Threat Classification System manual 2008: Revised categories 2021. Department of Conservation.
- Owen, K. L., Wilson, T. D., Latham, P. M., & Young, K. D. (2006). *Distribution and conservation of shorebirds in the Bay of Plenty, New Zealand, 1984–2003* (DOC Technical Report Series 35). Department of Conservation, Rotorua.
- Robertson, H. A., Baird, K. A., Elliott, G. P., Hitchmough, R. A., McArthur, N., Makan, T. D., Miskelly, C. M., Sagar, P. M., Scofield, R. P., Taylor, G. A., & Michel, P. (2021). Conservation status of birds in Aotearoa New Zealand, 2021 (New Zealand Threat Classification Series No. 36). Department of Conservation.
- Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D., & Ussher, G. T. (2018). Ecological impact assessment (EcIA). EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems (2nd ed.). Environment Institute of Australia and New Zealand.
- Shaw, W. 2011. Ecological aspects of a whole island plan for Matakana Island. Contract Report No. 2729, August 2011, Western Bay of Plenty District Council
- Wiser SK, Buxton RP, Clarkson BR, Hoare RJB, Holdaway RJ, Richardson SJ, Smale MC, West C, Williams PA. 2013. New Zealand's naturally uncommon ecosystems. In Dymond JR ed. Ecosystem services in New Zealand – conditions and trends. Manaaki Whenua Press, Lincoln, New Zealand.

Appendix 1: EIANZ criteria for assigning ecological value to terrestrial communities

MATTER	ATTRIBUTES TO BE CONSIDERED
Representativeness	Criteria for representative vegetation and aquatic habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity / distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally¹¹ uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity & pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations - pattern, complexity • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history, and local environmental conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in the RMA) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning – high level, key species identification, habitat as proxy

¹¹ Locally - defined as within Ecological District

Appendix 2: BOP RPS Appendix F Set 3 criteria (Indigenous vegetation and habitats of indigenous fauna)

MATTER	CRITERIA
Representativeness	Indigenous vegetation or habitat of indigenous fauna contains associations of indigenous species representative, typical or characteristic of the natural diversity of the region or any relevant ecological districts.
Rarity or distinctive features	Indigenous vegetation or habitat of indigenous fauna supports an indigenous species or associations of indigenous species threatened or rare nationally, regionally or within the relevant ecological district. Indigenous vegetation or habitat of indigenous fauna can contribute to the maintenance or recovery of a species threatened or rare nationally, regionally or within the relevant ecological district. Indigenous vegetation or habitat of indigenous fauna is distinctive, of restricted occurrence, or at the limits of its natural distribution range, or has developed as a result of factors such as natural geothermal activity, historical cultural practices, altitude, water table, or soil type. Indigenous vegetation or habitat of indigenous fauna is significantly reduced in area and is degraded but retains key natural ecosystem functions (for example hydrology) and has a high potential for restoration.
Diversity and pattern	Indigenous vegetation or habitat of indigenous fauna contains a high diversity of indigenous ecosystem or habitat types, or changes in species composition, reflecting the existence of diverse natural features (for example landforms, soil types or hydrology), or communities along an ecological gradient.
Naturalness	Indigenous vegetation or habitat of indigenous fauna is in a natural state or healthy condition, or is in an original condition.
Ecological context	Indigenous vegetation or habitat of indigenous fauna contributes to the ecological viability of adjoining natural areas and biological communities, by providing or contributing to an important ecological linkage or network or providing a buffer from adjacent land uses. Indigenous vegetation or habitat of indigenous fauna provides habitat for indigenous species at key stages of their life cycle
Viability and sustainability	Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape and has the capacity to maintain its ecological viability over time. Indigenous vegetation or habitat of indigenous fauna supports intact habitats and healthy functioning ecosystems. Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape to resist changes initiated by external agents.
Māori	Indigenous vegetation or habitat of indigenous fauna contributes to the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga. (Refer also to set 4 - Māori Culture and Traditions criteria).
Historical	Indigenous vegetation or habitat of indigenous fauna is known and valued for its connection to the history of the place.
Community association	Indigenous vegetation or habitat of indigenous fauna is known and valued by the immediate and wider community for its contribution to a sense of place leading to community association with or public esteem for the place, or due to its value for recreation or education. Indigenous vegetation or habitat of indigenous fauna is valued for the contribution it is making to research into the Bay of Plenty's or New Zealand's ecosystems.

Appendix 3: NZCPS Policy 11 – Indigenous Biological Diversity

Policy 11 Indigenous biological diversity (biodiversity)

To protect indigenous biological diversity in the coastal environment:

- (a) avoid adverse effects of activities on:
 - (i) indigenous taxa⁴ that are listed as threatened⁵ or at risk in the New Zealand Threat Classification System lists;
 - (ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;
 - (iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare⁶;
 - (iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;
 - (v) areas containing nationally significant examples of indigenous community types; and
 - (vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation; and
- (b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:
 - (i) areas of predominantly indigenous vegetation in the coastal environment;
 - (ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;
 - (iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;
 - (iv) habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;
 - (v) habitats, including areas and routes, important to migratory species; and
 - (vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy.

Appendix 4: Representative site and vegetation community photos



Northern edge from Glen Isla Place access, Three Mile creek and sand bagged edge on left.



Northern end, eastern spinifex on loose sand dune with pingao.



Looking south at the between foredune and back terrace dune hollow with grasses and herbs. Note goldedn wattle cover on the right.



Looking north back along the dune hallow, between the predominantly native spinifex foredune right and the exotic shrub left. Note large woody debris.



Typical vegetation cover of the terrace slope, agapanthus, pohuehue, daisy, bushy asparagus and Dimorphotheca fruticose.



Southern end of the spinifex fordune looking east, a clear demarcation between exotic and native dune, much reduced pohuehue here.



Exotic terrace riser near the Norfolk pine, agapathus prominat cover.



Ginger, kikuyu grass and other garden escapes on terrace looking south.



Southern end showing terrace escarpment edge in spinifex and terrace with reasonable pohuehue cover to the right.



Southern end in pohuehue, occasional shrubs, karo, kawakawa, five finger and a yucca. Aloe and other weeds also evident.



The southern most end in pohuehue and knobby cluib rush as well as kikuyu.



The southern end's terrace escarpment a mix of species but often more spinifex.

Appendix 5: Plant species recorded on site

SPECIES LATIN NAME	COMMON NAME	Exotic or Native	NZ THREAT CLASSIFICATION ¹²
<i>Acacia longifolia</i>	Sydney golden wattle	Exotic	Not Threatened
<i>Acanthus mollis</i>	Bears breachers	Exotic	Not Threatened
<i>Aeonium haworthii</i>	Pinwheel aeonium	Exotic	Not Threatened
<i>Agapanthus praeox</i>	Agapanthus	Exotic	Not Threatened
<i>Aloe arborescens</i>	Tree aloe	Exotic	Not Threatened
<i>Araucaria heterophylla</i>	Norfolk pine	Exotic	Not Threatened
<i>Arcotis stoechadifolia</i>	White daisy	Exotic	Not Threatened
<i>Arum italicum</i>	Red hot poker Lilly	Exotic	Not Threatened
<i>Asparagus aethiopicus</i>	Bushy asparagus	Exotic	Not Threatened
<i>Atriplex prostrata</i>	Orache	Exotic	Not Threatened
<i>Cakile edentula</i>	Sea rocket	Exotic	Not Threatened
<i>Cakile maritima</i>	Sea Spurge	Exotic	Not Threatened
<i>Carpobrotus edulis</i>	Ice plant	Exotic	Not Threatened
<i>Chamaecytisus palmensis</i>	Tree lucerne	Exotic	Not Threatened
<i>Cortaderia selloana</i>	Pampas	Exotic	Not Threatened
<i>Cotyledon orbiculate</i>	Pigs ear	Exotic	Not Threatened
<i>Crepis capillarius</i>	Hawksbeard	Exotic	Not Threatened
<i>Dimorphotheca fruticosa</i>	Trailing African daisy	Exotic	Not Threatened
<i>Euonymus europaeus</i>	Strawberry tree	Exotic	Not Threatened
<i>Ficinia</i>	Pingao	Native	At Risk -Declining
<i>Furcraea foetida</i>	False agave	Exotic	Not Threatened
<i>Gazania linearis</i>	Daisy	Exotic	Not Threatened
<i>Gazania rigens</i>	Daisy	Exotic	Not Threatened
<i>Hedychium gardnerianum</i>	Ginger	Exotic	Not Threatened
<i>Hypochaeris radicata</i>	Dandelion	Exotic	Not Threatened
<i>Lagurus ovatus</i>	Hairs tail	Exotic	Not Threatened
<i>Lilium formosanum</i>	Xmas lily	Exotic	Not Threatened
<i>Lotus corniculatus</i>	Bird trifol	Exotic	Not Threatened

¹² de Lange et al. (2018)

SPECIES LATIN NAME	COMMON NAME	Exotic or Native	NZ THREAT CLASSIFICATION ¹²
<i>M complexa</i>	pohuehue	Native	Not Threatened
<i>Malva dendromorpha</i>	Tree mallow	Exotic	Not Threatened
<i>Myoporum insulare</i>	Australian ngaio	Exotic	Not Threatened
<i>Pennisetum clandestinum</i>	Kikuyu grass	Exotic	Not Threatened
<i>Pittosporum crassifolium</i>	Karo	Native	Not Threatened
<i>Plantago lanceolata</i>	plantain	Exotic	Not Threatened
<i>Spinifex seriseus</i>	Spinifex	Native	Not Threatened
<i>Tradescantia fluminensis</i>	Wandering jew	Exotic	Not Threatened
<i>Tropaeolum majus</i>	Nasturtium	Exotic	Not Threatened
<i>Yucca gloriosa</i>	Yucca	Exotic	Not Threatened



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Our Ref: 23028

28 March 2024

Mr Allan Fraser
Glen Isla Place
Waihi Beach

Dear Mr Fraser,

Memorandum – Location of Mean Highwater Springs Glen Isla Place, Waihi Beach

1.0 Introduction

In the context of investigating the provision of erosion control measures at Glen Isla Place, Waihi Beach, we have undertaken an analysis of the position of Mean High Water Springs (MHWS) at the site.

Mean High Water Springs (MHWS) is specified as the jurisdictional boundary between “Land” and the “Coastal Marine Area” (sea) in the Resource Management Act (RMA). The District Plan defines the Planning Rules and Consent requirements for Activities landward of this line. The Regional Coastal Plan has the same function seaward of this line.

Definition of this boundary was usefully explained by Professor J. Hannah of University of Otago to the Planning Tribunal (Falkner v Gisborne District Council Decision A82/94) as *“a two-stage process: determining the vertical height of the mean high water springs level, and then projecting that height on to the shore profile to determine the horizontal location of the mean high water springs contour.”*

The boundary can be envisaged as a flat plane at the level of MHWS intersecting with the sloping shoreline (Figure1). We have used this two-stage process to determine MHWS at the site.

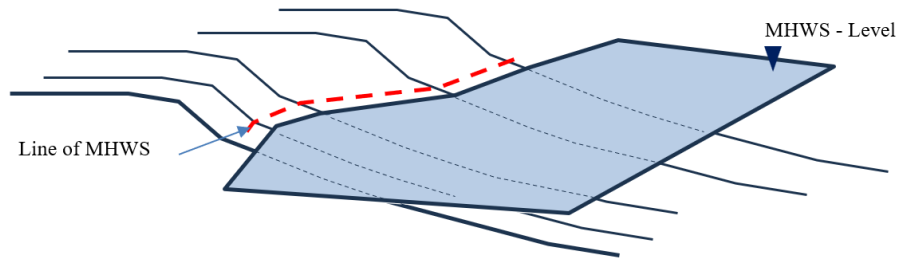


Figure 1 – Depiction of MHWS Calculation

2.0 Vertical Height of MHWS

MHWS is a statistic of the variable level of the high tide. It is typically interpreted as an average water level of spring tide.

There are multiple definitions of MHWS. A traditional maritime definition of MHWS (and MLWS) is provided by LINZ as *“The average of the levels of each pair of successive high waters, and of each pair of low waters, during that period of about 24 hours in each semi-lunation (approximately every 14 days), when the range of the tide is greatest (spring range).”* This definition was expected to be exceeded by approximately the 12% highest tides.

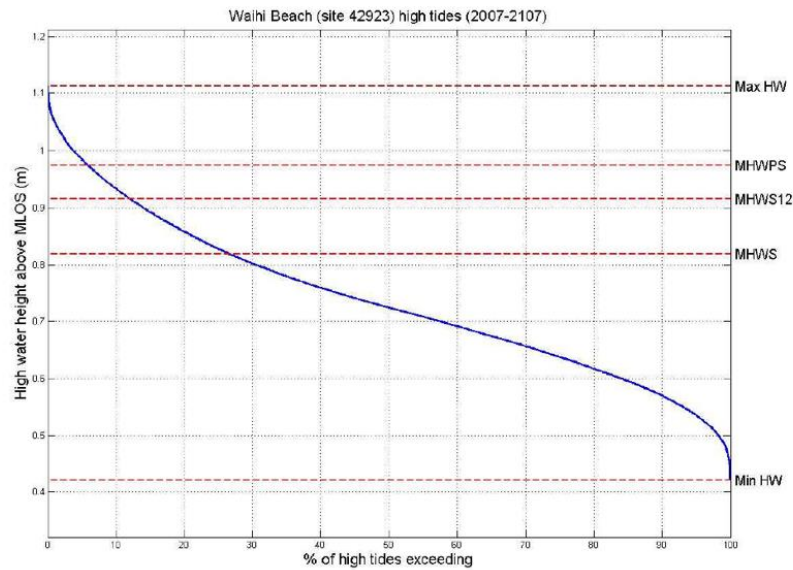
A mathematical algorithm (Equation 1) has often been used to calculate MHWS. It takes the primary harmonic Sun and Moon components of tide and combines the maxima of these to define high tide. In recent years, issues with this producing a representative MHWS in New Zealand, particularly in the upper South Island, led to inclusion of a third (N_2) harmonic component (Equation 2). The N_2 component accounts for changes in tidal height due to the variation in distance between the moon and earth resulting from the elliptical lunar orbit. The component is at its maximum when the moon is at its closest point or perigee and the resulting tidal statistic often defined as the Perigean Mean High Water Spring (MHWSP).

$$MHWS = MLOS + A(M_2) + A(S_2) \quad (1)$$

$$MHWSP = MLOS + A(M_2) + A(S_2) + A(N_2) \quad (2)$$

With the advent of more sophisticated computer modelling and longer-term tidal monitoring to provide calibration, tidal exceedance curves have been developed. These curves show the frequency that all high tide levels occur. A figure for MHWS is then defined as level that only a given percentage of tides exceed. Typically, because of the traditional expectation that 12% of tides were greater than MHWS the height exceeded by 12% of tides is provided from the exceedance curve (MHWS12). The height exceeded by only 10% of high tides (MHWS10) is also another relatively common measure. NIWA have been at the forefront of this work in New Zealand and in 2006 provided a report for the Bay of Plenty Regional Council (BOPRC) detailing tidal calculation methods and modelling tidal levels in the Region. They produced an exceedance curve for Waihi Beach (Figure 2).

The exceedance curve for Waihi, reproduced from the 2006 report, shows the maximum tide is RL1.1 and all high tides are between RL 0.4 and RL1.1. The level of the traditionally defined MHWS is approximately RL 0.8 and the MHWSP is approximately RL1.2. (Table 1) These levels are all given relative to the *“Mean Level of the Sea (MLOS)”*. They are set out in Table 1 below along with conversion to levels in respect to the Moturiki Vertical Datum 1953 (MVD1953). The Moturiki Datum is typically used in topographical survey data for the area.



High-tide exceedance curve for **Waihi Beach** relative to MLOS (which will vary). Annotation descriptors are given in the text above

Figure 2 – High Tide Exceedance for Waihi Beach ex NIWA 2006

Statistic	Level (m) Relative to MLOS	Level (m) Relative to MVD1953
Maximum High tide	1.1	1.2
MHWS10	0.9 (0.93)	1.0
MHWS12	0.9 (0.916)	1.0
MHWS	0.8	0.9
Minimum High tide	0.4	0.5

Table 1 – Summary of High tide Statistics ex NIWA 2006

Both Case law and published reporting on tidal determination, highlight the need for pragmatism in determining MHWS. There is no correct or definitive value that can be specified. However, there is only a 300mm difference between a traditional value of MHWS and the maximum highest tide expected (excluding sea level rise). Between all the MHWS statistics quoted in the NIWA report there is less than a 200mm difference. This difference is largely theoretical and relevant primarily to the mathematical model.

On an open coast such as Waihi, tidal height is overlain by an active wave environment and the tide acts on a dynamic changing beach. In this context, the difference in level between the various definitions becomes less significant.

For the purposes of defining MHWS for this matter we have adopted the value adopted by NIWA in their specialist report to BOPRC on this matter, which is exceeded by only approximately 10 % of tides. The adopted value by the NIWA report to one decimal place is RL1.0 MVD1953.

MHWS = RL1.0 MVD1953

This value has the benefit of being a contour that is readily and often plotted in a number of historic and contemporary studies and plans. It therefore provides a practicable and useable value. The contours on some topographical mapping, including the GIS mapping used by the BOPRC website, expresses contours and height in NZVD2016. Table 2 shows the offset of 0.3 between the data. Where the GIS shows a RL1.0 contour based on NZVD2016, the line of MHWS will be 0.3m above this.

	MVD1953	NZVD2016
MHWS	1.0	1.3
1.0 Contour on WBOPRC GIS	0.7	1.0

Table 2 – Comparison of RL1.0 in MVD and NZVD

3.0 Location of MHWS Line at Glen Isla Place

In order to locate the line of MHWS on site we must determine where the beach is at the level of RL1.0 or the location of the RL1.0 contour. This RL1.0 contour is the line MHWS.

However, the level of the beach varies due to many drivers on differing times scales. This includes diurnal tidal changes, seasonal and storm event changes as well as longer term changes from longer weather patterns. Changing weather patterns can be associated with El Nino/ La Nina cycles over many years and pan-decadal patterns have also been defined. In combination with these fluctuations, changes in the beach drivers such as a change in sediment supply, change in local control points (river outlets, headlands), sea level rise or man-made effects can also create changes in the beach profile.

Both Case law and published reporting on tidal determination, highlight the need for pragmatism in determining MHWS. There is no correct or definitive value that can be specified. The location chosen may depend on the accuracy required for the task at hand and practicable measures such as site features which provide some consistency in determining the jurisdictional boundary.

For the purposes of determining the jurisdictional planning boundary at this site, we have investigated the range of locations that the line of MHWS has been in over time and related this to the proposed location of any potential works. The over-arching philosophy is to maintain our works landward of any reasonable depiction of MHWS so that the work is firmly on Land and not within the Coastal Marine Area.

Waihi Beach has reasonable monitoring data for approximately 20 years, and a limited amount of older data going back over 30 years. This monitoring tends to show a generally stable beach, but this may be influenced by human interventions.

There are long term monitoring sites (Figure 3), CS49 and CS50, 400-600m each side of the site, that have 37-year and 34-year records, respectively. A set of three profiles at the Glen Isla site were monitored for 6 years between 2012 and 2018. This is understood to have been some short-term monitoring in relation to the drainage outlet of Three Mile Creek.

The data is mapped as beach cross sections or profiles, as Figure 4 and Attachment 1. From this record of profiles an envelope of profiles can be determined. This envelope provides a cross-section area of within which the beach profile has fluctuated. but also an area outside and landward of this which has always been above MHWS and therefore “Land” under the Resource Management Act. Activities in this area are subject to the District Plan and Sections 9 and 15 of the Act but not Section 12. For this area the District Council is the primary Planning Consent Authority.



Figure 3: Monitoring Locations

A useful tool in determining the location of MHS over time is to map the “excursion” of the RL1.0m contour over time. This maps the horizontal distance from a fixed monitoring point to the RL1.0m contour. As more sand builds up on the beach and the beach builds seaward, the RL1.0 contour moves seaward. In times of storm erosion and beach retreat the beach lowers and the RL1.0 contour moves closer to the shore, landward.

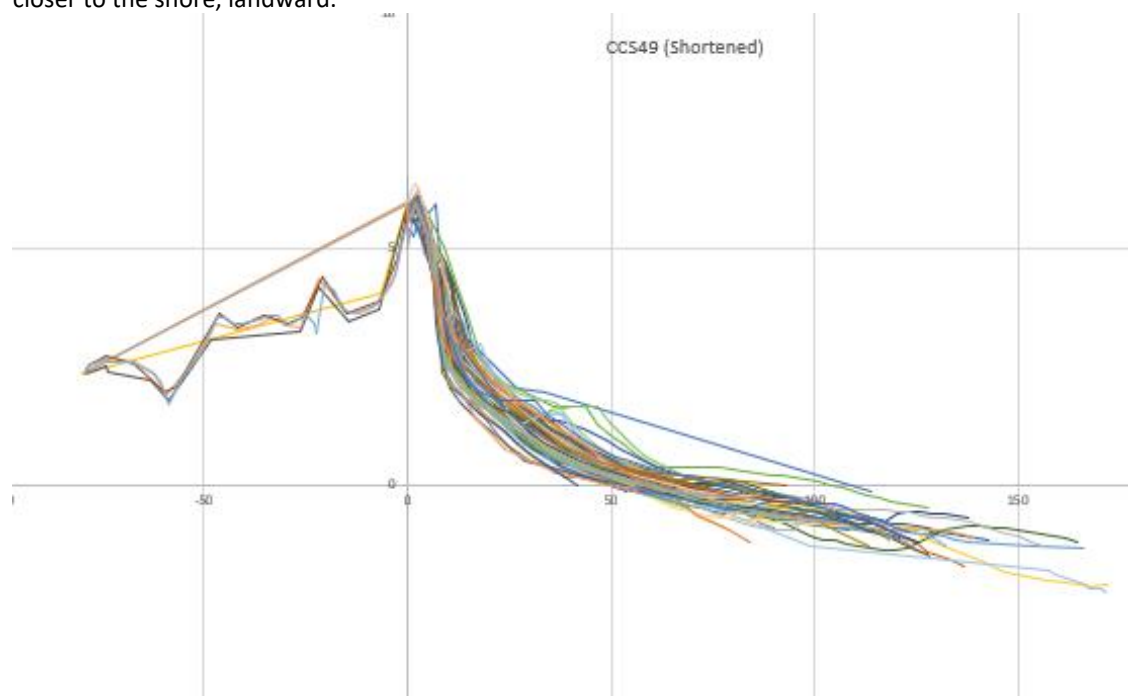


Figure 4: CS49 Profile Data

We mapped Excursions for all five profiles (Figures 5 and 6 and Attachment 1). As would be expected, there was greater variability and a greater range of excursion of the MHWS mark on the profiles that had been monitored over a longer time frame when compared to the profiles monitored for only six years. In order to determine the applicability of the wider range of movement to our site, which was adjacent to profiles only monitored over a short timeframe, all profiles were compared over similar 6-year timeframe to compare fluctuations at the sites.

Over the similar six-year period (2012-2018) the long-term monitoring sites (CS49 and CS50) behaved similarly to S1, S2 and S3. The range of excursion was 17m +/-1m at all profiles. Table 3 provides the maximum and minimum excursion information for the MHWS contour. Over the 6-year time period the minimum excursion was within 1m of that monitored over the 30year timeframe. The majority of the larger range of excursion in the longer record depicts a higher level of sand on the beach and a more seaward line of MHWS.

It was therefore extrapolated that S1-S3 would behave similarly to CS49 and CS50 over longer time frames and it was reasonable to assume the range of excursion documented at CS49 and CS50 would have been present at the site over that time. As the minimum excursion represents the "most eroded" of landward location of the beach although the 30-year period minimum was within 1m of the 6-year minimum, it was assumed that the long-term excursion was 2m further landward than the six-year figures.

This width of excursion was then mapped in Plan onto the beach seaward of Glen Isla as the area in which MHWS has been located over the last 30-35 years. (Figure 7 Attachment 2)

It is assumed that work landward of this area, and so landward of MHWS for the last 30 years is therefore outside the Coastal Marine Area and under the Jurisdiction of the District Plan and Terrestrial Consent Authority, Western BOPDC

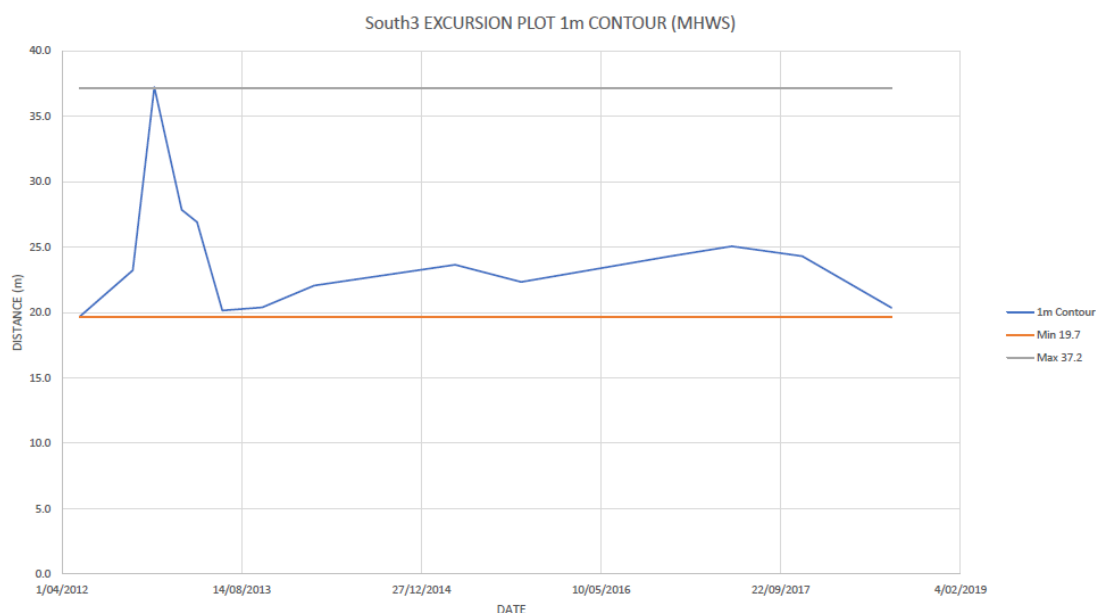


Figure 5 – Excursion of RL1.0m contour (MHWS) 2012-2019 Glen Isla Place

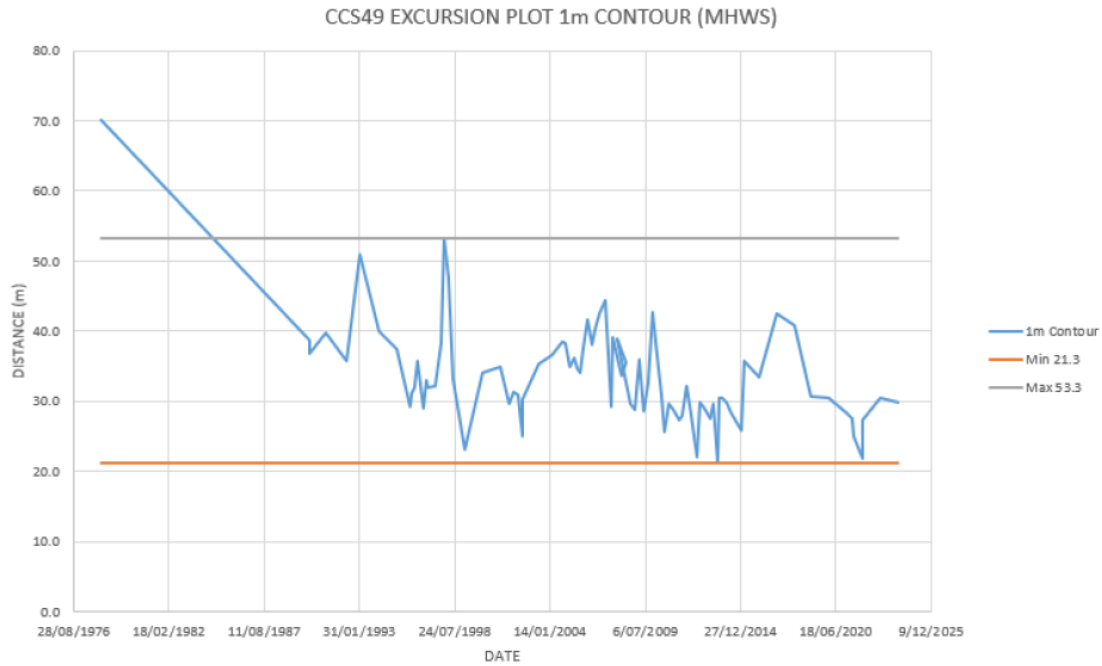


Figure 6 – Excursion of RL1.0m contour (MHWS) 1987-2024 CS49

MONITORING PROFILE EXCURSION RANGE - FULL PERIOD						
Profile	Duration			Excursion		Range
			years	min	max	m
CS49	1987 -	2024	37	21	53	32
CS50	1990 -	2024	34	47	71	24
N	2012 -	2018	6	15	33	17
S1	2012 -	2018	6	46	62	16
S2	2012 -	2018	6	25	43	18
S3	2012 -	2018	6	20	37	17
MONITORING PROFILE EXCURSION RANGE - 2012-2018						
Profile	Duration			Excursion		Range
			years	min	max	m
CS49	2012 -	2018	6	21	33	17
CS50	2012 -	2018	6	48	67	19
N	2012 -	2018	6	15	33	17
S1	2012 -	2018	6	46	62	16
S2	2012 -	2018	6	25	43	18
S3	2012 -	2018	6	20	37	17

Table 3 – Excursion Range of MHWS

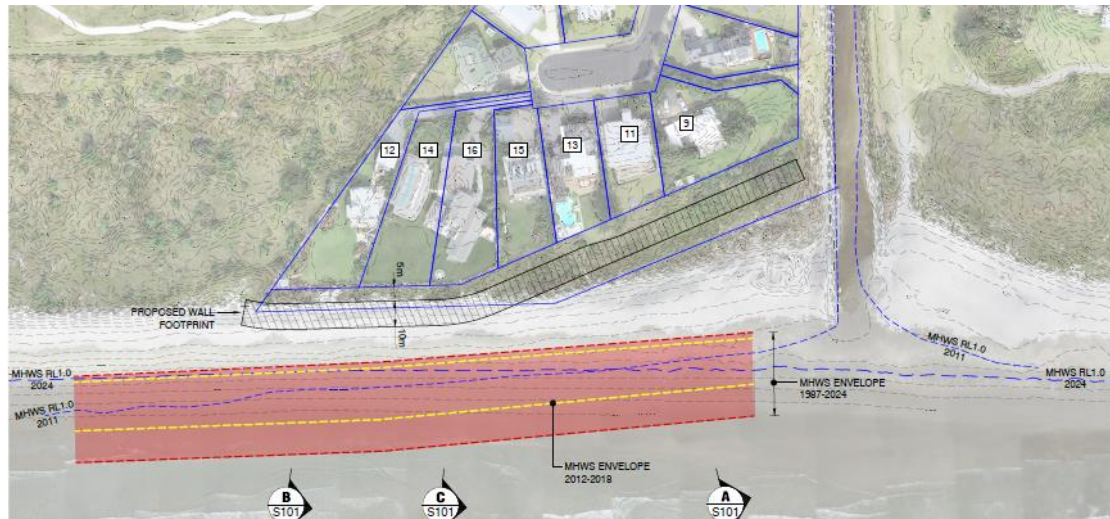


Figure 7 – Plan Showing Historic Range of MHWS 30+ years

4.0 Sea Level Rise

The location of MHWS is likely to migrate landward with rising levels due to Climate Change. Accepted theory is that as the water level increases the average location of the shoreline is likely to also migrate shoreward.

This is at odds with the longer-term processes such that estuaries tend to infill and barrier bar beaches tend to migrate seaward over long-term sea-level rise. Again, the quantum of sea level rise is relevant. Within a typical design time frame (50Y) sea-level rise is likely to be in the order of 0.5m and shoreward translation of 5m for a 1:10 Beach. This will be insufficient to make the proposed works within the CMA. We therefore consider that the structure is within an area of District Council Jurisdiction for construction of any erosion protection.

5.0 Conclusion

The location of MHWS has been considered on the site in order to determine Consent requirements of any proposal to address erosion issues for the properties on Glen Ilsa Place, Waihi. A level of pragmatism and judgement is required when determining the location of MHWS.

In this case, a detailed study and modelling of the height of MHWS has been undertaken by NIWA in 2006 and adopted by the Regional Council. The height of MHWS at Waihi Beach provided by that report and adopted for this exercise is RL1.0 (MVD53).

We have utilised the monitoring data of beach level over a period of over 30 years and plotted where this line of MHWS would have been due to beach fluctuation over that time. A median or mean location would seem a reasonable representation of MHWS at the site. However, we have adopted the most landward position that MHWS has been within that 30 year+ period and ensured all proposed work is outside this line.

All coastal protection measures considered will be located landward of this MHWS mark. As such, any infringements by any structures will be under the jurisdiction of the WBOPDC and the District Plan.

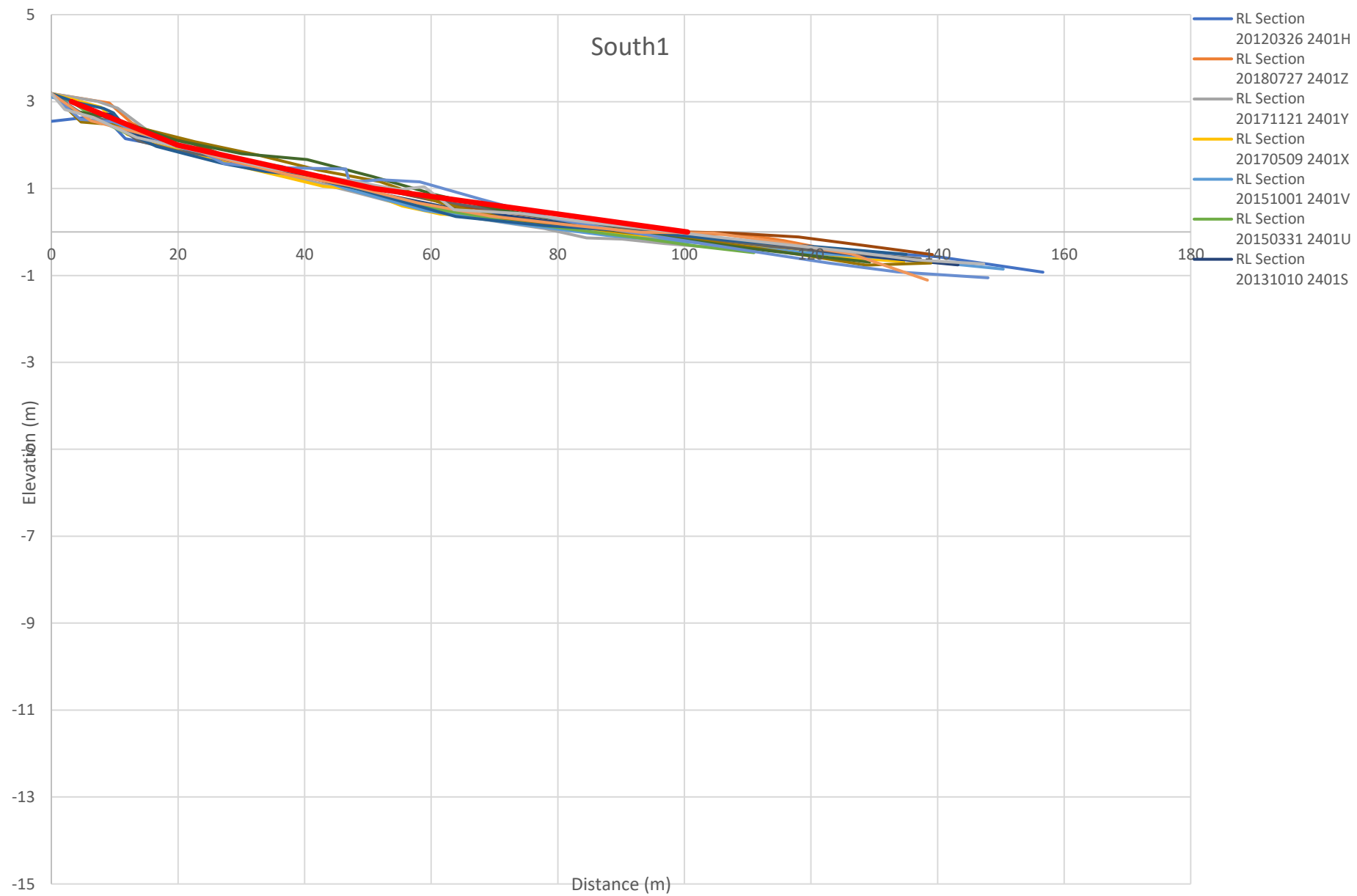
Yours sincerely,

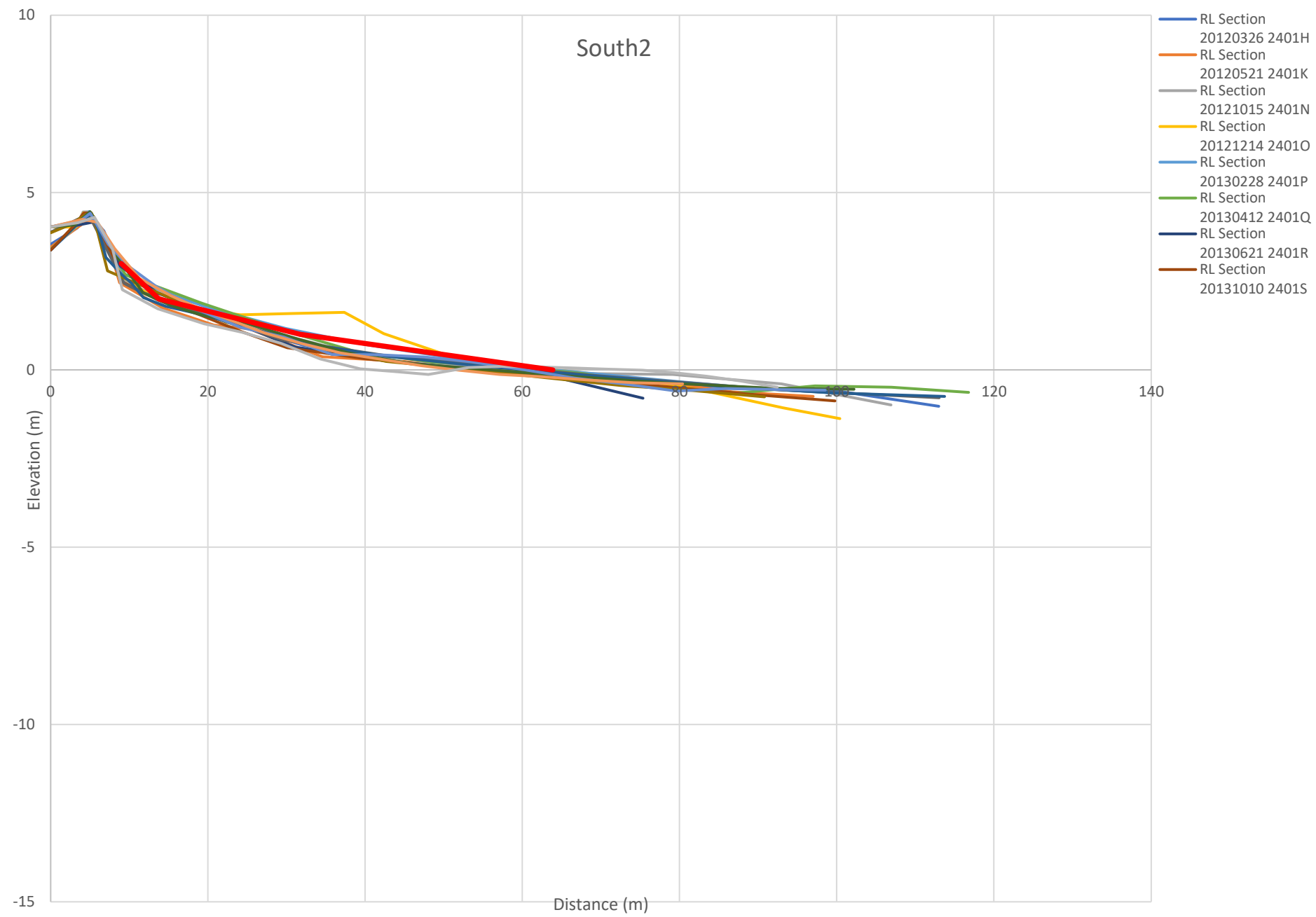


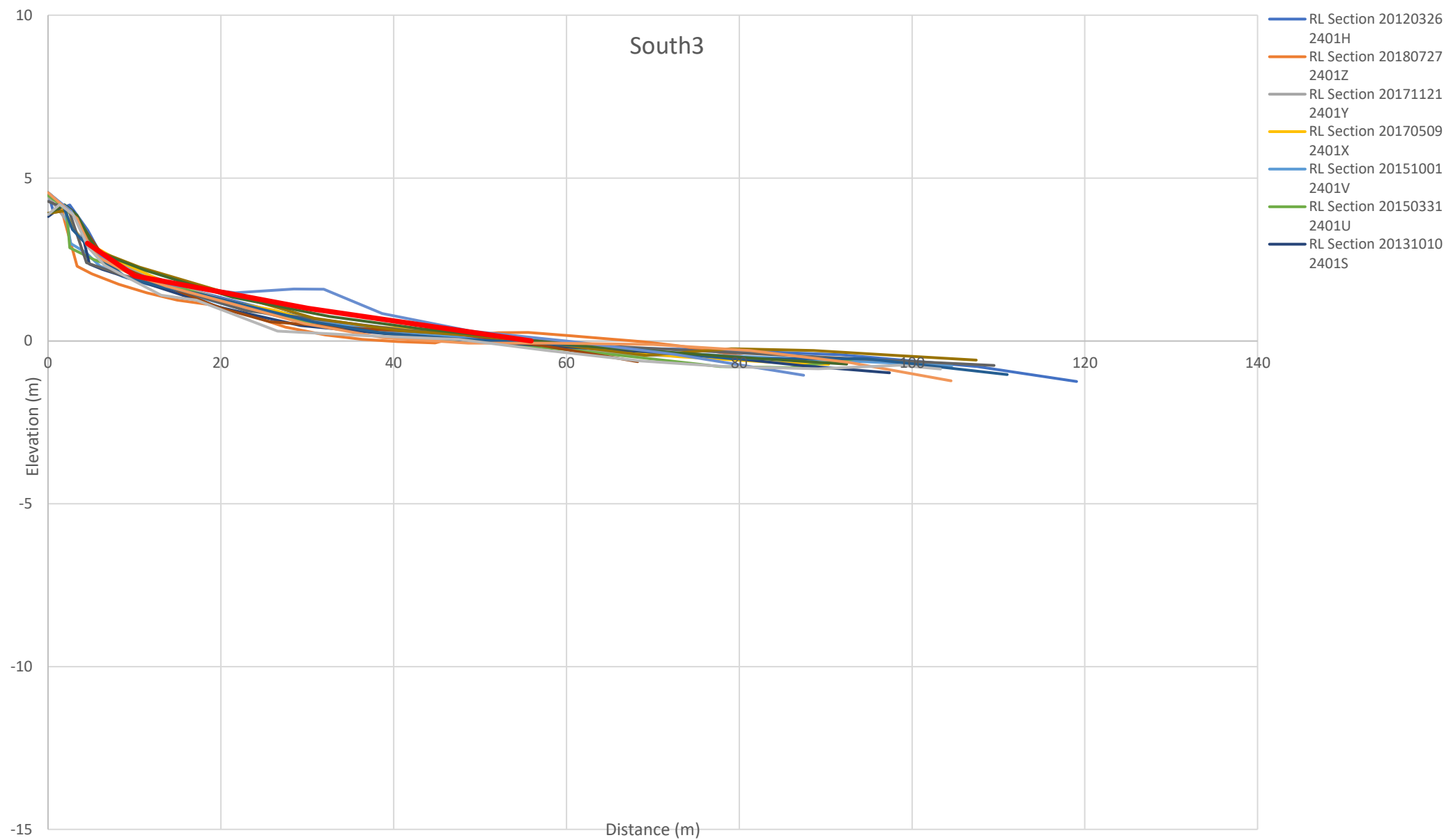
Craig Davis
BE, CPEng, IntPE(NZ), CMENZ

ATTACHMENT A

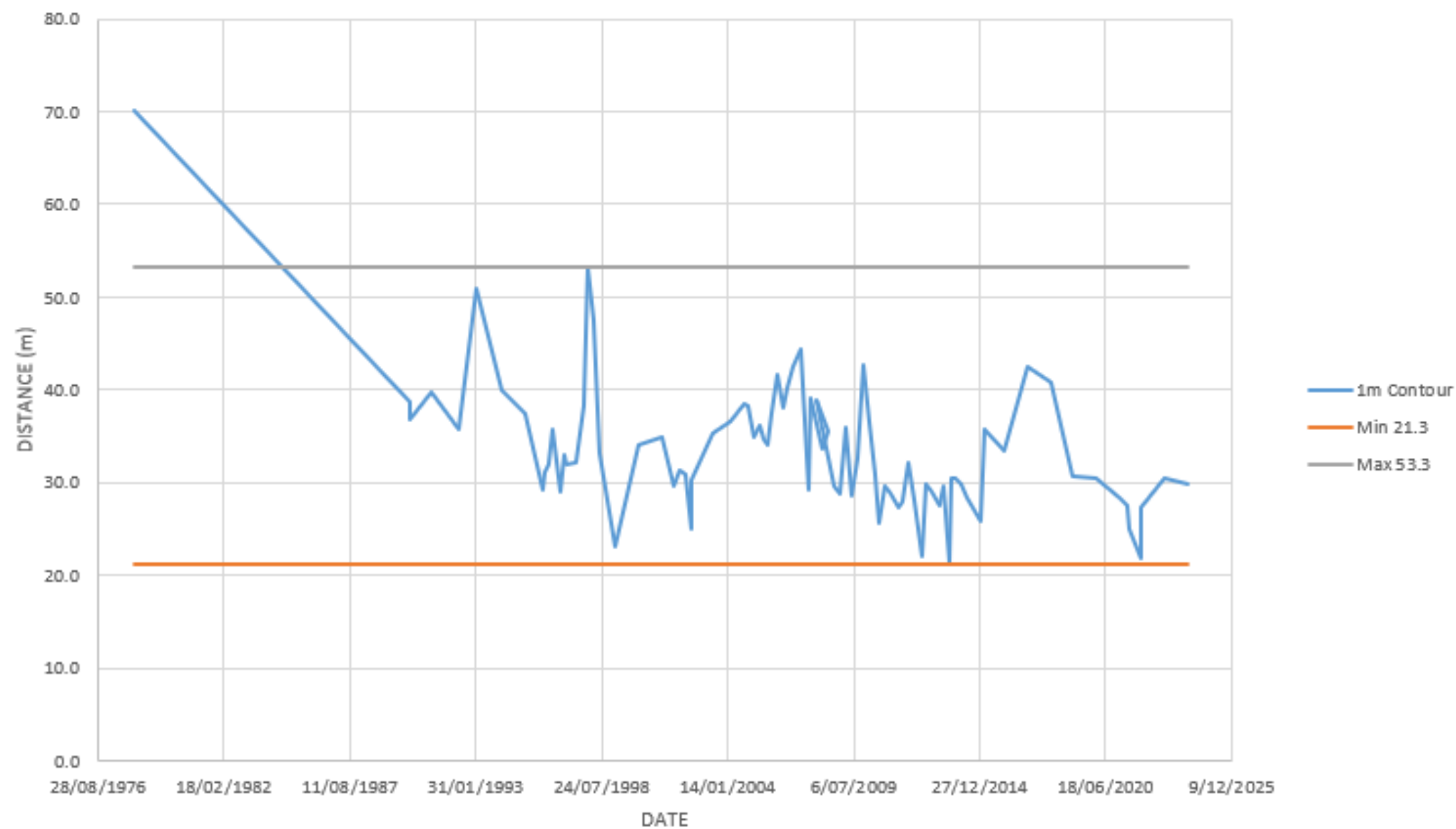
Monitoring Profiles and Excursion Data Plots



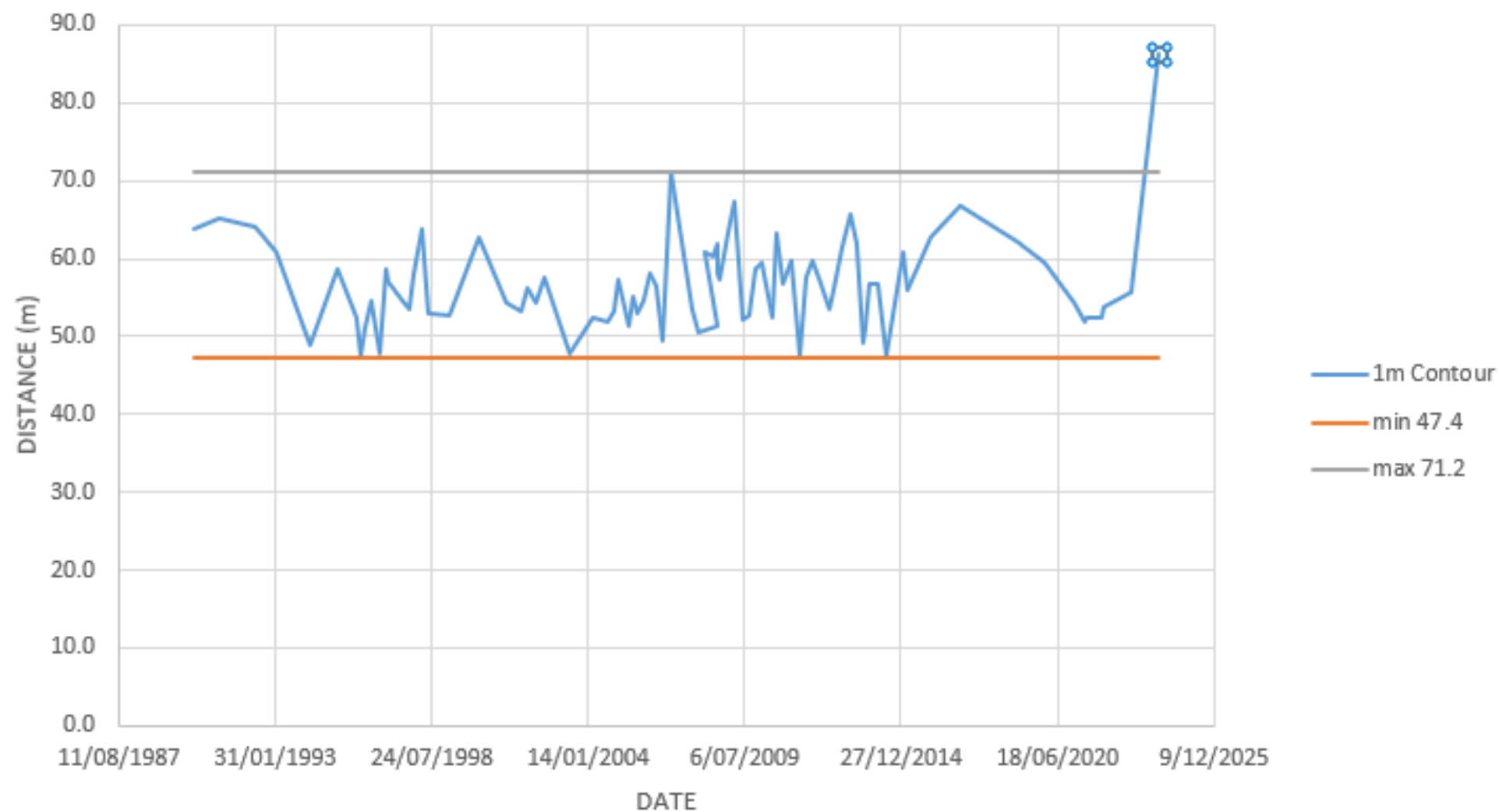




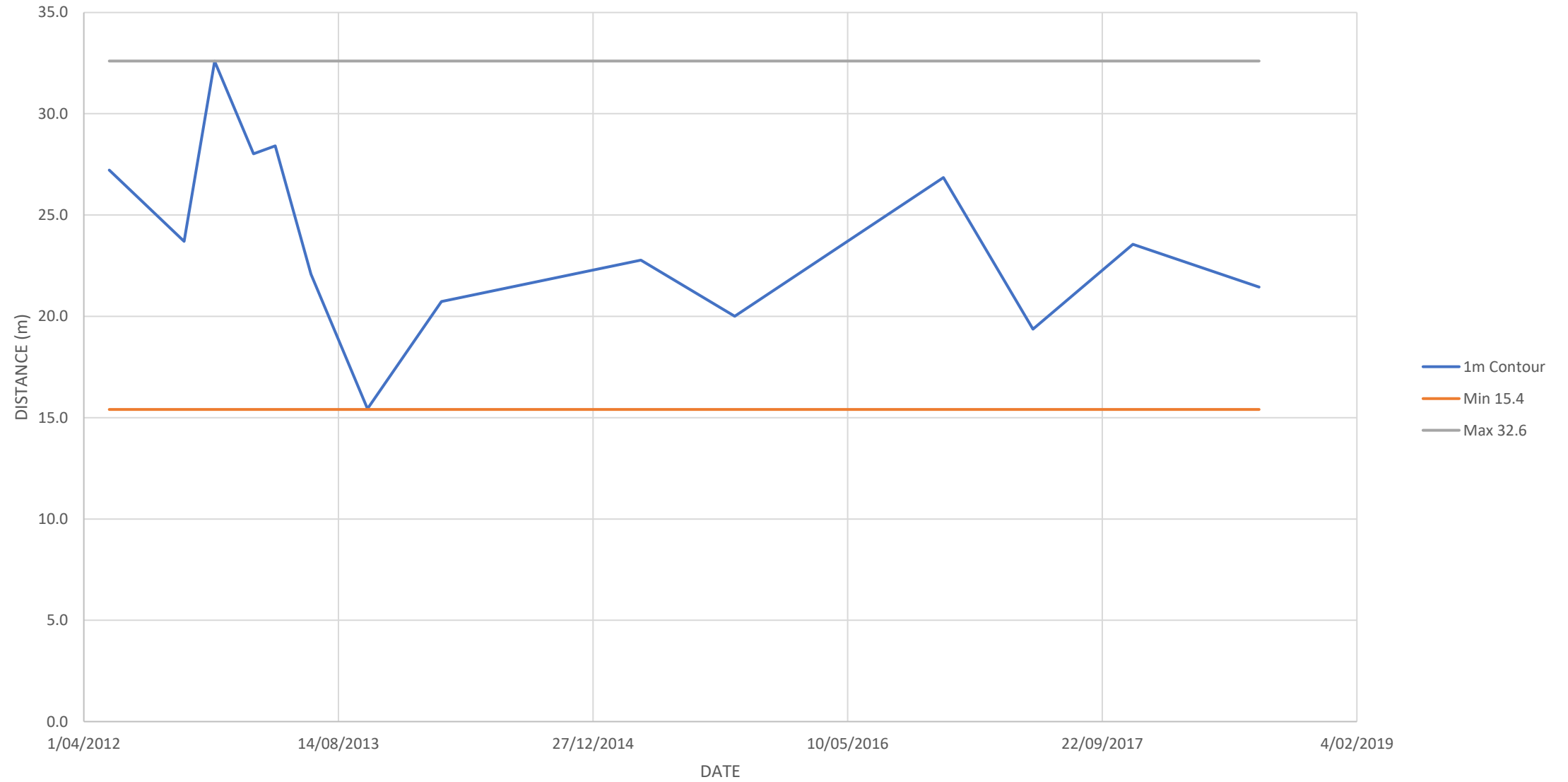
CCS49 EXCURSION PLOT 1m CONTOUR (MHWS)



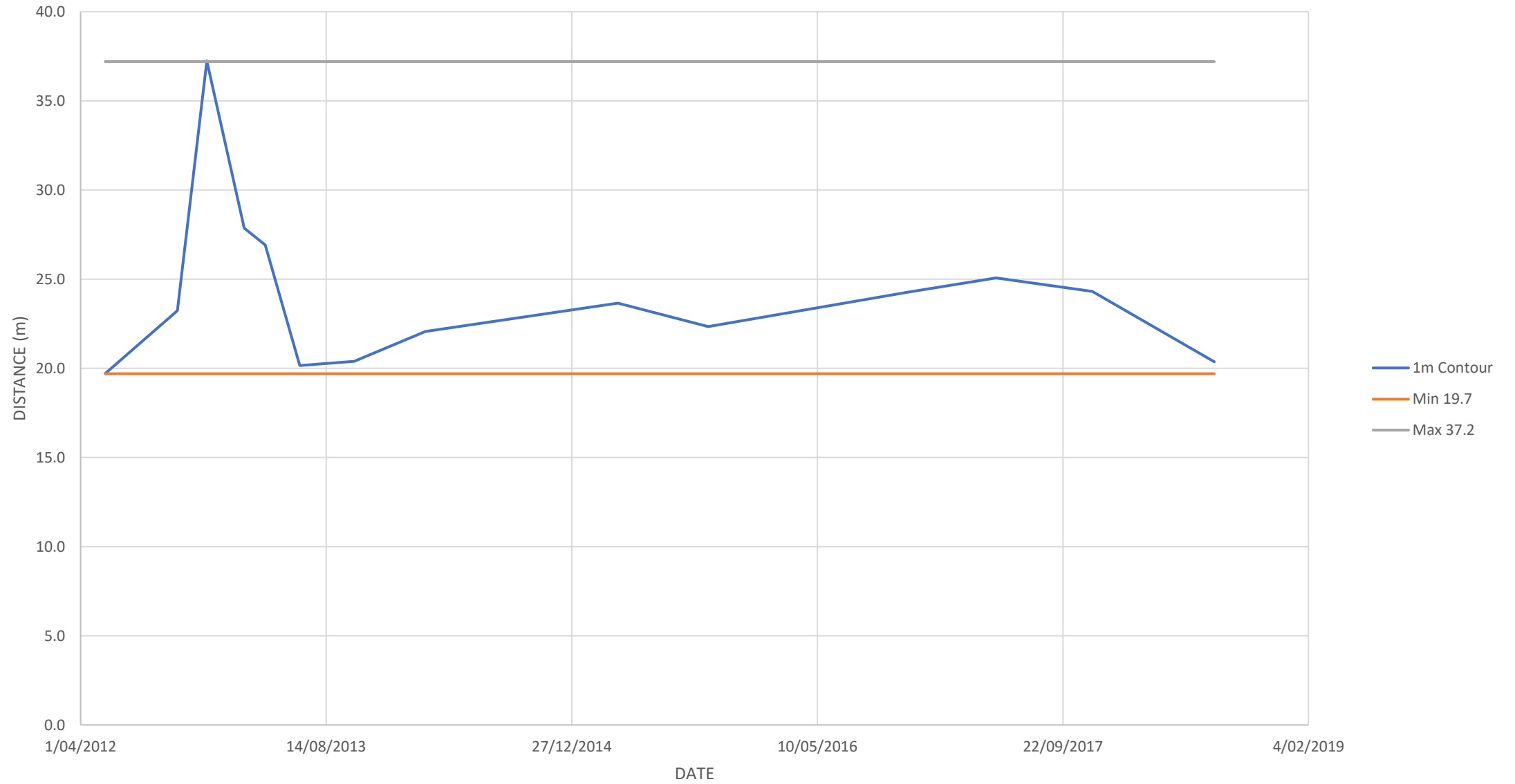
CCS50 EXCURSION PLOT 1m CONTOUR (MHWS)



North 1 EXCURISON PLOT 1m CONTOUR (MHWS)

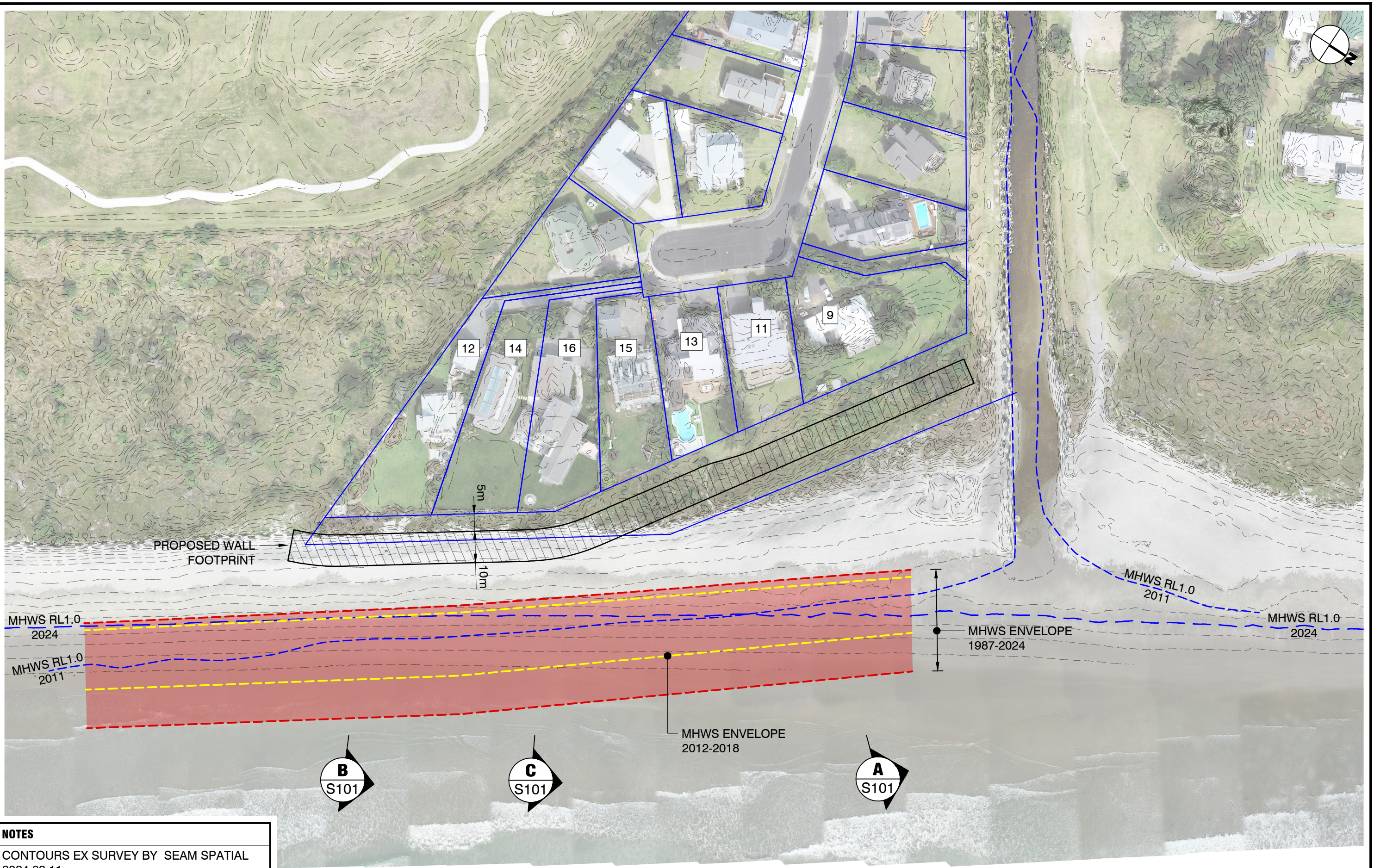


South3 EXCURSION PLOT 1m CONTOUR (MHWS)



ATTACHMENT B

Site Plan Showing Historic Extent of MHWS over 30+ years



NOTES

CONTOURS EX SURVEY BY SEAM SPATIAL
2024.03.11

-	PRELIMINARY ISSUE	03.04.2024
No.	REVISION DETAILS	DATE

DESIGN: DAVIS COASTAL CONSULTANTS
SURVEY: SEAM SPATIAL
DRAWN: JMA
CHECKED: -
DATE: APRIL 2024
SCALE: 1:1000 @ A3
CAD FILE: 23028-01 Glen Isla Place Waihi

NOT FOR CONSTRUCTION

JOB TITLE:

GLEN ISLA EROSION PROTECTION OPTIONS



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DRAWING TITLE:
PROPOSED WALL LAYOUT

SERIES:
PRELIMINARY

FILE NO: 23028
SHT NO: S100
REV: -