FILE: 5454
(11, 13 to 16, 19, 21, 22, 24, 25, 28 to 33, 35 to 37, 39 to 41)
Replacement (15)

Resource Consent

Document Date: 04.10.2023

Pursuant to the Resource Management Act 1991, the Northland Regional Council (hereinafter called "the council") does hereby grant a Resource Consent to:

FAR NORTH HOLDINGS LIMITED

To undertake the following activities at Paihia, Bay of Islands:

AUT.005454.11.03	**Construct a reef type breakwater (approximately 190 metres long and involving approximately 15,000 cubic metres of material) in the coastal marine area between Motumaire Island and Kuia Rongouru (Taylor) Island (The Northern Breakwater).**
AUT.005454.13.03	**Construct a reef type breakwater (approximately 180 metres long and involving approximately 3,800 cubic metres of material) in the coastal marine area on the western side of Motumaire Island (The Outer Western Breakwater).**
AUT.005454.14.03	**Construct a rock abutment (approximately 100 metres long and comprising approximately 3,300 cubic metres of material) in the coastal marine area off Nihonui Point.**
AUT.005454.15.04	**Dredge approximately 43,000 cubic metres of material from the seabed in the coastal marine area over an area of 4.4 hectares and a horizontal distance of 550 metres to create and maintain a new navigation channel from the Paihia Wharf to navigable water and also areas of suitable depth for mooring vessels adjacent to the wharf.**
AUT.005454.16.03	**Reclaim approximately 2,900 square metres of the coastal marine area for a horizontal distance of 115 metres from the stream at the base of Flagstaff Hill for the purposes of providing improved public coastal access and improved and additional berthing facilities for craft, sites for three maritime related buildings, along with landscaped open space, seating and other public facilities.**
AUT.005454.19.03	**Construct a piled concrete and timber promenade structure (approximately 6 metres wide and 115 metres long) in the coastal marine area adjacent to the existing and proposed reclamations.**
AUT.005454.21.03	**Construct and use of a fixed concrete helipad landing facility approximately 120 square metres in area, along with a walkway, in the coastal marine area towards the eastern end of the proposed deck.**
AUT.005454.22.03	**Replace the existing low level landing and fast boat berthing structures in the coastal marine area along the eastern side of the main wharf with a new fixed and floating structure approximately 24 metres long and 3 metres wide and its use by commercial craft.**

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AUT.005454.24.03	**Replace the existing fuel jetty in the coastal marine area on the northern arm of the wharf with a new floating pontoon structure approximately 16 metres long and 4 metres wide, plus a gangway connected to a 6 metre extension of the wharf.**
AUT.005454.25.03	**Install a floating pontoon (approximately 15 metres long and 3 metres wide) in the coastal marine area along the southern (inland) side of the western arm of the wharf.**
AUT.005454.28.03	**Construct a piled concrete and timber deck structure (approximately 6 metres wide and 115 metres long) in the coastal marine area between the existing wharf and the proposed abutment at the eastern end of the proposed beach.**
AUT.005454.29.03	**Construct a timber walkway (approximately 220 metres long) in the coastal marine area from the proposed eastern abutment along the western (inner) side of the proposed beach, along with parts of two connecting walkways to Marsden Road being approximately 30 metres and 10 metres long respectively.**
AUT.005454.30.03	**Construct five shelters, each approximately 20 square metres in area, incorporating seating and other public facilities, in the coastal marine area adjacent to the proposed timber walkway and beach.**
AUT.005454.31.03	**Install electricity, telecommunications, water, and sewer lines to the proposed fixed and floating structures in the coastal marine area.**
AUT.005454.32.04	**Combine six existing stormwater pipes into a single discharge line terminating in the coastal marine area to the south of the Aquarium Café and provide associated headwall and scour protection structures.**
AUT.005454.33.04	**Discharge stormwater to the coastal marine area from a single (combined) outlet.**
AUT.005454.35.04	**Discharge decant water into the coastal marine area from material placed on the beach as part of the proposed beach replenishment.**
AUT.005454.36.03	**Occupy space in the coastal marine area with and use the structures approved by AUT.005454.(11, 13, 14, 16, 19, 21-22, 24, 25, 28-31).**
AUT.005454.37.03	**Occupy the coastal marine area to the exclusion of the general public.**
AUT.005454.39.04	**Earthworks and land filling associated with placement of approximately 41,000 cubic metres of sand and other material over a distance of approximately 325 metres between two proposed abutments for the purposes of beach replenishment, creation of a public open space, informal recreational areas and protection of Marsden Road.**
AUT.005454.40.04	**Discharge stormwater runoff to ground from the earthworks and land filling areas.**
AUT.005454.41.04	**Place approximately 41,000 cubic metres of sand and other material over a distance of approximately 325 metres on the foreshore and seabed in the coastal marine area between the two proposed abutments for the purposes of beach replenishment, forming, in part, a reclamation, and creation of a public open space and protection of Marsden Road.**

At or about location co-ordinates 6095200N 1699390E at Paihia, Bay of Islands.

Notes:

1. *All location co-ordinates in this document refer to Geodetic Datum 2000, New Zealand Transverse Mercator Projection.*
2. *The term renourished, where referred to in this document and in related plans, shall mean replenished.*
3. *The principle contact for the Northland Regional Council for these consents shall be the Northland Regional Council's assigned monitoring officer.*

Subject to the following conditions:

1 Development shall, subject to these conditions, proceed in general accordance with the plans listed in **Schedule 4 attached**.

2 The Consent Holder shall comply with the General Performance Standards **attached** in **Schedule 3**.

Esplanade Strip on Reclamation Adjacent to Paihia Wharf Area

3 An esplanade strip shall be created on the reclamation no less than 3.5 metres wide from the line of mean high water springs. In addition, open space covenants for public access and recreation purposes shall be created over Areas A and B on **attached** ASL Plan referenced as Northland Regional Council Plan Number **5059** to the satisfaction of the Regional Council's Chief Executive or delegate.

Occupation

4 The occupation area approved under consent AUT.005454.37 shall be the hatched areas as shown on Northland Regional Council Plan Number **4221B** but excluding the area shown on Far North Holdings Limited Plan titled "Overall View of Occupation Area to be Transferred", referenced as Northland Regional Council Plan Number **4978**.

5 The Consent Holder may only exclude the general public from the three finger jetties that extend off the promenade deck and the helipad structure, other than during emergencies where there is a need for public access to one or more finger jetties for reasons of safety.

Advice Note: *For the avoidance of doubt, the eastern attenuator finger jetty and the low level landing alongside the southern side of Paihia Wharf are not finger jetties referred to in this condition.*

6 Other than the exclusive occupation of space associated with the three finger jetties provided by conditions of these consents, the occupation of space by the structures authorised by these consents shall not be an exclusive occupation of space. All promenade and viewing deck areas authorised by these consents that are located in the coastal marine area shall be available for public pedestrian access and use, free of charge, at all times, other than times when it is necessary to limit public pedestrian access for reasons of safety. Any limitation of public access for reasons of safety or operational necessity shall be over the minimum area and for the minimum time necessary.

Lighting

7 Lighting, other than lighting required by the Director of Maritime Safety to meet international, hydrographic standards for navigational safety purposes shall:

(a) Be the minimum required for its purpose – pathway, surface signage illumination, active building entrance, wharf illumination;

(b) Be entirely of fully shielded full cut off fittings to contain all light below the horizontal from fittings or masts no higher than 4 metres; and

(c) Restrict all spillage to no more than 20 metres from the boundary of wharves and attenuator and no more than 10 metres from paths or commercial and maritime building reclamation.

Fuel Berth

8 The Consent Holder shall ensure that signage containing the information detailed in **Schedule 5 attached**, is permanently displayed in a prominent position immediately adjacent to the dispenser. The Consent Holder shall submit a copy of the proposed text of the sign to the Northland Regional Council, within 15 working days of the date of granting of these consents, for certification that it contains the information required by **Schedule 5**. The sign shall be erected after the Northland Regional Council's certification of the text but no later than the first time that the dispenser is operated.

Advice Note: *The sign is a permitted activity provided it meets the relevant standards in the Regional Coastal Plan for Northland. Otherwise, a resource consent will be required for the sign.*

9 The Consent Holder shall ensure that the fuel transfer system associated with the fuel berth includes the following:

(a) A drip tray placed appropriately to collect drips from within the dispenser housing. It shall be adequately maintained, including the regular replacement of any oil absorbent material;

(b) An automatic shut off valve located at the dispenser to ensure supply is stopped immediately if the dispenser is damaged;

(c) A dispenser activated valve to isolate the pipeline from the storage tank when the dispenser is not being operated;

(d) An "in-line accumulator" to absorb the increased line pressure from thermal expansion to prevent the nozzle from dripping;

(e) Leak detectors that will operate to prevent the dispensing of fuel if there is significant pressure drop in the line;

(f) A breakaway coupling on the dispenser hose so that if a vessel moves away from the pontoon with the nozzle still in the vessel, the hose will break away rather than pulling away the dispenser; and

(g) An emergency stop button at the dispenser, which, when operated, will instantly close off valves to stop any fuel being dispensed.

Sewage Pump Out

10 The sewage pump-out at the finger jetty at the base of the eastern attenuator shall be located and configured so that it can be used by visiting vessels on the outside of the attenuator at times when the sewage pump-out is not in use by commercial craft at the assigned commercial berth. The proposed dinghy tie-up area shall be located so as to enable easy access by visiting vessels using the pump-out.

11 The operation of the sewage pump-out system shall not give rise to any discharge of contaminants, which are noxious, dangerous, offensive, or objectionable at or beyond a radius of 10 metres from the source of the contaminant discharge.

Noise Levels

12 Noise levels associated with dredging**,** the construction of the breakwaters and reclamation and the construction and operation of facilities authorised by these consents shall not exceed those set out in **Schedule 1 attached**.

Oil Spills

13 At least one month prior to construction works commencing on any of the facilities, the Consent Holder shall provide to the Northland Regional Council for its approval a procedure for dealing with oil spills that may occur at the facility during construction.

Notification

14 The Consent Holder shall notify the Northland Regional Council in writing of the date construction and/or dredging work is to commence at least two weeks before the on site starting date on each occasion.

Reclamation Adjacent to Paihia Wharf Area

15 A suitably experienced archaeologist shall monitor the construction activities associated with the reclamation, particularly in the area of the stream base of Flagstaff/Maiki Hill, and provide a report on the monitoring to the Northland Regional Council and Heritage New Zealand Pouhere Taonga within two weeks of completion of the construction of the reclamation.

In the event of archaeological sites or koiwi being uncovered, activities in the vicinity of the discovery shall cease. The Consent Holder shall then consult with the relevant local iwi and the Heritage New Zealand Pouhere Taonga, and shall not recommence works in the area of the discovery until the relevant Historic Places Trust approvals to damage, destroy or modify such sites have been obtained.

16 The position of the toe of the rock revetment on the seaward side of the reclamation shall be marked out and certified as being in the position shown on the plans authorised by these consents by either a Chartered Professional Engineer (Civil) or by Northland Regional Council monitoring staff before any construction of the underlying bund commences.

Advice Note: *The purpose of this condition is to ensure that the reclamation is constructed entirely within the area of seabed authorised for it.*

Breakwaters and Abutments

17 The Consent Holder shall provide engineering plans, specifications and calculations of the Northern and Outer Western rock reef breakwaters to the Northland Regional Council before the construction of these structures commences. The plans shall be accompanied by a report from a suitably experienced coastal processes engineer that explains the detailed designs, along with the rock sourcing, selection and placement. The report shall also document the advice received from the Consent Holder's archaeological, cultural, ecological, landscape and navigation/safety advisers.

A marine archaeological survey of the areas of the Northern and Outer Western rock breakwaters shall be undertaken by the Consent Holder at least two months prior to their construction. The results of the survey shall be provided to the Northland Regional Council, Heritage New Zealand Pouhere Taonga and Department of Conservation within one month of completion of the survey.

Advice Note: *Although shown on Bellingham Marine plans PWD 1-01, Rev. 5, July 08 and PWD 1-03, Rev.5, July 08, the alternative Northern Breakwater footprint/position is not approved under these consents.*

18 The New Zealand Archaeological Association (NZAA) recorded archaeological site on Motumaire Island shall be marked out by a suitably experienced archaeologist, at least one week prior to construction of the Northern and Outer Western rock reef breakwaters, and maintained for the duration of their respective construction periods. The marking out shall be undertaken after consultation with the Department of Conservation and only as it relates to those parts of the site adjacent to the breakwaters. Evidence of consultation with the Department shall be provided to the Northland Regional Council before the marking out occurs.

19 No construction plant or material shall be landed on either Motumaire or Kuia Rongouru (Taylor) Island.

20 For the avoidance of doubt, no part of any breakwater authorised by these consents shall be located landward of the line of Mean Low Water Springs at Motumaire Island and Kuia Rongouru (Taylor) Island.

21 The Consent Holder shall prepare a detailed design and specification covering the final visual appearance of each of the Northern and Outer Western breakwaters and the two beach abutments. The detailed design and specification shall be peer reviewed by a panel of three suitably qualified and experienced independent landscape architects, acceptable to the Northland Regional Council's Compliance Manager.

The peer review shall be funded by the applicant.

Construction of any breakwater or abutment shall not take place until the peer review panel is satisfied that the visual appearance of each breakwater and abutment is as natural as is reasonably possible in the context of the location and that the design is appropriate and acceptable and generally in accordance with the plans approved under these consents.

During the construction of the breakwaters and abutments, at least one of the landscape architects shall be engaged in at least an observation role to ensure that the as-built works complies with the final design and specification that was accepted by the review panel

Advice Note: *The three landscape architects that appeared at the hearing would be possible candidates for the review panel.*

22 A predator management plan for Motumaire Island and Kuia Rongouru (Taylor) Island shall be prepared by a suitably qualified and experienced person after consultation with the Department of Conservation and Te Runanga A Iwi O Ngapuhi and relevant Hapu. The predator management plan shall detail the nature of predator control programmes required to deal with existing predators on the islands and any issues resulting from possible enhanced access by predators to the islands as a result of constructing the Northern and Outer Western rock reef breakwaters for a period of up to five years after their construction. A copy of the predator management plan shall be forwarded to the Northland Regional Council.

23 The predator control programme in the predator management plan for Motumaire Island and Kuia Rongouru (Taylor) Island shall be implemented by the Consent Holder, but only upon the written agreement of the Department of Conservation and Te Runanga A Iwi O Ngapuhi and relevant Hapu. A copy of any agreed predator control programme shall be forwarded to the Northland Regional Council.

Construction and Dredging

24 Prior to the commencement of any construction on the site, the Consent Holder shall provide a construction works programme that outlines the expected stages of the project and their approximate timing to the Northland Regional Council's Compliance Manager.

25 The dredging must be undertaken in general accordance with the attached Shorewise Engineering Consultants Plan referenced as Northland Regional Council Plan Number **5194/1** and **5194/2**. The channel depth shall be up to 2.5 metres below Chart Datum and no less than 2.0 metres below Chart datum. The channel base width must not be narrower than 35 metres nor wider than 45 metres. The Consent Holder must maintain the navigation channel so that it continues to comply with these dimension limits. The navigation channel cross-sectional shape must generally follow that shown on the **attached** Richardson Stevens drawing referenced as Northland Regional Council Plan Number **5054/1**, notwithstanding that those cross-sections relate to an earlier channel alignment.

26 Maintenance dredging may be carried within the approved areas to no deeper than previously approved levels, with all dredgings being disposed of to an authorised land based site.

27 The Consent Holder must notify the Northland Regional Council in writing of the date dredging is to commence at least one week, but not more than two weeks, before dredging commences on each occasion. At the same time, the Consent Holder must contact the Regional Harbour Master (Northland Regional Council) to initiate the issue of any Notice to Mariners regarding navigation warning arising from the dredging activities.

28 The Consent Holder must notify the Northland Regional Council in writing as soon as the works and dredging operations respectively are completed on each occasion.

29 Construction work shall only be carried out between 7.30 a.m. and sunset or 6.00 p.m., whichever occurs earlier, and only on days other than Sundays and public holidays, including the period between 23 December and 3 January.

29A Dredging must only be carried out:

(a) Between 7.30 a.m. and sunset or 6.00 p.m., whichever occurs earlier, and only on days other than Sundays and public holidays; and

(b) Between 1 February and 30 September (inclusive) in any year.

30 The methods used to carry out dredging must be by barge-mounted hydraulic digger into a sealed hopper bin mounted on the barge or by cutter suction dredge pumping directly to the beach being replenished.

30A All of the dredged material must be:

(a) Contained and disposed of to land at a location authorised to accept the material; or

(b) Dredged material that is suitable for constructing the base layer of the replenished beach may be used for this purpose, or for the reclamation adjacent to the Paihia Wharf.

The Consent Holder shall at least four weeks prior to any dredging taking place provide the Northland Regional Council's assigned monitoring officer with details on the nature of the material dredged for any material to be used in the beach replenishment or reclamation, or the location of the land based disposal site.

31 During capital dredging navigational access from open water beyond Kuia Rongouru (Taylor) Island to berths at Paihia must be available for vessels of the size and draft accessing the berths at the date of the exercise of these consents.

32 Maintenance dredging operations must not result in the complete blockage of navigation channels at any time.

33 The Consent Holder must publicly advertise the location and timing of dredging in the Northern Advocate and Northern News, at least one week in advance of commencing dredging operations at the site on each occasion. Signs pre-advertising the dredging period and available navigational access shall be placed at the Paihia Wharf.

34 The Consent Holder shall contact the Regional Harbourmaster, at least one month in advance of any construction in the coastal marine area, to initiate the issue of a Notice to Mariners regarding any necessary navigation warning arising from construction activities.

35 Immediately upon completion of the construction of all works associated with these consents the Consent Holder shall, in writing, notify:

Hydrographic Surveyor
Land Information New Zealand
Private Box 5501
Wellington 6145

The Maritime Safety Inspector Maritime New Zealand
PO Box 195
Ruakākā 0151

The Far North District Council
Private Bag 752
Kaikohe 0440

Northland Regional Council
Private Bag 9021
Whangarei 0110

The Consent Holder shall include a plan of the completed works with the notification.

36 Within one month of completion of dredging on each occasion, the Consent Holder must, in writing, notify:

Hydrographic Surveyor
Land Information New Zealand
Private Box 5501
Wellington 6145

The Maritime Safety Inspector Maritime New Zealand
PO Box 195
Ruakākā 0151

The Far North District Council
Private Bag 752
Kaikohe 0440

Northland Regional Council
Private Bag 9021
Whangarei 0110

The Consent Holder must include a bathymetric survey of the completed dredged area with the notification to each of the above parties.

37 The bathymetric survey(s) required by these consents must indicate the dredged area by shading or similar identification and shall show the positions of the channel marks. The bathymetric survey must be carried out at or better than the following specifications:

(a) Sample rate: Maximum of 2 Hz.

(b) Survey line spacing: Maximum of 20 metres, located perpendicular to the dredged channel.

(c) Accuracy: RTK-GPS or similar methodology that can provide equivalent or higher accuracy.

(d) Datum: Datum 2000, NZTM projection, with elevations referenced to OTP1964 vertical datum or Chart Datum.

(e) Data Supply: ASCII X, Y, Z file in csv format.

A copy of the ASCII X, Y, Z file, referred to in (e) above must be provided to the Northland Regional Council at the same time as the bathymetric plan. The datum used for the bathymetric survey must be the applicable Chart Datum at the site.

Water Quality During Dredging and Construction

38 The Consent Holder must ensure that, relative to background levels established in accordance with the methodology specified in **Schedule 2**, the quality of the receiving waters at any point 50 metres from the location of construction work associated with the facilities and 200 metres from the footprint of the area of dredging (in respect of dredging activity) as a result of the exercise of these consents, at all times meets the following standards:

Purpose	Standard
Natural visual clarity	Not reduced more than 20% during construction and 33% during dredging.
Natural hue	Not changed more than 10 Munsell units.
Oil/grease film, scum, foam, odour	No conspicuous oil or grease film, scum or foam, floatable or suspended materials, or emissions of objectionable odour.

Water Quality – Occupation Area

39 The Consent Holder shall ensure that the quality of the receiving waters at any point 50 metres outside the boundary of the occupation area, as a result of the exercise of these consents, meets the following standard:

Purpose	Standard
Natural visual clarity	Not reduced more than 20%.
Natural hue	Not changed more than 10 Munsell units.
Oil/grease film, scum, foam, odour	No conspicuous oil or grease film, scum or foam, floatable or suspended materials, or emissions of objectionable odour.

Rubbish/Debris

40 The Consent Holder shall provide rubbish collection facilities, appropriate to the rubbish to be collected, on the completed reclamation and shall dispose of all rubbish to authorised disposal facilities. The Consent Holder shall keep the coastal marine area free of rubbish and debris.

Maintenance of Vessels

41 Maintenance of vessels using the facilities authorised by these consents shall be limited to minor maintenance activities that do not give rise to discharges of contaminants to the coastal marine area unless the discharge is authorised by a resource consent, or is permitted by a rule in a Regional Plan or by provisions of the Resource Management (Marine Pollution) Regulations 1998

42 The Consent Holder shall, on becoming aware of any discharge associated with the Consent Holder's operations that is not authorised by these consents:

(a) Immediately take such action, or execute such work as may be necessary, to stop and/or contain the discharge;

(b) Immediately notify the Northland Regional Council by telephone of the discharge;

(c) Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the discharge; and

(d) Report to the Northland Regional Council in writing within one week on the cause of the discharge and the steps taken or being taken to effectively control or prevent the discharge.

For telephone notification, during the council's opening hours, the council's assigned monitoring officer for these consents shall be contacted. If that person cannot be spoken to directly, or it is outside of the council's opening hours, then the Environmental Emergency Hotline shall be contacted.

Advice Note: *The Environmental Emergency Hotline is a 24 hour, seven day a week, service that is free to call on 0800 504 639.*

Maintenance of Structures and Facilities

43 The structures and facilities authorised by these consents shall be maintained in good order and repair.

Monitoring

44 Various elements of the monitoring may be carried out by the Consent Holder with the agreement of the Northland Regional Council.

A sampling and testing programme associated with the monitoring shall generally follow that set out in **Schedule 2 attached**. The sampling and testing programme may, as a result of consultation between the Northland Regional Council and the Consent Holder, be amended, subject to the prior written approval of the Northland Regional Council.

Advice Note: *Monitoring of the consent will be carried out by the Northland Regional Council, except as otherwise approved by the Northland Regional Council.*

45 Monitoring of water quality during dredging and placement of materials to the beach shall be undertaken by the Consent Holder on a daily basis via visual inspection during the course of the works operations. This monitoring shall be undertaken by the contractor during dredging or the Consent Holder's nominated agent. This shall involve daily inspections during the period when dredging is being carried out to identify any visually observable change in clarity (turbidity) or change in the colour (hue) in the waters from the activities at or beyond the mixing zone boundaries referred to in Condition 38. Results of the daily inspections shall be recorded in a written log by the Consent Holder, and submitted to the Northland Regional Council weekly via fax or email.

Construction Management Plans

46 The Consent Holder shall submit to the Northland Regional Council, at least 15 working days prior to the commencement of each construction stage (including dredging), a detailed construction management plan to be implemented and maintained for all activities related to the activities in the stage that are the subject of these consents.

The construction management plan shall specify, but not necessarily be limited to, the following matters:

(a) A construction timetable.

(b) Site management, including details of:

- Site access.
- Storage of fuels and lubricants *(**Advice Note:** These should be bunded or contained in such a manner so as to prevent the discharge of contaminants from spillages)*.
- Maintenance of machinery and plant to minimise the potential for leakage of fuels and lubricants.
- Confirmation that no equipment or machinery is cleaned, or refuelled in any part of the coastal marine area, except for machinery operating on the barge that may require refuelling.

(c) Methods to minimise discolouration of the coastal marine area during construction and dredging activities.

(d) Methods to ensure compliance with noise standards.

(e) Methods to remedy any disturbance to the foreshore during works.

(f) A contingency plan in the event that there is any discharge to the coastal marine area.

(g) Measures to provide for public safety.

(h) A Construction Traffic Management Plan, prepared in consultation with the New Zealand Transport Agency and the Far North District Council, which shall include, but not by way of limitation, specific details relating to avoiding, remedying or mitigating any adverse effects of:

- Machinery during site works.
- Proposed numbers and timing of truck movements throughout the day and the proposed routes including the identification of heavy vehicle routes which avoid residential streets.
- Safe and clear pedestrian access and thoroughfare on roads and footpaths adjacent to the site.
- Storage of materials and loading and unloading of equipment.

(i) Measures to address biosecurity.

Prior to construction commencing, the Consent Holder shall lodge a Biosecurity Management Plan (BMP) with the Northland Regional Council. The BMP shall address measures to avoid the introduction of any unwanted or risk species through the use of construction plant and equipment which is to be bought to the site from other locations. The BMP shall include details regarding the cleaning and inspection of machinery and plant brought into the Bay of Islands and on staff training, monitoring and reporting mechanisms.

Prior to the first use of any introduced construction plant and equipment as referred to above, the Consent Holder shall arrange inspection of the same for infestation of any unwanted or risk species and certification of it having been treated and inspected as required by this condition by a suitably qualified and experienced person. A copy of this certification shall be provided to the Northland Regional Council on request. The Consent Holder shall not allow any construction plant and equipment under its control or direction, associated with the proposal not certified as having been treated and inspected as required by this condition, or showing any indication of being infected with any unwanted or risk species or having visited an area infested with such species to be used.

The BMP shall have the following objectives:

(a) To avoid the introduction of any unwanted or risk species into the Bay of Islands in the construction phase of the development;

(b) To ensure effective treatment of all construction plant and equipment used in association with the construction phase of the development to ensure it does not become a vector for the spread of any unwanted or risk species; and

(c) To set out a staff biodiversity monitoring and reporting system.

Advice Notes: *1. The purpose of each construction management plan is to ensure that all works in the stage are undertaken in a manner which avoids, remedies or mitigates adverse effects on the environment.*

2. The involvement of the New Zealand Transport Agency and Far North District Council is intended to ensure that the requirements of those entities, as the respective authorities for State Highway 11 and local district roads, are accommodated.

Prevention of Damage to State Highway 11

47 The Consent Holder shall not damage State Highway 11, or any Crown owned infrastructure, or adversely affect State Highway drainage during construction activities, beyond those activities specifically authorised by resource consent or otherwise agreed with the land owner. Should damage occur, the Consent Holder shall promptly advise this to the land owner.

Review of Conditions of Consent

48 The Northland Regional Council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of these consents. Such notice may be served annually during the month of October. The review may be initiated for any one or more of the following purposes:

(a) To deal with any adverse effects on the environment that may arise from the exercise of these consents and which it is appropriate to deal with at a later stage, or to deal with any such effects following assessment of the results of the monitoring of these consents and/or as a result of the Northland Regional Council's monitoring of the state of the environment in the area.

(b) To deal with any material inaccuracies that may in future be found in the information made available with the application. (Notice may be served at any time for this reason.)

The Consent Holder shall meet all reasonable costs of any such review.

49 Prior to the expiry, cancellation, or lapsing of these consents the Consent Holder shall remove all structures (other than reclamations) and other materials and refuse associated with these consents from the consent area and shall restore the consent area to the satisfaction of the Northland Regional Council, unless an application for a replacement consent has been properly made beforehand or the activity is permitted by a rule in the Regional Plan.

Lapsing of Consent

50 The consents for the Outer Western breakwater and Beach Abutment (Nihonui Point), and the reclamations (AUT.005454.(13,14,16 & 41)) shall lapse on 31 March 2026, unless the consent is given effect to before the expiry of this period or such longer period as may be granted under Section 125 of the Act**.**

51 The consents for the Northern Breakwater and the dredging (AUT.005454.(11 & 15)) shall not lapse until their expiry.

52 The consents for decant water discharge (AUT.005454.(35)) beach replenishment and associated stormwater discharges (AUT.005454.(39-40)) shall not lapse until their expiry.

53 All other consents not referred to in Conditions 50-52 shall lapse on 31 March 2026, unless the consent is given effect to before the expiry of this period or such longer period as may be granted under Section 125 of the Act.

Esplanade Strip on Reclamation Created by Beach Replenishment

54 An esplanade strip shall be created on the reclamation resulting from the beach replenishment. The esplanade strip shall extend between the line of Mean High Water Springs and the seaward boundary of the adjacent road reserve, subject to the width of the esplanade strip being a maximum distance of 20 metres measured from the line of Mean High Water Springs.

Monitoring of Cross Shore Beach Profiles

55 The Consent Holder shall survey the cross shore profiles of the replenished Horotutu Beach for a period of at least 10 years following the beach replenishment as follows:

(a) Baseline profiles within one month prior to carrying out replenishment; and

(b) At six months following completion of the replenishment, thereafter annually; and

(c) Within one month of each storm of probability of 20% or smaller return period in any year.

The Consent Holder shall also survey the cross shore profile of Te Ti Beach for a minimum period of two years prior to and 10 years following the beach replenishment. Monitoring of Te Ti Beach shall be carried out:

(d) At six months following completion of the replenishment, thereafter annually; and

(e) Within one month of each storm of 1 in 5 year or greater return period.

At least two profiles, at approximately the third points along the replenished Horotutu Beach and at least three profiles at approximately the quarter points along Te Ti Beach shall be obtained on each survey occasion.

All profiles shall be repeatable and shall extend from the eastern edge of Marsden Road to the line of Mean Low Water Springs. The northern-most profile of the replenished Horotutu Beach shall commence at the kerb directly across the road from the boundary of no's 96 and 98 Marsden Point Road and shall follow a bearing of 42 degrees (true).

The Consent Holder shall forward copies of the result of each survey, together with an interpretation of the results by a suitably qualified coastal expert, to the Northland Regional Council and to the New Zealand Transport Agency within two months of the particular survey date.

***Advice Note**: The purpose of this condition is to document any change in littoral sand circulation in response to the placed breakwaters and rock abutments.*

56 If, after 5 years following replenishment, the need for further survey monitoring is considered unnecessary by the Consent Holder and the Northland Regional Council's Monitoring Programme Manager – Coastal, the Consent Holder may seek a reduction in the survey period under Section 127 of the Act.

Maintenance of the Replenished Beach

57 The Consent Holder shall maintain Horotutu Beach in its replenished state. Notwithstanding the generality of this, in the event that the sand section of the berm, as shown on the Shorewise Engineering Consultants drawing referenced as Northland Regional Council Plan Number 5091/1, reduces to less than 3 metres, or the fill under the beach is exposed, then, without delay, the Consent Holder shall reinstate the berm to its approved width and the "imported" beach surface layer reinstated to its approved thickness.

***Advice Note**: In the above event, the Consent Holder should check with the Northland Regional Council regarding any further consents, if any, that may be required.*

Bonds

58 The Consent Holder shall enter into a bond, called the Replenishment Capital Works Bond, with the Northland Regional Council, at least three months prior to the commencement of the placement of the first of either the Northern or the Outer Western Breakwaters. The purpose of the Replenishment Capital Works Bond is to ensure that the Horotutu Beach replenishment occurs upon the placement of at least one of the breakwaters. The value of the Replenishment Capital Works Bond shall be $(Dec 2008)1,000,000. The Replenishment Capital Works Bond shall remain in place until the Horotutu Beach replenishment has been completed to specification.

***Advice Note**: For the avoidance of doubt, the total Replenishment Capital Works Bond required by this resource consent and any Replenishment Capital Works Bond required by the Northland Regional Council are not additive.*

59 The Consent Holder shall enter into a bond, called the Replenishment Maintenance Bond, with the Northland Regional Council at least three months prior to the completion of the initial Horotutu Beach replenishment activity. The purpose of the Replenishment Maintenance Bond is to ensure the performance of Condition 57 above. The value of the Replenishment Maintenance Bond shall be $(Dec 2008)100,000. The Replenishment Maintenance Bond shall remain in place for not less than 10 years after the expiry date of the consent for the replenished beach.

***Advice Note**: For the avoidance of doubt, the total Replenishment Maintenance Bond required by this resource consent and any Replenishment Maintenance Bond required by the Northland Regional Council are not additive.*

60 The values of each of the bonds to be provided under these consents shall be adjusted for inflation at five yearly intervals and the Consent Holder shall provide any additional bond amount required as a result of this.

61 The forms of the bonds shall be cash amounts or bank or other security acceptable to the Northland Regional Council. The total bonds in each case may comprise combinations of the above alternatives.

***Advice Note**: The Far North District Council would be an acceptable surety.*

62 If a bond is provided by a bank or other security, then it shall be prepared by the Northland Regional Council's solicitor, and shall be signed and sealed by both parties. All costs associated with the preparation and registration of the bonds shall be met by the Consent Holder.

63 The bonds shall be in accordance with the relevant principles and terms set out in **Schedule 6 attached**.

64 The Consent Holder shall advise the Northland Regional Council in writing of its chosen form of bond:

(a) At least six months prior to the placement of the first of any breakwater (Outer Western or Northern) in respect of the Replenishment Capital Works Bond; and

(b) At least six months prior to the completion of the initial Horotutu Beach replenishment activity.

65 If the resource consents for either the breakwaters or the beach replenishment are transferred in part or in whole to another party or person, the transferor Consent Holder shall not be entitled to the release, if sought, of any part of any bond provided by it until the transferee Consent Holder has a replacement bond of the same value, or proportional value in the case of partial transfer, and which is fully compliant with the relevant consent, in place with the Northland Regional Council.

66 If the cross shore profiles of Te Ti Beach indicate that adverse effects on beach stability are occurring or have occurred as a result of the breakwaters and/or beach abutments placed under the authority of these consents the Consent Holder shall avoid, remedy or mitigate these adverse effects in consultation with the Northland Regional Council and obtain, at the same time, such consents as are required to amend these consents.

Beach Replenishment Sand

67 Sand used in the beach replenishment at Paihia shall be similar to the natural beach sediment. The "imported" beach surface layer material shall be no less than 1.0 metre thick and shall generally meet the following guidelines:

(a) Grade: A median sand diameter (d_{50}) of 0.4 – 0.5 mm shall be used.

(b) Less than 25% shell material by volume.

(c) Less than 2.5% shall be finer than 63 micrometres (µm) (i.e., silt and clay) by weight.

(d) Sand colour shall be light as distinct from dark.

(e) Sand shall be free of any organic material and contaminants.

(f) Proof of sand source and consents for the extraction of sand, if required, shall be supplied to the Northland Regional Council.

The Consent Holder shall submit a sample of the intended imported sand, together with a material specification demonstrating compliance with the above guidelines, to the Northland Regional Council at least two months before the date it is intended to first place this material on Horotutu Beach.

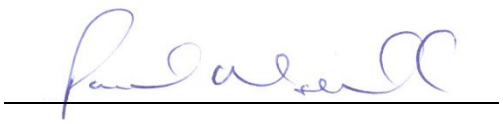
68 Samples of beach replenishment sand proposed to be imported from other locations than the Paihia dredge sites covered by these consents shall be taken from the first three barge loads of sand and analysed by a soils testing laboratory to confirm compliance with the material specification provided under Condition 67. Sample results shall be supplied to the Northland Regional Council within five working days of sampling, including confirmation of compliance and identification of any aspects of non-compliance with the material specification.

69 The Consent Holder's earthworks, beach replenishment and reclamation operations shall not give rise to any discharge of contaminants, which are noxious, dangerous, offensive, or objectionable at or beyond the footprint of the earthworks, beach replenishment and reclamation areas.

EXPIRY DATES:

AUT.005454.(11, 13 & 14) **Breakwaters and Beach Abutment (Nihonui Point)**	**31 MARCH 2044**
AUT.005454.(15) **Dredging**	**31 MARCH 2044**
AUT.00545.(16 & 41) **Reclamation**	**IN PERPETUITY**
AUT.005454.(19-25, 28-33, 36-37) **Construction/Placement and Use Activities**	**31 MARCH 2044**
AUT.005454.(35) **Decant Water Discharge**	**31 MARCH 2044**
AUT.005454.(39-40) **Beach Replenishment (Landfill) and Associated Stormwater Discharge**	**31 MARCH 2044**

This consent (AUT.005454.15.04) is granted this Fourth day of October 2023 under delegated authority from the council by:



Paul Maxwell
Coastal and Works Consents Manager

Note: *The plans attached to this consent are reduced copies and therefore may not be to scale and may be difficult to read. In the event that compliance and/or enforcement action is to be based on compliance with the attached plans, it is important that the original plans, are sighted and used. Originals of the plans referred to are available for viewing at the council's Whangārei office.*

SCHEDULE 1

ENVIRONMENTAL STANDARDS – NOISE

CONSTRUCTION

From NZS 6803: 1999 "Acoustics – Construction Noise", Standards New Zealand

Time of Week	Time Period	Noise Limit (dBA)	
		L_{eq}	L_{max}
Weekdays	0630 -0730	60	75
	0730-1800	75	90
	1800-2000	70	85
	2000-0630	45	75
Saturdays	0630 -0730	45	75
	0730-1800	75	90
	1800-2000	45	75
	2000-0630	45	75
Sundays and Public Holidays	0630 -0730	45	*75*
	0730-1800	*55*	*85*
	1800-2000	*45*	*75*
	2000-0630	*45*	*75*

Note: The definitions of L_{eq} and L_{max} are given in NZS 6803:2008.

OPERATION

Based on Rule 9.6.5.1.12 of the Far North District Plan.

Noise emitted from any activity, when measured at the boundary of the zone (as defined below), shall not exceed the following noise levels.

Time Period	*Noise Limit*
0700 hrs to 2200 hrs	***55 dBA L_{10}***
2200 hrs to 0700 hrs the following day	***45 dBA L_{10}***
	70 dBA L_{max}

Note: The boundary of the zone shall be the line of mean high water springs and the radius of 100 metres of the source of the noise.

Sound levels shall be measured in accordance with New Zealand Standard NZS 6801:2008 Measurement of Sound and assessed in accordance with NZS 6802:1991 Assessment of Environmental Sound.

SCHEDULE 2

SAMPLING AND TESTING PROGRAMME

During Dredging

During dredging operations, temperature, pH, salinity, clarity, ~~faecal coliforms~~ and dissolved oxygen in the area being dredged, will be checked not less than twice during dredging operations to ensure that the effects of these continue to be minor.

Visual inspections will be conducted as required by consent conditions.

The clarity will be measured at three sites (at approximately 10 metre spacings across current) 200 metres down-current and also at three sites (at approximately 10 metre spacings across current) 200 metres up-current from the footprint of the area of dredging using a Black Disk and/or Secchi Disk methods. If the clarity down-current (the value being the median of the three down-current measurements) is reduced by more than 33% of the up-current visual clarity (the value being the median of the three up-current measurements), then this shall be interpreted as a change to a conspicuous extent.

During Construction

Visual inspections will be conducted as required by consent conditions.

The clarity will be measured at three sites (at approximately 10 metre spacings across current) 50 metres down-current and also at three sites (at approximately 10 metre spacings across current) 50 metres up-current from the down-current and up-current ends, respectively, of the reclamation, using a Black Disk and/or Secchi Disk methods. If the clarity down-current (the value being the median of the three down-current measurements) is reduced by more than 20% of the up-current visual clarity (the value being the median of the three up-current measurements), then this shall be interpreted as a change to a conspicuous extent.

SCHEDULE 3

GENERAL PERFORMANCE STANDARDS

(Section 31.8.12 of the Regional Coastal Plan for Northland)

The following standards shall apply to all specified permitted, controlled, restricted discretionary and discretionary activities, and to all non-complying activities, listed in the Marine 6 Management Area:

(a) Noise generated as a result of activity within the coastal marine area shall comply with the following standards:

(i) the activity shall not cause excessive noise as defined in Section 326 of the Resource Management Act; and

(ii) the level of noise received at or beyond the Coastal Marine Area boundary shall not exceed the level imposed by the relevant district plans.

(b) All lighting associated with activities in the coastal marine area shall not by reason of its direction, colour or intensity, create:

(i) a hazard to navigation and safety; or

(ii) a hazard to traffic safety on wharves, ramps, and adjacent roads; or

(iii) a nuisance to other users of the surrounding coastal marine area or adjacent land.

(c) Parking shall be provided to the extent required by the relevant district plan or proposed district plan. If a particular activity is not referred to in the appendix of the relevant district plan or proposed district plan, use the closest, most similar activity for the proposal. The parking shall be provided within a reasonable and practical distance to service the activity.

(d) Discharges to water shall, after reasonable mixing, comply with the relevant receiving water quality standards and shall not contain any contaminants which could cause:

(i) The production of conspicuous oil or grease film, scum or foam, or floatable or suspended materials.

(ii) Any conspicuous change in the colour or decrease in the visual clarity of the receiving waters.

(iii) Any emission of objectionable odour.

(iv) Accumulation of debris on the foreshore or seabed underlying or adjacent to the discharge point.

(v) Any significant adverse effects on aquatic life or public health.

(e) Any modification of the contour of the foreshore caused during any authorised construction or maintenance activity, other than dredging or reclamation, shall be restored as soon as practicable after the completion of the construction or maintenance activity.

(f) Unless expressly authorised to do so by a coastal permit, structures within the coastal marine area shall not unduly impede safe navigation within natural drainage channels or unduly restrict the flow of flood waters within such channels.

(g) Design and Appearance of Buildings on Wharves for Opua

Height: 10 metres (above surface/deck of wharf).

Colour: Where building is to be painted, the colour should be sympathetic and appropriate to the landscape setting (both natural and built) that the building is to be located within. Large areas of reflective materials such as unpainted roofs and the use of iridescent or vivid colours is to be avoided. Some degree of harmony should be exercised in the selection of roof colours, with a preference for heritage colours.

SCHEDULE 4

LIST OF PLANS RELATING TO CONSENTS

Figure No.	Applicant's Figure Title/ General Content of Plan	Applicant's Plan Title or Other Identifier (if any)	NRC Plan References
	2021 Master Plan update	Shorewise Consulting Engineers, Master Plan with Sea Level, Project 20-0057 Paihia Waterfront Sheet M002, REV 5, 30/08/21	5045
1	Master Plan		5049/1
2	Landscape Masterplan		5049/2
3	Landscape Plan of Proposed Reclamation		5049/3
4	Landscape Plan of Wharf Entry and Beach Area		5049/4
5	Draft Paihia Waterfront Plan		5050
12	Plan of Existing Wharf Facilities	Butt Design Group, Job No. 2056 Sheet 1_001	5055/1
	General Layout of Development	Far North Holdings Limited, Project No; PAWF-00, Sheet 00, Rev. A, 6/10/09	5052
	Northern Breakwater	Far North Holdings Limited, Plan and Long Section, Project No; PAWF-00, Sheet 100, Rev. B, 24/12/09	5053/1
	Western Breakwater	Far North Holdings Limited, Plan and Long Section, Project No; PAWF-00, Sheet 102, Rev. A, 31/08/09	5053/2
	Beach Replenishment		5091/1, 5091/2, 5091/3 and 5091/8
18	Cross and Long Sections of Proposed Navigation Channel	Richardson Stevens, Dredging Cross-sections, Project 2534, Sheet 2A, March 2006	5054/1
19	Plan of Wharf Area Dredging and New Structures	Richardson Stevens, Wharf Layout, Project 2534, Sheet 8B, March 2006	5054/2
	Plan of Proposed Reclamation	Richardson Stevens, Reclamation Plan, Project 2534, Sheet 5D, March 2006,	5054/3
21	Plan of Proposed Northern Deck and Finger Piles	Richardson Stevens, Deck Elevation and Sections, Project 2534, Sheet 4d, March 2006	5054/4
	Plan of Redeveloped Wharf Area	Bellingham Marine, Redeveloped Wharf Area, PWD 1-02, Rev 5, July 08	5051/2
23	Cross Section Plan of Proposed Finger Piers and Eastern Attenuator	Bellingham Marine, Typical Details of Southeast Pier and Commercial Berths	5056/1
24	Plan of Proposed Mediterranean Moorings	Travel and Moore/Ade Consultants, Chain Moorings System, May '02.	5058
25	Plan of Proposed Fuel Berth	Bellingham Marine, Typical Details of Fuel Berth and Berth Adjacent to Wharf, PWD 2-02, April 05	5056/2
28	Plan of Proposed Western Deck and Boardwalk	Richardson Stevens, Decking at Aquarium and Timber Board Layout, Project 2534, Sheet 6C, March 2006	5054/5
29	Plan of Proposed Helipad	Richardson Stevens, Helicopter Pad Details Southern Deck and Cribwalls, Project 2534, Sheet 3d, March 2006	5054/6
30	Plan of Proposed Helicopter Flight Paths	Northern Civil, Helicopter Flight Lines Plan, Job 1142, Sheet 1, Jan 2005	5057
39	Plan of Proposed Finger Pier Services	Richardson Stevens, Services Layout, Project 2534, Sheet 7, March 2006	5054/7

Figure No.	Applicant's Figure Title/ General Content of Plan	Applicant's Plan Title or Other Identifier (if any)	NRC Plan References
40	Stormwater Management		5091/14, 5091/15, 5091/16 and 5091/17
	Western Beach Abutment	Bellingham Marine, Western Beach Abutment, PWD1-04, Rev 6, Dec 09.	5051/3
46	Plan of Management Area Boundaries and Proposed Facilities	Butt Design Group, Job No. 2056, Sheet 1_002	5055/2
47	Plan of Management Area Boundaries Around South-eastern Pier	Butt Design Group, Job No. 2056, Sheet 1_003	5055/3
	Paihia Waterfront Development Esplanade Area and Public Open Space Plan	Andrew Stewart Limited, Project AA0330 Plan PWD-1 Revision A, dated 20.8.09	5059
59	Plan of Existing Moorings	Richardson Stevens, Mooring Layout, Project 2534, Sheet 12, March 2006	5054/9
60	Plan of Casual Berthing Areas	Bellingham Marine, Redeveloped Wharf Area, PWD 1-02, Rev 3, Dec 05.	5051/2
	Occupation Area	Northland Regional Council Plan Number 4221B	4221B
	Overall View of Occupation Area to be Transferred	Far North Holdings Limited, Project No; 1030, Sheet 10, Rev. 1.1, 23/05/11.	4978
	Civil Engineering detailed design drawings for Initial Development of the breakwaters abutments and renourished breach.	Northland Regional Council Plan Numbers 5061/1-5061/7 and 5061/12 5061/13.	5061/1-5061/7 5061/12-5061/13
	Dredging footprint, depths and volumes	MASTER PLAN – GENERAL ARRANGEMENT, Project 20-0057 PAIHIA WATERFRONT, Sheet Number Z-001 and Z-002	5194/1 and 5194/2

Note: The plans identified in Schedule 4 above have been amended by the Section 127 application APP.043088.01.01 of 14 September 2021 to the extent shown on the Shorewise Consulting Engineers drawing titled 'Master Plan with Sea Level 'referenced as Northland Regional Council Plan number 5045.

Note: The plans referenced as Northland Regional Council Plan Number 5091 identified in Schedule 4 above apply to the changes granted under APP.043624.01.01 relating to the eastern abutment (AUT.043619) which resulted in consequential changes to activities relating to beach replenishment (AUT.005454.35 and AUT.005454.39 to AUT.005454.41) and stormwater management (AUT.005454.32 and AUT.005454.33).

Note: The plans referenced as Northland Regional Council Plan Number 5194 identified in Schedule 4 above apply to the dredging activities authorised by AUT.005454.15.04 granted under APP.043183.01.01.

SCHEDULE 5

SIGNAGE

The sign shall include the following information:

(1) Information regarding emergency procedures. The emergency procedure information must detail how to respond to a product spillage, a fire or an equipment failure. In all cases the procedures for keeping people safe, stopping the refuelling operation and minimising pollution of the marine environment is to be clearly displayed.

(2) The location and access details for spill response equipment held on site, such as sorbent materials.

(3) Emergency response organisation contact details for the following organisations:

- The refuelling site operator's 24 hour contact number;
- The Northland Regional Council's environmental hotline number 0800 504 639;
- The Rescue Co-ordination Centre of New Zealand (Maritime New Zealand contact) 0508 472 269; and
- The New Zealand Fire service 111.

(4) The delivery nozzle is to be attended at all times when being operated.

SCHEDULE 6

I BOND AGREEMENT PRINCIPLES

A USE OF REPLENISHMENT CAPITAL WORKS BOND

The use of this bond shall include the following:

(a) To provide a mechanism to have finance immediately available to the Northland Regional Council to mitigate or control the environmental consequences of the inability of the Consent Holder to complete the beach replenishment.

(b) To provide a mechanism immediately available to the Northland Regional Council to enable:

  (i) restoration of Horotutu Beach to an appropriate form should the beach replenishment works not be completed; and /or

  (ii) completion, or partial completion, of the beach replenishment works to an environmentally acceptable state; and

(c) To provide for the costs involved in the planning, management administration and monitoring of the measures described in (a) and (b) above.

B USE OF REPLENISHMENT MAINTENANCE WORKS BOND

The use of this bond shall include the following:

(a) To provide a mechanism to have finance immediately available to the Northland Regional Council to mitigate or control the environmental consequences of the inability of the Consent Holder to maintain the replenished beach, to the extent enabled by the value of the Bond; and

(b) To provide for the costs involved in the planning, management administration and monitoring of any measures described in (a) above.

II TERMS OF BANK BOND OR OTHER SECURITY

The terms of these bonds or securities shall include a provision that the bond or security is available to the Northland Regional Council on demand, without restraint of any kind, in the event of it being required. The bond or security shall take the form of a development, bank or insurance bond or a guarantee by a financial institution or other entity acceptable to the Northland Regional Council.

Each bond or security shall have a period sufficient to ensure that the funds are available for the purpose described above, until the time specified in the relevant condition of these consents, at which time any funds remaining will be reimbursed to the Consent Holder.

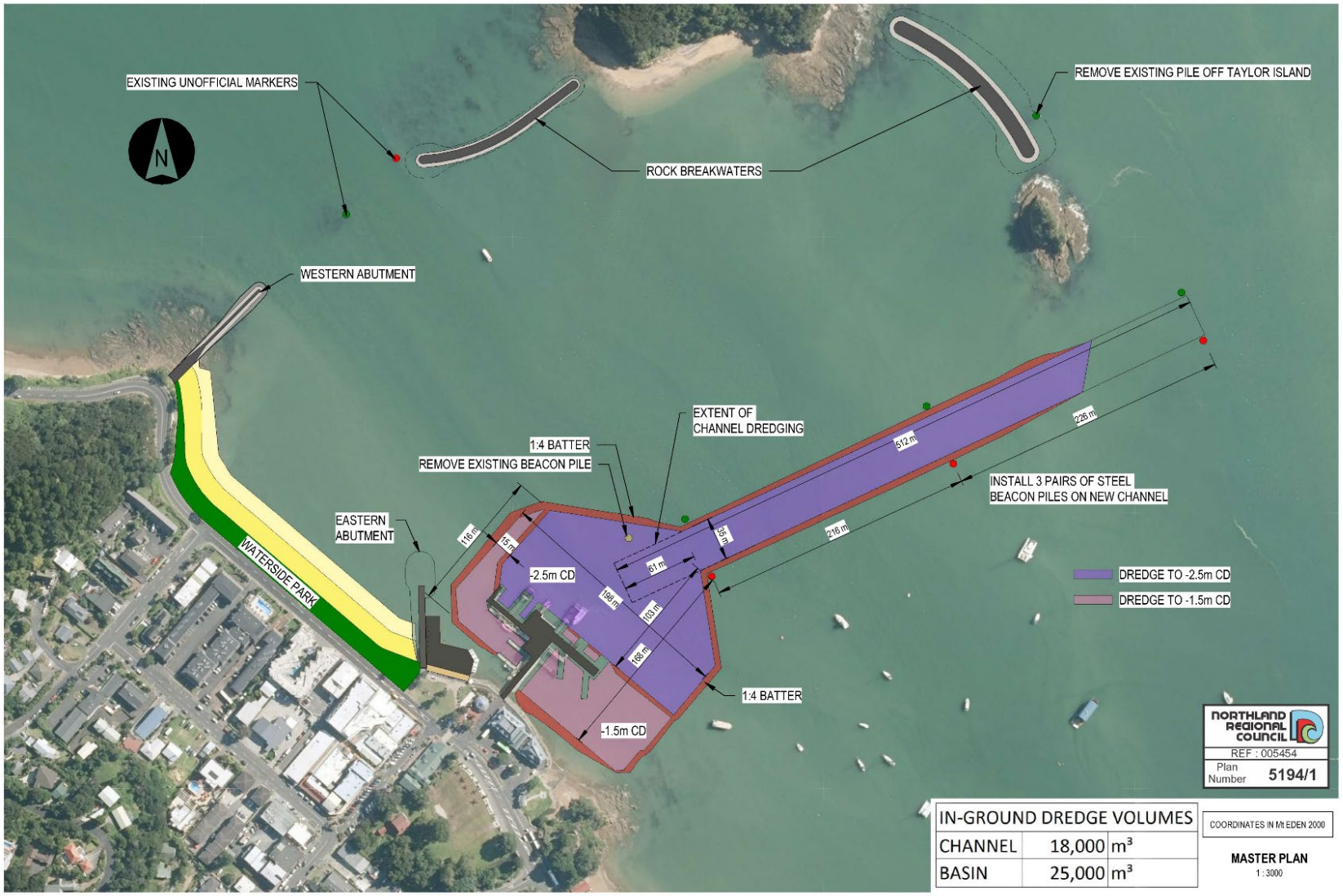
III PAYMENT OF NET INTEREST ON CASH BONDS TO CONSENT HOLDER AND DEFAULT

Net interest on any cash bond will be paid to the Consent Holder annually by 30 August for the previous year (July to June).

The net interest paid will be any residual interest following deduction of inflation (nominally set at 3%, but subject to revision in accordance with the assumptions in the Northland Regional Council's Long Term Council Community Plan [LTCCP] and Annual Plan) from the interest earned based on the bond fund for each Consent Holder at the average 90 day cash deposit rate over the financial year.

In the event that the gross interest in any year is less than the inflation rate used, then no payment will be made to the Consent Holder. All inflation amounts will be accrued into the bond amount held.

If the Consent Holder defaults on any payment required in respect of inflation related to the bond, then all subsequent payments of net interest will immediately cease until the default payment is rectified by the Consent Holder.



IN-GROUND DREDGE VOLUMES		
CHANNEL	18,000	m^3
BASIN	25,000	m^3

COORDINATES IN Mt EDEN 2000

MASTER PLAN
1 : 3000

Filename:
Plot Date: 1/10/2021 12:24:13 pm

SHOREWISE ENGINEERING CONSULTANTS
www.shorewise.co.nz

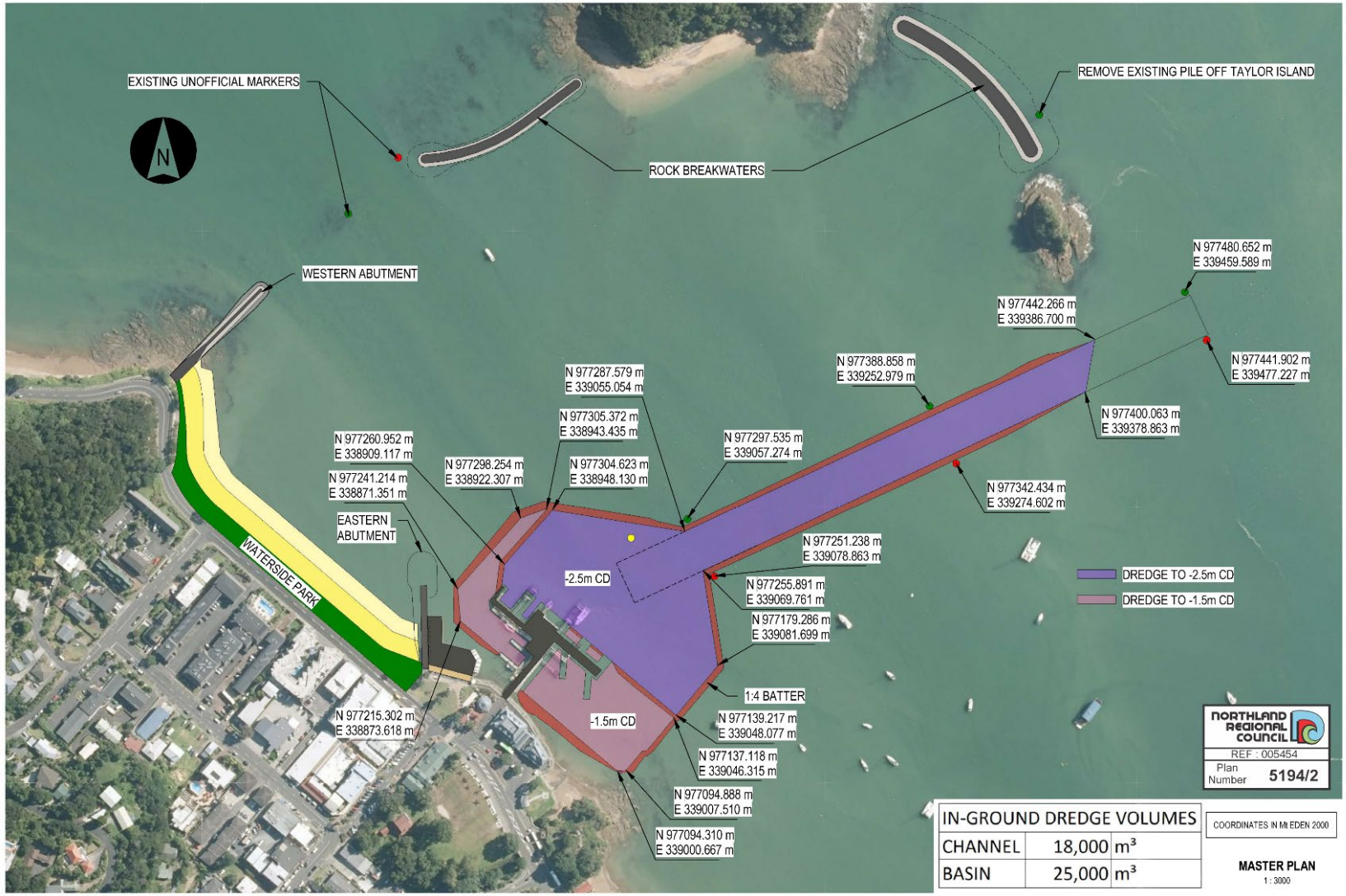
CLIENT: Far North Holdings Limited

REV	DETAILS	DATE
0	ISSUED FOR REVIEW	01/10/2021

PROJECT: 20-0057 PAIHIA WATERFRONT
SHEET DESCRIPTION: MASTER PLAN - GENERAL ARRANGEMENT

STATUS: FOR CONSENT

DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	Z-001	0



IN-GROUND DREDGE VOLUMES		
CHANNEL	18,000	m^3
BASIN	25,000	m^3

COORDINATES IN MT EDEN 2000

MASTER PLAN
1 : 3000

Filename:
Plot Date: 1/10/2021 12:24:15 pm

SHOREWISE ENGINEERING CONSULTANTS
www.shorewise.co.nz

CLIENT: Far North Holdings Limited

REV	DETAILS	DATE
0	ISSUED FOR REVIEW	01/10/2021

PROJECT: 20-0057 PAIHIA WATERFRONT
SHEET DESCRIPTION: MASTER PLAN - COORDINATES

STATUS: FOR CONSENT

DRAWN BY	APPROVED BY	SHT
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PROJECT NO.	SHEET NO.	REV
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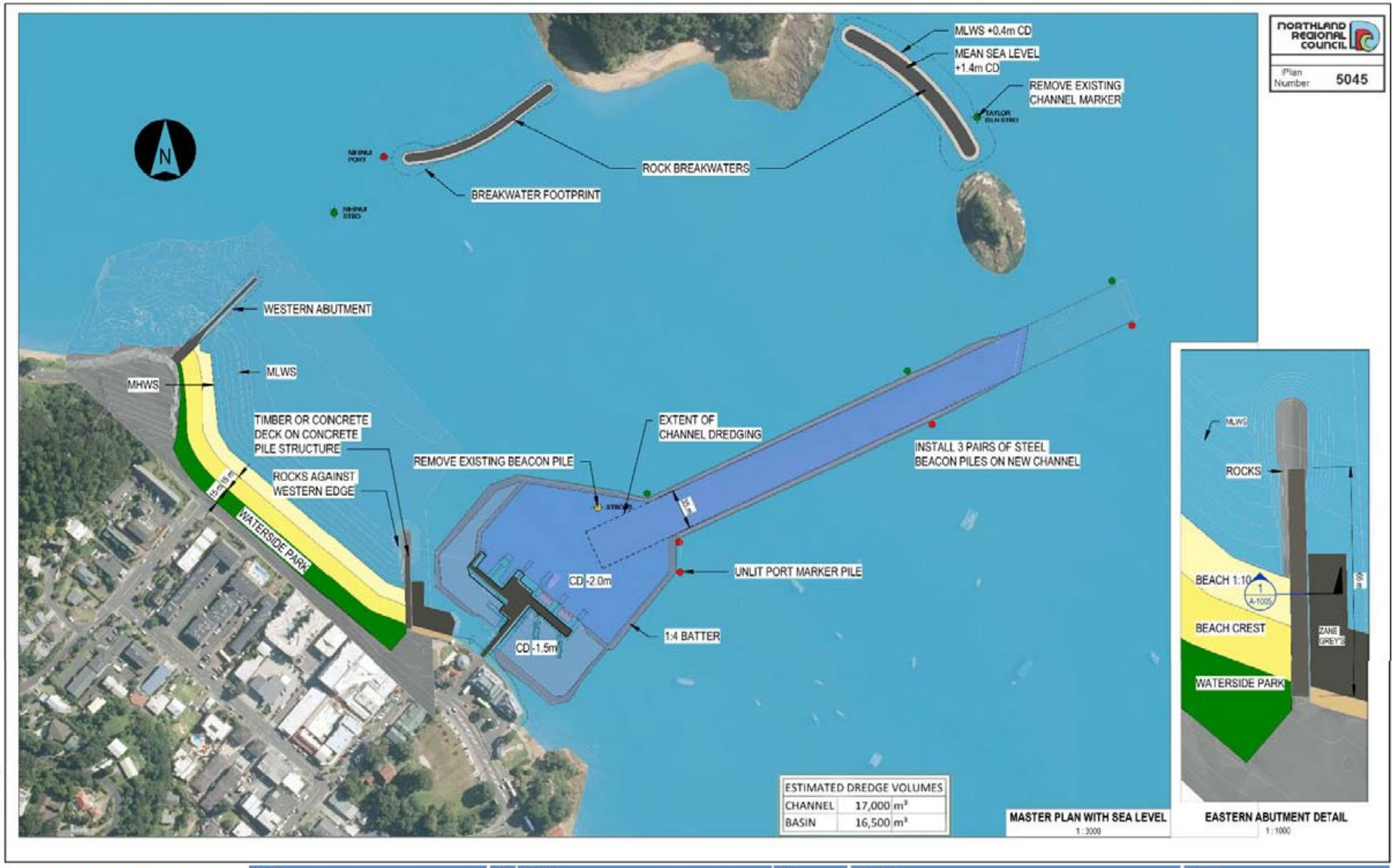


NORTHLAND REGIONAL COUNCIL

Plan Number 5045

SHOREWISE ENGINEERING CONSULTANTS

www.shorewise.co.nz

CLIENT: Far North Holdings Limited

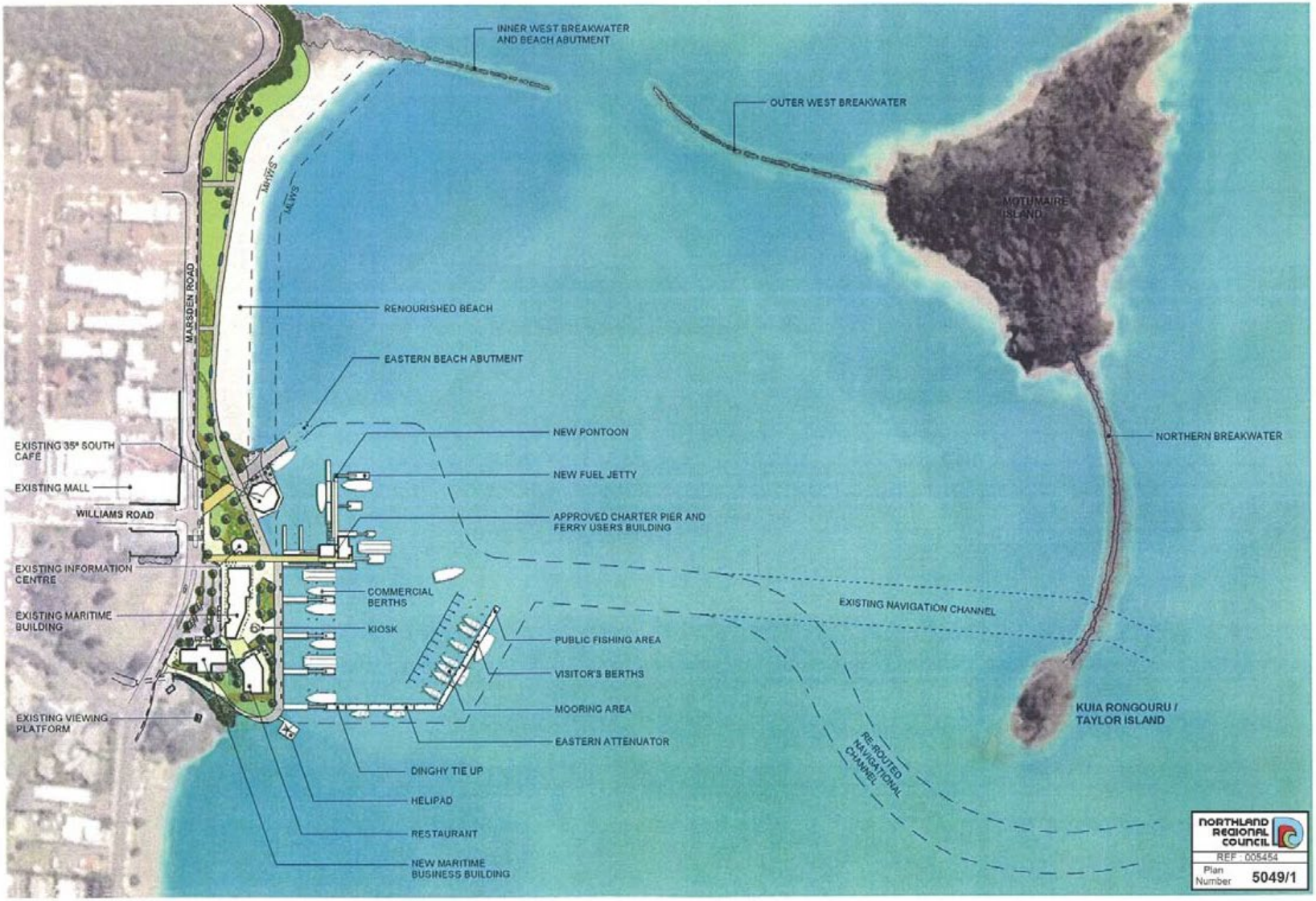
REV	DETAILS	DATE
0	ISSUED FOR REVIEW	26/05/2021
1	ISSUED FOR REVIEW	24/06/2021
2	RE-ISSUED FOR REVIEW	30/06/2021
3	RE-ISSUED FOR REVIEW	06/07/2021
4	ISSUED FOR REVIEW	21/07/2021
5	ISSUED FOR CONSENT	30/08/2021

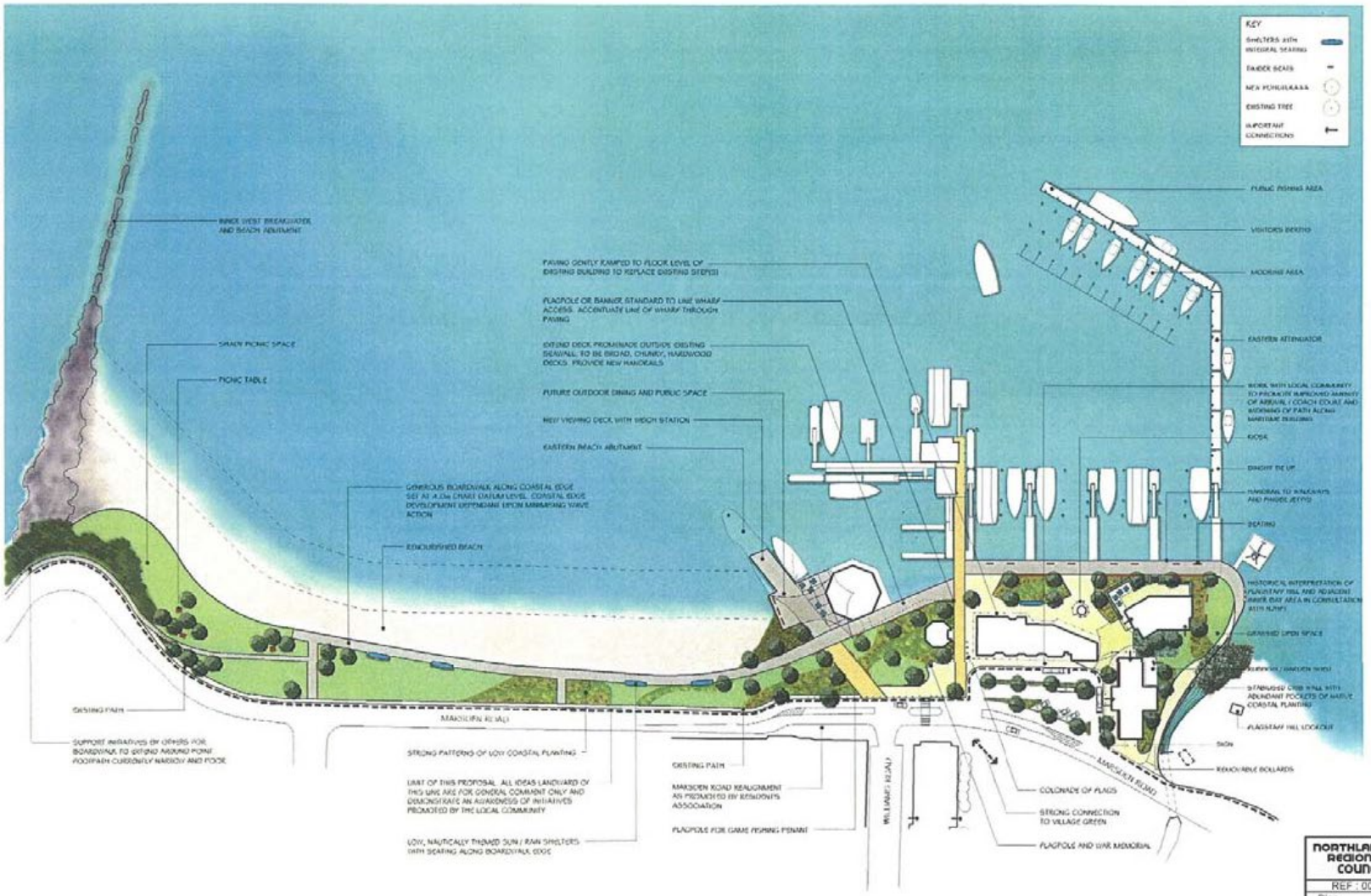
PROJECT: 20-0057 PAIHIA WATERFRONT

SHEET DESCRIPTION: MASTER PLAN WITH SEA LEVEL

STATUS: FOR CONSENT

DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	M002	5

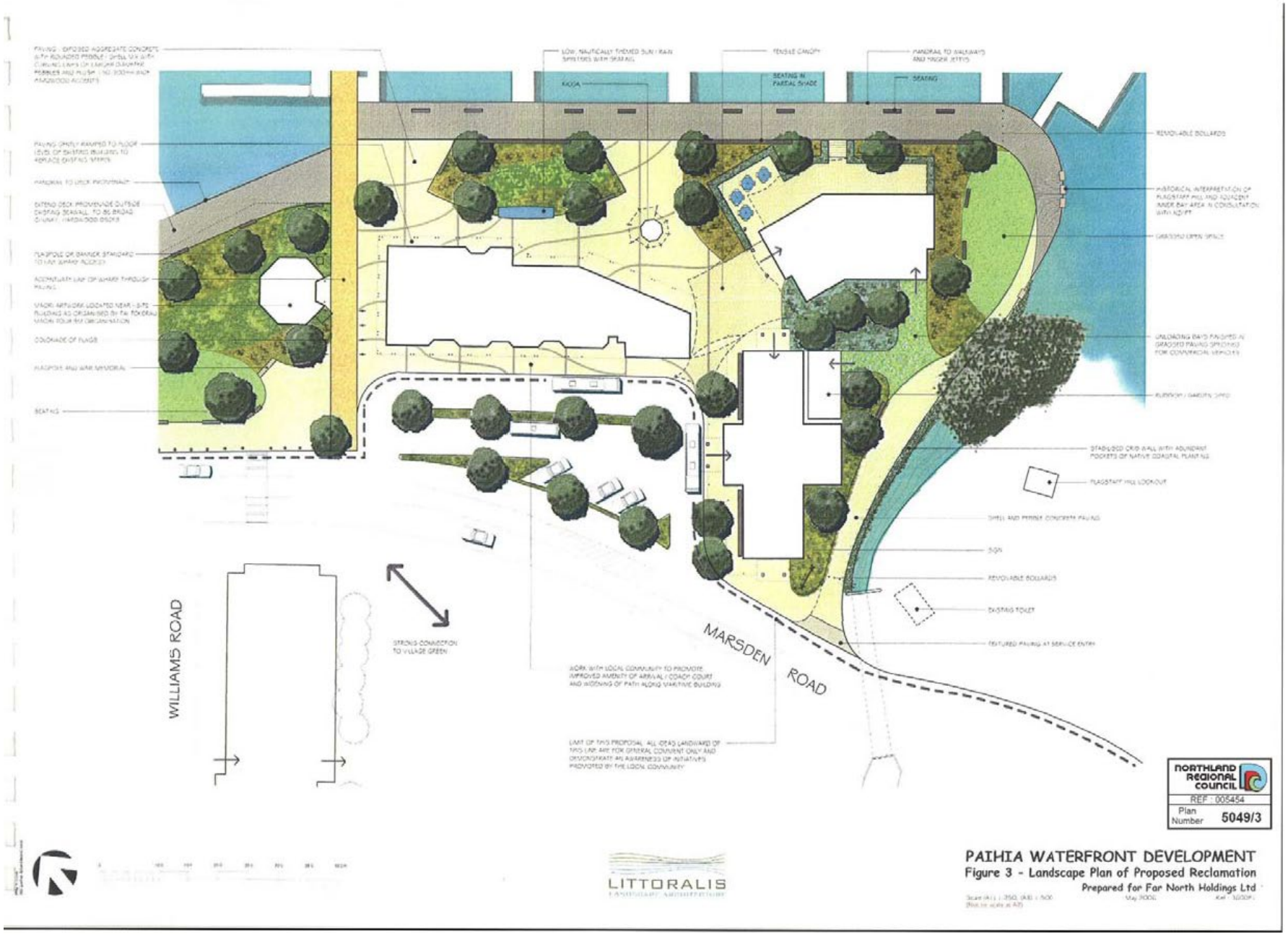

INNER WEST BREAKWATER AND BEACH ABUTMENT
OUTER WEST BREAKWATER
MOTUMAIRE ISLAND
MARSDEN ROAD
RENOURISHED BEACH
EASTERN BEACH ABUTMENT
NEW PONTOON
NEW FUEL JETTY
APPROVED CHARTER PIER AND FERRY USERS BUILDING
NORTHERN BREAKWATER
EXISTING 35° SOUTH CAFÉ
EXISTING MALL
WILLIAMS ROAD
EXISTING INFORMATION CENTRE
EXISTING MARITIME BUILDING
COMMERCIAL BERTHS
KIOSK
PUBLIC FISHING AREA
VISITOR'S BERTHS
MOORING AREA
EASTERN ATTENUATOR
EXISTING VIEWING PLATFORM
DINGHY TIE UP
HELIPAD
RESTAURANT
NEW MARITIME BUSINESS BUILDING
EXISTING NAVIGATION CHANNEL
RE-ROUTED NAVIGATIONAL CHANNEL
KUIA RONGOURU / TAYLOR ISLAND
NORTHLAND REGIONAL COUNCIL
REF: 605454
Plan Number 5049/1
0 25.0 50.0 75.0 100.0 125.0 150.0 m
LITTORALIS
LANDSCAPE ARCHITECTURE
PAIHIA WATERFRONT DEVELOPMENT
FIGURE 1 - MASTER PLAN
Prepared for Far North Holdings Ltd
Scale 1:2500 at A3, 1:1250 at A1
May 2006
Ref: 360CP1

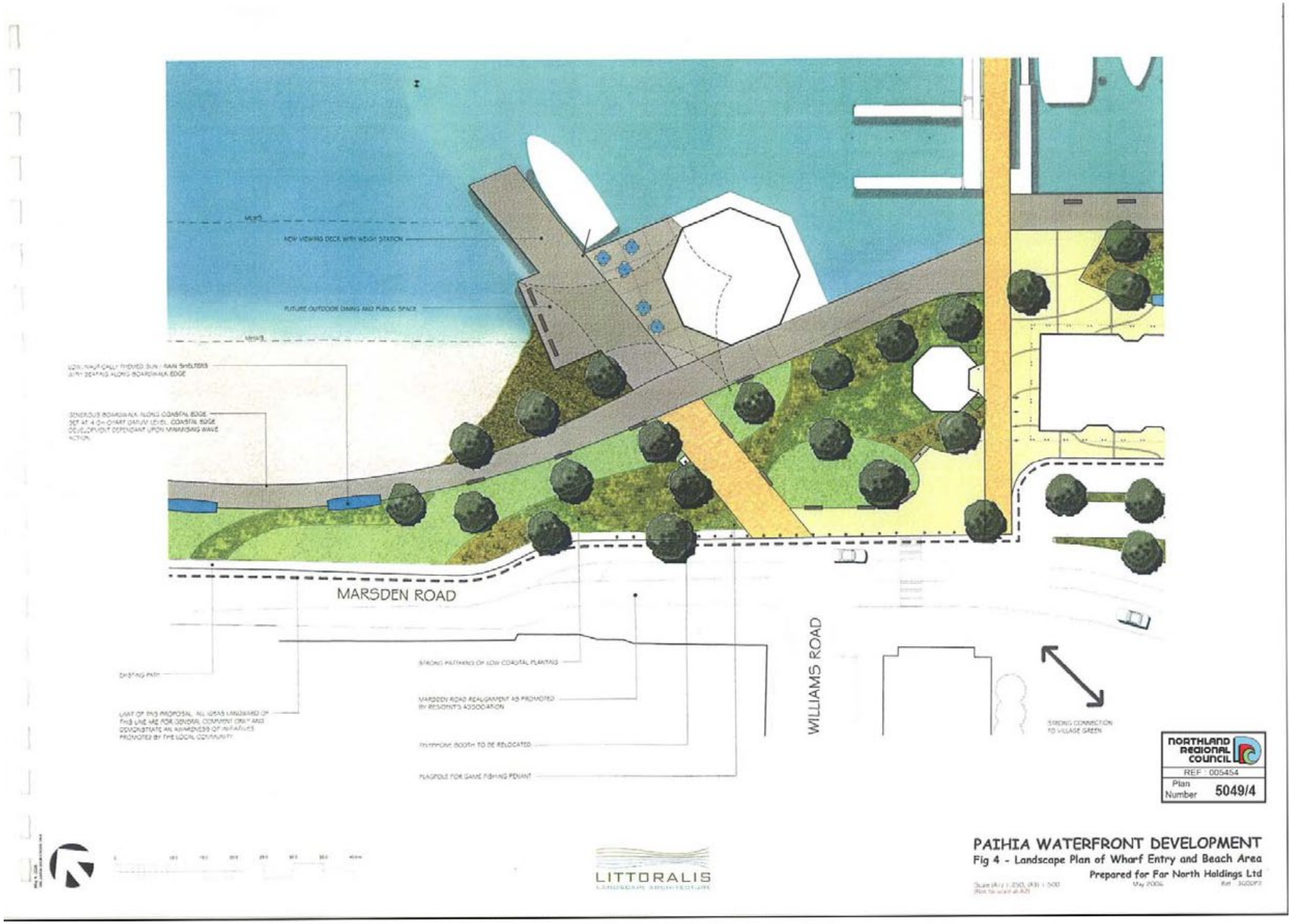


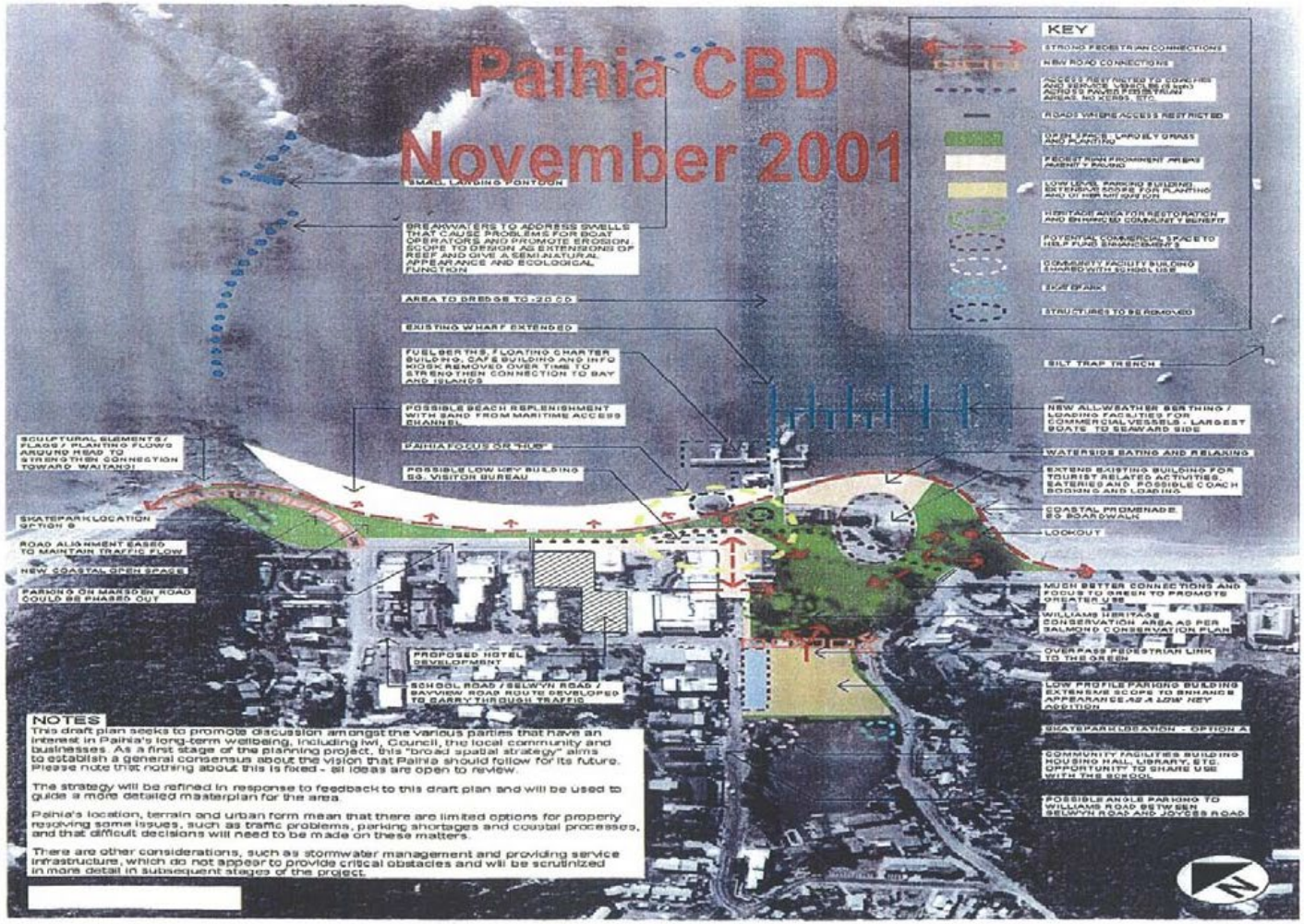
NORTHLAND REGIONAL COUNCIL
REF : 005454
Plan Number 5049/2

LITTORALIS

PAIHIA WATERFRONT DEVELOPMENT
Figure 2 - Landscape Masterplan
Prepared for Far North Holdings Ltd


WILLIAMS ROAD
MARSDEN ROAD
STRONG CONNECTION TO VILLAGE GREEN
WORK WITH LOCAL COMMUNITY TO PROMOTE IMPROVED AMENITY OF ARRIVAL / COACH COURT AND WIDENING OF PATH ALONG MARITIME BUILDING
LIMIT OF THIS PROPOSAL. ALL OTHER LANDWARD OF THIS LINE ARE FOR GENERAL COMMENT ONLY AND DEMONSTRATE AN AWARENESS OF INITIATIVES PROMOTED BY THE LOCAL COMMUNITY
SEATING IN PARTIAL SHADE
SEATING
REMOVABLE BOLLARDS
SIGN
REMOVABLE BOLLARDS
EXISTING TOILET
FLAGSTAFF HILL LOOKOUT
NORTHLAND REGIONAL COUNCIL
REF : 005454
Plan Number 5049/3
LITTORALIS
PAIHIA WATERFRONT DEVELOPMENT
Figure 3 - Landscape Plan of Proposed Reclamation
Prepared for Far North Holdings Ltd


MARSDEN ROAD
WILLIAMS ROAD
NORTHLAND REGIONAL COUNCIL
REF 005454
Plan Number 5049/4
PAIHIA WATERFRONT DEVELOPMENT
Fig 4 - Landscape Plan of Wharf Entry and Beach Area
Prepared for Far North Holdings Ltd
LITTORALIS



BROADSCALE STRATEGY FOR PAIHIA CENTRAL

Draft Discussion Plan

SCALE 1 : 3000 approx NOVEMBER 2001 REF : 212C1

Prepared for Far North Holdings Ltd by Littoralis Landscape Architecture, Tuohey Consulting Ltd, Brian Wilson Consulting Engineer and Joyce Consultants Ltd

Figure 5: Draft Paihia Waterfront Plan

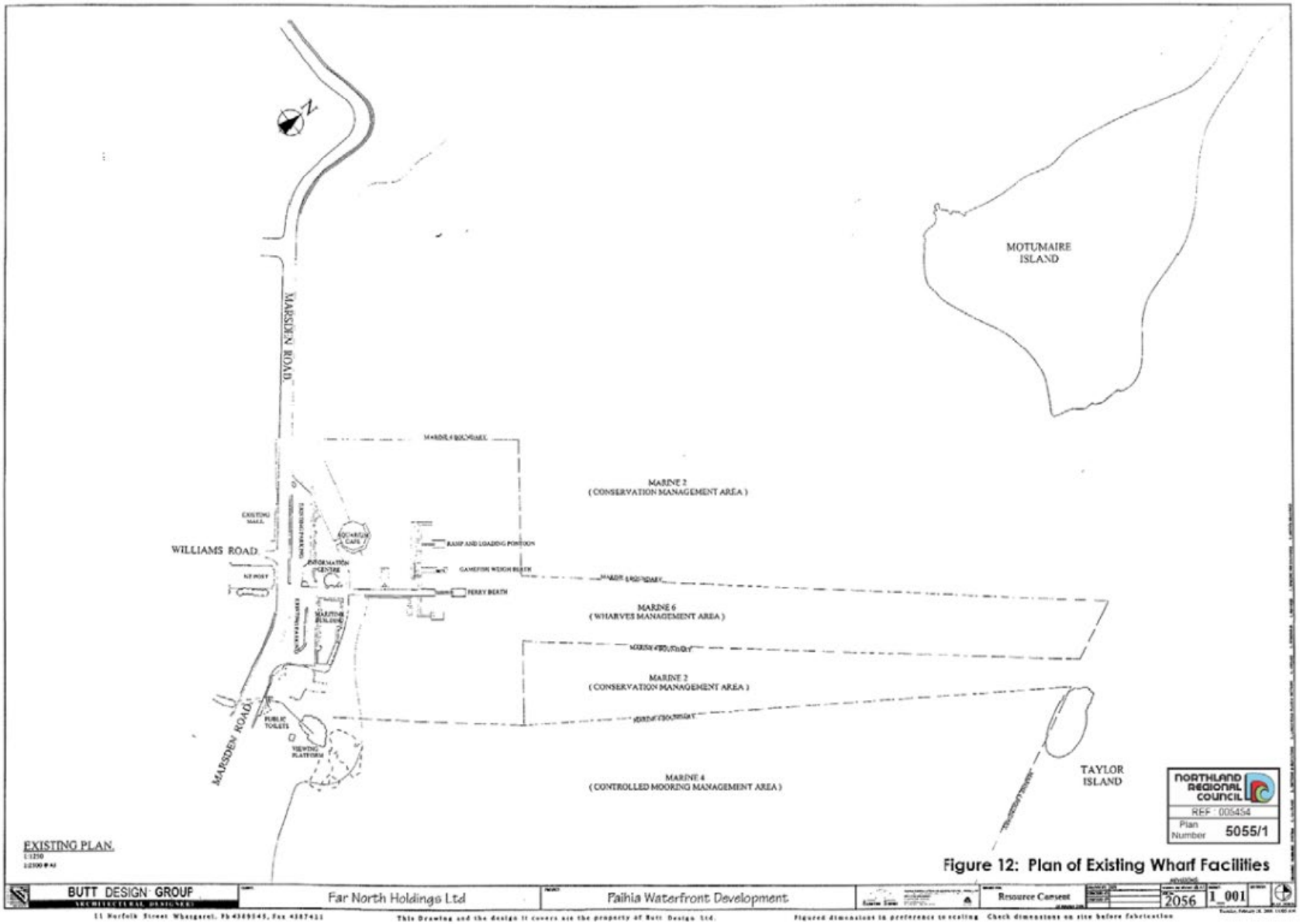
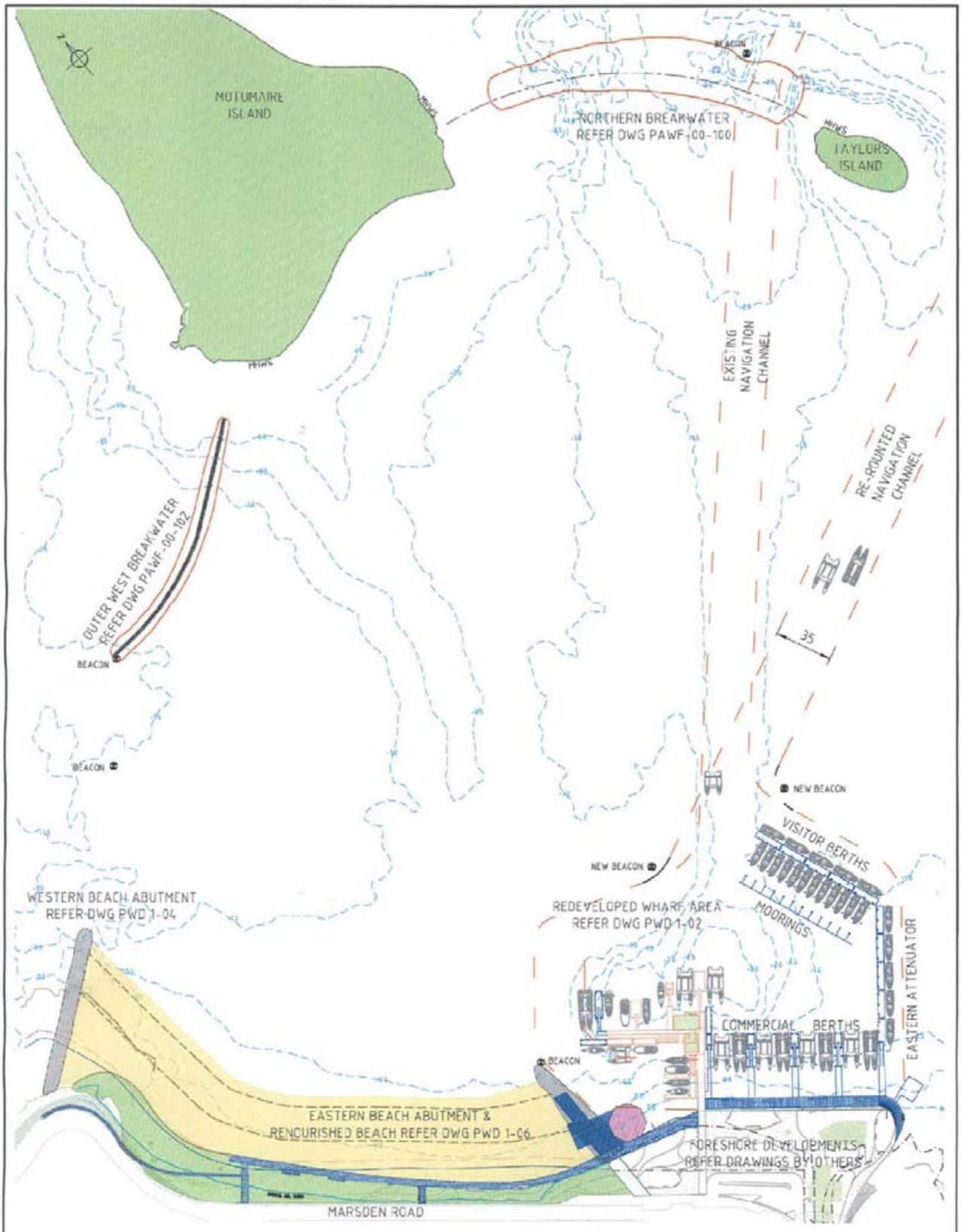
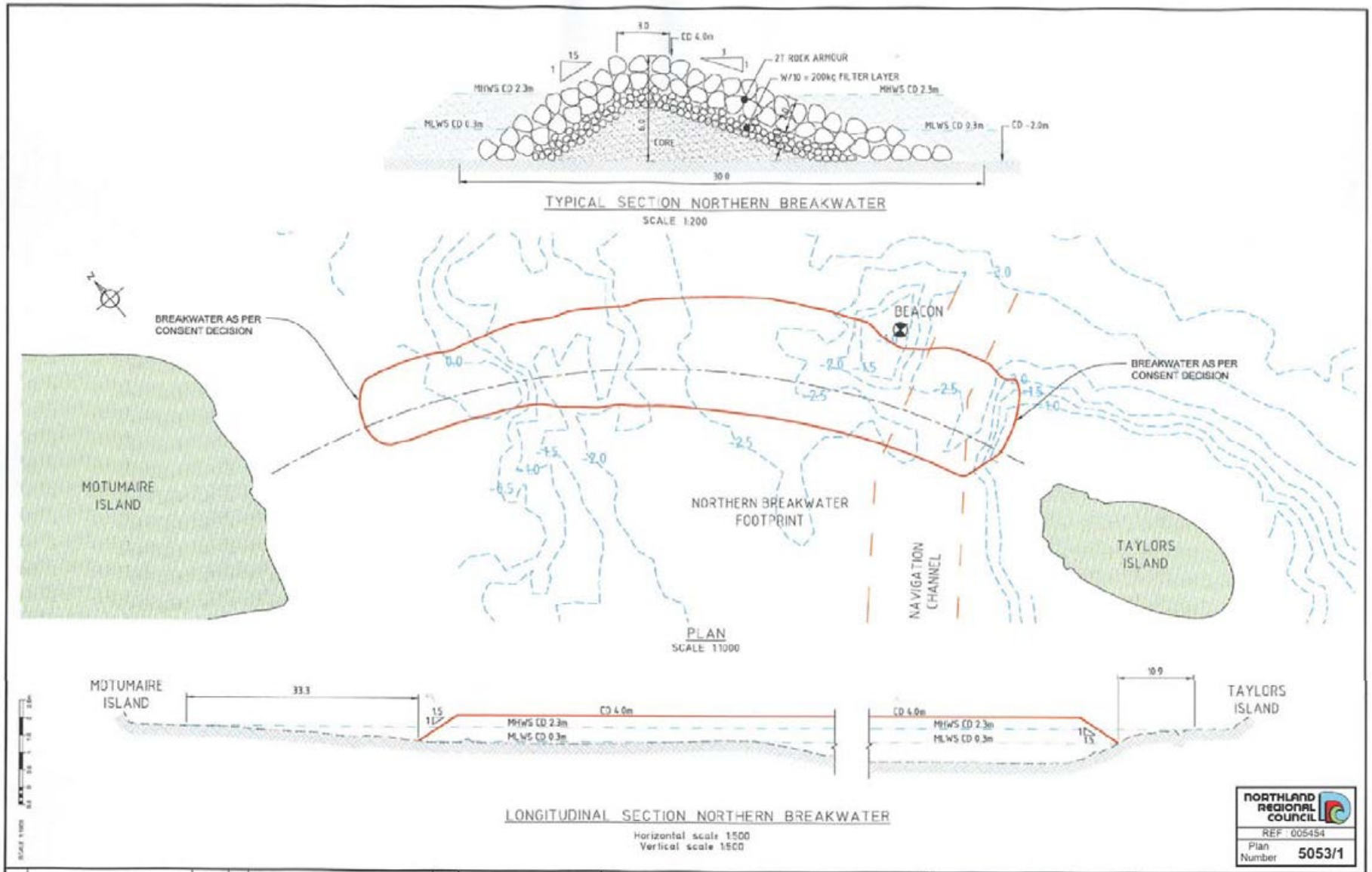
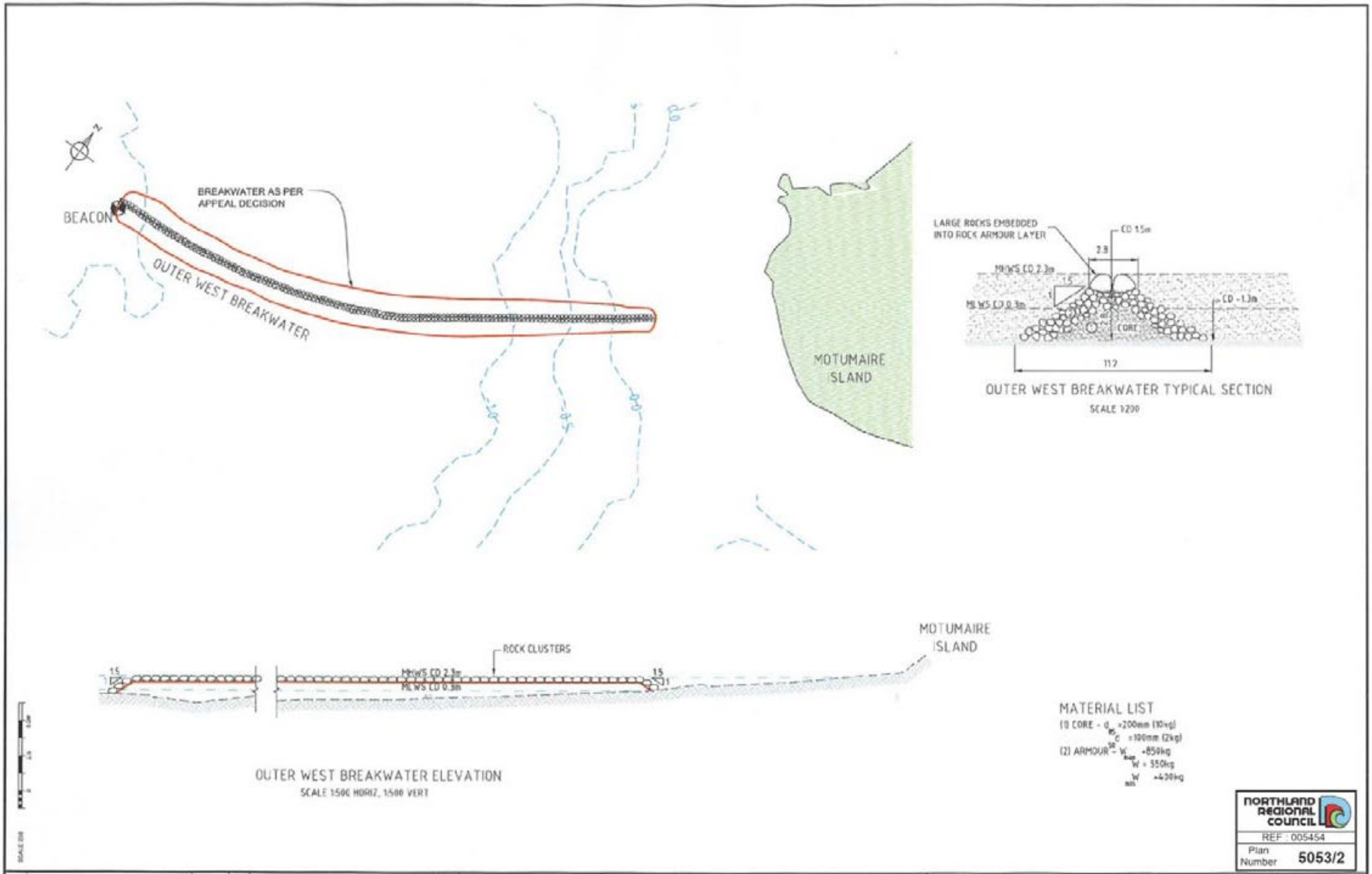


Figure 12: Plan of Existing Wharf Facilities



			Survey: WILLIAMS & KING Design: VARIOUS Drawn: VARIOUS Checked: CNJ Date: 6/10/09 Scale: 1:2000@A3 CAD Filename: PAWF-00-100.DWG	Job Title: PAIHIA WATERFRONT DEVELOPMENT GENERAL LAYOUT	Far North Holdings Limited Opua Marine Park P.O. Box 7 Opua, 0841 Bay Of Islands, New Zealand Ph. (09) 402 0659 Email: wmg.kiwi@xtra.co.nz	Drawing Title: PLAN	
A	ISSUED FOR DISCUSSION	6/10/09				Project No.: PAWF-00	Rev.: A / Sheet No.: 00
No.	Revision Details	Date					


CD 4.0m
2T ROCK ARMOUR
W/10 = 200kg FILTER LAYER
MHWS CD 2.3m
MLWS CD 0.3m
CD -2.0m
CORE
30.0
TYPICAL SECTION NORTHERN BREAKWATER
SCALE 1:200
BREAKWATER AS PER CONSENT DECISION
BEACON
MOTUMAIRE ISLAND
NORTHERN BREAKWATER FOOTPRINT
NAVIGATION CHANNEL
TAYLORS ISLAND
PLAN
SCALE 1:1000
33.3
10.0
LONGITUDINAL SECTION NORTHERN BREAKWATER
Horizontal scale 1:500
Vertical scale 1:500
NORTHLAND REGIONAL COUNCIL
REF : 005454
Plan Number 5053/1
B BREAKWATER AMENDED 24/12/09
A PRELIMINARY ISSUE 31/08/09
Survey: Williams & King
Design: CNJ
Drawn:
Checked:
Date: 24/12/09
Scale:
CAD Filename: PAWF-00-100
Job Title.
PAIHIA WATERFRONT DEVELOPMENT
NORTHERN BREAKWATER
Far North Holdings Limited
Drawing Title.
PLAN AND LONG SECTION
Project No. PAWF-00
Rev. B
Sheet No. 100


BREAKWATER AS PER APPEAL DECISION
BEACON
OUTER WEST BREAKWATER
MOTUMAIRE ISLAND
LARGE ROCKS EMBEDDED INTO ROCK ARMOUR LAYER
CD 1.5m
MHWS CD 2.3m
MLWS CD 0.3m
CD -1.3m
CORE
11.2
OUTER WEST BREAKWATER TYPICAL SECTION
SCALE 1:200
MOTUMAIRE ISLAND
ROCK CLUSTERS
MHWS CD 2.3m
MLWS CD 0.3m
OUTER WEST BREAKWATER ELEVATION
SCALE 1:500 HORIZ, 1:500 VERT
MATERIAL LIST
(1) CORE - d50 >200mm (10kg)
d50 >100mm (2kg)
(2) ARMOUR - W50 >850kg
W50 >550kg
W50 >430kg
NORTHLAND REGIONAL COUNCIL
REF: 005454
Plan Number 5053/2
A PRELIMINARY ISSUE 31/08/09
Survey: Williams & King
Design: CNJ
Drawn:
Checked:
Date: 31/08/09
Scale:
CAD File Name: PAWF-00-102.DWG
Job Title.
PAIHIA WATERFRONT DEVELOPMENT
WESTERN BREAKWATER
Far North Holdings Limited
Opua Marine Park
P.O. Box 7
Opua, 0241
Bay Of Islands, New Zealand
Ph. (09) 402 0659
Email: enquiries@fnh.co.nz
Drawing Title.
PLAN & LONG SECTION
Project No. PAWF-00
Rev. A
Sheet No. 102

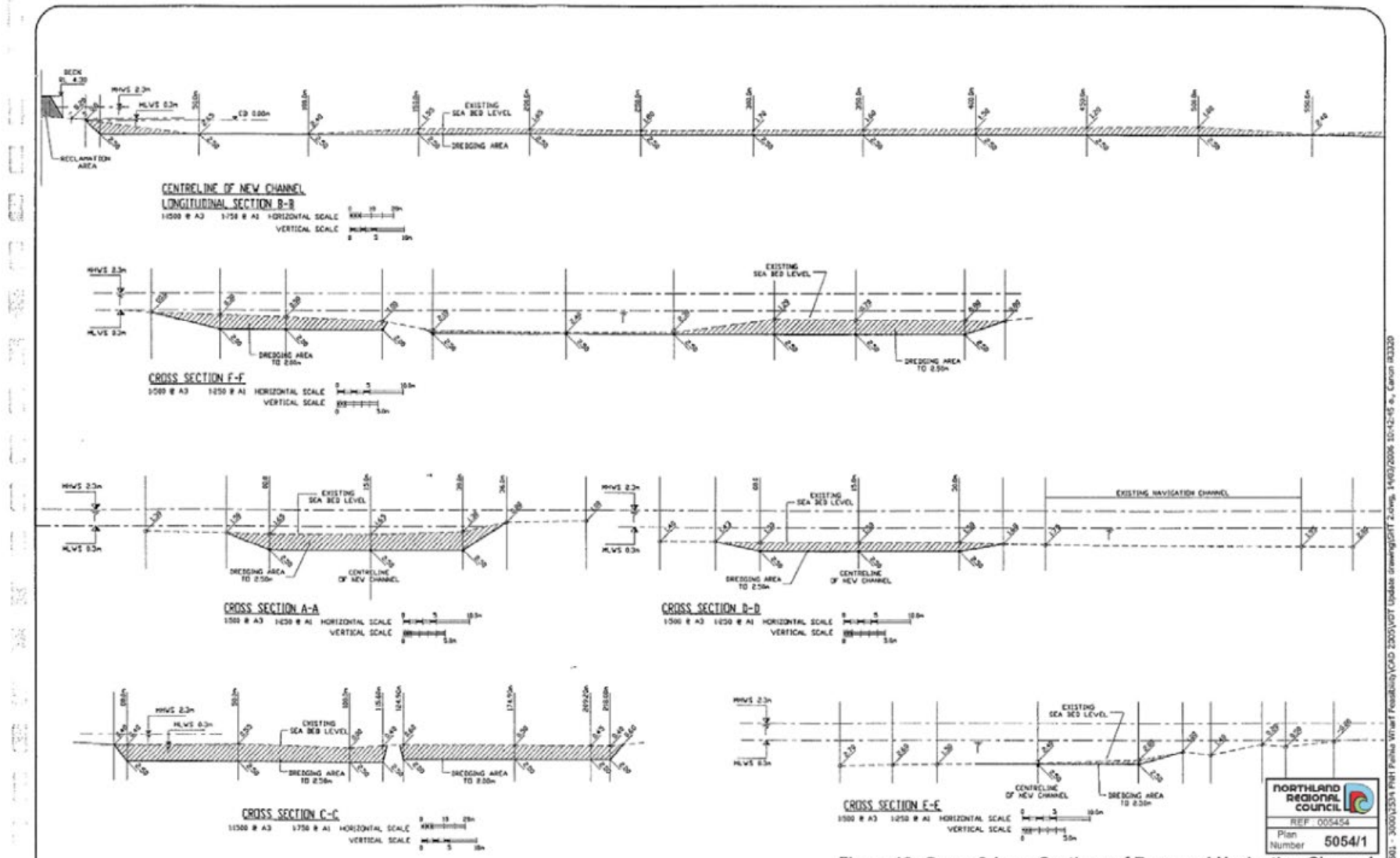


Figure 18: Cross & Long Sections of Proposed Navigation Channel

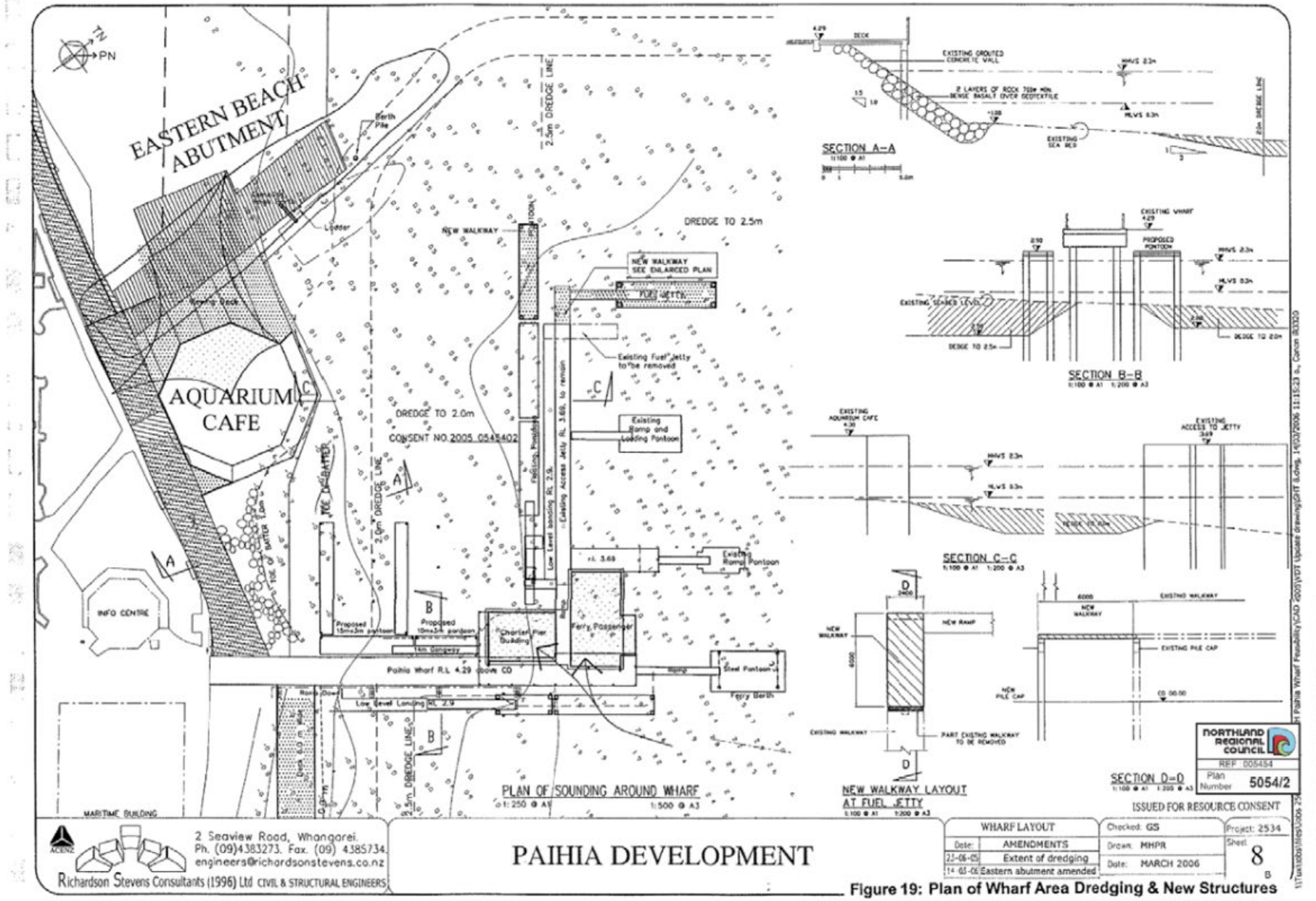
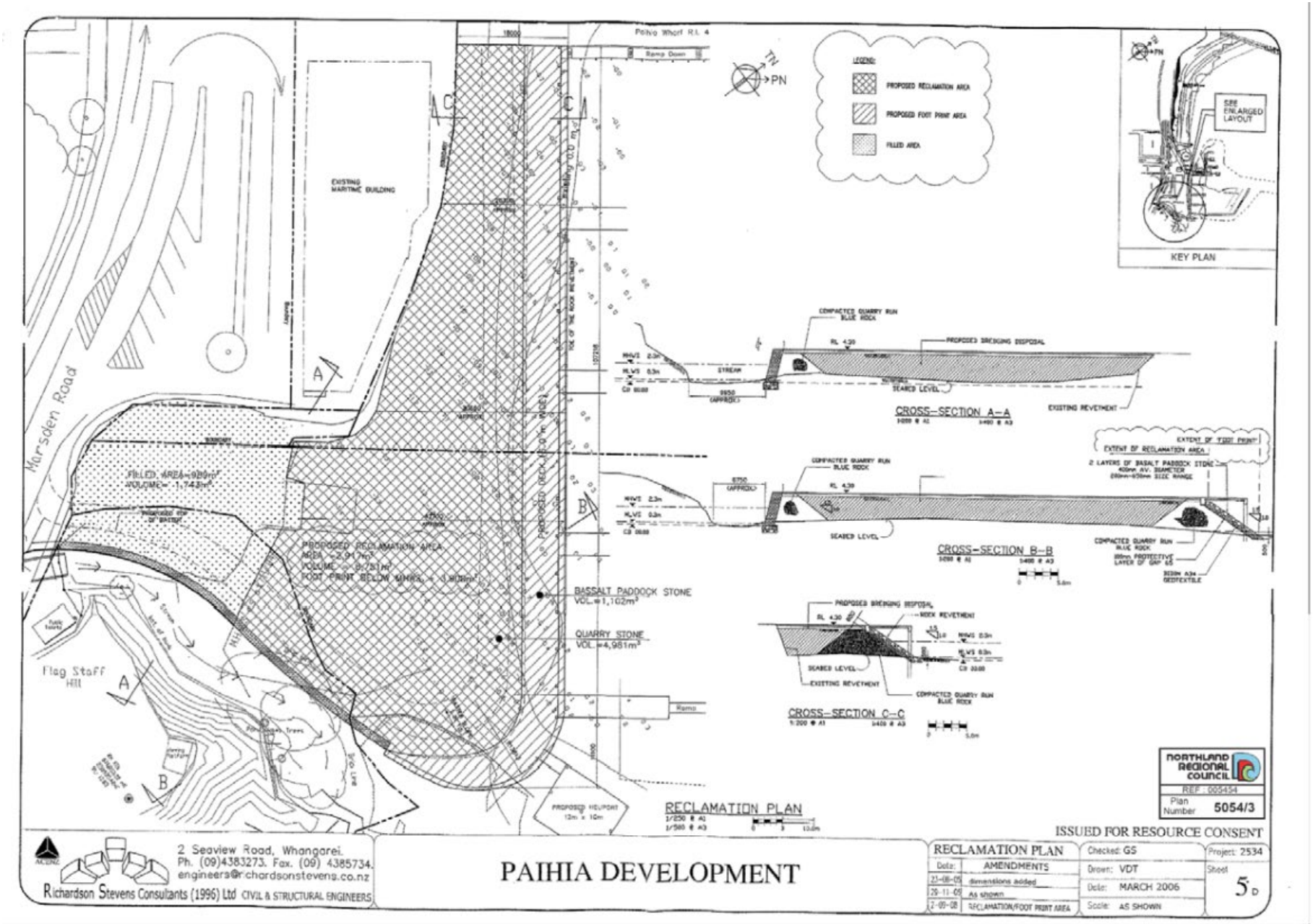


Figure 19: Plan of Wharf Area Dredging & New Structures


Paihia Wharf R.L. 4
Ramp Down
EXISTING MARITIME BUILDING
Marsden Road
FILLED AREA=920m²
VOLUME= 1,748m³
PROPOSED RECLAMATION AREA
AREA =2,941m²
VOLUME = 8,751m³
FOOT PRINT BELOW MHWS = 1,903m²
BASSALT PADDOCK STONE
VOL.=1,102m³
QUARRY STONE
VOL.=4,981m³
Flag Staff Hill
Ramp
PROPOSED HELIPORT 12m x 10m
LEGEND:
PROPOSED RECLAMATION AREA
PROPOSED FOOT PRINT AREA
FILLED AREA
SEE ENLARGED LAYOUT
KEY PLAN
CROSS-SECTION A-A
1:200 @ A1 1:400 @ A3
COMPACTED QUARRY RUN BLUE ROCK
PROPOSED DREDGING DISPOSAL
SEABED LEVEL
EXISTING REVETMENT
CROSS-SECTION B-B
1:200 @ A1 1:400 @ A3
EXTENT OF FOOT PRINT
EXTENT OF RECLAMATION AREA
2 LAYERS OF BASALT PADDOCK STONE
CROSS-SECTION C-C
1:200 @ A1 1:400 @ A3
ROCK REVETMENT
RECLAMATION PLAN
1:250 @ A1
1:500 @ A3
NORTHLAND REGIONAL COUNCIL
REF: 005434
Plan Number 5054/3
ISSUED FOR RESOURCE CONSENT
2 Seaview Road, Whangarei.
Ph. (09)4383273. Fax. (09) 4385734.
engineers@richardsonstevens.co.nz
Richardson Stevens Consultants (1996) Ltd CIVIL & STRUCTURAL ENGINEERS
PAIHIA DEVELOPMENT
RECLAMATION PLAN
Date: AMENDMENTS
21-08-09 dimensions added
26-11-09 As shown
2-09-08 RECLAMATION/FOOT PRINT AREA
Checked: GS
Drawn: VDT
Date: MARCH 2006
Scale: AS SHOWN
Project: 2534
Sheet 5 D

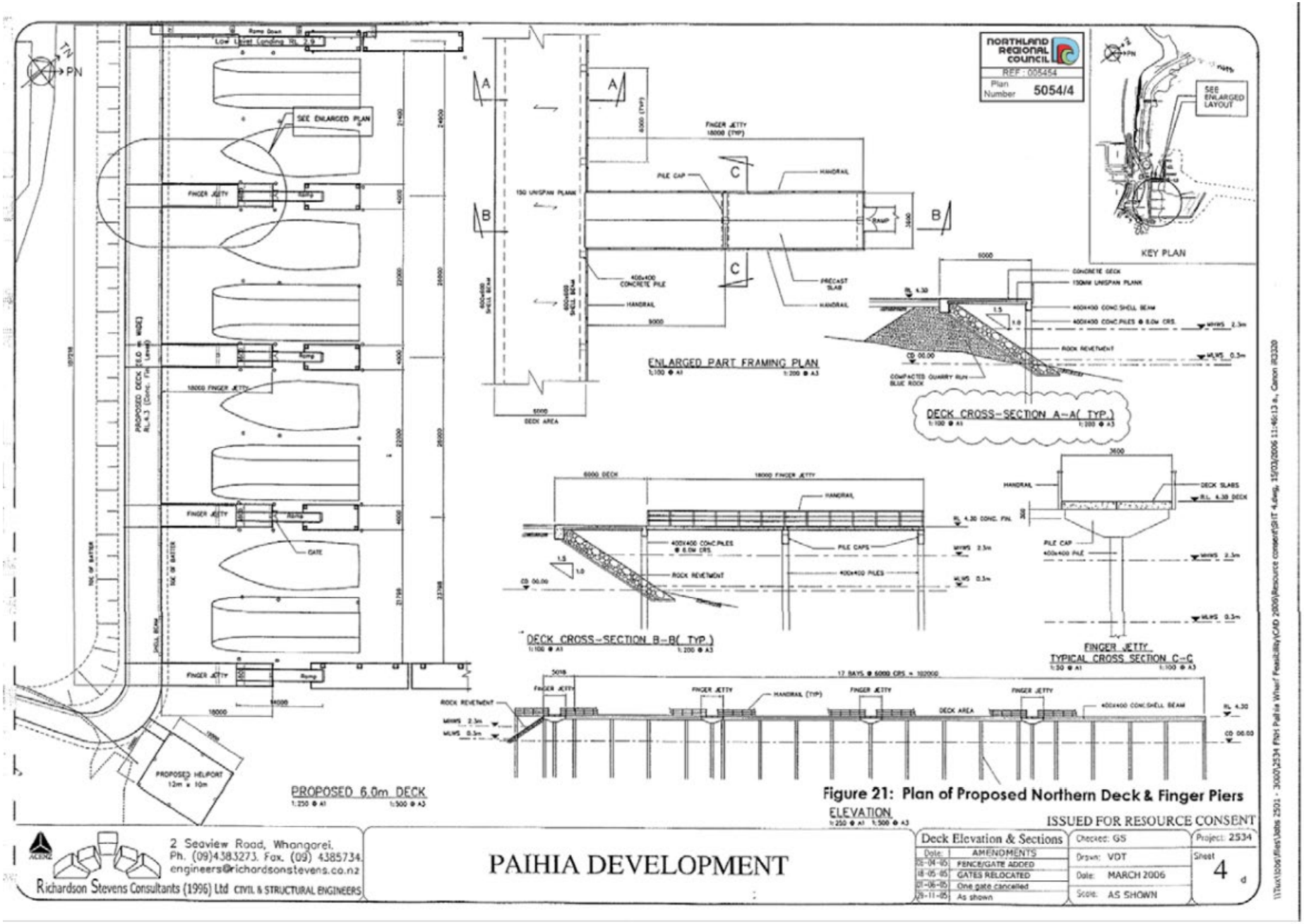
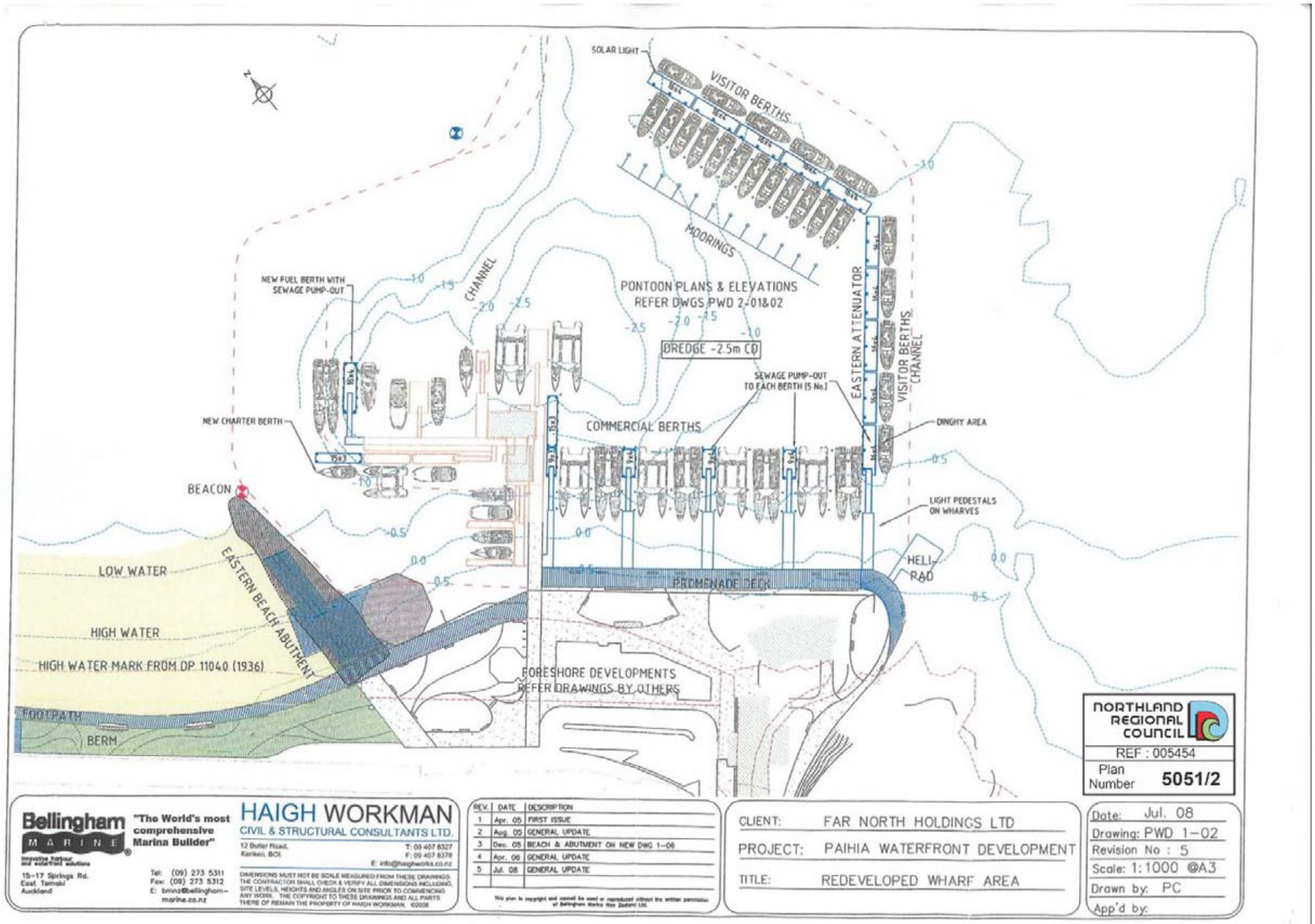


Figure 21: Plan of Proposed Northern Deck & Finger Piers


SOLAR LIGHT
VISITOR BERTHS
MOORINGS
CHANNEL
NEW FUEL BERTH WITH SEWAGE PUMP-OUT
PONTOON PLANS & ELEVATIONS REFER DWGS PWD 2-01&02
DREDGE -2.5m CD
EASTERN ATTENUATOR
VISITOR BERTHS CHANNEL
SEWAGE PUMP-OUT TO EACH BERTH (5 No.)
NEW CHARTER BERTH
COMMERCIAL BERTHS
DINGHY AREA
BEACON
LIGHT PEDESTALS ON WHARVES
HELI PAD
PROMENADE DECK
LOW WATER
EASTERN BEACH ABUTMENT
HIGH WATER
HIGH WATER MARK FROM DP 11040 (1936)
FORESHORE DEVELOPMENTS REFER DRAWINGS BY OTHERS
FOOTPATH
BERM
NORTHLAND REGIONAL COUNCIL
REF : 005454
Plan Number 5051/2
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"The World's most comprehensive Marina Builder"
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Tel: (09) 273 5311
Fax: (09) 273 5312
E: bmnz@bellingham-marine.co.nz
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REV. DATE DESCRIPTION
1 Apr. 05 FIRST ISSUE
2 Aug. 05 GENERAL UPDATE
3 Dec. 05 BEACH & ABUTMENT ON NEW DWG 1-06
4 Apr. 06 GENERAL UPDATE
5 Jul. 08 GENERAL UPDATE
This plan is copyright and cannot be used or reproduced without the written permission of Bellingham Marine New Zealand Ltd.
CLIENT: FAR NORTH HOLDINGS LTD
PROJECT: PAIHIA WATERFRONT DEVELOPMENT
TITLE: REDEVELOPED WHARF AREA
Date: Jul. 08
Drawing: PWD 1-02
Revision No : 5
Scale: 1:1000 @A3
Drawn by: PC
App'd by:

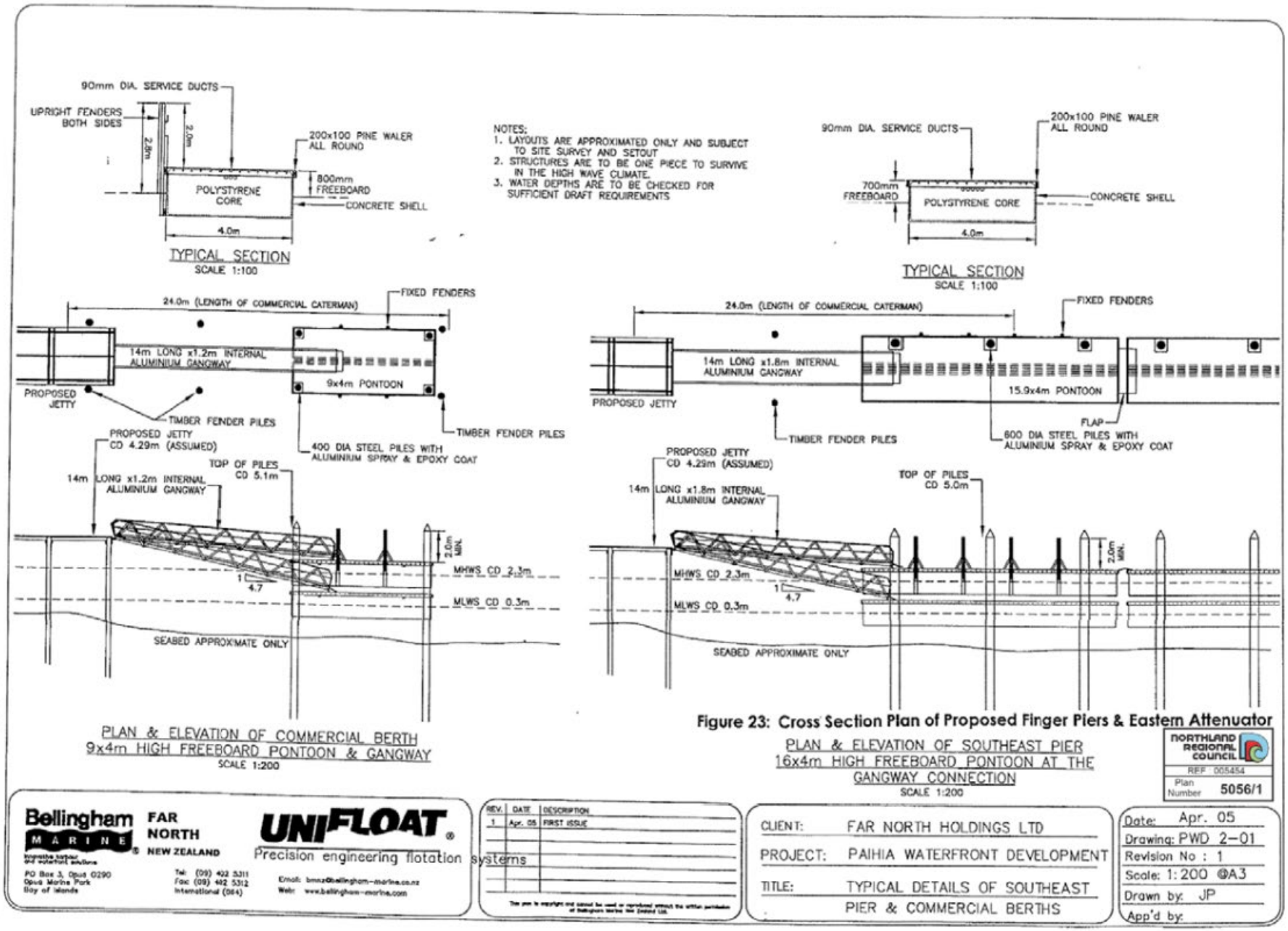


Figure 23: Cross Section Plan of Proposed Finger Piers & Eastern Attenuator

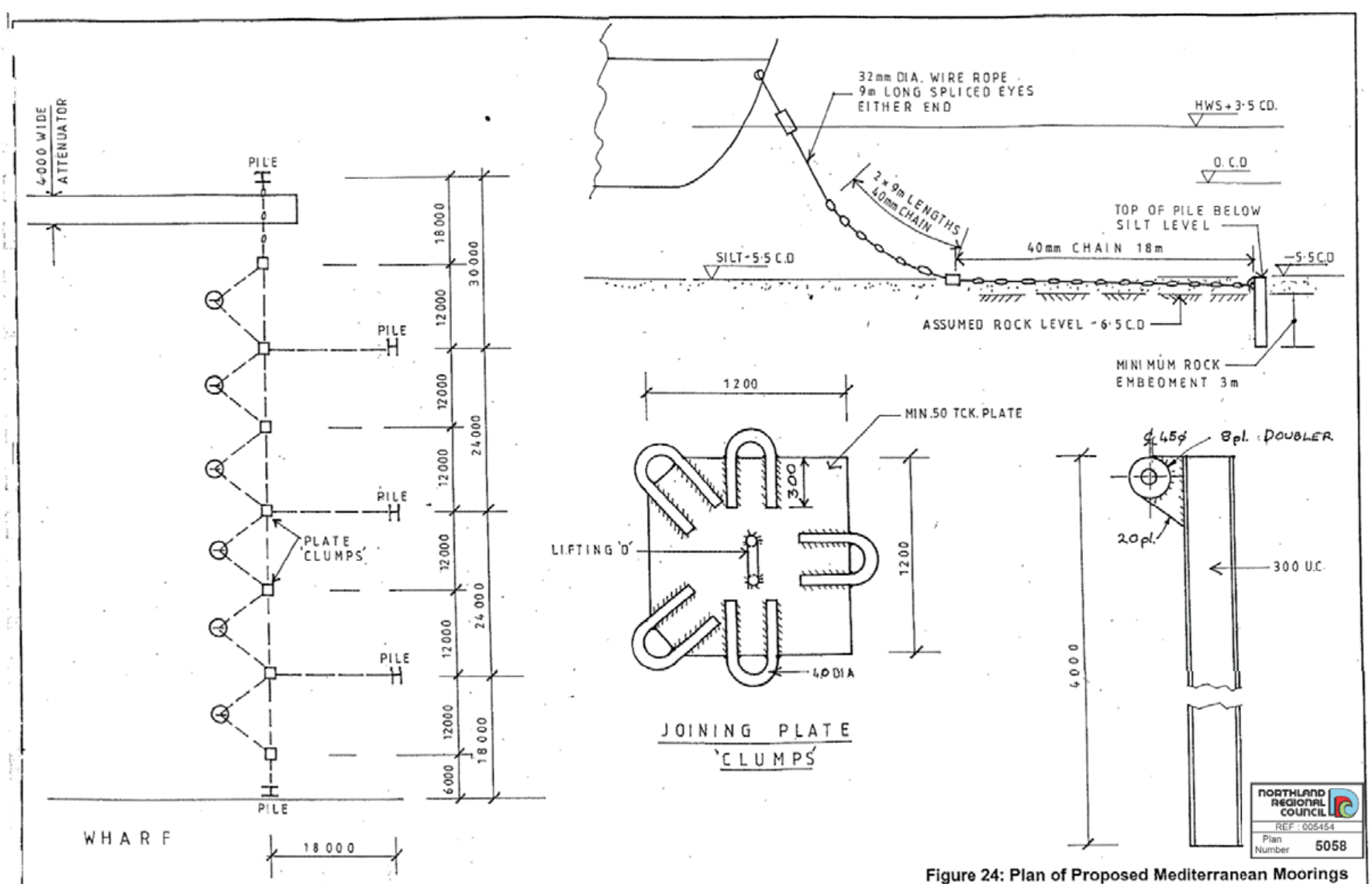


Figure 24: Plan of Proposed Mediterranean Moorings

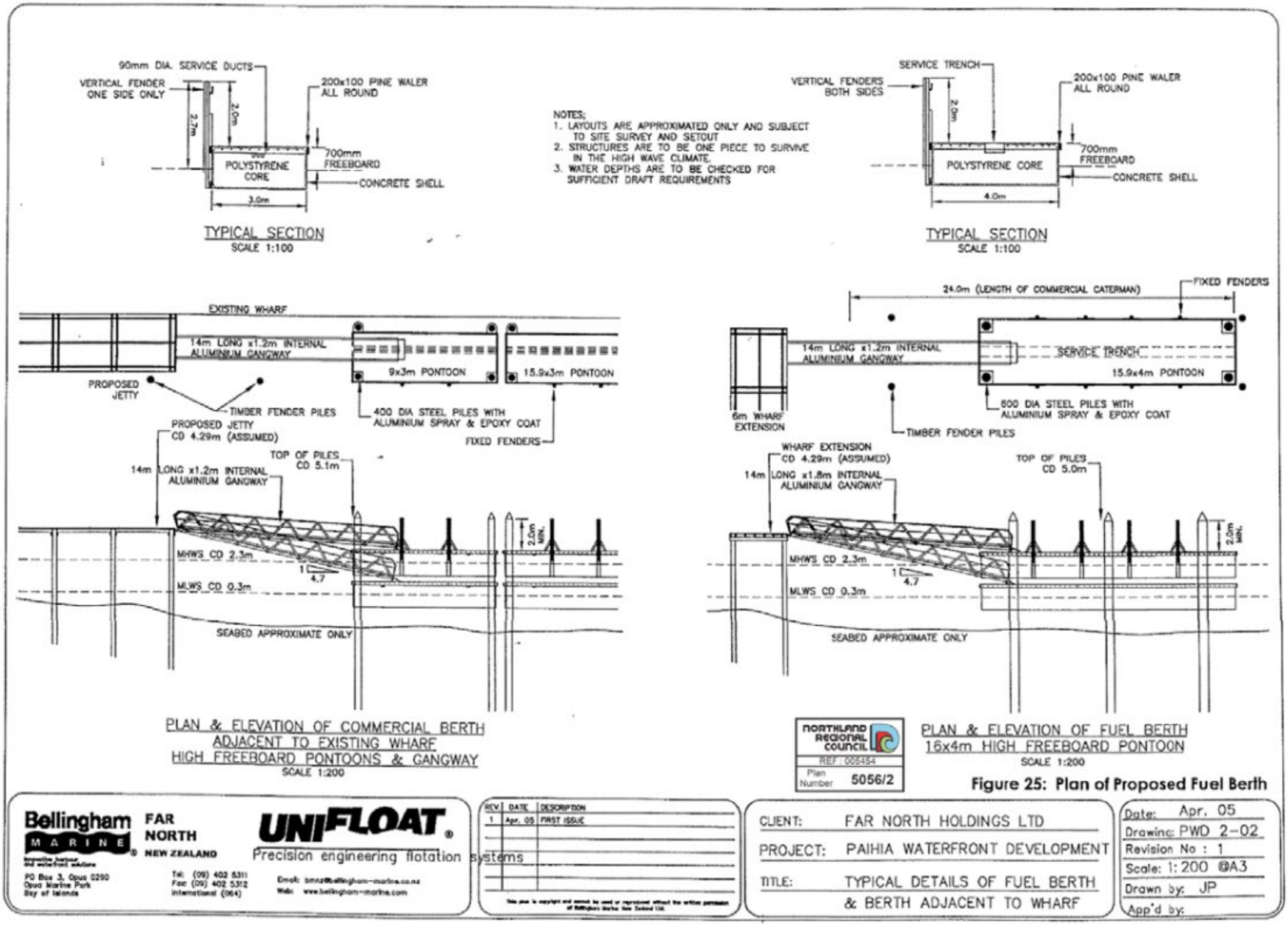
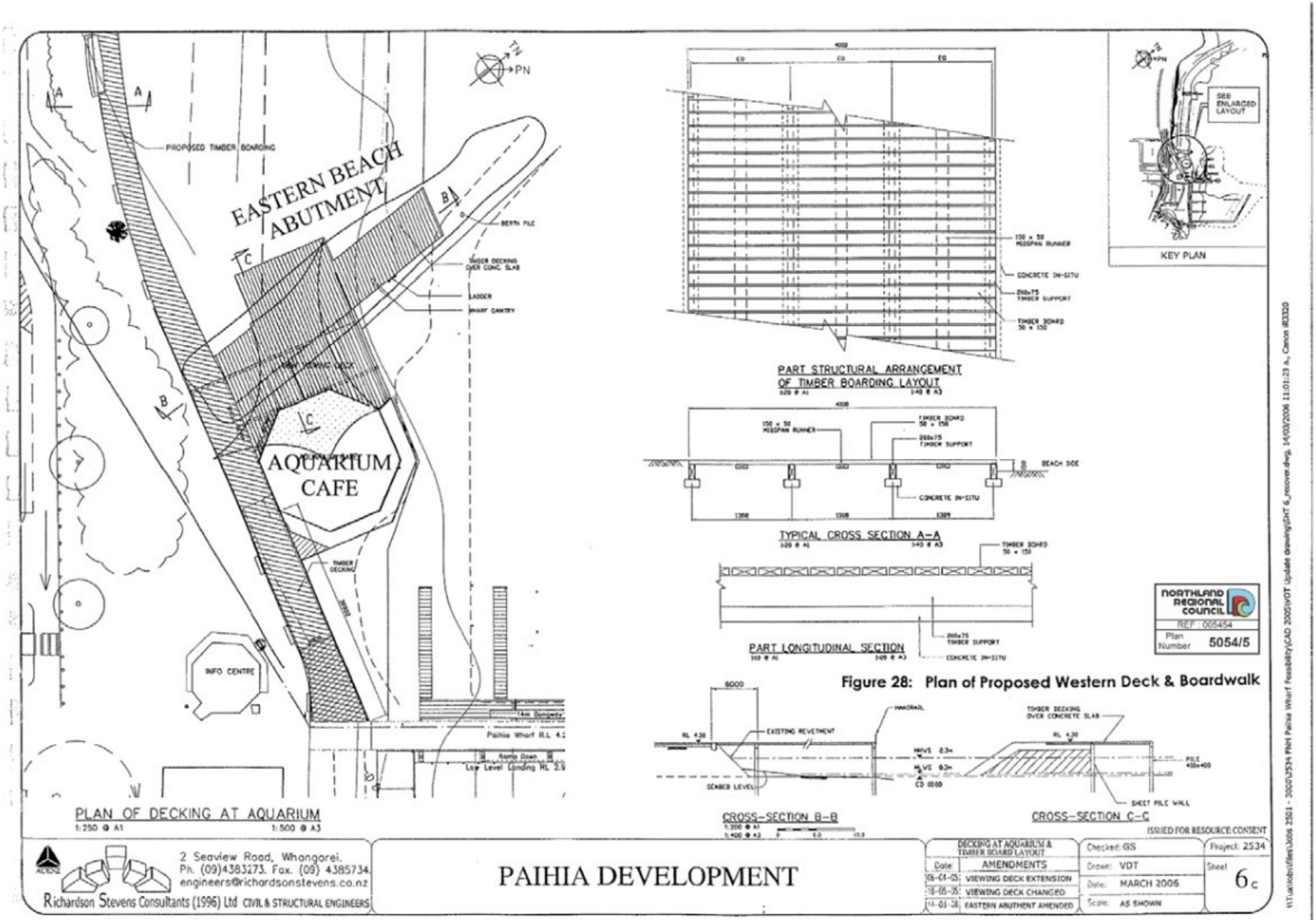


Figure 25: Plan of Proposed Fuel Berth


EASTERN BEACH ABUTMENT
PROPOSED TIMBER BOARDING
AQUARIUM CAFE
INFO CENTRE
PLAN OF DECKING AT AQUARIUM
1:250 @ A1 1:500 @ A3
PART STRUCTURAL ARRANGEMENT OF TIMBER BOARDING LAYOUT
TYPICAL CROSS SECTION A–A
PART LONGITUDINAL SECTION
CROSS-SECTION B–B
CROSS-SECTION C–C
KEY PLAN
SEE ENLARGED LAYOUT
NORTHLAND REGIONAL COUNCIL
REF: 005454
Plan Number 5054/5
Figure 28: Plan of Proposed Western Deck & Boardwalk
ISSUED FOR RESOURCE CONSENT
2 Seaview Road, Whangarei.
Ph. (09)4383273. Fax. (09) 4385734.
engineers@richardsonstevens.co.nz
Richardson Stevens Consultants (1996) Ltd CIVIL & STRUCTURAL ENGINEERS
PAIHIA DEVELOPMENT
DECKING AT AQUARIUM & TIMBER BOARD LAYOUT
Date: AMENDMENTS
05-04-25: VIEWING DECK EXTENSION
18-05-25: VIEWING DECK CHANGED
14-08-26: EASTERN ARUTMENT AMENDED
Checked: GS
Drawn: VDT
Date: MARCH 2006
Scale: AS SHOWN
Project: 2534
Sheet 6c

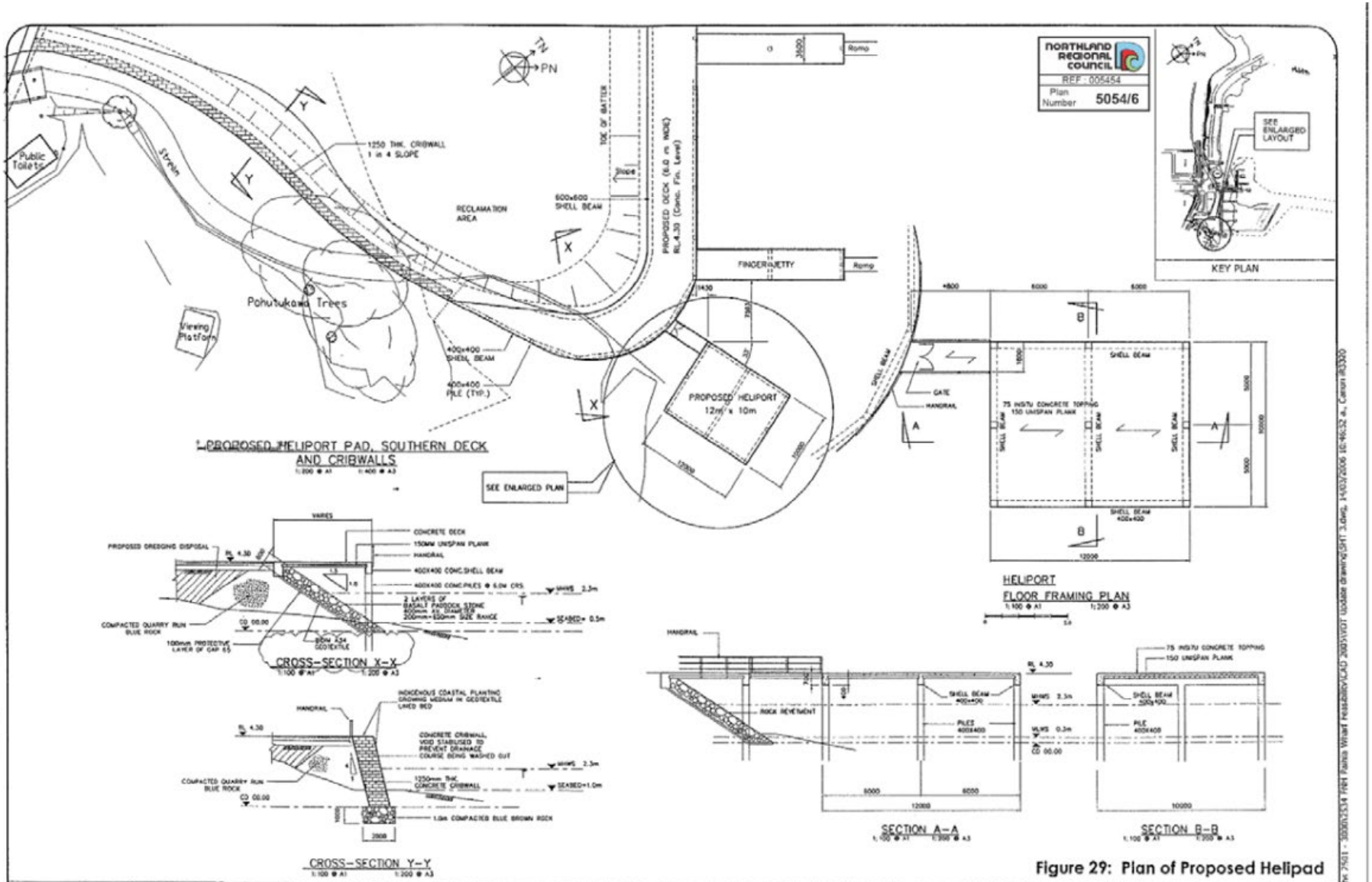


Figure 29: Plan of Proposed Helipad

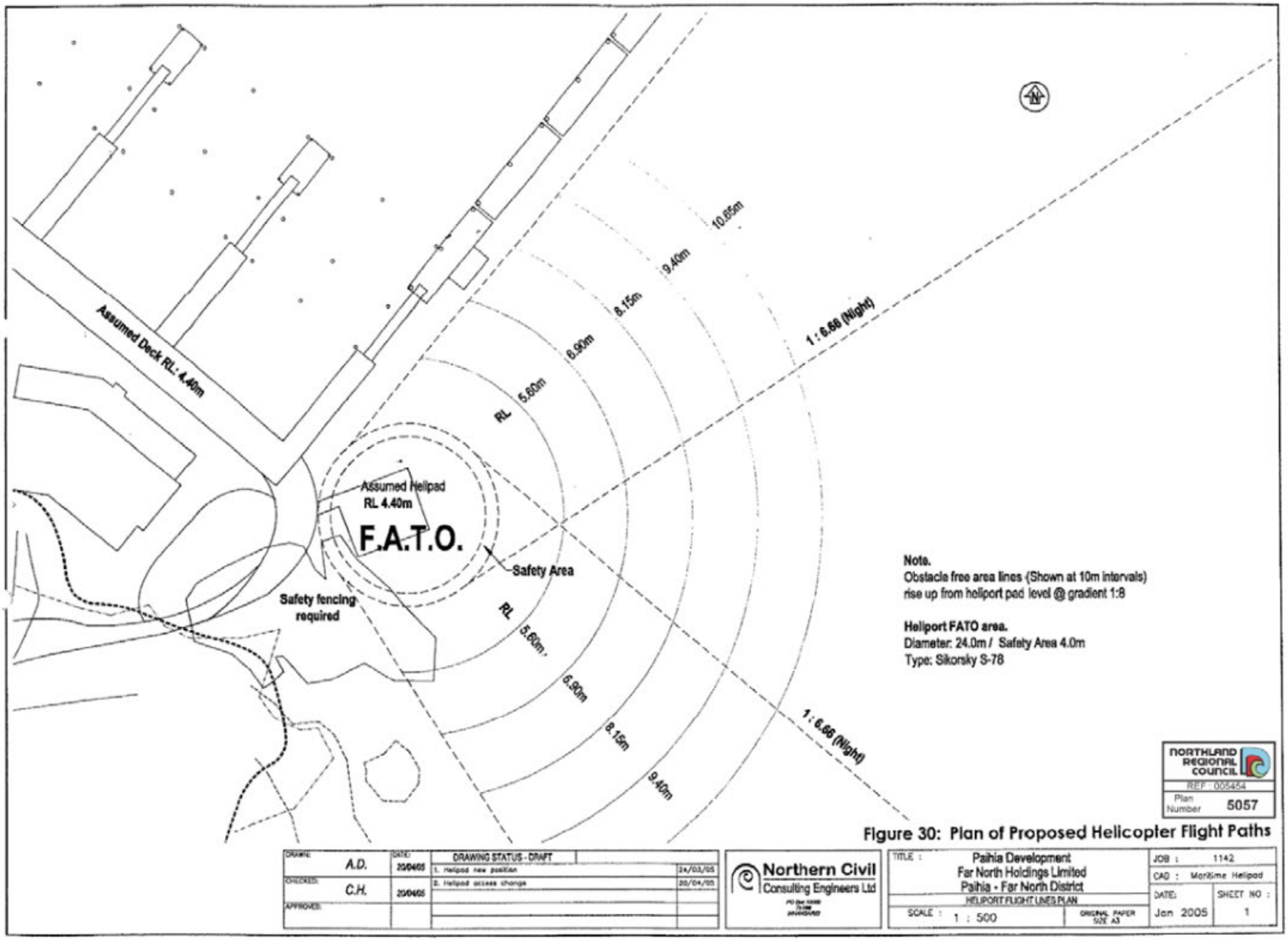


Figure 30: Plan of Proposed Helicopter Flight Paths

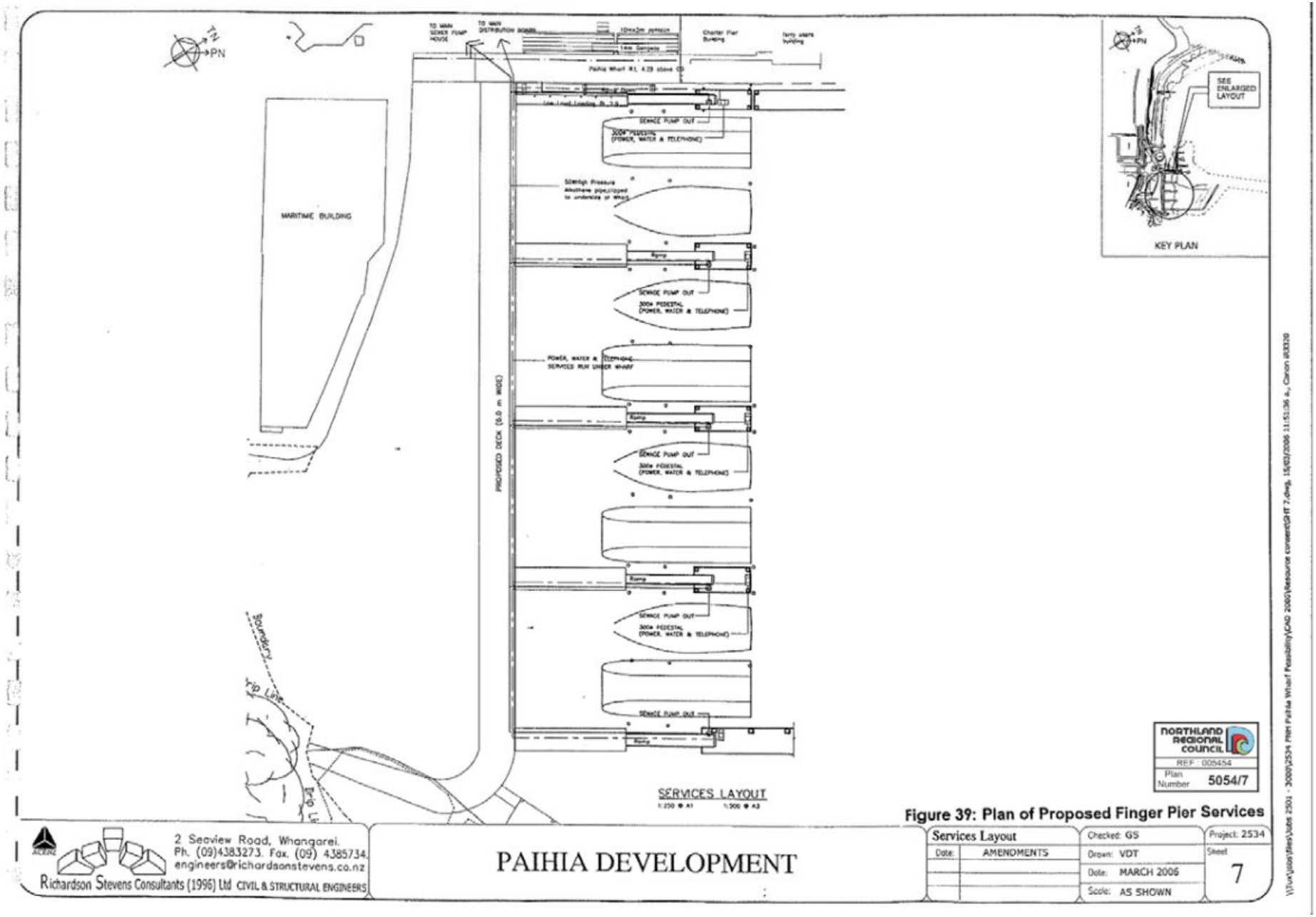


Figure 39: Plan of Proposed Finger Pier Services

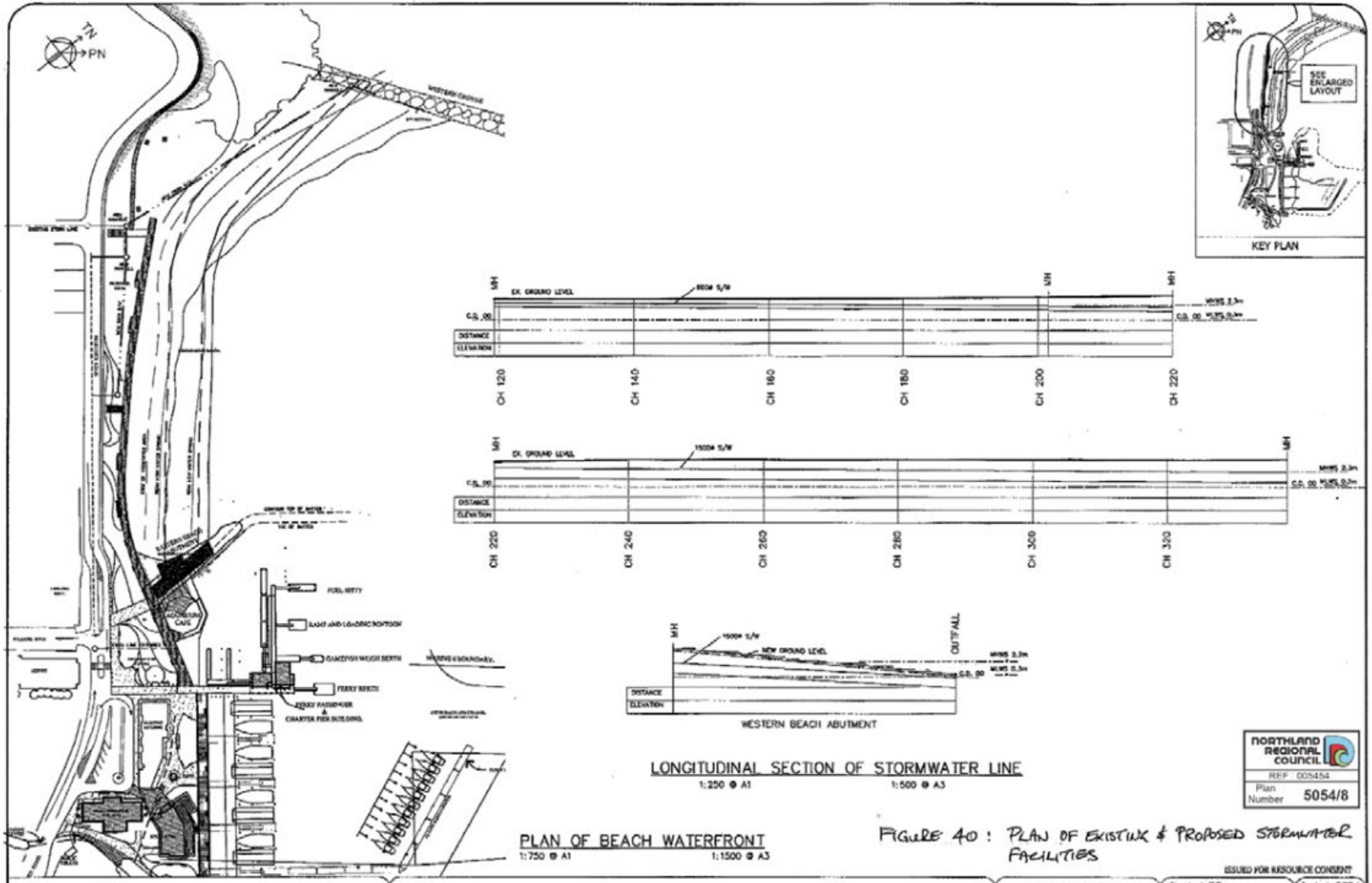
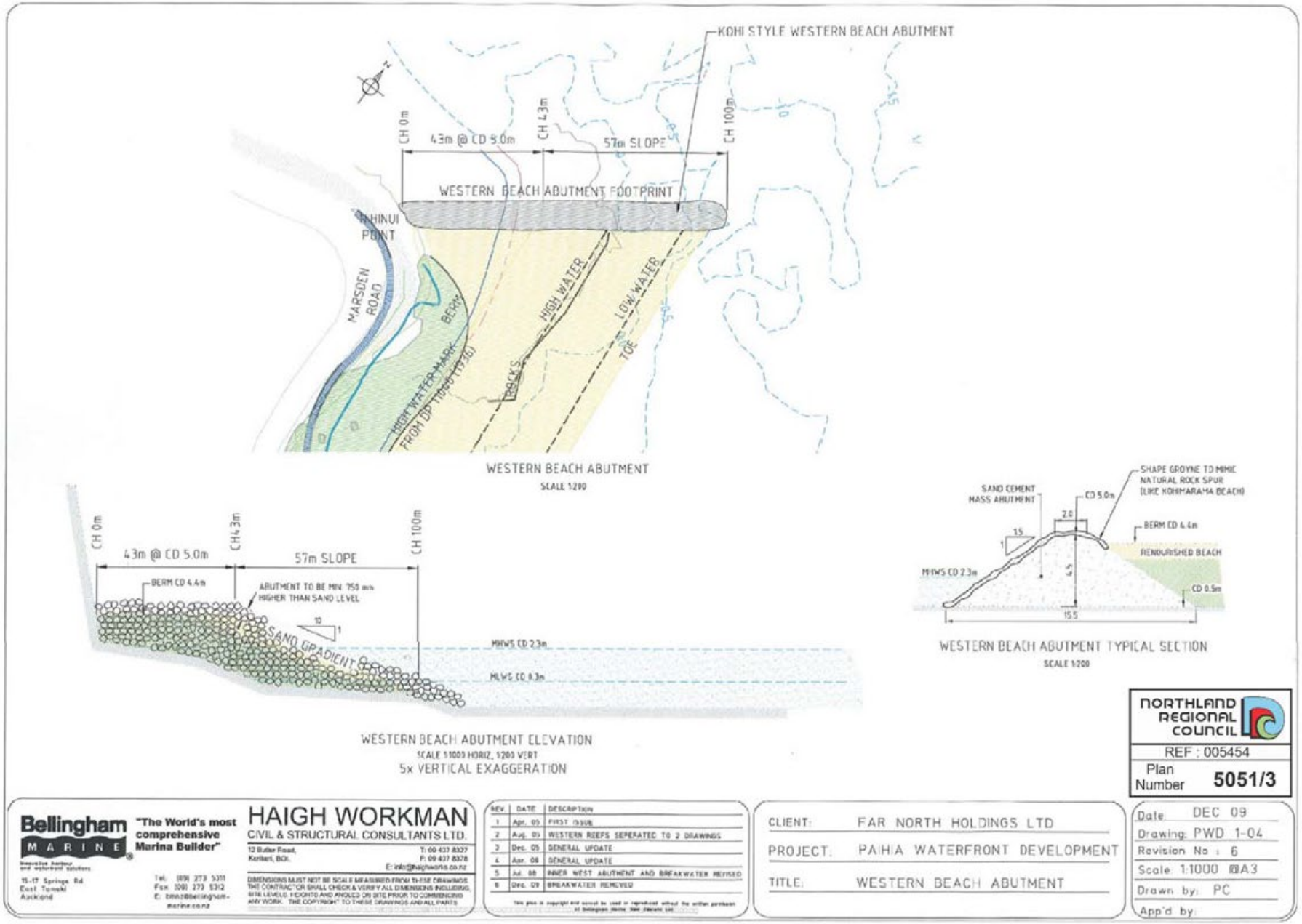


FIGURE 40 : PLAN OF EXISTING & PROPOSED STORMWATER FACILITIES


KOHI STYLE WESTERN BEACH ABUTMENT
CH 0m
43m @ CD 5.0m
CH 43m
57m SLOPE
CH 100m
WESTERN BEACH ABUTMENT FOOTPRINT
TAHINUI POINT
MARSDEN ROAD
BERM
HIGH WATER
LOW WATER
TOE
HIGH WATER MARK FROM DP 110801 (1950)
WESTERN BEACH ABUTMENT
SCALE 1:200
CH 0m
43m @ CD 5.0m
CH 43m
57m SLOPE
CH 100m
BERM CD 4.4m
ABUTMENT TO BE MIN 750 mm HIGHER THAN SAND LEVEL
10
1
SAND GRADIENT
MHWS CD 2.3m
MLWS CD 0.3m
WESTERN BEACH ABUTMENT ELEVATION
SCALE 1:1000 HORIZ, 1:200 VERT
5x VERTICAL EXAGGERATION
SAND CEMENT MASS ABUTMENT
CD 5.0m
2.0
SHAPE GROYNE TO MIMIC NATURAL ROCK SPUR (LIKE KOHIMARAMA BEACH)
BERM CD 4.4m
1.5
1
RENOURISHED BEACH
MHWS CD 2.3m
4.5
CD 0.5m
15.5
WESTERN BEACH ABUTMENT TYPICAL SECTION
SCALE 1:200
NORTHLAND REGIONAL COUNCIL
REF : 005454
Plan Number 5051/3
Bellingham MARINE
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East Tamaki
Auckland
HAIGH WORKMAN
CIVIL & STRUCTURAL CONSULTANTS LTD.
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REV | DATE | DESCRIPTION
1 | Apr. 05 | FIRST ISSUE
2 | Aug. 05 | WESTERN REEFS SEPERATED TO 2 DRAWINGS
3 | Dec. 05 | GENERAL UPDATE
4 | Apr. 08 | GENERAL UPDATE
5 | Jul. 08 | INNER WEST ABUTMENT AND BREAKWATER REVISED
6 | Dec. 09 | BREAKWATER REMOVED
CLIENT: FAR NORTH HOLDINGS LTD
PROJECT: PAIHIA WATERFRONT DEVELOPMENT
TITLE: WESTERN BEACH ABUTMENT
Date DEC 09
Drawing PWD 1-04
Revision No : 6
Scale 1:1000 @A3
Drawn by: PC
App'd by:

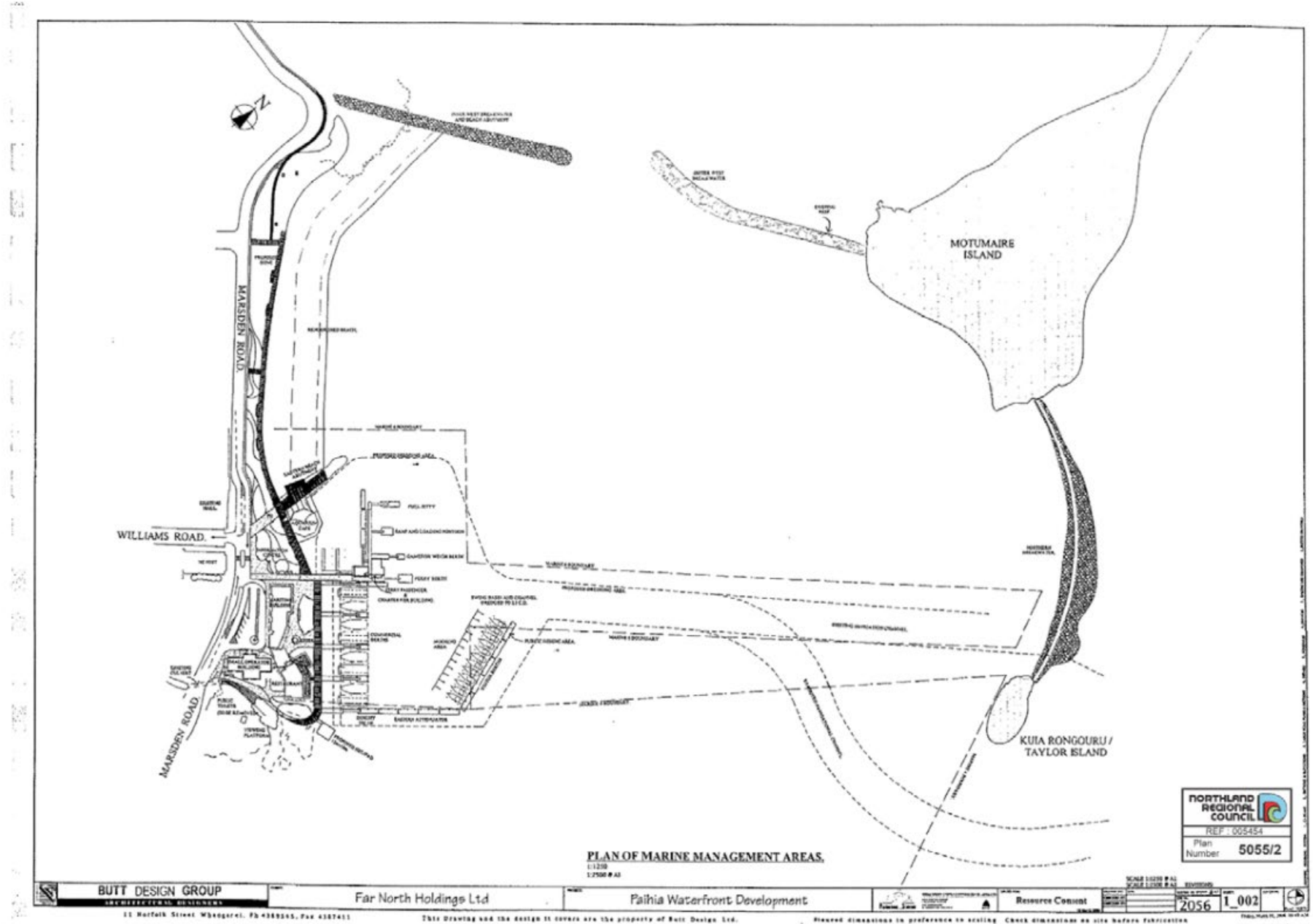


Figure 46: Plan of Management Area Boundaries & Proposed Facilities

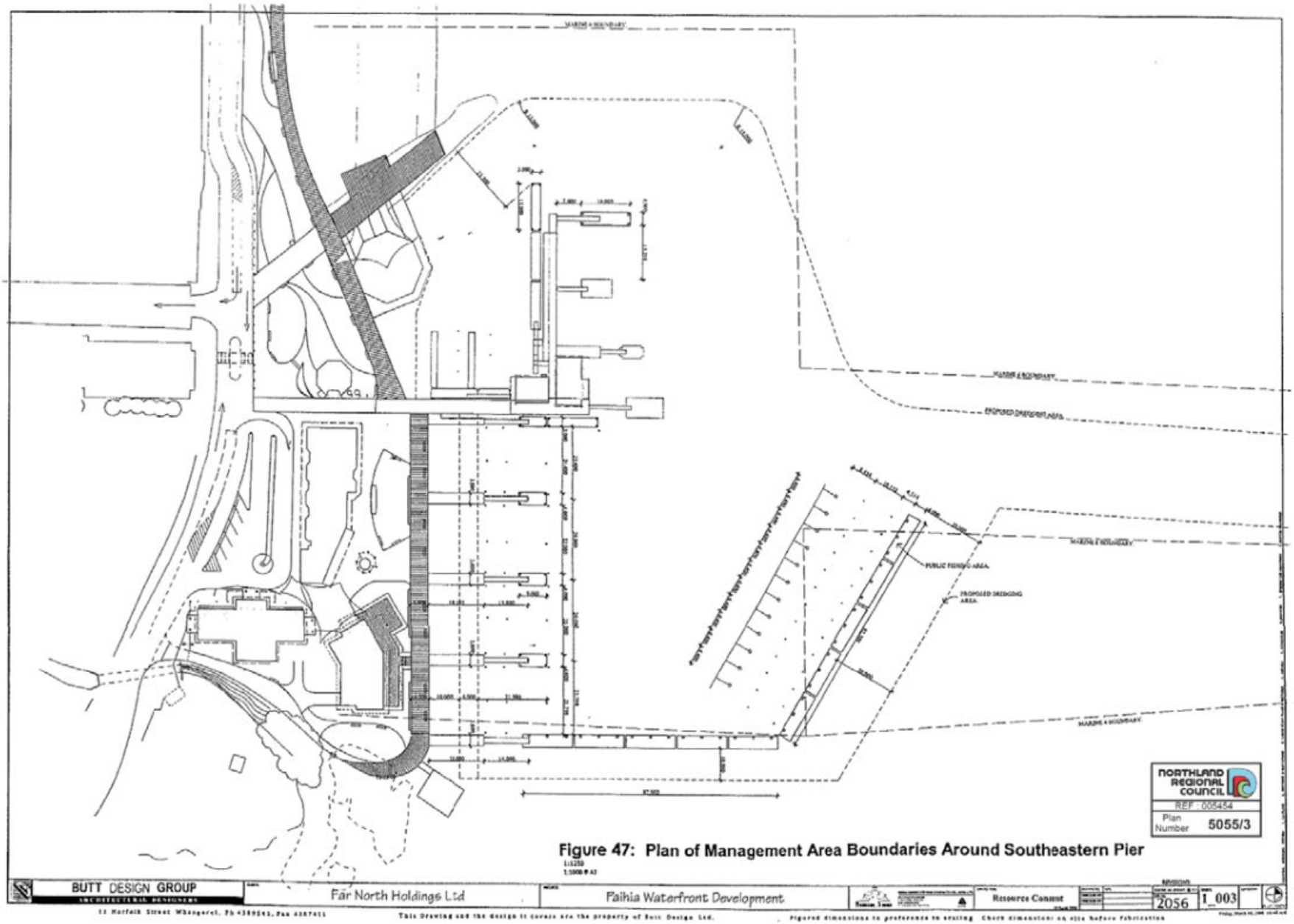
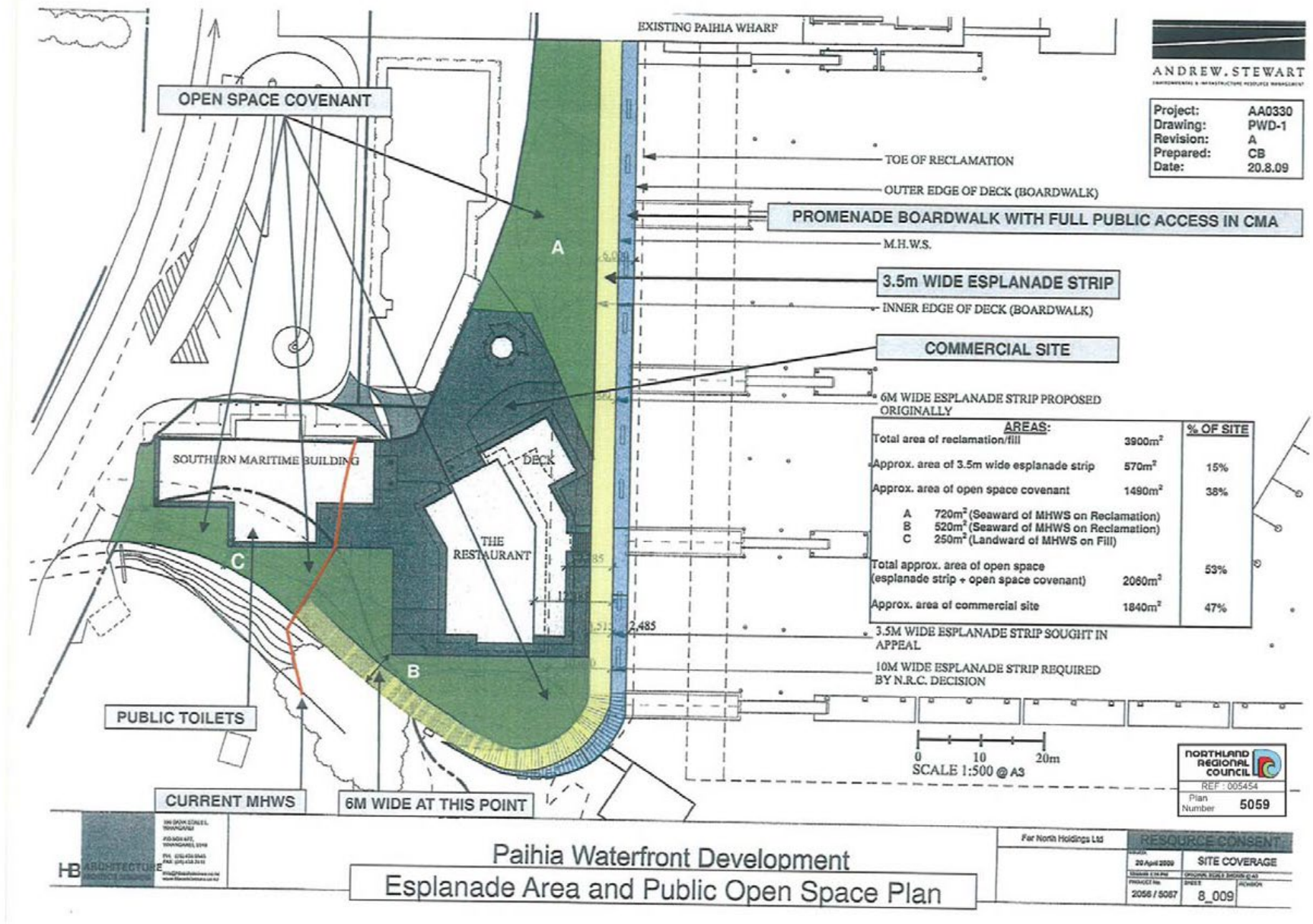
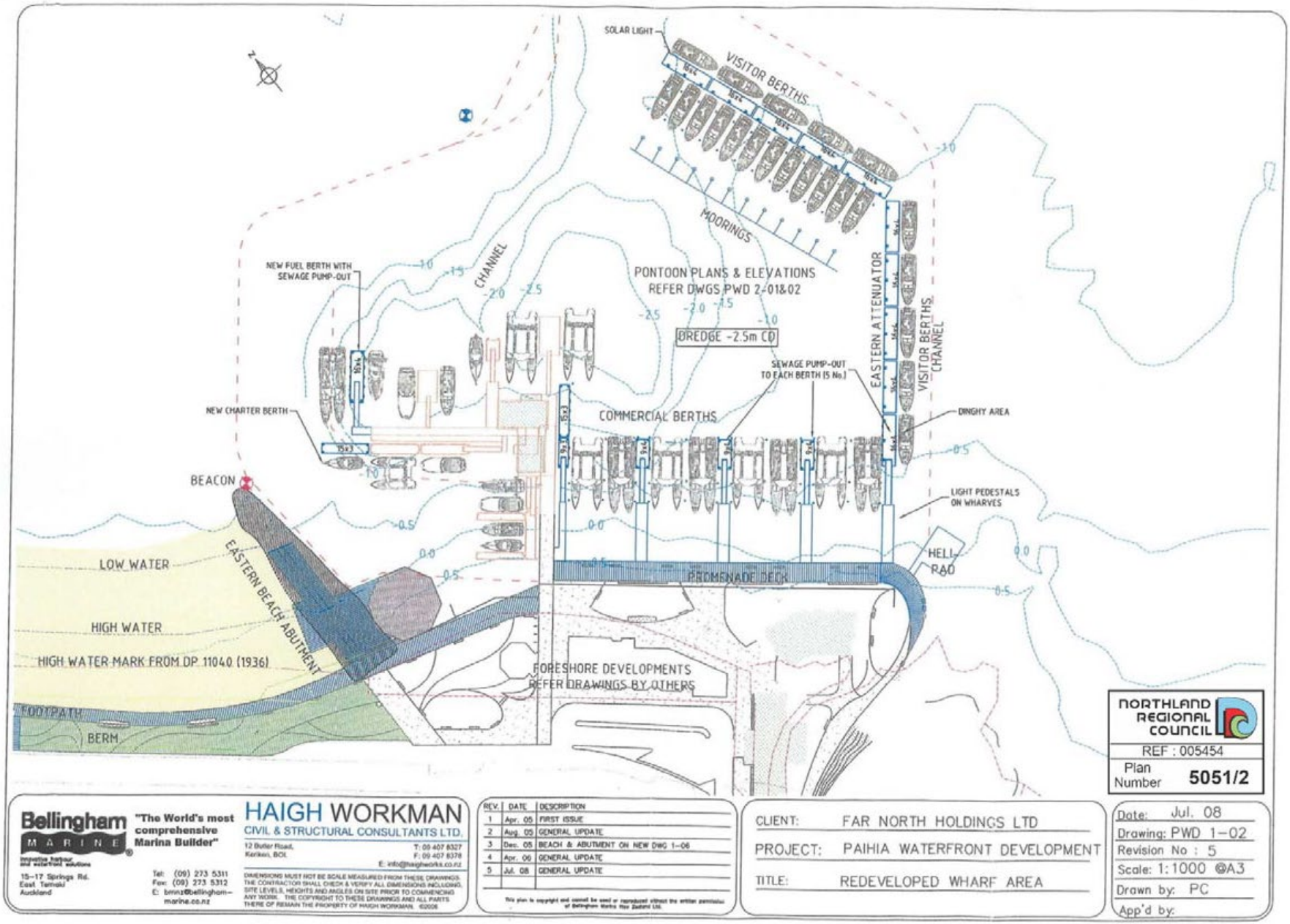


Figure 47: Plan of Management Area Boundaries Around Southeastern Pier


EXISTING PAIHIA WHARF
ANDREW. STEWART
Project: AA0330
Drawing: PWD-1
Revision: A
Prepared: CB
Date: 20.8.09
OPEN SPACE COVENANT
TOE OF RECLAMATION
OUTER EDGE OF DECK (BOARDWALK)
PROMENADE BOARDWALK WITH FULL PUBLIC ACCESS IN CMA
M.H.W.S.
3.5m WIDE ESPLANADE STRIP
INNER EDGE OF DECK (BOARDWALK)
COMMERCIAL SITE
6M WIDE ESPLANADE STRIP PROPOSED ORIGINALLY
A
B
C
SOUTHERN MARITIME BUILDING
DECK
THE RESTAURANT
AREAS:
% OF SITE
Total area of reclamation/fill 3900m²
Approx. area of 3.5m wide esplanade strip 570m² 15%
Approx. area of open space covenant 1490m² 38%
A 720m² (Seaward of MHWS on Reclamation)
B 520m² (Seaward of MHWS on Reclamation)
C 250m² (Landward of MHWS on Fill)
Total approx. area of open space (esplanade strip + open space covenant) 2060m² 53%
Approx. area of commercial site 1840m² 47%
2,485
3.5M WIDE ESPLANADE STRIP SOUGHT IN APPEAL
10M WIDE ESPLANADE STRIP REQUIRED BY N.R.C. DECISION
PUBLIC TOILETS
CURRENT MHWS
6M WIDE AT THIS POINT
0 10 20m
SCALE 1:500 @ A3
NORTHLAND REGIONAL COUNCIL
REF : 005454
Plan Number 5059
HB ARCHITECTURE
Far North Holdings Ltd
RESOURCE CONSENT
20 April 2009
SITE COVERAGE
2056 / 5057
8_009
Paihia Waterfront Development
Esplanade Area and Public Open Space Plan



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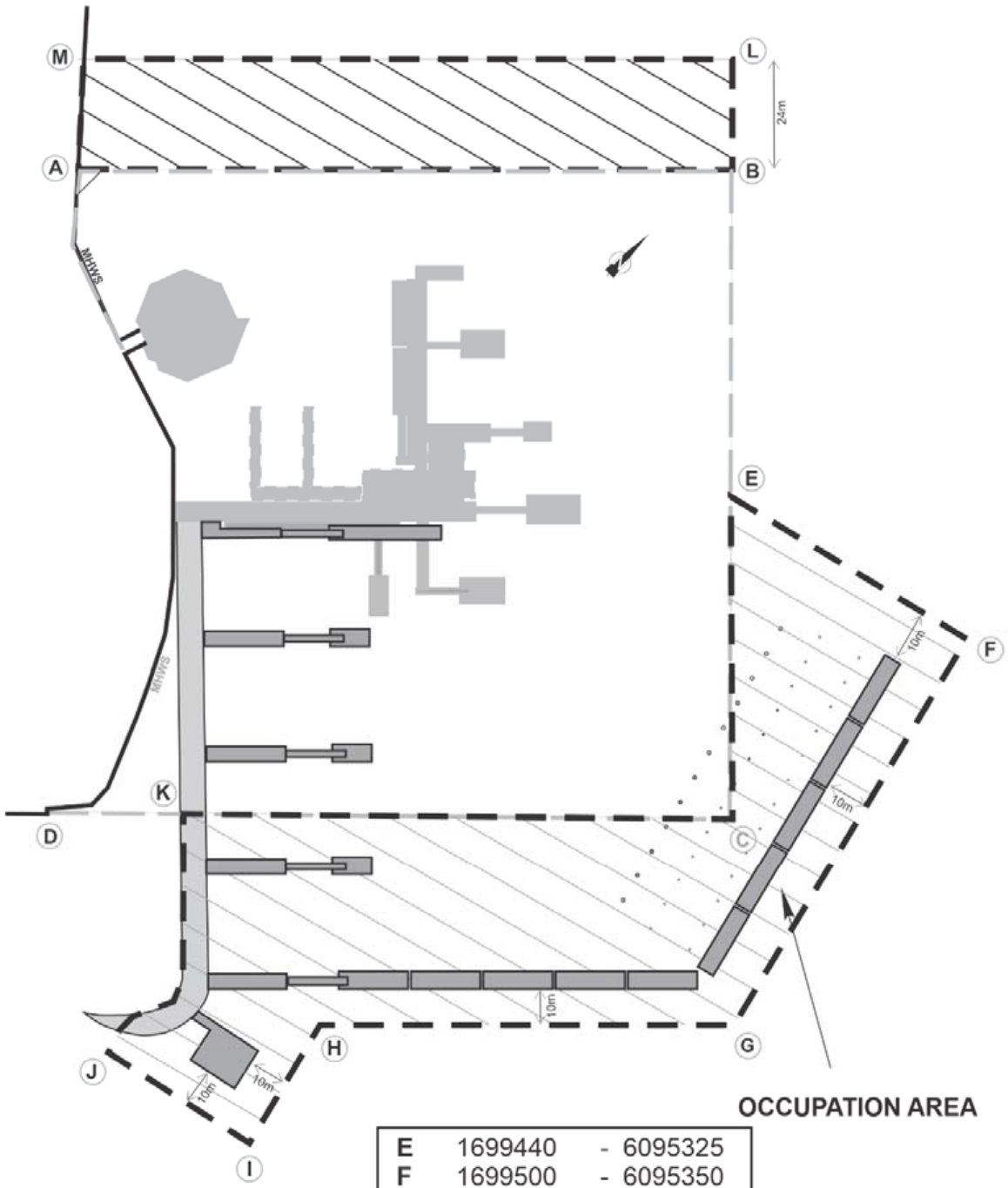
REV.	DATE	DESCRIPTION
1	Apr. 05	FIRST ISSUE
2	Aug. 05	GENERAL UPDATE
3	Dec. 05	BEACH & ABUTMENT ON NEW DWG 1–06
4	Apr. 06	GENERAL UPDATE
5	Jul. 08	GENERAL UPDATE

CLIENT: FAR NORTH HOLDINGS LTD
PROJECT: PAIHIA WATERFRONT DEVELOPMENT
TITLE: REDEVELOPED WHARF AREA

Date: Jul. 08
Drawing: PWD 1–02
Revision No : 5
Scale: 1:1000 @A3
Drawn by: PC
App'd by:



Boundary Co-ordinates (NZTM)

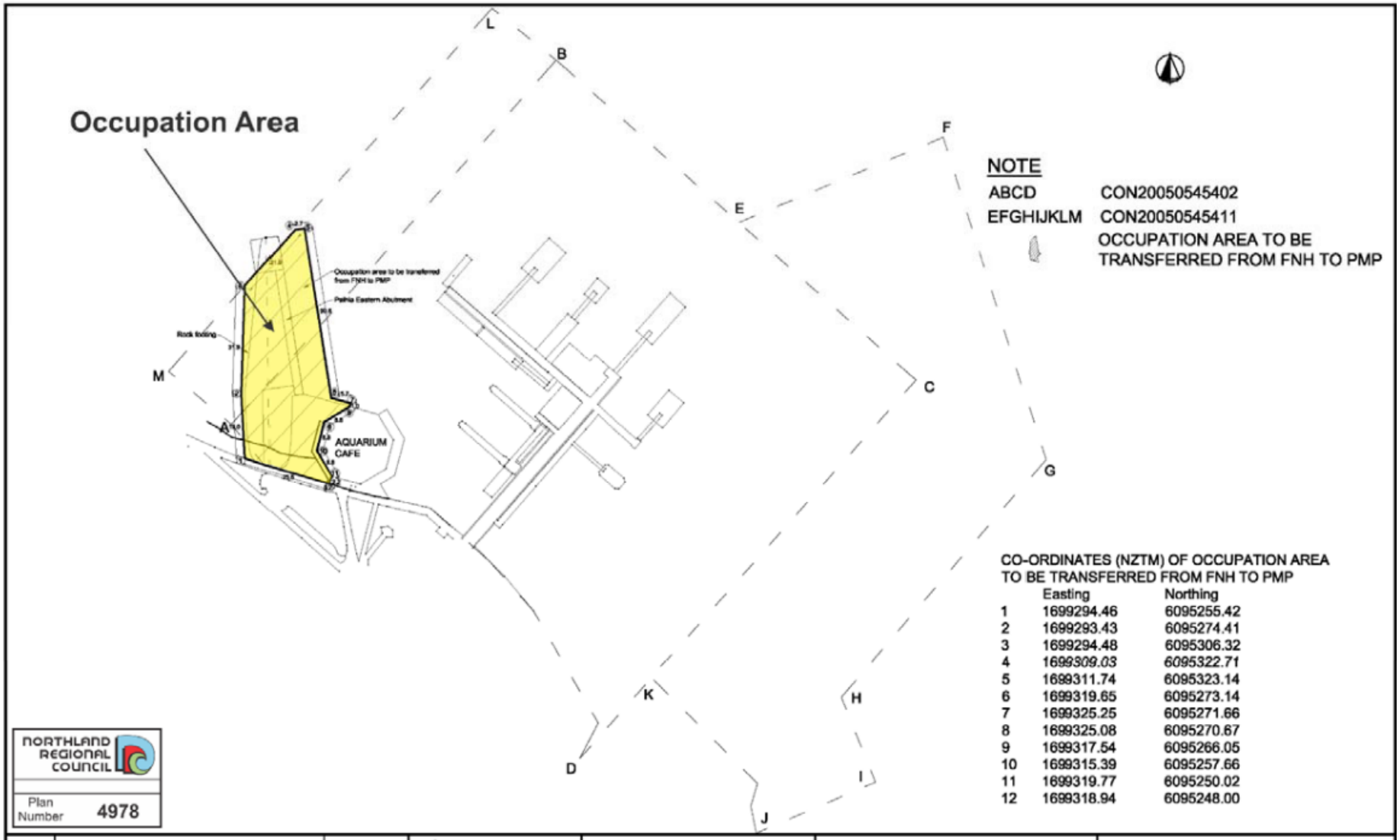
	Easting		Northing
A	1699290.50	-	6095265.40
B	1699385.92	-	6095372.74
C	1699491.96	-	6095278.47
D	1699392.84	-	6095166.97

E	1699440	-	6095325
F	1699500	-	6095350
G	1699530	-	6095255
H	1699470	-	6095185
I	1699480	-	6095160
J	1699445	-	6095145
K	1699415	-	6095190
L	1699367	-	6095388
M	1699272	-	6095281

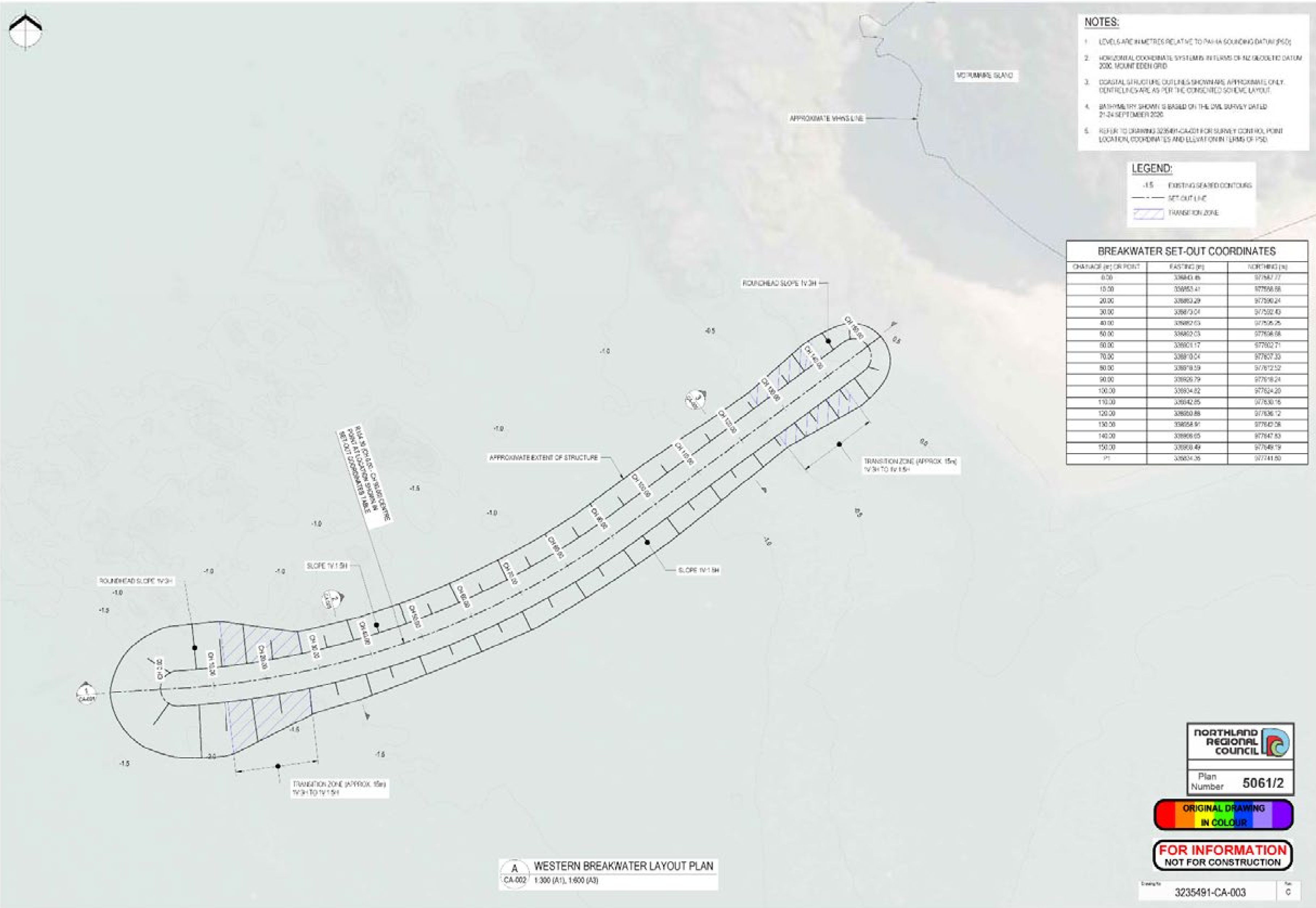
NORTHLAND REGIONAL COUNCIL

Far North Holdings Ltd
Paihia Wharf Redevelopment
Occupation Area

Scale: N.T.S.
Drawn: PMAX 11/21
REF: 005454
Plan Number.
4221B


Occupation Area
L
B
F
E
C
G
M
A
K
H
D
I
J
AQUARIUM CAFE
Occupation area to be transferred from FNH to PMP
Paihia Eastern Abutment
Rock footing
NOTE
ABCD CON20050545402
EFGHIJKLM CON20050545411
OCCUPATION AREA TO BE TRANSFERRED FROM FNH TO PMP
CO-ORDINATES (NZTM) OF OCCUPATION AREA TO BE TRANSFERRED FROM FNH TO PMP
Easting Northing
1 1699294.46 6095255.42
2 1699293.43 6095274.41
3 1699294.48 6095306.32
4 1699309.03 6095322.71
5 1699311.74 6095323.14
6 1699319.65 6095273.14
7 1699325.25 6095271.66
8 1699325.08 6095270.67
9 1699317.54 6095266.05
10 1699315.39 6095257.66
11 1699319.77 6095250.02
12 1699318.94 6095248.00
NORTHLAND REGIONAL COUNCIL
Plan Number 4978
v1.0 Drawing Status - Consent / Tender Draft 13/05/11
v1.1 Drawing Status - Occupation area revised 23/05/11
Survey:
Design: IMS
Drawn: IMS
Checked: GS
Date: 23/05/11
Scale: 1:1000@A3
Drawing title: PAEA_1.0
Job Title.
PAIHIA EASTERN ABUTMENT -
PAIHIA MARITIME PROPERTIES LTD
Far North Holdings Limited
Opua Marine Park
P.O. Box 7
Opua, 0241
Bay Of Islands, New Zealand
Ph. (09) 402 5659
Email: enquiries@fnhl.co.nz
Drawing Title.
OVERALL VIEW OF OCCUPATION AREA TO BE TRANSFERRED
Project No. 1030
Rev. 1.1
Sheet No. 10


NOTES:
1. LEVELS ARE IN METRES RELATIVE TO PAKIA SOUNDING DATUM (PSD).
2. COASTAL STRUCTURE OUTLINES SHOWN ARE APPROXIMATE ONLY. CENTRELINES ARE AS PER THE CONSENTED SCHEME LAYOUT.
3. BATHYMETRY SHOWN IS BASED ON SURVEYS FROM DML DATED 21-24 SEPTEMBER 2020, WILLIAMS & KING DATED SEPTEMBER 2020 AND SURVEY & PLANNING SOLUTIONS LTD. IN 2009 BETWEEN MOTUMARE ISLAND AND NORTHERN BREAKWATER.
4. REFER TO DRAWING 3235491-CA-001 FOR SURVEY CONTROL POINT LOCATION, COORDINATES AND ELEVATION IN TERMS OF PSD.
LEGEND:
1.5 EXISTING SEABED CONTOURS
SET OUT LINE
BAY OF ISLANDS
APPROXIMATE MHWS LINE
MOTUMARE ISLAND
NEW WESTERN BREAKWATER
NEW NORTHERN BREAKWATER
APPROXIMATE MHWS LINE
TAYLOR ISLAND
NEW WESTERN ABUTMENT
REPLENISHED BEACH
WATERSIDE PARK (DESIGN BY OTHERS)
NEW EASTERN ABUTMENT
MARSDEN ROAD (STATE HIGHWAY 11)
WILLIAMS ROAD
GENERAL LAYOUT PLAN
SCALE 1:1500 (A1), 1:3000 (A3)
NORTHLAND REGIONAL COUNCIL
Plan Number 5061/1
ORIGINAL DRAWING IN COLOUR
FOR INFORMATION
NOT FOR CONSTRUCTION
3235491-CA-002
D



NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PAIHIA SOUNDING DATUM (PSD)
2. HORIZONTAL COORDINATE SYSTEM IS IN TERMS OF NZ GEODETIC DATUM 2000, MOUNT EDEN GRID
3. COASTAL STRUCTURE OUTLINES SHOWN ARE APPROXIMATE ONLY. CENTRELINES ARE AS PER THE CONSENTED SCHEME LAYOUT.
4. BATHYMETRY SHOWN IS BASED ON THE DML SURVEY DATED 21-24 SEPTEMBER 2020
5. REFER TO DRAWING 3235491-CA-001 FOR SURVEY CONTROL POINT LOCATION, COORDINATES AND ELEVATION IN TERMS OF PSD.

LEGEND:

-1.5 EXISTING SEABED CONTOURS
SET OUT LINE
TRANSITION ZONE

BREAKWATER SET-OUT COORDINATES

CHAINAGE (m) OR POINT	EASTING (m)	NORTHING (m)
0.00	338843.85	977587.77
10.00	338853.41	977588.56
20.00	338863.29	977590.24
30.00	338873.04	977592.43
40.00	338882.63	977595.25
50.00	338892.03	977598.58
60.00	338901.17	977602.71
70.00	338910.04	977607.33
80.00	338918.59	977612.52
90.00	338926.79	977618.24
100.00	338934.82	977624.20
110.00	338942.85	977630.16
120.00	338950.88	977636.12
130.00	338958.91	977642.08
140.00	338966.65	977647.83
150.00	338968.49	977649.79
P1	338834.36	977741.80

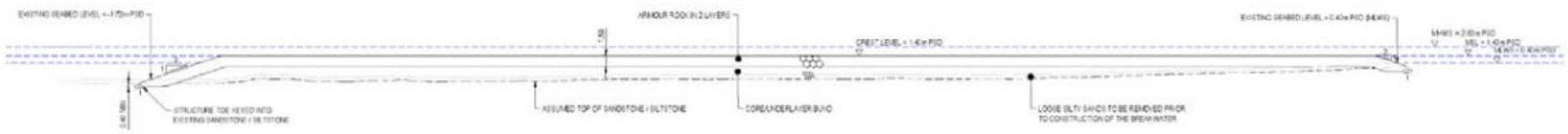
A WESTERN BREAKWATER LAYOUT PLAN
CA-002 1:300 (A1), 1:600 (A3)

NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PAKIA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. TO BE READ IN ACCORDANCE WITH THE ROCK SPECIFICATION (DRAWING 3235491-CA-005 AND 3235491-CA-006).
4. REFER TO DRAWINGS 3235491-CA-005 FOR ROCK GRADINGS.
5. BATHYMETRY SHOWN IS BASED ON THE DML SURVEY DATED 23-24 SEPTEMBER 2023.
6. LEVEL OF SANDSTONE/SILTSTONE IS SHOWN INDICATIVELY ONLY, BASED ON THE AVAILABLE BOREHOLES. ACTUAL LEVEL OF SANDSTONE/SILTSTONE WILL VARY ALONG THE LENGTH OF THE BREAKWATER. ACTUAL LEVELS TO BE CONFIRMED ON SITE SUCH THAT THE BREAKWATER CORE MATERIAL IS PLACED DIRECTLY ON THE SANDSTONE/SILTSTONE AND THE TOE IS TO BE TRENCHED IN THE SANDSTONE/SILTSTONE TO A MINIMUM DEPTH AS SHOWN IN THE DRAWING DASHED SIDES.

WEST

EAST



1 CA-003 WESTERN BREAKWATER LONG SECTION

1:250 (A1), 1:500 (A3)

NORTHLAND REGIONAL COUNCIL

Plan Number 5061/3

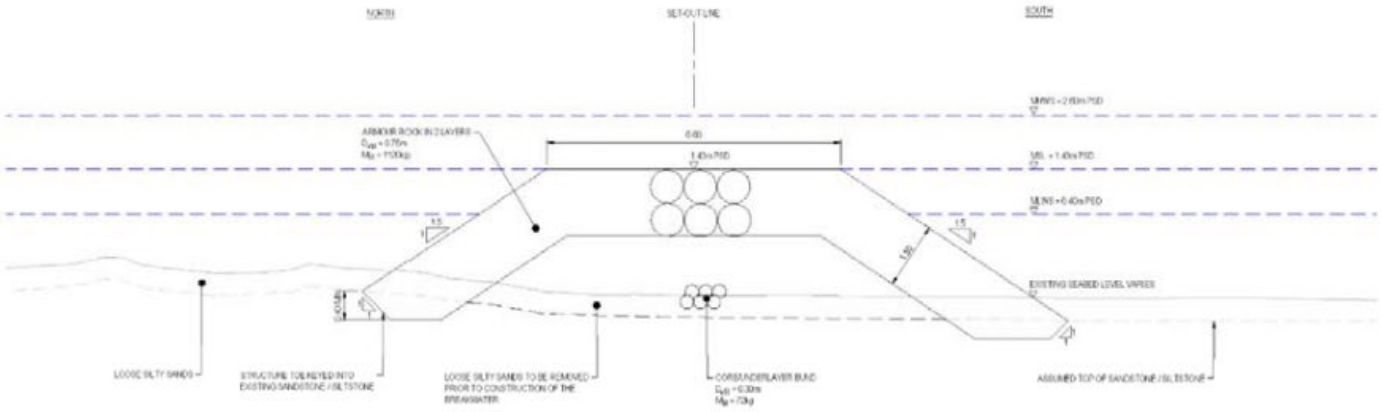
ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

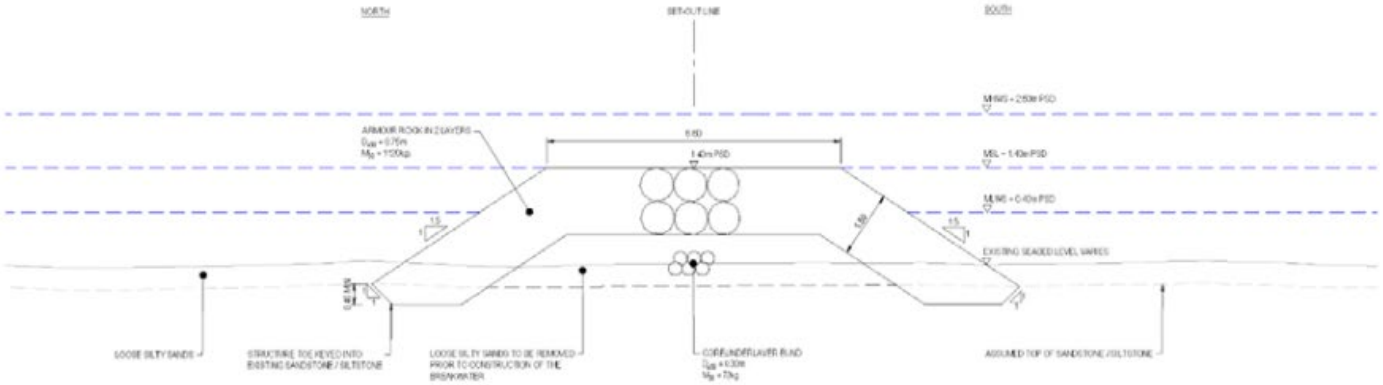
Drawing No.	Rev.
3235491-CA-004	D

NOTES:

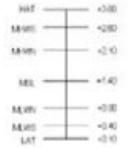
1. LEVELS ARE IN METRES RELATIVE TO PAMA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. TO BE READ IN ACCORDANCE WITH THE ROCK SPECIFICATION (DRAWING 3235491-CA-035 AND 3235491-CA-036).
4. BATHYMETRY SHOWN IS BASED ON THE BML SURVEY DATED 21-24 SEPTEMBER 2020.
5. LEVEL OF SANDSTONE/SILTSTONE IS SHOWN INDICATIVELY ONLY, BASED ON THE AVAILABLE BOREHOLES. ACTUAL LEVEL OF SANDSTONE/SILTSTONE WILL VARY ALONG THE LENGTH OF THE BREAKWATER. ACTUAL LEVEL IS TO BE CONFIRMED ON SITE SUCH THAT THE BREAKWATER CORE MATERIAL IS PLACED DIRECTLY ON THE SANDSTONE/SILTSTONE AND THE TOE IS TO BE TRENCHED IN THE SANDSTONE/SILTSTONE TO A MINIMUM DEPTH AS SHOWN ON THE DRAWING ON BOTH SIDES.
6. THE CROSS SECTION WILL VARY ALONG THE LENGTH OF THE BREAKWATER.



2 WESTERN BREAKWATER CROSS SECTION AT CHAINAGE 36m
1:CA-003 1:50 (A1), 1:100 (A3)



3 WESTERN BREAKWATER CROSS SECTION AT CHAINAGE 118m
1:CA-003 1:50 (A1), 1:100 (A3)



TIDE BAR
(m PSD)

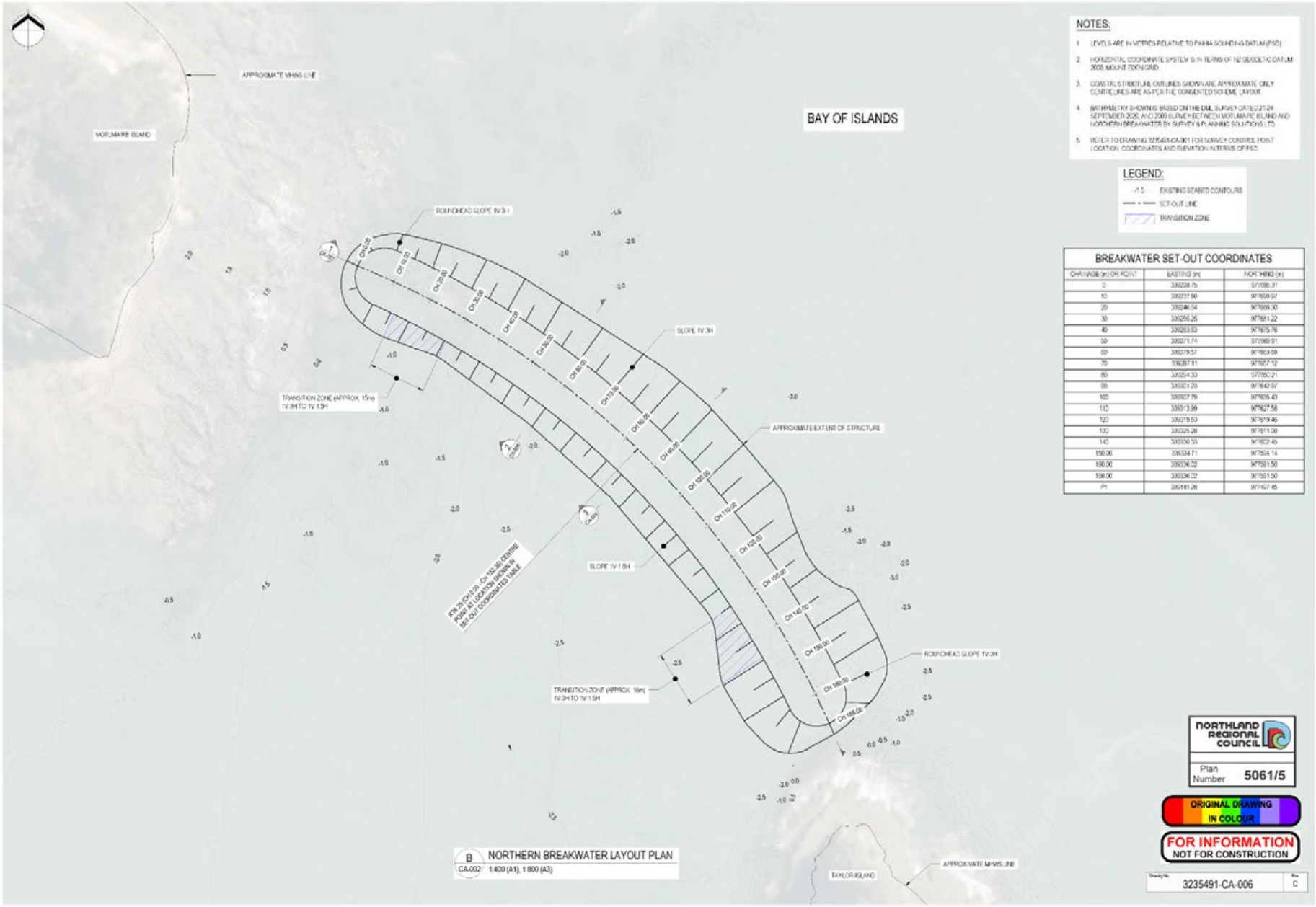
NORTHLAND REGIONAL COUNCIL

Plan Number 5061/4

ORIGINAL DRAWING IN COLOUR

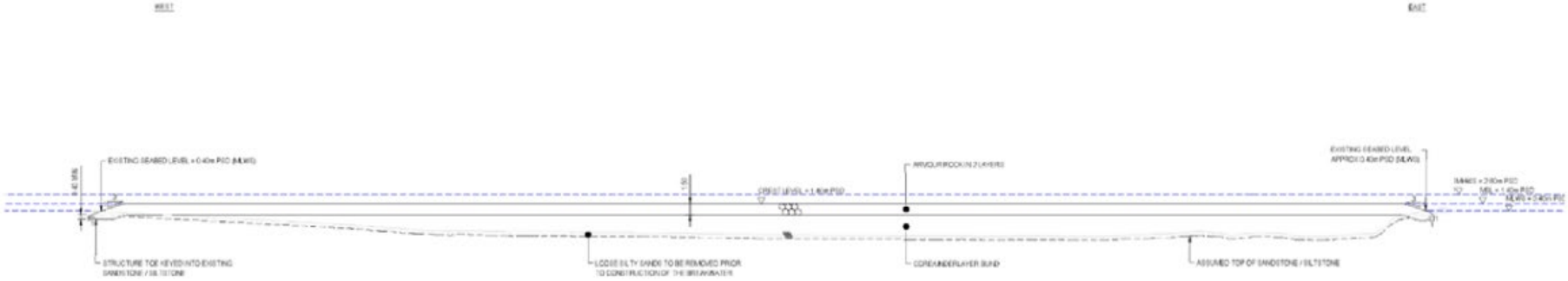
FOR INFORMATION
NOT FOR CONSTRUCTION

3235491-CA-005 | D


APPROXIMATE MHWS LINE
MOTUMARE ISLAND
BAY OF ISLANDS
ROUNDHEAD SLOPE 1V:3H
SLOPE 1V:3H
APPROXIMATE EXTENT OF STRUCTURE
TRANSITION ZONE (APPROX. 15m) 1V:3H TO 1V:1.5H
SLOPE 1V:1.5H
TRANSITION ZONE (APPROX. 15m) 1V:3H TO 1V:1.5H
ROUNDHEAD SLOPE 1V:3H
TAYLOR ISLAND
APPROXIMATE MHWS LINE
NOTES:
1. LEVELS ARE IN METRES RELATIVE TO DARWIN SOUNDING DATUM (PSD)
2. HORIZONTAL COORDINATE SYSTEM IS IN TERMS OF NZ GEODETIC DATUM 2000, MOUNT EDEN GRID
3. COASTAL STRUCTURE OUTLINES SHOWN ARE APPROXIMATE ONLY. CONTROLLING ARE AS PER THE CONSENTED SCHEME LAYOUT
4. BATHYMETRY SHOWN IS BASED ON THE LINZ SURVEY DATED 27-29 SEPTEMBER 2006, AND 2009 SURVEY BETWEEN MOTUMARE ISLAND AND NORTHERN BREAKWATER BY SURVEY & PLANNING SOLUTIONS LTD
5. REFER TO DRAWING 3235491-CA-001 FOR SURVEY CONTROL POINT LOCATION, COORDINATES AND ELEVATION IN TERMS OF PSD
LEGEND:
-1.5 EXISTING SEABED CONTOURS
SET-OUT LINE
TRANSITION ZONE
BREAKWATER SET-OUT COORDINATES
CHAINAGE (m) FOR POINT
EASTING (m)
NORTHING (m)
0 330259.75 977086.91
10 330237.60 977659.97
20 330246.54 977686.30
30 330256.25 977681.22
40 330263.53 977675.76
50 330271.74 977669.91
60 330279.57 977663.69
70 330287.11 977657.12
80 330294.33 977650.21
90 330301.29 977643.97
100 330927.79 977635.43
110 330913.99 977627.58
120 330919.83 977619.46
130 330925.28 977611.09
140 330930.33 977602.45
150.00 330934.71 977594.14
160.00 330936.22 977591.50
168.00 330936.22 977591.50
P1 330161.26 977427.45
NORTHLAND REGIONAL COUNCIL
Plan Number 5061/5
ORIGINAL DRAWING IN COLOUR
FOR INFORMATION NOT FOR CONSTRUCTION
3235491-CA-006
C
B NORTHERN BREAKWATER LAYOUT PLAN
CA-002 1:400 (A1), 1:800 (A3)

NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PWMA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. TO BE READ IN ACCORDANCE WITH THE ROCK SPECIFICATION (DRAWING 3235491-CA-020 AND 3235491-CA-021).
4. REFER TO DRAWING 3235491-CA-008 FOR ROCK GRADINGS.
5. BATHYMETRY SHOWN IS BASED ON THE SNL SURVEY DATED 21-24 SEPTEMBER 2020.
6. LEVEL OF SANDSTONE/SILTSTONE IS SHOWN INDICATIVELY ONLY, BASED ON THE AVAILABLE BOREHOLES. ACTUAL LEVEL OF SANDSTONE /SILTSTONE WILL VARY ALONG THE LENGTH OF THE BREAKWATER. ACTUAL LEVELS TO BE CONFIRMED ON SITE SUCH THAT THE BREAKWATER CORE MATERIAL IS PLACED DIRECTLY ON THE SANDSTONE/SILTSTONE AND THE TOE IS TO BE TRENCHED IN THE SANDSTONE/SILTSTONE TO A MINIMUM DEPTH AS SHOWN IN THE DRAWING ON BOTH SIDES.



1 CA006 NORTHERN BREAKWATER LONG SECTION
1:250 [A1], 1:500 [A3]

NORTHLAND REGIONAL COUNCIL

Plan Number 5061/6

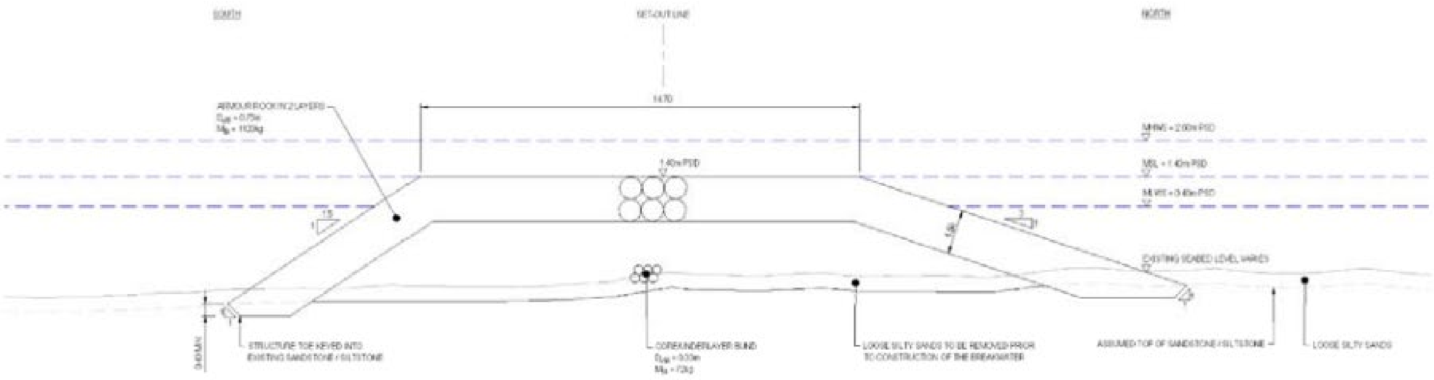
ORIGINAL DRAWING IN COLOUR

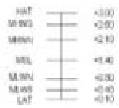
FOR INFORMATION
NOT FOR CONSTRUCTION

Drawing No.	Rev.
3235491-CA-007	D

NOTES:

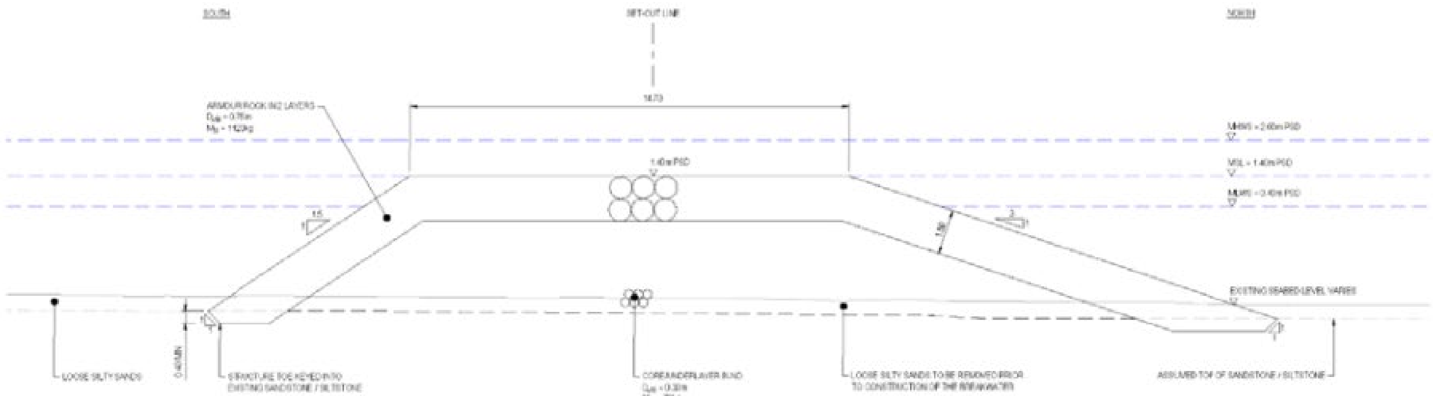
1. LEVELS ARE IN METRES RELATIVE TO PAIHIA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. TO BE READ IN ACCORDANCE WITH THE ROCK SPECIFICATION (DRAWING 3235491-CA-025 AND DRAWING 3235491-CA-026).
4. BATHYMETRY SHOWN IS BASED ON THE DML SURVEY DATED 23/24 SEPTEMBER 2020, AND 2009 SURVEY BETWEEN MOTUMAIRE ISLAND AND NORTHERN BREAKWATER BY SURVEY & PLANNING SOLUTIONS LTD.
5. LEVEL OF SANDSTONE/SILTSTONE IS SHOWN INDICATIVELY ONLY, BASED ON THE AVAILABLE BOREHOLES. ACTUAL LEVEL OF SANDSTONE/SILTSTONE WILL VARY ALONG THE LENGTH OF THE BREAKWATER. ACTUAL LEVEL IS TO BE CONFIRMED ON SITE SUCH THAT THE BREAKWATER CORE MATERIAL IS PLACED DIRECTLY ON THE SANDSTONE/SILTSTONE AND THE TOE IS TO BE TRENCHED IN THE SANDSTONE/SILTSTONE TO A MINIMUM DEPTH AS SHOWN IN THE DRAWING ON BOTH SIDES.
6. THE CROSS SECTION WILL VARY ALONG THE LENGTH OF THE BREAKWATER.





TIDE BAR
(m PSD)

2 NORTHERN BREAKWATER CROSS SECTION AT CHAINAGE 57m
CA-006 1:50 (A1), 1:100 (A3)



3 NORTHERN BREAKWATER CROSS SECTION AT CHAINAGE 88m
CA-006 1:50 (A1), 1:100 (A3)

NORTHLAND REGIONAL COUNCIL

Plan Number 5061/7

ORIGINAL DRAWING IN COLOUR

FOR INFORMATION
NOT FOR CONSTRUCTION

Drawing No. 3235491-CA-008 Rev. D

ARMOUR ROCK SPECIFICATION

GENERAL

THIS SPECIFICATION SHALL BE READ IN CONJUNCTION WITH THE STANDARD "CIRIA C683 THE ROCK MANUAL - THE USE OF HYDRAULIC ROCK IN ENGINEERING, 2007" AND ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THIS STANDARD UNLESS EXPRESSLY NOTED OTHERWISE.

THE CONTRACTOR SHALL PREPARE A METHOD STATEMENT FOR THE ENGINEER'S REVIEW INCLUDING SOURCES OF MATERIALS AND QUARRYING, HOW THE SPECIFIED ROCK GRADINGS WILL BE ACHIEVED, HANDLING, TRANSPORT AND STOCKPILING OF ROCK, WORK SEQUENCE, ROCK PLACEMENT AND TOLERANCES, EXPERIENCE OF KEY PERSONNEL, DIVING INSPECTIONS, INCLUDING SAFETY AND LEGISLATIVE REQUIREMENTS, EMERGENCY PLANS FOR STORM AND NATURAL HAZARD EVENTS, WEATHER (AN WAVE CLIMATE FORECASTING AND WARNING SYSTEMS), SURVEY TECHNIQUES, PROCEDURES FOR SAMPLING AND TESTING PROCEDURES, HEALTH AND SAFETY AND ENVIRONMENTAL MATTERS. THE WORK METHOD STATEMENT SHALL ADDRESS THE SPECIFIED TOLERANCES FOR THE MATERIALS TO BE PLACED, THE INAVE AND WEATHER SEASONS AND CONDITIONS, THE OPERATING INAVE, VESSEL, TRAFFIC, AND THE MEASURES TO CONTAIN MATERIALS DURING CONSTRUCTION AND TO PREVENT LOSS OF MATERIALS IN ADVERSE CONDITIONS.

THE CONTRACTOR SHALL NOMINATE AT THE TIME OF TENDER, THE SOURCE AND MATERIAL TYPE FOR THE ROCK. SOURCE TESTING AND GRADINGS IS REQUIRED FOR EACH OF THE TESTS DESCRIBED BELOW UNDER ROCK QUALITY AND ROCK GRADING AND RESULTS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO THE COMMENCEMENT OF INWORKS. TESTING IS TO BE UNDERTAKEN AT AN IANZ ACCREDITED LABORATORY.

THE CONTRACTOR SHALL CONDUCT A TRIAL TO DEMONSTRATE HOW THE PROPOSED WORK METHODS AND RESOURCES WILL RESULT IN THE BREAKWATER BEING BUILT IN FULL ACCORDANCE WITH THE SPECIFICATION. THE TRIAL SHALL EXTEND OVER THE FULL LAYER HEIGHT IN A SINGLE PASS AND MINIMUM LENGTH OF 10m. PROVIDED THE TRIAL MEETS THE SPECIFICATION, THE TRIAL PANEL MAY BE INCORPORATED INTO THE PERMANENT WORKS.

THE CONTRACTOR SHALL CARRY OUT PRE AND POST WORK SURVEYS. MEASUREMENT SURVEYS TO SUPPORT PROGRESS PAYMENT APPLICATIONS, SURVEYS TO MONITOR SETTLEMENT OF ROCK STRUCTURE BELOW AND ABOVE WATER AND INTERMEDIATE SURVEYS UPON COMPLETION OF EACH STAGE OF WORKS. SURVEY OF ROCK BE CARRIED OUT USING A COMBINATION OF DGPS SURVEY SYSTEMS RIGGED TO CONSTRUCTION EQUIPMENT, NARROW BEAM ECHO SOUNDING OR MULTIBEAM ECHO SOUNDING MAY BE USED. THE PROPOSED SURVEY SYSTEMS TO BE INCLUDED IN THE CONTRACTOR'S WORK METHOD STATEMENT FOR REVIEW BY THE ENGINEER.

ROCK QUALITY - ARMOUR ROCK AND UNDERLAYER

EACH TEST SPECIFIED BELOW SHALL COMPRISE A MINIMUM OF THREE SAMPLES.

1. ARMOUR ROCK AND UNDERLAYER SHALL BE HARD, DURABLE, CRUSHED, QUARRIED OR NATURAL STONE FREE FROM VISUALLY OBSERVABLE OR CHEMICALLY DETECTABLE IMPURITIES, DUST, CLAY, ORGANIC MATTER AND OTHER DELETERIOUS MATERIAL. THE STONE SHALL BE FREE FROM LAMINATIONS AND CLEAVAGES AND SHALL NOT DISINTEGRATE ON EXPOSURE TO WEATHERING.

2. ROCK SHALL BE CRUSHED, ANGULAR SHAPED MATERIAL COMPLYING WITH THE REQUIREMENTS OF THE SPECIFICATION FROM A SOURCE WHICH SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER. UNCONFINED COMPRESSIVE STRENGTH SHALL BE A MINIMUM OF 100MPa WHEN TESTED WITH AS TM STANDARD C2938-96. UNLESS OTHERWISE SPECIFIED, EACH TEST SHALL COMPRISE A MINIMUM OF THREE SAMPLES.

3. THE MINIMUM SOLID DENSITY (SSD) OF ARMOUR ROCK AND UNDERLAYER FOR THE BREAKWATER IS SHALL BE 2.45 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.

3. THE MINIMUM SOLID DENSITY (SSD) OF ARMOUR ROCK AND UNDERLAYER FOR THE EASTERN ABUTMENT SHALL BE 2.50 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.

4. THE ARMOUR ROCK AND UNDERLAYER SHALL HAVE A WATER ABSORPTION LESS THAN 3.0% IN ACCORDANCE WITH NZS 2111.

5. ARMOUR ROCK AND UNDERLAYER RESISTANCE TO ABRASION - LOS ANGELES ABRASION NOT MORE THAN 35% LOSS IN WEIGHT IN ACCORDANCE WITH NZS 4407.

6. THE QUARRY STONE USED FOR ARMOUR ROCK AND UNDERLAYER SHALL HAVE A QUALITY INDEX OF AA, AB, OR BA WHEN TESTING IN ACCORDANCE WITH NZS 4407.

7. QUARRY STONE USED FOR ARMOUR ROCK AND UNDERLAYER SHALL HAVE A CRUSHING RESISTANCE NOT LESS THAN 650kN TO YIELD OUT A MAXIMUM OF 10% FINES WHEN TESTED IN ACCORDANCE WITH NZS 4407.

ROCK GRADING

1. QUARRY RUN CORE

QUARRY RUN MATERIAL FOR USE IN THE BREAKWATER CORE SHALL BE CAPABLE OF ACHIEVING A RELATIVELY HIGH DENSITY WITHOUT COMPACTION WHEN DUMPED UNDER WATER.

QUARRY RUN SHALL BE EVENLY GRADED 10mm TO 500mm, WITH MATERIAL SMALLER THAN 75mm NOT TO EXCEED 10% OF TOTAL WEIGHT. THE TARGET GRADINGS:

QUARRY RUN GRADING						
ROCK SIZE (mm)	10	20	75	150	400	500
% PASSING	0	4	18	24	75	97

THE CONTRACTOR SHALL DEVELOP A QUARRY RUN GRADING WITH UPPER AND LOWER LIMITS AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO ROCK PRODUCTION.

2. UNDERLAYER, ARMOUR AND ARCHITECTURAL ROCK

THE MASS DISTRIBUTION AND THE MEDIAN MASS SHALL BE DETERMINED IN ACCORDANCE WITH SECTION 3.4.3 OF CIRIA C683, THE ROCK MANUAL, AND SHALL CONFORM TO THE FOLLOWING TABLE.

ROCK GRADING							
M_{50}	D_{n50}	GRADING CLASS DESIGNATION	LAYER THICKNESS	EUL	NUL	MUL	EUL
kG	m	kG	m	kG	kG	kG	kG
WESTERN BREAKWATER, NORTHERN BREAKWATER, WESTERN ABUTMENT, EASTERN ABUTMENT							
1100	0.75	ARMOUR	1.50	300	540	1000	2200
72	0.30	UNDERLAYER	VARIES	15	20	130	220

WHERE M_{50} IS THE MEAN MASS, $M = 0.52 \times \rho_r D_{n50}^3$
D_{n50} IS THE NOMINAL DIAMETER CONSIDERING THE ROCK AS AN EQUIVALENT CUBE
D IS THE SIEVE SIZE AND USED FOR ON SITE MEASUREMENT, CONVERSION TO BE CONFIRMED ON CONFIRMATION OF ROCK SUPPLY.

THE CONTRACTOR SHALL DEVELOP GRADINGS WITH UPPER AND LOWER LIMITS BASED ON DATA IN THE ROCK GRADING TABLE AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO ROCK PRODUCTION.

- EXTREME LOWER LIMIT (ELL) - THE MASS BELOW WHICH NO MORE THAN 5% PASSING BY MASS IS PERMITTED FOR M_{50} GREATER THAN 300KG, 2% FOR M_{50} LESS THAN 300KG
- NOMINAL LOWER LIMIT (NLL) - THE MASS BELOW WHICH NO MORE THAN 10% PASSING BY MASS IS PERMITTED
- NOMINAL UPPER LIMIT (NUL) - THE MASS BELOW WHICH NO LESS THAN 70% PASSING BY MASS IS PERMITTED
- EXTREME UPPER LIMIT (EUL) - THE MASS BELOW WHICH NO LESS THAN 98% PASSING BY MASS IS PERMITTED

SAMPLING AND TESTING SHALL BE ACCORDING TO CIRIA C683, THE ROCK MANUAL, USING AT LEAST 50 PIECES TAKEN AT RANDOM FROM STONES GREATER IN MASS THAN THE ELL.

ROCK SHAPE

1. ALL ROCK SHALL BE ESSENTIALLY EQUIDIMENSIONAL WITH FLOGGATED OR THIN SLABS OF ROCK BEING UNDESIRABLE. QUARRY STONE USED FOR ARMOUR, UNDERLAYER AND ARCHITECTURAL ROCK SHALL HAVE A LENGTH (L) TO WIDTH (W) RATIO OF LESS THAN 3. FIFTY PERCENT (50%) OF STONES SHALL NOT HAVE A L/W RATIO GREATER THAN 2.

2. SAMPLING AND TESTING SHALL BE ACCORDING TO CIRIA C683, THE ROCK MANUAL, USING AT LEAST 50 PIECES TAKEN AT RANDOM FROM STONES GREATER IN MASS THAN THE ELL.

3. BLOCKS OF QUARRY STONE IN HEAVY GRADINGS SHOWING CLEAR SIGNS OF SIGNIFICANT EDGE OR CORNER WEAR OR OF SEVERE ROUNDING SHALL NOT BE ACCEPTED.

TEST FREQUENCY

4. ROCK PROPERTIES AND GRADING TO BE UNDERTAKEN AND SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO WORK COMMENCING.

5. ROCK PROPERTIES AND GRADING TO BE REPEATED IF MATERIAL SOURCE CHANGES.

6. THE CONTRACTOR SHALL CARRY OUT TESTING IN ACCORDANCE WITH THE FOLLOWING TABLES. THE ENGINEER MAY CARRY OUT CHECK TESTING. THE CONTRACTOR SHALL BE REQUIRED TO COOPERATE.

SOURCE TESTING BEFORE CONSTRUCTION:

MATERIAL	TEST	FREQUENCY
QUARRY RUN CORE, ARCHITECTURAL ROCK, UNDERLAYER AND ARMOUR ROCK	DENSITY GRADING SHAPE WEATHERING RESISTANCE RESISTANCE TO IMPACT AND MINERAL FABRIC BREAKAGE CRUSHING RESISTANCE RESISTANCE TO ABRASION DROP TEST ABSORPTION UNCONFINED COMPRESSIVE STRENGTH	DENSITY: ONE SET (10 TESTS PER SET) PER MATERIAL TYPE AND SOURCE. ALL REMAINING: ONE SET (3 TESTS PER SET) PER MATERIAL TYPE AND SOURCE

NO ROCK SHALL BE PLACED UNTIL ALL THE TEST RESULTS HAVE BEEN SUBMITTED TO AND REVIEWED BY THE ENGINEER.

TESTS AND INSPECTIONS DURING CONSTRUCTION:

MATERIAL	TEST	FREQUENCY
QUARRY RUN CORE	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 7,000 m³
	GRADING AND SHAPE	1 TEST PER 3,000 m³
ARMOUR AND ARCHITECTURAL ROCK	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 7,000 m³
	GRADING AND SHAPE	1 TEST PER 3,000 m³
UNDERLAYER	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 3,000 m³
	GRADING AND SHAPE	1 TEST PER 2,000 m³
TRIMMED CORE, ARCHITECTURAL ROCK, ARMOUR AND UNDERLAYERS	LINE AND LEVEL OF EACH LAYER	1 PER 5m LONGITUDINALLY AND AT TRANSITIONS AND 1 PER 5m SLOPE TRANSVERSALLY AND AT ANGLE CHANGES

THE CONTRACTOR SHALL ALLOW FOR THE COSTS OF SAMPLING AND TESTING AS DESCRIBED ABOVE. TESTING SHALL BE CARRIED OUT BY AN IANZ ACCREDITED LABORATORY AND THE RESULTS SHALL BE SUBMITTED TO THE ENGINEER AND REVIEWED PRIOR TO ANY CONSTRUCTION.

CONSTRUCTION

1. PLACING OF EACH LAYER SHALL COMMENCE AT THE TOE AND SHALL PROCEED UPWARDS TOWARDS THE TOP, CONSTRUCTING THE FULL LAYER THICKNESS IN A SINGLE PASS.

2. ROCKS SHALL BE PLACED TO:
   a. ACHIEVE A WELL KEYED, DENSELY PACKED STRUCTURE AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION. WHERE THE CONTRACTOR USES A HIGHER ROCK DENSITY (SSD) SPECIFIED THEY SHALL SPECIFY THE REVISED ROCK DENSITY AND ADJUST THE TARGET PLACED DENSITY PRO RATA.
   b. ACHIEVE EFFECTIVE INTERLOCKING, SO THAT EACH ROCK IS SECURELY HELD IN PLACE BY ITS NEIGHBOURS AND DOES NOT DEPEND ON FRICTIONAL RESISTANCE FOR STABILITY PRIOR TO PLACING FURTHER STONES.
   c. ACHIEVE A FINISHED LAYER AT LEAST TWO ROCKS THICK UNLESS SHOWN OTHERWISE ON THE DRAWINGS.
   d. AVOID FORMING, WITHIN THE OVERALL THICKNESS OF THE LAYER, SEPARATE LAYERS IN THE PLANE PARALLEL TO THE SLOPE OF THE UNDERLYING MATERIAL.
   e. MINIMISE ANY DISTURBANCE TO ALREADY PLACED ROCK.
   f. AVOID DAMAGE TO ANY EXISTING STRUCTURES.

3. UNDERLAYER AND ARMOUR ROCK SHALL BE PLACED AS SOON AS PRACTICABLE TO PROTECT THE UNDERLYING MATERIAL. MATERIAL ERODED BY WAVE ACTION OR ANY OTHER CAUSE SHALL BE MADE GOOD BY THE CONTRACTOR, AT THE CONTRACTOR'S OWN EXPENSE BEFORE PLACING THE APPROPRIATE PROTECTIVE LAYER.

4. UNDERLAYER ROCK SHALL BE DEPOSITED CAREFULLY SO THAT GEOTEXTILE FABRIC IS NOT PUNCTURED. WHERE GEOTEXTILE IS PRESENT ROCKS SHALL NOT BE DROPPED. MAXIMUM DROP HEIGHT OF THE UNDERLAYER ROCK SHALL BE LIMITED TO 1.0m. THE CONTRACTOR SHALL BE PERMITTED TO USE ROCK TRAYS FOR PLACEMENT OF THE UNDERLAYER.

5. ARMOUR AND ARCHITECTURAL ROCK SHALL BE INDIVIDUALLY PLACED PIECE BY PIECE, INTO THE STRUCTURE, TO ACHIEVE A MINIMUM 3 POINT SUPPORT AND BE STABLE TO THE LINES AND LEVELS SHOWN ON THE DRAWINGS. THE STONE SHALL BE DEPOSITED CAREFULLY SO THAT THE GEOTEXTILE FABRIC IS NOT PUNCTURED. THE DROP TEST BREAKAGE INDEX BASED ON SAMPLING AND TESTING AS DESCRIBED IN CIRIA C683 SHALL BE LESS THAN 5%.

TOLERANCES

6. HORIZONTAL TOLERANCE FOR THE BREAKWATER AXIS AND FOOTPRINT TO BE ±0.60m.

7. THE VERTICAL TOLERANCES FOLLOW ACCORDING TO ROCK CLASS AND LOCATION:

LEVEL OF PLACING	QUARRY RUN CORE	UNDERLAYER, ARMOUR AND ARCHITECTURAL ROCK	
		ON INDIVIDUAL MEASUREMENTS (m)	ON SMOOTH PROFILE TO ACTUAL MEAN PROFILE (m)
ABOVE CHART DATUM (m CD)	± 0.20m	$\pm 0.30m \times D_{n50}$	$+0.35m \times D_{n50}$ $-0.25m \times D_{n50}$
BELOW CHART DATUM (m CD)	+0.20m -0.30m	$\pm 0.50m \times D_{n50}$	$+0.60m \times D_{n50}$ $-0.40m \times D_{n50}$

NOTWITHSTANDING THE TOLERANCES ABOVE, THE FOLLOWING SHALL APPLY TO ARMOUR LAYERS:

- THE TOLERANCES ON TWO CONSECUTIVE MEAN ACTUAL PROFILES SHALL NOT BE NEGATIVE.
- NOTWITHSTANDING ANY ACCUMULATION OF POSITIVE TOLERANCES ON UNDERLYING LAYERS, THE THICKNESS OF THE LAYER SHALL NOT BE LESS THAN 90% OF THE NOMINAL THICKNESS SHOWN ON THE DRAWINGS WHEN CALCULATED USING MEAN PROFILES.
- THE ACTUAL MEAN PROFILE IS THE LINE TAKEN AT THE BOTTOM OF THE SLOPE AND AT THE TOP OF THE SLOPE.

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FOR INFORMATION
NOT FOR CONSTRUCTION

Drawing No. 3235491-CA-025 Rev. D

ARMOUR ROCK SPECIFICATION

GEOTEXTILE

1. GEOTEXTILE TO BE TEXDEL 6600 OR EQUIVALENT.

2. THE GEOTEXTILE FABRIC SHALL BE PLACED AT THE LOCATIONS SHOWN ON THE DRAWINGS. THE SITE SHALL BE PREPARED BY CLEARING AND GRADING THE AREA REQUIRED. ALL SHARP OBJECTS AND STONES SHALL BE REMOVED. GEOTEXTILES SHALL BE PLACED JUST AHEAD OF ASSOCIATED ADVANCING CONSTRUCTION WORK AND BE COVERED BY THE UNDERLAYER WITHIN 48 HOURS OF BEING PLACED AND WITHOUT PUNCTURES OR TEARS.

3. GEOTEXTILE SHALL BE STABILISED AGAINST ULTRAVIOLET LIGHT AND SHALL NOT BE PERMANENTLY IMPAIRED BY TEMPORARY EXPOSURE TO DIRECT SUNLIGHT DURING CONSTRUCTION. GEOTEXTILE SHALL BE SUPPLIED IN ROLLS AT LEAST 4.5M WIDE.

4. THE GEOTEXTILE SHALL BE KEPT IN ITS PROTECTIVE WRAPPING ON THE SITE AND STORED OUT OF DIRECT SUNLIGHT SO IT IS NOT EXPOSED TO ULTRA-VIOLET LIGHT PRIOR TO INSTALLATION. GEOTEXTILE THAT IS NOT IMMEDIATELY COVERED AFTER INSTALLATION SHALL BE COVERED WITH AN APPROVED MATERIAL OF SUFFICIENT THICKNESS TO PROTECT IT FROM ULTRA-VIOLET LIGHT. GEOTEXTILE THAT IS DAMAGED SHALL BE REJECTED AND REMOVED FROM SITE.

5. THE LAP WIDTH OF ADJACENT STRIPS OF GEOTEXTILE SHALL DEPEND ON THE METHOD OF JOINTING AS FOLLOWS:

JOINT METHOD	MINIMUM LAP WIDTH (mm)
FACTORY STITCHED	150
LAP ONLY	1,000

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3235491-CA-026 | D

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Beca LITTORALIS LANDSCAPE ARCHITECTURE

CLIENT
Far North Holdings Limited

REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
BEACH AND ABUTMENTS LAYOUT PLAN	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-011	2

NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PAIHIA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. TO BE READ IN ACCORDANCE WITH "THE BEACH SAND SPECIFICATION (DRAWING CA-022)
4. BATHYMETRY SHOWN IS BASED ON SURVEYS FROM DML DATED 21-24 SEPTEMBER 2020 AND WILLIAMS & KING DATED SEPTEMBER 2020
5. THE CROSS SECTION WILL VARY ALONG THE LENGTH OF THE BEACH

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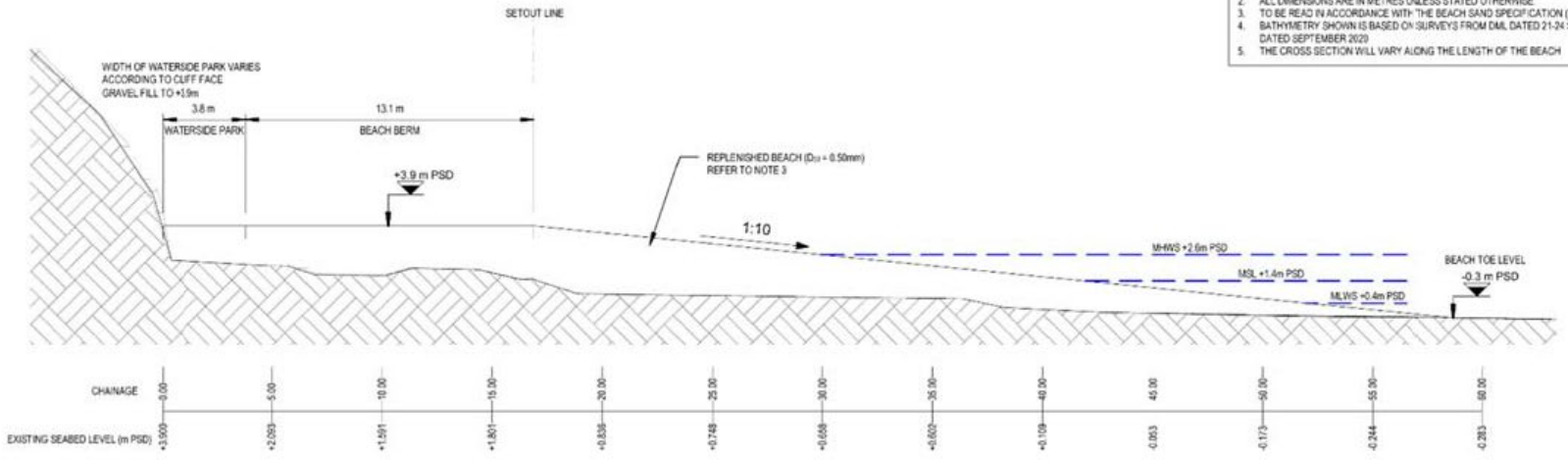
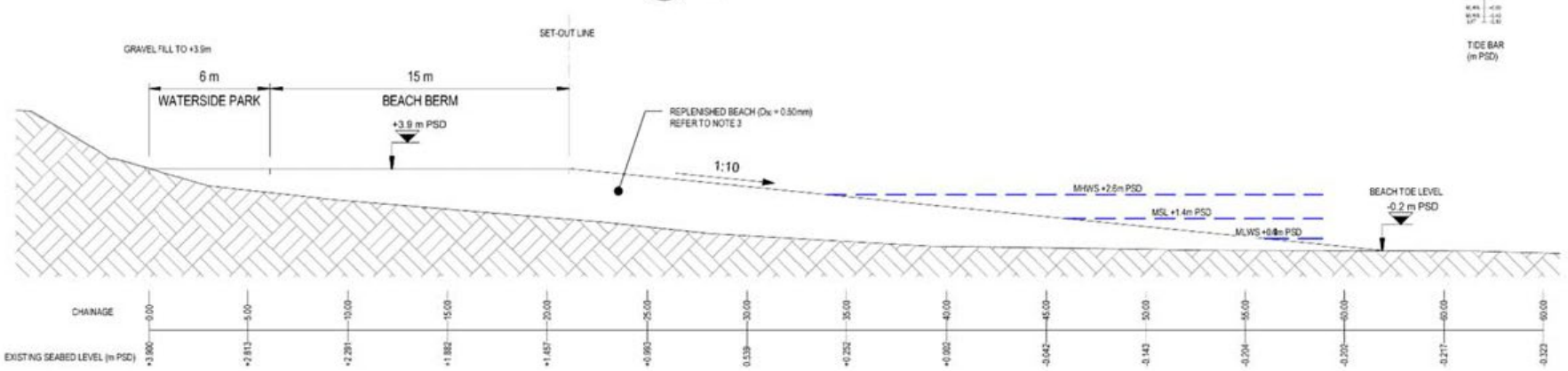
Plan Number 5091/2



1 CA-011 **BEACH CROSS SECTION AT 22.00m**
1 : 200



2 CA-011 **BEACH CROSS SECTION AT 73.20m**
1 : 200

Filename:
Plot Date: 29/02/2022 2:46:06 pm

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REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
BEACH CROSS SECTIONS (SHEET 1 OF 2)	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-012	2

NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PAIHIA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. TO BE READ IN ACCORDANCE WITH THE BEACH SAND SPECIFICATION (DRAWING CA-022).
4. BATHYMETRY SHOWN IS BASED ON SURVEYS FROM DML DATED 21-24 SEPTEMBER 2020 AND WILLIAMS & KING DATED SEPTEMBER 2020
5. THE CROSS SECTION WILL VARY ALONG THE LENGTH OF THE BEACH

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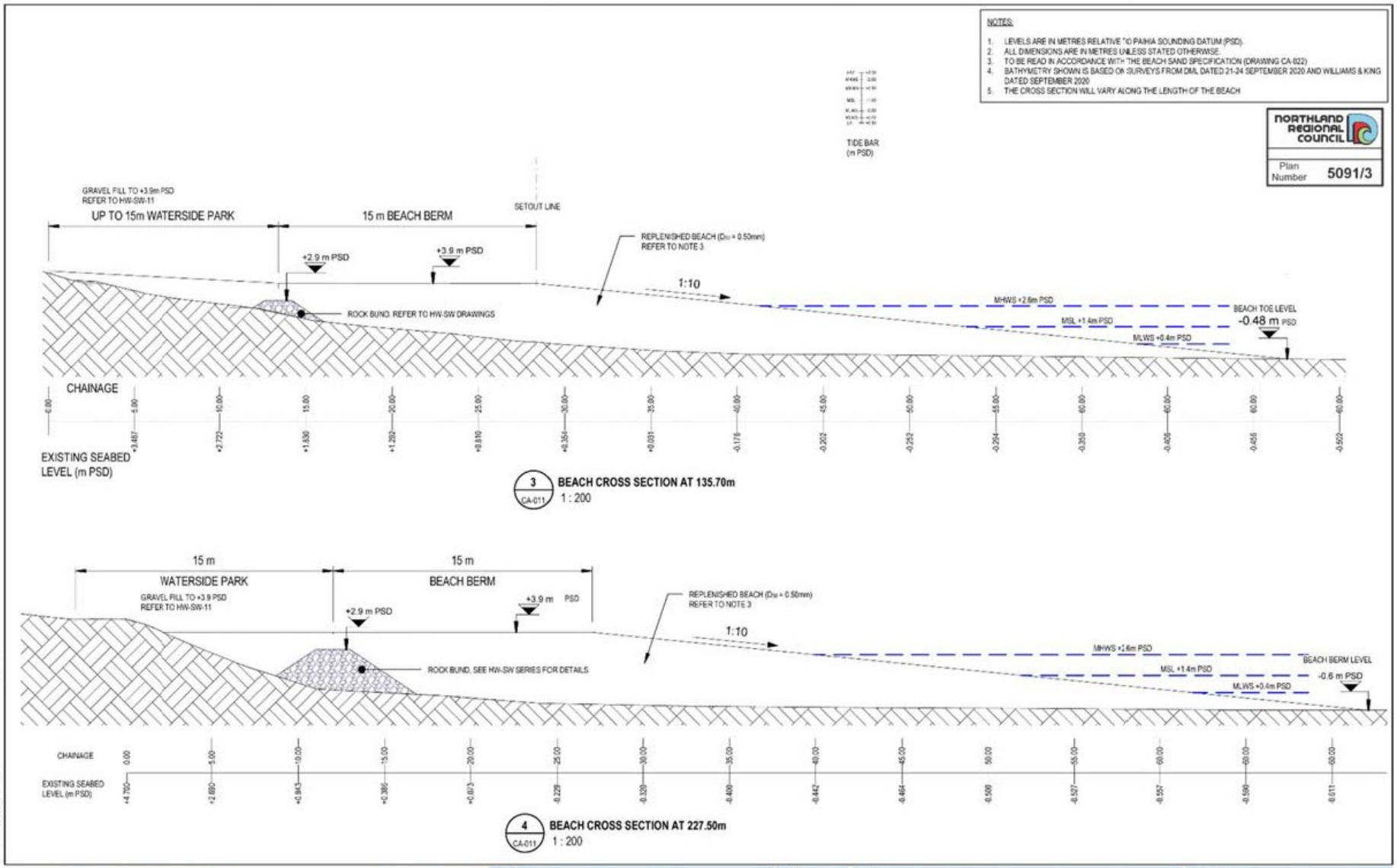
Plan Number 5091/3



Plot Date: 29/03/2022 2:44:09 pm

Filename:

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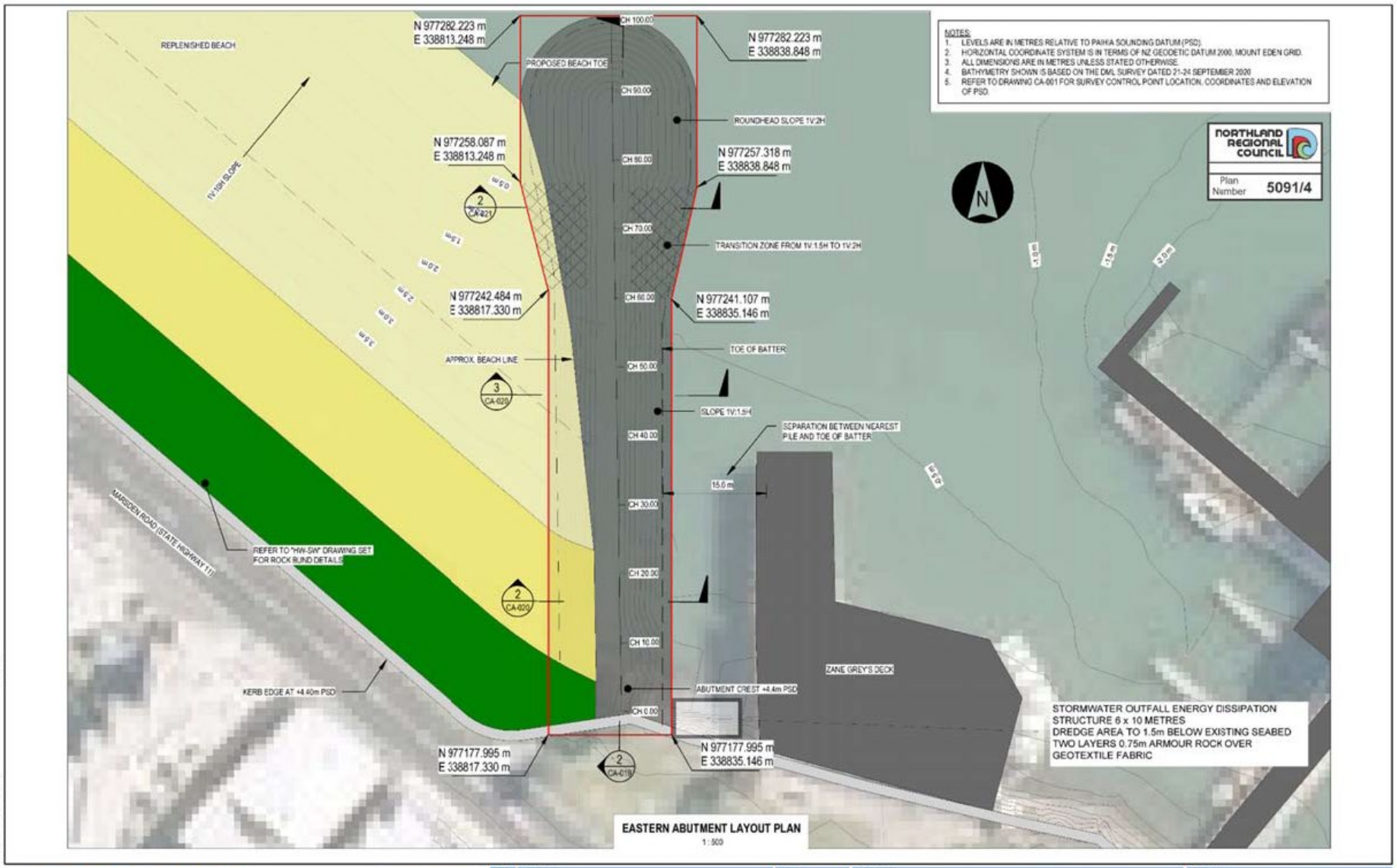
REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
BEACH CROSS SECTIONS (SHEET 2 OF 2)	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-013	2



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REV.	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	01/04/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
EASTERN ABUTMENT LAYOUT PLAN	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-018	2

PRELIMINARY ONLY - DESIGN AND DRAWINGS WILL BE REFINIED DURING DETAILED DESIGN, CONSISTENT WITH STANDARD DESIGN PRACTICE

NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PAIHIA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. BATHYMETRY SHOWN IS BASED ON THE DML SURVEY DATED 21-24 SEPTEMBER 2020.
4. TO BE READ IN ACCORDANCE WITH THE ROCK SPECIFICATION (DRAWING 3235491-CA-025).
5. GEOTEXTILE AS SHOWN ON DRAWING CA-020 AND CA-021.
6. EXISTING ROCK SEAWALL TO BE REMOVED PRIOR TO CONSTGRUCTION OF THE ABUTMENT AND EXISTING ROCK TO BE REUSED WHERE POSSIBLE.
7. THE OUTER LAYER OF ARMOUR ROCK ABOVE MLWS IS TO BE STAINED ROCK SOURCED FROM THE SPECIFIED QUARRY AND PLACED AS DIRECTED BY THE ENGINEER.
8. THE OUTER LAYER OF ROCK (APPROXIMATELY CH 0m TO CH 67m) IS TO BE PLACED WITH OUTER ROCK FACES ORIENTATED TO FORM A SMOOTH SURFACE.

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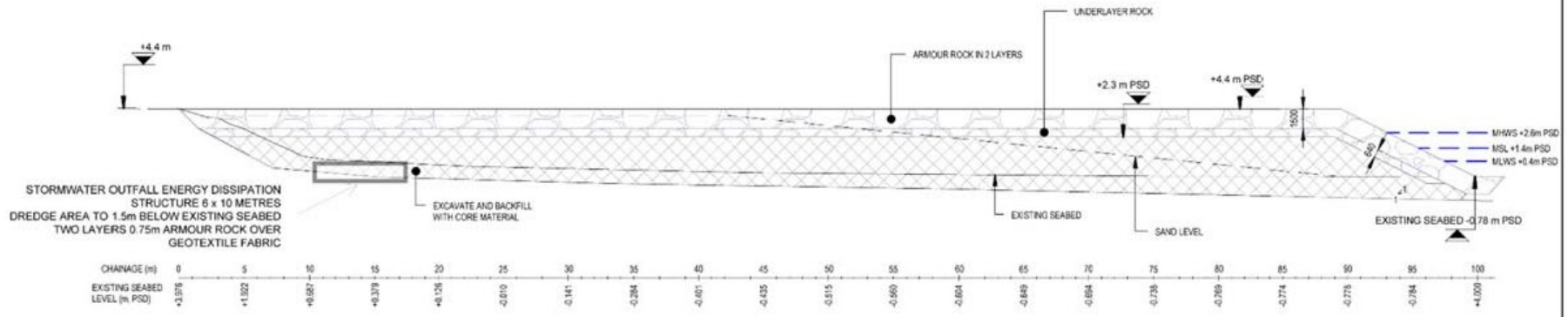

2 / CA-018 **EASTERN ABUTMENT LONG SECTION**
1 : 300

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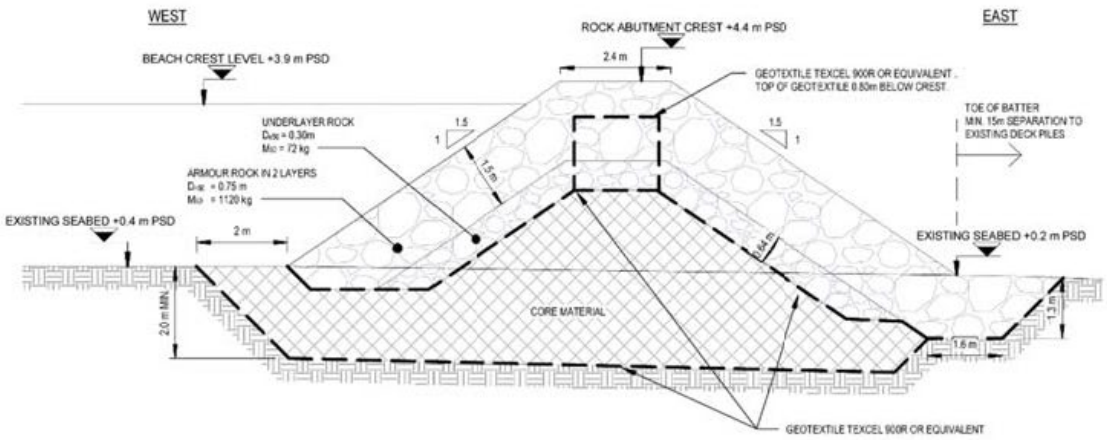
REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	01/04/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
EASTERN ABUTMENT LONG SECTION	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-019	2

Filename:
Plot Date: 08/12/2022 2:53:26 pm



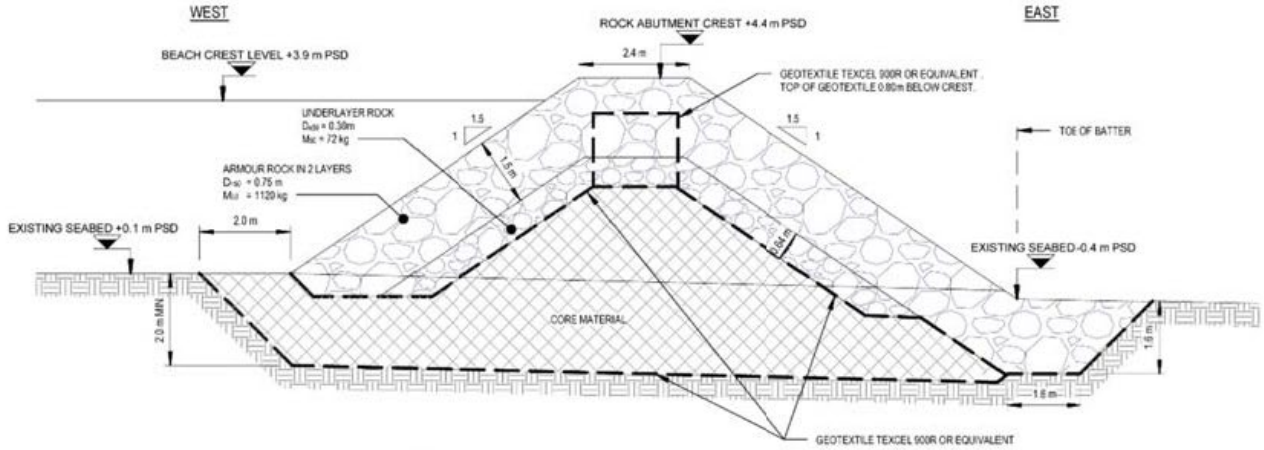
2 / CA-015 **EASTERN ABUTMENT CROSS SECTION AT CHAINAGE 20.00m**
1 : 100

NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PAIHIA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. BATHYMETRY SHOWN IS BASED ON THE DML SURVEY DATED 21-24 SEPTEMBER 2020.
4. TO BE READ IN ACCORDANCE WITH THE ROCK SPECIFICATION (DRAWING 3235481-CA-025).
5. THE CROSS SECTION WILL VARY ALONG THE LENGTH OF THE ABUTMENT.
6. THE OUTER LAYER OF ARMOUR ROCK ABOVE MLWS IS TO BE STAINED ROCK SOURCED FROM THE SPECIFIED QUARRY AND PLACED AS DIRECTED BY THE ENGINEER.
7. THE OUTER LAYER OF ROCK ALONGSIDE THE NEW DECK (APPROXIMATELY CH 0m TO CH 67m IS TO BE PLACED WITH OUTER ROCK FACES ORIENTATED TO FORM A SMOOTH SURFACE.

NORTHLAND REGIONAL COUNCIL
Plan Number 5091/6


TIDE BAR (m PSD)



3 / CA-015 **EASTERN ABUTMENT CROSS SECTION AT CHAINAGE 50.00m**
1 : 100

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CLIENT: Far North Holdings Limited

REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	01/04/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
EASTERN ABUTMENT CROSS SECTIONS (SHEET 1 OF 2)	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-020	2

NOTES:

1. LEVELS ARE IN METRES RELATIVE TO PAIHIA SOUNDING DATUM (PSD).
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. BATHYMETRY SHOWN IS BASED ON THE DML SURVEY DATED 21-24 SEPTEMBER 2020.
4. TO BE READ IN ACCORDANCE WITH THE ROCK SPECIFICATION (DRAWING 3235491-CA-025).
5. THE OUTER LAYER OF ARMOUR ROCK ABOVE MLWS IS TO BE STAINED ROCK SOURCED FROM THE SPECIFIED QUARRY AND PLACED AS DIRECTED BY THE ENGINEER.

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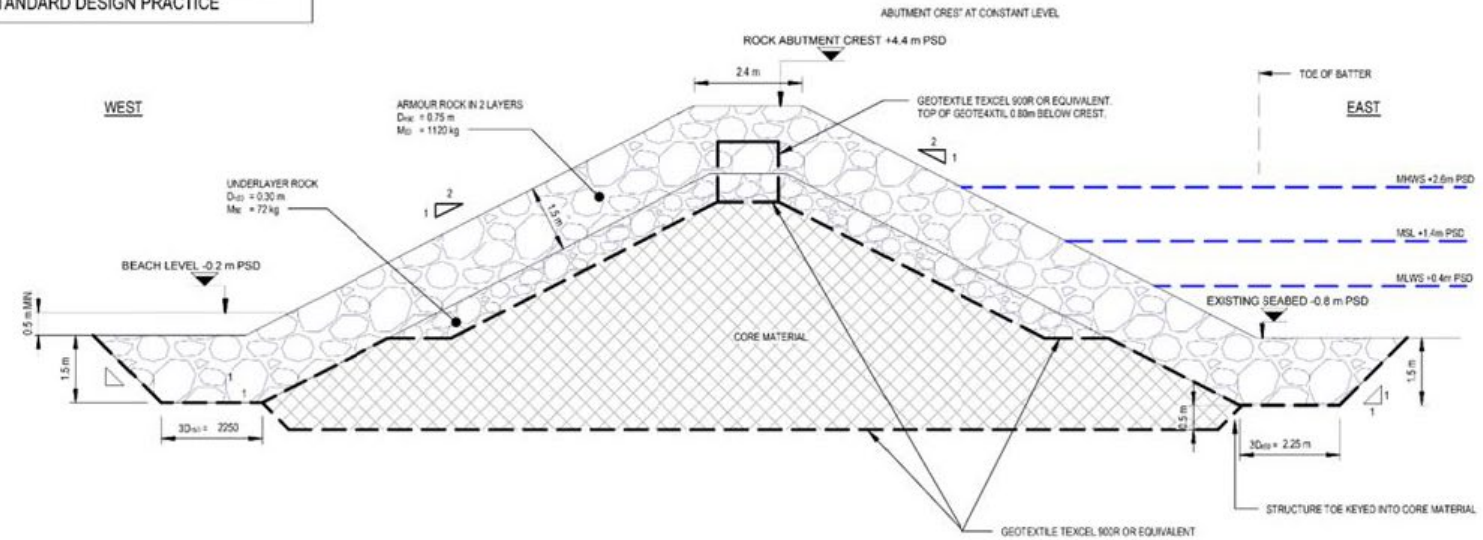
Plan Number 5091/7

TIDE BAR (m PSD)

PRELIMINARY ONLY - DESIGN AND DRAWINGS WILL BE REFINIED DURING DETAILED DESIGN, CONSISTENT WITH STANDARD DESIGN PRACTICE



2 / CA-016 **EASTERN ABUTMENT CROSS SECTION AT CHAINAGE 75.00m**
1 : 100

Filename:
Plot Date: 08/7/2022 2:53:29 pm

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REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	01/04/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
EASTERN ABUTMENT CROSS SECTIONS (SHEET 2 OF 2)	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-021	2

BEACH SAND SPECIFICATION

1. BEACH SAND

1.1 OBJECTIVE

THE OBJECTIVE OF THE CONTRACT IS TO SUPPLY, PLACE AND PROFILE UP TO APPROXIMATELY 37,700m³ OF SAND AS SPECIFIED ALONG HOROTUTU BEACH IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

1.2 SCOPE OF CONTRACT

THE SCOPE OF THIS CONTRACT INCLUDES BUT IS NOT NECESSARILY LIMITED TO:

SUPPLY AND PLACEMENT OF APPROXIMATELY 48,500m³ OF SAND IN ACCORDANCE WITH THE SAND SPECIFICATION.

1.3 RESOURCE CONSENT REQUIREMENTS

THE CONTRACTOR SHALL COMPLY WITH THE RESOURCE CONSENTS - PERMIT NO. CON20110545411 AND CON20110545419.

1.4 BEACH SAND CHARACTERISTICS

THE SAND SHALL COMPLY WITH THE SPECIFICATION PROVIDED IN CONDITION 53 OF THE RESOURCE CONSENT - PERMIT NO. CON20110545411. IN ADDITION TO THE CONSENT CONDITIONS THE SAND SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS.

BEACH SAND SHALL BE CLEAN, ANGULAR SAND WON FROM APPROVED LOCATIONS. SAND SHALL CONTAIN NO OBSERVABLE OR CHEMICALLY DETECTABLE IMPURITIES OR FOREIGN MATTER. THE ENGINEER'S PRIOR APPROVAL OF SAND, IN TERMS OF GRADING, APPEARANCE AND PHYSICAL/CHEMICAL CHARACTERISTICS, SHALL BE OBTAINED.

BEACH SAND SHALL COMPLY WITH THE PARTICLE SIZE DISTRIBUTION GRADING ENVELOPE DEFINED IN **FIGURE 1**. IN ADDITION, THE SORTING COEFFICIENT, S, SHALL BE LESS THAN 2, WHERE:

$S = (D_{75}/D_{25})^{1/2}$

THE CONTRACTOR MAY SUBMIT FOR APPROVAL SANDS WHICH MARGINALLY LIE OUTSIDE THE SPECIFIED GRADING AT THE EXTREME ENDS OF THE ENVELOPES, E.G. A SMALL PERCENTAGE (LESS THAN 5%) OF COARSER AND/OR FINER FRACTIONS MAY BE ACCEPTABLE IN A SAND WHICH OTHERWISE COMPLIES WITH THE SPECIFIED GRADING ENVELOPE. THE CONTRACTOR SHALL NOT ASSUME, HOWEVER, THAT SUCH SANDS, WHICH DO NOT LIE COMPLETELY WITHIN THE GRADING ENVELOPE, WILL BE ACCEPTABLE.

BEACH SAND SHALL NOT CONTAIN MORE THAN 25% BY VOLUME OF SHELL MATERIAL OR CHALK.

SAND FROM AN OFFSHORE SOURCE SHALL BE SCREENED TO REMOVE COARSE SHELLS AND MARINE ORGANISMS GREATER THAN 50MM IN SIZE.

BEACH SAND SHALL BE OF AN APPROVED PALE BEIGE/YELLOW OR LIGHT GREY COLOUR. SAND WHICH IS DARK COLOURED WHEN DRY WILL NOT BE ACCEPTABLE.

1.5 BEACH SAND SAMPLING AND TESTING

BEACH SAND SHALL BE SAMPLED AT RANDOM LOCATIONS IN THE SCREENED STOCKPILES AND SUBJECTED TO TESTING TO CONFIRM THE ACHIEVEMENT OF THE REQUIRED PHYSICAL CHARACTERISTICS. SAMPLING LOCATIONS SHALL BE SELECTED BY THE ENGINEER. SAMPLING AND TESTING SHALL BE AT THE AVERAGE RATE OF ONE BULK SAMPLE FOR EACH 1000m³ STOCKPILED OR PLACED IN THE BEACH AREAS, WHICHEVER IS THE GREATER. HOWEVER, MORE FREQUENT SAMPLING AND TESTING SHALL BE UNDERTAKEN INITIALLY TO OBTAIN THE ENGINEER'S APPROVAL OF THE PROPOSED SAND SOURCE(S) AND CONFIRM THAT SUITABLE SAND IS BEING STOCKPILED. SAMPLING AND TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH THE APPROPRIATE SECTIONS OF NZS 4402.

1.6 TRANSPORTATION OF BEACH SAND

BEACH SAND SHALL BE TRANSPORTED TO THE SITE OF THE PERMANENT WORKS ALONG AN APPROVED ROUTE. THE CONTRACTOR SHALL OBTAIN THE APPROVAL OF THE ENGINEER AND THE APPROPRIATE AUTHORITIES BEFORE USING PUBLIC HIGHWAYS. THE CONTRACTOR SHALL AVOID DAMAGE TO PUBLIC ROADS AND SHALL REPAIR ANY DAMAGE THAT DOES OCCUR.

1.7 BEACH SAND PLACING

THE CONTRACTOR SHALL CLEAR OR OTHERWISE DEAL WITH DEBRIS AND THE LIKE WITHIN THE BEACH AREA ABOVE LOW WATER LEVEL PRIOR TO PLACING TO THE EXTENT THAT NOTHING SHALL BE LEFT IN THE BEACH AREA IN A CONDITION WHICH IS LIKELY TO CAUSE A VOID IN THE SAND FILL.

BEACH SAND SHALL BE PLACED ON THE BEACH TO THE PLAN SHAPE AND PROFILE DETAILED ON THE DRAWINGS. THE SAND SHALL BE PLACED OVER THE BEACH AREA SO AS TO OPTIMISE THE HOMOGENEITY OF FILLING. THE MATERIAL SHALL BE DEPOSITED SO THAT THE UPPER SURFACE IS BROUGHT UP TO THE PROFILES SHOWN ON THE DRAWINGS AND SPREAD AND LEVELLED TO THE APPROVAL OF THE ENGINEER. PRE-AND POST-PLACING SURVEYS SHALL BE CARRIED OUT DOWN THE BEACH SLOPES BY THE CONTRACTOR AT 5 METRE SPACINGS ALONG THE BEACH SETTING-OUT LINE TO RECORD THE VOLUMES AND THICKNESSES OF SAND PLACED ON INDIVIDUAL LENGTHS OF BEACH. THE SURVEYS SHALL BE PLOTTED AS SECTIONS AT A SCALE OF 1:100 ON AUTOCAD/CIVIL 3D-PRODUCED DRAWINGS AND SUPPORTING CALCULATIONS PRESENTED OF THE VOLUMES OF MATERIAL PLACED. DRAWINGS SHALL BE PRODUCED TO AN APPROVED FORMAT AND SUBMITTED TO THE ENGINEER FOR AGREEMENT AND APPROVAL.

THE CONTRACTOR SHALL HAND OVER TO THE ENGINEER ONE ORIGINAL PDF PLOT OF EACH APPROVED RECORD DRAWING, TOGETHER WITH THE DRAWINGS AS AUTOCAD OR DXF FORMAT AND THE SURVEY DATA .XYZ FILE TO BE PROVIDED.

1.8 PLACEMENT TOLERANCE

THE PLACEMENT TOLERANCE SHALL BE: +300mm AND -0mm. THE FINAL PROFILE SHALL BE FREE FROM ABRUPT CHANGES IN LEVEL AND LOCAL HIGH OR LOW SPOTS.

1.9 UNSUITABLE MATERIAL

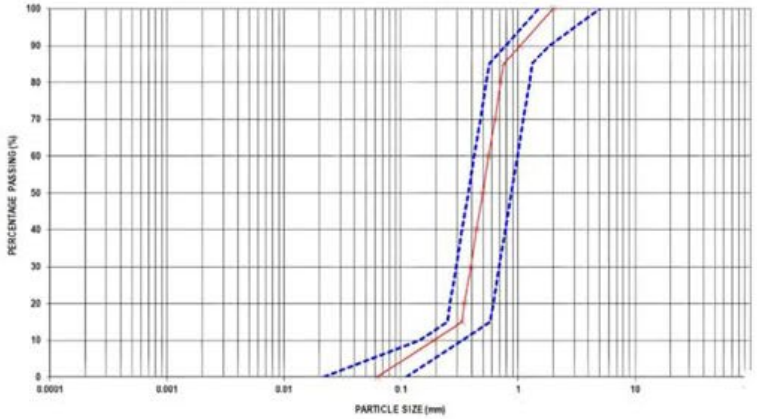
ANY DREDGED MATERIAL THAT, ACCORDING TO THE ENGINEER IS UNSUITABLE FOR BEACH REPLENISHMENT (I.E. 'BLACK SAND'), SHALL NOT BE DISCHARGED AT THE BEACH. SUCH MATERIAL SHALL BE LEFT IN-SITU AT THE EXTRACTION SITE OR SHALL BE DISPOSED OF AS DIRECTED BY THE ENGINEER. THE DISPOSAL OF UNSUITABLE DREDGED MATERIAL WILL BE THE CONTRACTOR'S RESPONSIBILITY.

1.10 METHOD OF MEASURE

VOLUME OF SAND IS TO BE MEASURED IN SITU PLACED ON THE BEACH. THE UNIT OF MEASURE WILL BE m³.

1.11 GRADING CURVE

GRADING ENVELOPE FOR BEACH SAND FOR PAIHIA WATERFRONT; D_{50} = 0.5mm



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

FIGURE 1: GRADING CURVE

NORTHLAND REGIONAL COUNCIL
Plan Number 5091/8

Filename:
Plot Date: 29/03/2022 2:44:26 pm

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Beca LITTORALIS LANDSCAPE ARCHITECTURE

CLIENT
Far North Holdings Limited

REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
BEACH SAND SPECIFICATION	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-022	1

ARMOUR ROCK SPECIFICATION

GENERAL

THIS SPECIFICATION SHALL BE READ IN CONJUCTION WITH THE STANDARD "CIRIA C683 THE ROCK MANUAL - THE USE OF HYDRAULIC ROCK IN ENGINEERING, 2007" AND ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THIS STANDARD UNLESS EXPRESSLY NOTED OTHERWISE.

THE CONTRACTOR SHALL PREPARE A METHOD STATEMENT FOR THE ENGINEER'S REVIEW INCLUDING SOURCES OF MATERIALS AND QUARRYING, HOW THE SPECIFIED ROCK GRADINGS WILL BE ACHIEVED, HANDLING, TRANSPORT AND STOCKPILING OF ROCK, WORK SEQUENCE, ROCK PLACEMENT AND TOLERANCES, EXPERIENCE OF KEY PERSONNEL, DIVING INSPECTIONS, INCLUDING SAFETY AND LEGISLATIVE REQUIREMENTS, EMERGENCY PLANS FOR STORM AND NATURAL HAZARD EVENTS, WEATHER AND WAVE, CLIMATE FORECASTING AND WARNING SYSTEMS, SURVEY TECHNIQUES, PROCEDURES FOR SAMPLING AND TESTING PROCEDURES, HEALTH AND SAFETY AND ENVIRONMENTAL MATTERS. THE WORK METHOD STATEMENT SHALL ADDRESS THE SPECIFIED TOLERANCES FOR THE MATERIALS TO BE PLACED, THE WAVE AND WEATHER SEASONS AND CONDITIONS, THE OPERATING WHARF, VESSEL TRAFFIC, AND THE MEASURES TO CONTAIN MATERIALS DURING CONSTRUCTION AND TO PREVENT LOSS OF MATERIALS IN ADVERSE CONDITIONS.

THE CONTRACTOR SHALL NOMINATE AT THE TIME OF TENDER, THE SOURCE AND MATERIAL TYPE FOR THE ROCK. SOURCE TESTING AND GRADING IS REQUIRED FOR EACH OF THE TESTS DESCRIBED BELOW UNDER ROCK QUALITY AND ROCK GRADING AND RESULTS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO THE COMMENCEMENT OF WORKS. TESTING IS TO BE UNDERTAKEN AT AN IANZ ACCREDITED LABORATORY.

THE CONTRACTOR SHALL CONDUCT A TRIAL TO DEMONSTRATE HOW THE PROPOSED WORK METHODS AND RESOURCES WILL RESULT IN THE BREAKWATER BEING BUILT IN FULL ACCORDANCE WITH THE SPECIFICATION. THE TRIAL SHALL EXTEND OVER THE FULL LAYER HEIGHT IN A SINGLE PASS AND MINIMUM WIDTH OF 10m. PROVIDED THE TRIAL MEETS THE SPECIFICATION, THE TRIAL PANEL MAY BE INCORPORATED INTO THE PERMANENT WORKS.

THE CONTRACTOR SHALL CARRY OUT PRE AND POST WORK SURVEYS. MEASUREMENT SURVEYS TO SUPPORT PROGRESS PAYMENT APPLICATIONS, SURVEYS TO MONITOR SETTLEMENT OF ROCK STRUCTURE BELOW AND ABOVE WATER AND INTERMEDIATE SURVEYS UPON COMPLETION OF EACH STAGE OF WORKS. SURVEY OF ROCK BE CARRIED OUT USING A COMBINATION OF DGPS SURVEY SYSTEMS RIGGED TO CONSTRUCTION EQUIPMENT. NARROW BEAM ECHO SOUNDING OR MULTIBEAM ECHO SOUNDING MAY BE USED. THE PROPOSED SURVEY SYSTEM IS TO BE INCLUDED IN THE CONTRACTOR'S WORK METHOD STATEMENT FOR REVIEW BY THE ENGINEER.

ROCK QUALITY: ARMOUR ROCK AND UNDERLAYER

EACH TEST SPECIFIED BELOW SHALL COMPRISE A MINIMUM OF THREE SAMPLES.

1. ARMOUR ROCK AND UNDERLAYER SHALL BE HARD, DURABLE, CRUSHED, QUARRIED OR NATURAL STONE FREE FROM VISUALLY OBSERVABLE OR CHEMICALLY DETECTABLE IMPURITIES DUST, CLAY, ORGANIC MATTER AND OTHER DELETERIOUS MATERIAL. THE STONE SHALL BE FREE FROM LAMINATIONS AND CLEAVAGES AND SHALL NOT DISINTEGRATE ON EXPOSURE TO WEATHERING.
2. ROCK SHALL BE CRUSHED, ANGULAR SHAPED MATERIAL, COMPLYING WITH THE REQUIREMENTS OF THE SPECIFICATION, FROM A SOURCE WHICH SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER. UNCONFINED COMPRESSIVE STRENGTH SHALL BE A MINIMUM OF 100MPa WHEN TESTED WITH ASTM STANDARD D2938-95, UNLESS OTHERWISE SPECIFIED. EACH TEST SHALL COMPRISE A MINIMUM OF THREE SAMPLES.
3. THE MINIMUM SOLID DENSITY (SSD) OF ARMOUR ROCK AND UNDERLAYER FOR THE BREAKWATERS SHALL BE 2.65 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.
3. THE MINIMUM SOLID DENSITY (SSD) OF ARMOUR ROCK AND UNDERLAYER FOR THE EASTERN ABUTMENT SHALL BE 2.50 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.
4. THE ARMOUR ROCK AND UNDERLAYER SHALL HAVE A WATER ABSORPTION LESS THAN 3.0% IN ACCORDANCE WITH NZS 3111.
5. ARMOUR ROCK AND UNDERLAYER RESISTANCE TO ABRASION - LOS ANGELES ABRASION NOT MORE THAN 25% LOSS IN WEIGHT IN ACCORDANCE WITH NZS 4407.
6. THE QUARRY STONE USED FOR ARMOUR ROCK AND UNDERLAYER SHALL HAVE A QUALITY INDEX OF AA, AB, OR BA WHEN TESTING IN ACCORDANCE WITH NZS 4407.
7. QUARRY STONE USED FOR ARMOUR ROCK AND UNDERLAYER SHALL HAVE A CRUSHING RESISTANCE NOT LESS THAN 150kN TO PRODUCE A MAXIMUM OF 10% FINES WHEN TESTED IN ACCORDANCE WITH NZS 4407.

ROCK QUALITY: ARCHITECTURAL ROCK

1. THE MINIMUM SOLID DENSITY (SSD) OF ARCHITECTURAL ROCK SHALL BE 2.50 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.

ROCK GRADING

1. QUARRY RUN CORE:

QUARRY RUN MATERIAL FOR USE IN THE BREAKWATER CORE SHALL BE CAPABLE OF ACHIEVING A RELATIVELY HIGH DENSITY WITHOUT COMPACTION WHEN DUMPED UNDER WATER.

QUARRY RUN SHALL BE EVENLY GRADED 13mm TO 500mm, WITH MATERIAL SMALLER THAN 75mm NOT TO EXCEED 10% OF TOTAL WEIGHT. THE TARGET GRADING IS:

QUARRY RUN GRADING						
ROCK SIZE (mm)	13	20	75	150	400	500
% PASSING	0	4	19	34	75	97

THE CONTRACTOR SHALL DEVELOP A QUARRY RUN GRADING WITH UPPER AND LOWER LIMITS AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO ROCK PRODUCTION.

2. ARMOUR, UNDERLAYER AND ARCHITECTURAL ROCK:

THE MASS DISTRIBUTION AND THE MEDIAN MASS SHALL BE DETERMINED IN ACCORDANCE WITH SECTION 3.4.3 OF CIRIA C683, THE ROCK MANUAL, AND SHALL CONFORM TO THE FOLLOWING TABLE:

ROCK GRADING							
M_{50}	D_{n50}	GRADING CLASS DESIGNATION	LAYER THICKNESS	E_{LL}	N_{LL}	M_{UL}	E_{UL}
(kg)	(m)	(kg)	(m)	(kg)	(kg)	(kg)	(kg)
WESTERN BREAKWATER, NORTH-ERN BREAKWATER, EASTERN ABUTMENT							
1125	0.75	ARMOUR	1.50	350	540	1600	2530
72	0.30	UNDERLAYER	VARIES	15	20	130	220
WESTERN ABUTMENT							
1430	0.83	ARCHITECTURAL	0.83	510	710	2025	3075
1125	0.75	ARMOUR	1.50	350	540	1600	2500
72	30	UNDERLAYER	VARIES	15	20	130	220

WHERE M_{50} IS THE MEAN MASS, M = 5.5D x D^3
D_n IS THE NOMINAL DIAMETER CONSIDERING THE ROCK AS AN EQUIVALENT CUBE.
D IS THE SIEVE SIZE AND USED FOR ON SITE MEASUREMENT. CONVERSION TO BE CONFIRMED ON CONFIRMATION OF ROCK SUPPLY.

THE CONTRACTOR SHALL DEVELOP GRADINGS WITH UPPER AND LOWER LIMITS BASED ON DATA IN THE ROCK GRADING TABLE AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO ROCK PRODUCTION.

- EXTREME LOWER LIMIT (ELL) - THE MASS BELOW WHICH NO MORE THAN 5% PASSING BY MASS IS PERMITTED FOR M_{50} GREATER THAN 300KG, 2% FOR M_{50} LESS THAN 300KG.
- NOMINAL LOWER LIMIT (NLL) - THE MASS BELOW WHICH NO MORE THAN 15% PASSING BY MASS IS PERMITTED.
- NOMINAL UPPER LIMIT (NUL) - THE MASS BELOW WHICH NO LESS THAN 70% PASSING BY MASS IS PERMITTED.
- EXTREME UPPER LIMIT (EUL) - THE MASS BELOW WHICH NO LESS THAN 97% PASSING BY MASS IS PERMITTED.

SAMPLING AND TESTING SHALL BE ACCORDING TO CIRIA C683, THE ROCK MANUAL, USING AT LEAST 50 PIECES TAKEN AT RANDOM FROM STONES GREATER IN MASS THAN THE ELL.

ROCK SHAPE

1. ALL ROCK SHALL BE ESSENTIALLY EQUI-DIMENSIONAL WITH ELONGATED OR THIN SLABS OF ROCK BEING UNDESIRABLE. QUARRY STONE USED FOR ARMOUR, UNDERLAYER AND ARCHITECTURAL ROCK SHALL HAVE A LENGTH (L) TO WIDTH (W) RATIO OF LESS THAN FIFTY PERCENT (50%) OF STONES SHALL NOT HAVE A L/W RATIO GREATER THAN 2.
2. SAMPLING AND TESTING SHALL BE ACCORDING TO CIRIA C683, THE ROCK MANUAL, USING AT LEAST 50 PIECES TAKEN AT RANDOM FROM STONES GREATER IN MASS THAN THE ELL.
3. BLOCKS OF QUARRY STONE IN HEAVY GRADINGS SHOWING CLEAR SIGNS OF SIGNIFICANT EDGE OR CORNER WEAR OR OF SEVERE ROUNDING SHALL NOT BE ACCEPTED.

TEST FREQUENCY

1. ROCK PROPERTIES AND GRADING TO BE UNDERTAKEN AND SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO WORK COMMENCING.
2. ROCK PROPERTIES AND GRADING TO BE REPEATED IF MATERIAL SOURCE CHANGES.
3. THE CONTRACTOR SHALL CARRY OUT TESTING IN ACCORDANCE WITH THE FOLLOWING TABLES. THE ENGINEER MAY CARRY OUT CHECK TESTING. THE CONTRACTOR SHALL BE REQUIRED TO COOPERATE.

SOURCE TESTING BEFORE CONSTRUCTION

MATERIAL	TEST	FREQUENCY
QUARRY RUN CORE, ARCHITECTURAL ROCK, CORE/UNDERLAYER AND ARMOUR ROCK	DENSITY GRADING SHAPE WEATHERING RESISTANCE RESISTANCE TO IMPACT AND MINERAL FABRIC BREAKAGE CRUSHING RESISTANCE RESISTANCE TO ABRASION DROP TEST ABSORPTION UNCONFINED COMPRESSIVE STRENGTH	DENSITY: ONE SET (10 TESTS PER SET) PER MATERIAL TYPE AND SOURCE ALL REMAINING: ONE SET (3 TESTS PER SET) PER MATERIAL TYPE AND SOURCE

NO ROCK SHALL BE PLACED UNTIL ALL THE TEST RESULTS HAVE BEEN SUBMITTED TO AND REVIEWED BY THE ENGINEER.

TESTS AND INSPECTIONS DURING CONSTRUCTION

MATERIAL	TEST	FREQUENCY
QUARRY RUN CORE	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 3,000m³
	GRADING AND SHAPE	1 TEST PER 2,000m³
ARMOUR AND ARCHITECTURAL ROCK	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 3,000m³
	GRADING AND SHAPE	1 TEST PER 2,000m³
UNDERLAYER ROCK	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 3,000m³
	GRADING AND SHAPE	1 TEST PER 2,000m³
TRIMMED CORE, ARCHITECTURAL ROCK, ARMOUR AND UNDERLAYER	LINE AND LEVEL OF EACH LAYER	1 PER 5m LONGITUDINALLY AND AT TRANSITIONS AND 1 PER 3m SLOPE TRANSVERSALLY AND AT ANGLE CHANGES

THE CONTRACTOR SHALL ALLOW FOR THE COSTS OF SAMPLING AND TESTING AS DESCRIBED ABOVE. TESTING SHALL BE CARRIED OUT BY AN IANZ ACCREDITED LABORATORY AND THE RESULTS SHALL BE SUBMITTED TO THE ENGINEER AND REVIEWED PRIOR TO ANY CONSTRUCTION.

CONSTRUCTION

1. PLACING OF EACH LAYER SHALL COMMENCE AT THE TOE AND SHALL PROCEED UPWARDS TOWARDS THE TOP, CONSTRUCTING THE FULL LAYER THICKNESS IN A SINGLE PASS.
2. ROCKS SHALL BE PLACED TO:
   a. ACHIEVE A WELL KEYED, DENSELY PACKED STRUCTURE AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION. WHERE THE CONTRACTOR USES A HIGHER ROCK DENSITY (SSD) SPECIFIED THEY SHALL SPECIFY THE REVISED ROCK DENSITY AND ADJUST THE TARGET PLACED DENSITY PRO-RATA.
   b. ACHIEVE EFFECTIVE INTERLOCKING, SO THAT EACH ROCK IS SECURELY HELD IN PLACE BY ITS NEIGHBOURS AND DOES NOT DEPEND ON FRICTIONAL RESISTANCE. FOR STABILITY PRIOR TO PLACING FURTHER STONES.
   c. ACHIEVE A FINISHED LAYER AT LEAST TWO ROCKS THICK UNLESS SHOWN OTHERWISE ON THE DRAWINGS.
   d. AVOID FORMING, WITHIN THE OVERALL THICKNESS OF THE LAYER, SEPARATE LAYERS IN THE PLANE PARALLEL TO THE SLOPE OF THE UNDERLYING MATERIAL.
   e. MINIMISE ANY DISTURBANCE TO ALREADY PLACED ROCK.
   f. AVOID DAMAGE TO ANY EXISTING STRUCTURES.
3. UNDERLAYER AND ARMOUR ROCK SHALL BE PLACED AS SOON AS PRACTICABLE TO PROTECT THE UNDERLYING MATERIAL. MATERIAL ERODED BY WAVE ACTION OR ANY OTHER CAUSE SHALL BE MADE GOOD BY THE CONTRACTOR, AT THE CONTRACTOR'S OWN EXPENSE BEFORE PLACING THE APPROPRIATE PROTECTIVE LAYER.
4. UNDERLAYER ROCK SHALL BE DEPOSITED CAREFULLY SO THAT GEOTEXTILE FABRIC IS NOT PUNCTURED. WHERE GEOTEXTILE IS PRESENT ROCKS SHALL NOT BE DROPPED. MAXIMUM DROP HEIGHT OF THE UNDERLAYER ROCK SHALL BE LIMITED TO 1.0m. THE CONTRACTOR SHALL BE PERMITTED TO USE ROCK TRAYS FOR PLACEMENT OF THE UNDERLAYER.
5. ARMOUR AND ARCHITECTURAL ROCK SHALL BE INDIVIDUALLY PLACED PIECE BY PIECE INTO THE STRUCTURE TO ACHIEVE A MINIMUM 3-POINT SUPPORT AND BE STABLE TO THE LINES AND LEVELS SHOWN ON THE DRAWINGS. THE STONE SHALL BE DEPOSITED CAREFULLY SO THAT THE GEOTEXTILE FABRIC IS NOT PUNCTURED. THE DROP TEST BREAKAGE INDEX BASED ON SAMPLING AND TESTING AS DESCRIBED IN CIRIA C683 SHALL BE LESS THAN 5%.

TOLERANCES

6. HORIZONTAL TOLERANCE FOR THE BREAKWATER AXIS AND FOOTPRINT TO BE ±0.50m.
7. THE VERTICAL TOLERANCES FOLLOW ACCORDING TO ROCK CLASS AND LOCATION:

LEVEL OF PLACING	QUARRY RUN CORE	ARMOUR, UNDERLAYER AND ARCHITECTURAL ROCK	
		ON INDIVIDUAL MEASUREMENTS (m)	DESIGN PROFILE TO ACTUAL MEAN PROFILE (m)
ABOVE CHART DATUM (0m CD)	± 0.20m	$\pm 0.30m + D_{n50}$	$+0.35m + D_{n50}$ $-0.25m + D_{n50}$
BELOW CHART DATUM (0m CD)	+0.30m -0.30m	$\pm 0.50m + D_{n50}$	$+0.60m + D_{n50}$ $-0.40m + D_{n50}$

NOTWITHSTANDING THE TOLERANCES ABOVE, THE FOLLOWING SHALL APPLY TO ARMOUR LAYERS:

- THE TOLERANCES ON TWO CONSECUTIVE MEAN ACTUAL PROFILES SHALL NOT BE NEGATIVE.
- NOTWITHSTANDING ANY ACCUMULATION OF POSITIVE TOLERANCES ON UNDERLYING LAYERS, THE THICKNESS OF THE LAYER SHALL NOT BE LESS THAN 80% OF THE NOMINAL THICKNESS SHOWN ON THE DRAWINGS WHEN CALCULATED USING MEAN PROFILES.
- THE ACTUAL MEAN PROFILE IS THE LINE TAKEN AT THE BOTTOM OF THE SLOPE AND AT THE TOP OF THE SLOPE.

GEOTEXTILE

1. GEOTEXTILE TO BE TEXCEL 900K OR EQUIVALENT.
2. THE GEOTEXTILE FABRIC SHALL BE PLACED AT THE LOCATIONS SHOWN ON THE DRAWINGS. THE SITE SHALL BE PREPARED BY CLEARING AND GRADING THE AREA REQUIRED. ALL SHARP OBJECTS AND STONES SHALL BE REMOVED. GEOTEXTILES SHALL BE PLACED JUST AHEAD OF ASSOCIATED ADVANCING CONSTRUCTION WORK AND BE COVERED BY THE UNDERLAYER WITHIN 48 HOURS OF BEING PLACED AND WITHOUT PUNCTURES OR TEARS.
3. GEOTEXTILE SHALL BE STABILISED AGAINST ULTRAVIOLET LIGHT AND SHALL NOT BE PERMANENTLY IMPAIRED BY TEMPORARY EXPOSURE TO DIRECT SUNLIGHT DURING CONSTRUCTION. GEOTEXTILE SHALL BE SUPPLIED IN ROLLS AT LEAST 4.5M WIDE.
4. THE GEOTEXTILE SHALL BE KEPT IN ITS PROTECTIVE WRAPPING ON THE SITE AND STORED OUT OF DIRECT SUNLIGHT SO IT IS NOT EXPOSED TO ULTRA-VIOLET LIGHT PRIOR TO INSTALLATION. GEOTEXTILE THAT IS NOT IMMEDIATELY COVERED AFTER INSTALLATION SHALL BE COVERED WITH AN APPROVED MATERIAL OF SUFFICIENT THICKNESS TO PROTECT IT FROM ULTRA-VIOLET LIGHT. GEOTEXTILE THAT IS DAMAGED SHALL BE REJECTED AND REMOVED FROM SITE.
5. THE LAP WIDTH OF ADJACENT STRIPS OF GEOTEXTILE SHALL DEPEND ON THE METHOD OF JOINTING AS FOLLOWS:

JOINT METHOD	MINIMUM LAP WIDTH (mm)
FACTORY STITCHED	150
LAP ONLY	1,000

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CLIENT

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REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
ROCK SPECIFICATION	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-025	1

CEMENT STABILISED MATERIAL (CSM) SPECIFICATION

1. DESCRIPTION

THE MARINE SOILS TO BE CEMENT STABILISED WILL BE OBTAINED FROM THE PAIHIA WATERFRONT CHANNEL AND EASTERN ABUTMENT DREDGING. STABILISED MARINE SEDIMENTS WILL BE USED FOR THE WESTERN ABUTMENT, AS SHOWN ON D90 3235491-CA-014.

GEOTECHNICAL INVESTIGATIONS WITHIN DREDGED AREA INDICATE THAT DREDGED MATERIAL IS LIKELY TO INCLUDE MARINE SEDIMENTS AND WEATHERED MATERIAL OVERLAYING SANDSTONE BEDROCK IN SOME AREAS. IT IS INTENDED TO CEMENT STABILISE THE DREDGED MATERIAL AND USE IT FOR CONSTRUCTION OF INNER PART OF THE WESTERN REVETMENT. THE CONTRACTOR SHALL DREDGE AND DELIVER THE DREDGED MATERIAL IN SUCH A MANNER TO ENSURE THAT THE MATERIALS BEING STABILISED ARE RELATIVELY CONSISTENT.

BECAUSE OF THE COHESIVE NATURE OF THE WEATHERED MATERIAL, THEY MAY NOT BE WELL SUITED TO PUGMILL STABILISATION. A SMALL AMOUNT OF SUCH MATERIAL CAN BE TOLERATED WITHIN THE STABILISED SEDIMENTS PROVIDING IT IS IN ISOLATED LUMPS AND WELL SPREAD THROUGHOUT THE MASS. THE CONTRACTOR SHALL SUPPLY PLANT OF APPROPRIATE SIZE AND STRENGTH CAPABLE OF THOROUGHLY MIXING THE DREDGINGS TO PRODUCE A UNIFORM PRODUCT BY BLENDING THIS MATERIAL WITH MARINE SEDIMENTS TO PRODUCE STABILISED MARINE SEDIMENTS. THE LUMPS SHALL BE EVENLY DISTRIBUTED THROUGHOUT THE DREDGING.

THE DREDGED MATERIAL CONSIDERED NOT SUITABLE FOR PUGMILL MIXING (I.E. CLAY) WILL BE STABILISED BY A METHOD OF SPREADING AND MIXING ON LAND TO ACHIEVE SPECIFIED STRENGTHS.

THE WORK SPECIFIED IN THIS SECTION INCLUDES THE CEMENT STABILISATION OF MARINE DREDGINGS, AND TRANSPORTATION AND PLACEMENT OF STABILISED MATERIAL FOR THE ABUTMENT/GROYNE.

2. PURPOSE FOR STABILISATION

THE REASON FOR STABILISING THE MARINE SEDIMENTS IS TO PRODUCE A UNIFORM STABILISED MATERIAL WITH THE SPECIFIED SHEAR STRENGTHS TO PRODUCE A COMPETENT MATERIAL SUITABLE FOR CONSTRUCTION OF STRUCTURES DESCRIBED ABOVE.

3. MATERIALS

3.1 STABILISING AGENT

THE STABILISING AGENT SHALL BE GENERAL PURPOSE PORTLAND CEMENT COMPLYING IN EVERY RESPECT WITH THE REQUIREMENTS OF NZS 3122.

THE USE OF MODIFIED STABILISING AGENTS, INCLUDING PROPORTIONS OF OTHER BINDERS SUCH AS POZZOLANS IN EXCESS OF THAT PERMITTED BY NZS 3122, WILL NOT BE ACCEPTABLE.

3.2 MARINE SOILS

THESE TYPICALLY COMPRISE RECENTLY DEPOSITED, VARIABLE MARINE SEDIMENTS, OF VARIABLE PARTICLE SIZE AND MOISTURE CONTENT. PAIHIA WATERFRONT DREDGE MATERIAL TYPICALLY CONSISTS OF MARINE WEATHERED CLAY. BOREHOLE LOGS AND LABORATORY TESTS ARE INCLUDED IN THE GEOTECHNICAL REPORTS AND PROVIDE A DESCRIPTION AND RESULTS OF TESTING OF THE SOILS THAT ARE LIKELY TO BE DREDGED AND STABILISED.

4. PROPORTION OF STABILISING AGENT REQUIRED

THE AMOUNT OF STABILISING AGENT ADDED TO THE DREDGINGS SHALL BE SUFFICIENT FOR THE DREDGINGS ONCE MIXED, TO ACHIEVE THE PROPERTIES SPECIFIED IN CLAUSE 5.1 AND CLAUSE 5.2, UNTIL OTHERWISE AGREED IN WRITING BY THE ENGINEER. A MINIMUM OF 80KG OF CEMENT OR AS DIRECTED BY THE ENGINEER SHALL BE ADDED TO EACH CUBIC METRE OF DREDGINGS.

5. C6/250 5REQUIRED PROPERTIES OF STABILISED MARINE SEDIMENTS

5.1 REQUIRED STRENGTHS

THE STABILISED SEDIMENTS SHALL ATTAIN THE FOLLOWING MINIMUM AND AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTHS AT 7 AND 28 DAYS:

TABLE 1: MINIMUM STRENGTH OF STABILISED SEDIMENTS

ZONE	TEST	MINIMUM FREQUENCY OF TESTING
WESTERN ABUTMENT	NZS 4402, TEST 6.3.1, UCS TESTS ON PRODUCTION SAMPLES (1 TEST AT 7 DAYS, 2 TESTS AT 28 DAYS)	2 SAMPLES
	BS 1377: PART 9: 1990: 4.4 (OR APPROVED EQUIVALENT), SHEAR VANE TESTS	10m BY 10m GRID

(a) ACCEPTANCE CRITERIA FOR THE MINIMUM UNCONFINED COMPRESSIVE STRENGTH SHALL BE NINE OUT OF TEN CONSECUTIVE TESTS EXCEEDING THE MINIMUM AND AVERAGE OF THE SAME NINE TESTS EXCEEDING VALUES SPECIFIED ABOVE AND NO SINGLE TEST RESULT IS LESS THAN 75% OF THE MINIMUM VALUE.

6. TRIAL STABILISATION

FOR EACH CLASS OF STABILISED MARINE SEDIMENT, A TRIAL COMPRISING A MINIMUM OF 250 CUBIC METRES OF STABILISED SEDIMENT SHALL BE UNDERTAKEN UPON THE COMMENCEMENT OF DREDGING/STABILISATION. THE INTENT OF THE TRIAL IS TO VERIFY THAT THE CONTRACTOR'S DREDGED MATERIALS, CEMENT CONTENT, MIXING AND PLACING TECHNIQUES ARE ABLE TO SATISFY THE REQUIREMENTS OF THIS SPECIFICATION.

a. FOUR SAMPLES (WHICH CONSTITUTE ONE SET) SHALL BE OBTAINED FROM A MINIMUM OF 2 BATCHES, MAKING A TOTAL OF 8 SAMPLES.
b. SAMPLE DESCRIPTION SHALL BE IN ACCORDANCE WITH THE NEW ZEALAND GEOTECHNICAL SOCIETY GUIDELINES AND MOISTURE CONTENTS SHALL BE DETERMINED FOR EACH SAMPLE.
c. TWO TEST CYLINDERS FROM EACH SET SHALL BE TESTED IN COMPRESSION AT 7 DAYS.
d. THE REMAINING CYLINDERS SHALL ALL BE TESTED IN COMPRESSION AT 28 DAYS.

IN ADDITION TO THE ABOVE, ONE LARGER BLOCK SAMPLE SHALL BE COLLECTED AND PLACED ON SITE SUCH THAT SHEAR STRENGTH MEASUREMENTS CAN BE UNDERTAKEN WITH A PILCON SHEAR VANE. SHEAR VANE TESTS SHALL BE UNDERTAKEN AT NOMINALLY 4, 8, 12 AND 24 HOURS FOLLOWING FORMING THE SAMPLE, TO DETERMINE WHEN THE SHEAR STRENGTH OF 100kPA HAS BEEN ACHIEVED.

THE RESULTS OF THIS TESTING SHALL BE MADE AVAILABLE TO THE ENGINEER. IF THE RESULTS OF THE TRIAL DO NOT MEET THE SPECIFIED CRITERIA, THE CONTRACTOR SHALL MODIFY HIS METHOD OF OPERATION AND REPEAT THE TEST UNTIL THE REQUIRED RESULTS ARE ACHIEVED, AT NO COST TO THE PRINCIPAL. IF THE TRIAL IS SUCCESSFUL, IT WILL BE USED AS PART OF THE CONTRACT VOLUMES.

7. STABILISING MARINE SEDIMENTS

GEOTECHNICAL INVESTIGATIONS WITHIN DREDGED AREA INDICATE THAT DREDGED MATERIAL IS LIKELY TO INCLUDE MARINE SEDIMENTS AND WEATHERED MATERIAL OVERLAYING SANDSTONE BEDROCK IN SOME AREAS. THE CONTRACTOR NEEDS TO CONSIDER THE METHOD TO STABILISE THESE TWO DREDGED MATERIAL TYPES: PUGMILL OR SPREADING AND MIXING.

IF MIXING PLANT IS TO BE USED, THE CONTRACTOR SHALL ARRANGE HIS OPERATION IN SUCH A WAY AS TO MINIMISE THE AMOUNT OF WATER WHICH IS ENTRAINED WITH THE MARINE SEDIMENTS AND DELIVERED TO THE MIXER. NO WATER SHALL BE ADDED TO THE DREDGINGS UNLESS OTHERWISE AGREED WITH THE ENGINEER. THE CONTRACTOR SHALL DREDGE AND DELIVER THE MARINE SEDIMENTS TO THE MIXER IN SUCH A MANNER AS TO ENSURE THAT THE MATERIALS BEING STABILISED ARE CONSISTENT.

THE CONTRACTOR SHALL SUPPLY PLANT THAT CAN THOROUGHLY MIX THE DREDGINGS AND STABILISING AGENT TO PRODUCE A UNIFORM PRODUCT WITHIN EACH BATCH.

THE STABILISED SEDIMENTS SHALL BE PLACED IN SUCH A MANNER SO TO MINIMISE THE VOLUME OF STABILISED MARINE DREDGINGS THAT COMES INTO CONTACT WITH SEA WATER. THE PLACING METHOD SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

FOR DREDGED MATERIAL NOT SUITABLE FOR PUGMILL MIXING (I.E. CLAY) A METHOD OF SPREADING AND MIXING THE MATERIAL ON LAND WILL BE ACCEPTABLE PROVIDED SPECIFIED STRENGTHS CAN BE ACHIEVED. THE LAYER OF MATERIAL SHALL BE NO THICKER THAN 300MM. MINIMUM CEMENT RATIO SHALL BE NO LESS THAN 25KG PER SQUARE METRE PER LAYER. THE STABILISING AGENT SHALL BE SPREAD UNIFORMLY OVER THE SURFACE OF THE MATERIAL TO BE STABILISED PRIOR TO MIXING AND SHALL IN NO CASE BE DEPOSITED IN ONE MASS WITH THE DREDGINGS.

SCALES WHICH ARE USED TO WEIGH THE STABILISING AGENT BEING ADDED SHALL BE CALIBRATED BY AN IANZ ACCREDITED LABORATORY ONCE ERECTED ON SITE AND A CERTIFICATE PROVING CORRECT CALIBRATION OF THE SCALES SHALL BE INCORPORATED INTO THE CONTRACTOR'S QUALITY SYSTEM. THE CONTRACTOR SHALL BE REQUIRED TO DEMONSTRATE THAT SPECIFIED AMOUNT OF CEMENT IS APPLIED (I.E. PER EACH SQUARE METRE OF THE MATERIAL SPREAD TO BE MIXED). THE SPECIFIED RATIO OF CEMENT IS 80KG/M³ FOR THE WESTERN ABUTMENT.

ALL STABILISED MATERIAL SHALL BE PLACED WITHIN AN HOUR OF MIXING (OR IN THE CASE OF CLAY STABILISATION SHALL BE TIPPED, TRUCKED AND ROLLED WITHIN HOUR OF STABILISATION), AND NO REWORKING SHALL TAKE PLACE MORE THAN ONE HOUR AFTER MIXING.

THE STABILISED MARINE DREDGINGS MATERIAL SHALL BE PLACED IN LAYERS NOT EXCEEDING 2 METRES. EACH LAYER SHALL NOT BE PLACED UNTIL THE UNDERLYING LAYER HAS ATTAINED THE MINIMUM 7 DAY SHEAR STRENGTH SPECIFIED IN CLAUSE 5.2 OR UNTIL A MINIMUM PERIOD OF 5 DAYS HAS ELAPSED, WHICHEVER IS THE LONGER.

STABILISED CLAY MATERIAL SHALL BE MIXED AND PLACED IN DRY (I.E. ABOVE WATER LEVEL).

8. STABILISATION RECORD CARD

ALL DREDGINGS PLACED IN THE WORKS SHALL BE STABILISED.

AS PART OF THE CONTRACTOR'S QUALITY SYSTEM, THE CONTRACTOR SHALL MAINTAIN ON A DAILY BASIS A RECORD OF ALL STABILISED DREDGINGS BEING PLACED WITHIN THE WESTERN ADUTMENT. AS A MINIMUM, THIS RECORD SHALL CONTAIN:

- THE AREA FROM WHICH THE DREDGINGS WERE OBTAINED.
- THE TYPE OF DREDGINGS.
- THE DATE AND TIMING OF MIXING.
- THE AMOUNT BY WEIGHT OF STABILISING AGENT ADDED.
- THE VOLUME OF DREDGINGS BEING STABILISED.
- THE METHOD OF MIXING AND PLACEMENT.
- THE DATE, TIMING AND LOCATION OF PLACEMENT.
- FOR STABILISATION OF SPREAD MATERIAL, THE DEPTH OF TREATMENT.

9. STRENGTH TESTING OF STABILISED SOILS

THE RATE OF STRENGTH GAIN WITH TIME AND THE ULTIMATE SHEAR STRENGTH OF THE STABILISED SEDIMENTS SHALL BE MONITORED ON AN ONGOING BASIS DURING CONSTRUCTION BY PERFORMING TESTS ON SAMPLES OF THE STABILISED MATERIAL.

AS A MINIMUM, ONE SET, COMPRISING A MINIMUM OF THREE SAMPLES OF STABILISED SEDIMENTS SHALL BE OBTAINED AT THE SAME TIME FROM THE MIXER PRIOR TO ITS PLACEMENT OR AFTER THE SPREADING AND MIXING FROM LAND BASED OPERATION FOR EVERY 500 CUBIC METRES OF MATERIAL MIXED. ALL SAMPLES SHALL BE REPRESENTATIVE OF THE STABILISED SOIL EXCEPTING THAT AT LEAST TWO ADDITIONAL SAMPLES SHALL BE OBTAINED OF ANY SEDIMENTS THAT SIGNIFICANTLY DIFFER FROM THE MAJORITY AND COMPRISE MORE THAN 10 CUBIC METRES.

EACH SAMPLE SHALL BE OF APPROXIMATELY 10 KG WEIGHT AND SHALL BE PLACED INTO A MOULD WITH MINIMAL COMPACTION TO PRODUCE APPROXIMATELY 75 MM DIAMETER 150 MM LONG CYLINDER. THESE CYLINDERS SHALL BE CURED IN A WATER-BATH AS FOR CONVENTIONAL CONCRETE CYLINDERS. MOISTURE CONTENT TESTS SHALL ALSO BE PERFORMED ON ALL SAMPLES.

CYLINDERS SHALL BE TESTED IN ACCORDANCE WITH NZS 4402 TEST N° 6.3.1 TO DETERMINE THE UNCONFINED COMPRESSIVE STRENGTH OF THE MATERIAL. ONE SAMPLE FROM EACH SET SHALL BE TESTED AT 7 DAYS AND TWO AT 28 DAYS TO CONFIRM THE STRENGTH REQUIREMENTS SPECIFIED AT CLAUSE 5 ARE MET.

28 DAYS AFTER COMPLETION OF THE STRUCTURES, 2 CORES SHALL BE PERFORMED AT EACH STRUCTURE AND UCS TESTS UNDERTAKEN ON SAMPLES FROM EACH BOREHOLE TO CONFIRM THE STRENGTH REQUIREMENTS SPECIFIED IN CLAUSE 5 ARE MET. THE CORE SHALL BE LABELLED, WRAPPED AND STORED ON SITE, AND SHALL BE MADE AVAILABLE FOR INSPECTION WHEN REQUESTED BY THE ENGINEER.

IN ADDITION, THE CONTRACTOR SHALL CARRY OUT LARGE SHEAR VANE TESTING IN ACCORDANCE WITH BS 1377: PART 9: 1990: 4.4 (OR APPROVED EQUIVALENT) TO DETERMINE THE STRENGTH OF THE INSITU MUDCRETE. THE MINIMUM DIMENSIONS OF THE LARGE VANE SHALL BE 50MM DIAMETER AND HEIGHT 100MM. THE CONTRACTOR SHALL HAVE THE SHEAR VANE CALIBRATED ON A ONE MONTHLY BASIS BY AN IANZ ACCREDITED LABORATORY. RESULTS OF THE CALIBRATIONS SHALL BE FORWARDED TO THE ENGINEER PRIOR TO TESTING. THE SHEAR VANE TESTING SHALL BE CARRIED OUT ON A 10M BY 10M GRID.

TABLE 2: TESTING DURING CONSTRUCTION

UNCONFINED COMPRESSIVE STRENGTH (kPa) (IN ACCORDANCE WITH NZS 4402, TEST 6.3.1)			
ZONE	MIN[1] @ 7 DAYS	MIN[2] @ 28 DAYS	AV @ 28 DAYS
WESTERN ABUTMENT	100	250	400

THE ENGINEER MAY CARRY OUT INDEPENDENT CHECK TESTING. THE CONTRACTOR SHALL BE REQUIRED TO CO-OPERATE WITH ANY REQUIREMENTS OF THE INDEPENDENT TESTING.

THE SAME STRENGTH TESTING REQUIREMENTS WILL APPLY TO MATERIAL MIXED ON LAND (CLAY MATERIAL).

10. STRENGTH VARIATION MONITORING

AS A MINIMUM, THE CONTRACTOR SHALL COMPARE THE 7 DAY STRENGTHS OBTAINED FROM EACH SET IN CLAUSE 9 ABOVE, TO ASSESS THE EFFECTIVENESS OF THE MIXING. SHOULD THESE STRENGTHS VARY BY MORE THAN 20% FROM THE AVERAGE STRENGTH OF THE SAMPLES TESTED, THE CONTRACTOR SHALL REVIEW HIS MIXING PROCEDURES AND MODIFY THEM AS REQUIRED TO OBTAIN MORE CONSISTENT RESULTS.

11. METHOD OF CALCULATION OF VOLUMES

VOLUMES OF MUDCRETE PRODUCED BY LAND BASED OPERATION WILL BE BASED ON THE AREA OF WHERE THE MATERIAL IS SPREAD AND 300MM THICKNESS OF THE MATERIAL TO BE MIXED.

VOLUME OF MUDCRETE PRODUCED BY PUGMILL WILL BE MEASURED BY DAILY PUGMILL LOGS, WHICH CLEARLY INDICATE MUDCRETE VOLUMES AND CEMENT USED.

CEMENT USED WILL BE BASED ON ACTUAL QUANTITY USED IN MIXING.

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REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR TENDER	09/02/2022
2	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT: 20-0057 PAIHIA WATERFRONT

STATUS: FOR CONSENT

SHEET DESCRIPTION: CEMENT STABILISED MATERIAL (CSM) SPECIFICATION

DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	CA-024	2

ARMOUR ROCK SPECIFICATION

GENERAL

THIS SPECIFICATION SHALL BE READ IN CONJUNCTION WITH THE STANDARD "CIRIA C683 THE ROCK MANUAL - THE USE OF HYDRAULIC ROCK IN ENGINEERING, 2007" AND ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THIS STANDARD UNLESS EXPRESSLY NOTED OTHERWISE.

THE CONTRACTOR SHALL PREPARE A METHOD STATEMENT FOR THE ENGINEER'S REVIEW INCLUDING SOURCES OF MATERIALS AND QUARRYING, HOW THE SPECIFIED ROCK GRADINGS WILL BE ACHIEVED, HANDLING, TRANSPORT AND STOCKPILING OF ROCK, WORK SEQUENCE, ROCK PLACEMENT AND TOLERANCES, EXPERIENCE OF KEY PERSONNEL, DIVING INSPECTIONS, INCLUDING SAFETY AND LEGISLATIVE REQUIREMENTS, EMERGENCY PLANS FOR STORM AND NATURAL HAZARD EVENTS, WEATHER AND WAVE CLIMATE FORECASTING AND WARNING SYSTEMS, SURVEY TECHNIQUES, PROCEDURES FOR SAMPLING AND TESTING PROCEDURES, HEALTH AND SAFETY AND ENVIRONMENTAL MATTERS. THE WORK METHOD STATEMENT SHALL ADDRESS THE SPECIFIED TOLERANCES FOR THE MATERIALS TO BE PLACED, THE WAVE AND WEATHER SEASONS AND CONDITIONS, THE OPERATING WHARF, VESSEL TRAFFIC, AND THE MEASURES TO CONTAIN MATERIALS DURING CONSTRUCTION AND TO PREVENT LOSS OF MATERIALS IN ADVERSE CONDITIONS.

THE CONTRACTOR SHALL NOMINATE AT THE TIME OF TENDER, THE SOURCE AND MATERIAL TYPE FOR THE ROCK. SOURCE TESTING AND GRADING IS REQUIRED FOR EACH OF THE TESTS DESCRIBED BELOW UNDER ROCK QUALITY AND ROCK GRADING AND RESULTS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO THE COMMENCEMENT OF WORKS. TESTING IS TO BE UNDERTAKEN AT AN IANZ ACCREDITED LABORATORY.

THE CONTRACTOR SHALL CONDUCT A TRIAL TO DEMONSTRATE HOW THE PROPOSED WORK METHODS AND RESOURCES WILL RESULT IN THE BREAKWATER BEING BUILT IN FULL ACCORDANCE WITH THE SPECIFICATION. THE TRIAL SHALL EXTEND OVER THE FULL LAYER HEIGHT IN A SINGLE PASS AND MINIMUM WIDTH OF 10m. PROVIDED THE TRIAL MEETS THE SPECIFICATION, THE TRIAL PANEL MAY BE INCORPORATED INTO THE PERMANENT WORKS.

THE CONTRACTOR SHALL CARRY OUT PRE AND POST WORK SURVEYS. MEASUREMENT SURVEYS TO SUPPORT PROGRESS PAYMENT APPLICATIONS. SURVEYS TO MONITOR SETTLEMENT OF ROCK STRUCTURE BELOW AND ABOVE WATER AND INTERMEDIATE SURVEYS UPON COMPLETION OF EACH STAGE OF WORKS. SURVEY OF ROCK BE CARRIED OUT USING A COMBINATION OF DGPS SURVEY SYSTEMS RIGGED TO CONSTRUCTION EQUIPMENT, NARROW BEAM ECHO SOUNDING OR KULTSEAM ECHO SOUNDING MAY BE USED. THE PROPOSED SURVEY SYSTEM IS TO BE INCLUDED IN THE CONTRACTOR'S WORK METHOD STATEMENT FOR REVIEW BY THE ENGINEER.

ROCK QUALITY: ARMOUR ROCK AND UNDERLAYER

EACH TEST SPECIFIED BELOW SHALL COMPRISE A MINIMUM OF THREE SAMPLES.

1. ARMOUR ROCK AND UNDERLAYER SHALL BE HARD, DURABLE, CRUSHED, QUARRIED OR NATURAL STONE FREE FROM VISUALLY OBSERVABLE OR CHEMICALLY DETECTABLE IMPURITIES, DUST, CLAY, ORGANIC MATTER AND OTHER DELETERIOUS MATERIAL. THE STONE SHALL BE FREE FROM LAMINATIONS AND CLEAVAGES AND SHALL NOT DISINTEGRATE ON EXPOSURE TO WEATHER NG.
2. ROCK SHALL BE CRUSHED, ANGULAR SHAPED MATERIAL, COMPLYING WITH THE REQUIREMENTS OF THE SPECIFICATION, FROM A SOURCE WHICH SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER. UNCONFINED COMPRESSIVE STRENGTH SHALL BE A MINIMUM OF 100MPa WHEN TESTED WITH ASTM STANDARD D2938-95. UNLESS OTHERWISE SPECIFIED, EACH TEST SHALL COMPRISE A MINIMUM OF THREE SAMPLES.
3. THE MINIMUM SOLID DENSITY (SSD) OF ARMOUR ROCK AND UNDERLAYER FOR THE BREAKWATERS SHALL BE 2.65 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.
3. THE MINIMUM SOLID DENSITY (SSD) OF ARMOUR ROCK AND UNDERLAYER FOR THE EASTERN ABUTMENT SHALL BE 2.50 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.
4. THE ARMOUR ROCK AND UNDERLAYER SHALL HAVE A WATER ABSORPTION LESS THAN 2.0% IN ACCORDANCE WITH NZS 3111.
5. ARMOUR ROCK AND UNDERLAYER RESISTANCE TO ABRASION - LOS ANGELES ABRASION NOT MORE THAN 25% LOSS IN WEIGHT IN ACCORDANCE WITH NZS 4407.
6. THE QUARRY STONE USED FOR ARMOUR ROCK AND UNDERLAYER SHALL HAVE A QUALITY INDEX OF AA, AB, OR BA WHEN TESTING IN ACCORDANCE WITH NZS 4407.
7. QUARRY STONE USED FOR ARMOUR ROCK AND UNDERLAYER SHALL HAVE A CRUSHING RESISTANCE NOT LESS THAN 150kN TO PRODUCE A MAXIMUM OF 10% FINES WHEN TESTED IN ACCORDANCE WITH NZS 4407.

ROCK QUALITY: ARCHITECTURAL ROCK

1. THE MINIMUM SOLID DENSITY (ssd) OF ARCHITECTURAL ROCK SHALL BE 2.50 t/m³ WHEN TESTED IN ACCORDANCE WITH NZS 4407.

ROCK GRADING

1. QUARRY RUN CORE.

QUARRY RUN MATERIAL FOR USE IN THE BREAKWATER CORE SHALL BE CAPABLE OF ACHIEVING A RELATIVELY HIGH DENSITY WITHOUT COMPACTION WHEN DUMPED UNDER WATER.

QUARRY RUN SHALL BE EVENLY GRADED 10mm TO 500mm, WITH MATERIAL SMALLER THAN 75mm NOT TO EXCEED 10% OF TOTAL WEIGHT. THE TARGET GRADING IS:

QUARRY RUN GRADING						
ROCK SIZE (mm)	10	20	75	150	400	500
% PASSING	0	4	18	34	75	97

THE CONTRACTOR SHALL DEVELOP A QUARRY RUN GRADING WITH UPPER AND LOWER LIMITS AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO ROCK PRODUCTION.

2. ARMOUR, UNDERLAYER AND ARCHITECTURAL ROCK.

THE MASS DISTRIBUTION AND THE MEDIAN MASS SHALL BE DETERMINED IN ACCORDANCE WITH SECTION 3.4.3 OF CIRIA C683, THE ROCKMANUAL, AND SHALL CONFORM TO THE FOLLOWING TABLE:

ROCK GRADING							
M_{50}	D_{n50}	GRADING CLASS DESIGNATION	LAYER THICKNESS	E_{LL}	N_{LL}	M_{UL}	E_{UL}
(kg)	(m)	(kg)	(m)	(kg)	(kg)	(kg)	(kg)
WESTERN BREAKWATER, NORTHERN BREAKWATER, EASTERN ABUTMENT							
1120	0.75	ARMOUR	1.50	350	540	1500	2530
72	0.30	UNDERLAYER	VARIES	15	20	130	220
WESTERN ABUTMENT							
1430	0.83	ARCHITECTURAL	0.83	530	710	2025	3075
1120	0.75	ARMOUR	1.50	350	540	1500	2530
72	30	UNDERLAYER	VARIES	15	20	130	220

WHERE M_{50} IS THE MEAN MASS, $M = 5302 \times D_n^3$

D_n IS THE NOMINAL DIAMETER CONSIDERING THE ROCK AS AN EQUIVALENT CUBE.

D IS THE SIEVE SIZE AND USED FOR ON SITE MEASUREMENT. CONVERSION TO BE CONFIRMED ON CONFIRMATION OF ROCK SUPPLY.

THE CONTRACTOR SHALL DEVELOP GRADINGS WITH UPPER AND LOWER LIMITS BASED ON DATA IN THE ROCK GRADING TABLE AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO ROCK PRODUCTION.

- EXTREME LOWER LIMIT (ELL) - THE MASS BELOW WHICH NO MORE THAN 5% PASSING BY MASS IS PERMITTED FOR M_{50} GREATER THAN 300KG, 2% FOR M_{50} LESS THAN 300KG.
- NOMINAL LOWER LIMIT (NLL) - THE MASS BELOW WHICH NO MORE THAN 10% PASSING BY MASS IS PERMITTED.
- NOMINAL UPPER LIMIT (NUL) - THE MASS BELOW WHICH NO LESS THAN 70% PASSING BY MASS IS PERMITTED.
- EXTREME UPPER LIMIT (EUL) - THE MASS BELOW WHICH NO LESS THAN 97% PASSING BY MASS IS PERMITTED.

SAMPLING AND TESTING SHALL BE ACCORDING TO CIRIA C683, THE ROCK MANUAL, USING AT LEAST 50 PIECES TAKEN AT RANDOM FROM STONES GREATER IN MASS THAN THE ELL.

ROCK SHAPE

1. ALL ROCK SHALL BE ESSENTIALLY EQUA-DIMENSIONAL WITH ELONGATED OR THIN SLABS OF ROCK BEING UNDESIRABLE. QUARRY STONE USED FOR ARMOUR, UNDERLAYER AND ARCHITECTURAL ROCK SHALL HAVE A LENGTH (L) TO WIDTH (W) RATIO OF LESS THAN FIFTY PERCENT (50%) OF STONES SHALL NOT HAVE A L/W RATIO GREATER THAN 2.
2. SAMPLING AND TESTING SHALL BE ACCORDING TO CIRIA C683, THE ROCK MANUAL, USING AT LEAST 50 PIECES TAKEN AT RANDOM FROM STONES GREATER IN MASS THAN THE ELL.
3. BLOCKS OF QUARRY STONE IN HEAVY GRADINGS SHOWING CLEAR SIGNS OF SIGNIFICANT EDGE OR CORNER WEAR OR OF SEVERE ROUNDING SHALL NOT BE ACCEPTED.

TEST FREQUENCY

1. ROCK PROPERTIES AND GRADING TO BE UNDERTAKEN AND SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO WORK COMMENCING.
2. ROCK PROPERTIES AND GRADING TO BE REPEATED IF MATERIAL SOURCE CHANGES.
3. THE CONTRACTOR SHALL CARRY OUT TESTING IN ACCORDANCE WITH THE FOLLOWING TABLES. THE ENGINEER MAY CARRY OUT CHECK TESTING. THE CONTRACTOR SHALL BE REQUIRED TO COOPERATE.

SOURCE TESTING BEFORE CONSTRUCTION:

MATERIAL	TEST	FREQUENCY
QUARRY RUN CORE, ARCHITECTURAL ROCK, CORE/UNDERLAYER AND ARMOUR ROCK	DENSITY GRADING SHAPE WEATHERING RESISTANCE RESISTANCE TO IMPACT AND MINERAL FABRIC BREAKAGE CRUSHING RESISTANCE RESISTANCE TO ABRASION DROP TEST ABSORPTION UNCONFINED COMPRESSIVE STRENGTH	DENSITY: ONE SET (10 TESTS PER SET) PER MATERIAL TYPE AND SOURCE ALL REMAINING: ONE SET (3 TESTS PER SET) PER MATERIAL TYPE AND SOURCE

NO ROCK SHALL BE PLACED UNTIL ALL THE TEST RESULTS HAVE BEEN SUBMITTED TO AND REVIEWED BY THE ENGINEER.

TESTS AND INSPECTIONS DURING CONSTRUCTION:

MATERIAL	TEST	FREQUENCY
QUARRY RUN CORE	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 3,000m³
	GRADING AND SHAPE	1 TEST PER 2,000m³
ARMOUR AND ARCHITECTURAL ROCK	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 3,000m³
	GRADING AND SHAPE	1 TEST PER 2,000m³
UNDERLAYER ROCK	DENSITY, WATER ABSORPTION AND LA ABRASION	1 TEST PER 3,000m³
	GRADING AND SHAPE	1 TEST PER 2,000m³
TRIMMED CORE, ARCHITECTURAL ROCK, ARMOUR AND UNDERLAYER	LINE AND LEVEL OF EACH LAYER	1 PER 3m LONGITUDINALLY AND AT TRANSITIONS AND 1 PER 3m SLOPE TRANSVERSALLY AND AT ANGLE CHANGES

THE CONTRACTOR SHALL ALLOW FOR THE COSTS OF SAMPLING AND TESTING AS DESCRIBED ABOVE. TESTING SHALL BE CARRIED OUT BY AN IANZ ACCREDITED LABORATORY AND THE RESULTS SHALL BE SUBMITTED TO THE ENGINEER AND REVIEWED PRIOR TO ANY CONSTRUCTION.

CONSTRUCTION

1. PLACING OF EACH LAYER SHALL COMMENCE AT THE TOE AND SHALL PROCEED UPWARDS TOWARDS THE TOP, CONSTRUCTING THE FULL LAYER THICKNESS IN A SINGLE PASS.
2. ROCKS SHALL BE PLACED TO:
   a. ACHIEVE A WELL KEYED, DENSELY PACKED STRUCTURE AND SUBMIT TO THE ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION. WHERE THE CONTRACTOR USES A HIGHER ROCK DENSITY (SSD) SPECIFIED THEY SHALL SPECIFY THE REVISED ROCK DENSITY AND ADJUST THE TARGET PLACED DENSITY PRORATA.
   b. ACHIEVE EFFECTIVE INTERLOCKING, SO THAT EACH ROCK IS SECURELY HELD IN PLACE BY ITS NEIGHBOURS AND DOES NOT DEPEND ON FRICTIONAL RESISTANCE. FOR STABILITY PRIOR TO PLACING FURTHER STONES.
   c. ACHIEVE A FINISHED LAYER AT LEAST TWO ROCKS THICK UNLESS SHOWN OTHERWISE ON THE DRAWINGS.
   d. AVOID FORSEING, WITHIN THE OVERALL THICKNESS OF THE LAYER, SEPARATE LAYERS IN THE PLANE PARALLEL TO THE SLOPE OF THE UNDERLYING MATERIAL.
   e. MINIMISE ANY DISTURBANCE TO ALREADY PLACED ROCK.
   f. AVOID DAMAGE TO ANY EXISTING STRUCTURES.
3. UNDERLAYER AND ARMOUR ROCK SHALL BE PLACED AS SOON AS PRACTICABLE TO PROTECT THE UNDERLYING MATERIAL. MATERIAL ERODED BY WAVE ACTION OR ANY OTHER CAUSE SHALL BE MADE GOOD BY THE CONTRACTOR, AT THE CONTRACTOR'S OWN EXPENSE BEFORE PLACING THE APPROPRIATE PROTECTIVE LAYER.
4. UNDERLAYER ROCK SHALL BE DEPOSITED CAREFULLY SO THAT GEOTEXTILE FABRIC IS NOT PUNCTURED. WHERE GEOTEXTILE IS PRESENT ROCKS SHALL NOT BE DROPPED. MAXIMUM DROP HEIGHT OF THE UNDERLAYER ROCK SHALL BE LIMITED TO 1.0m. THE CONTRACTOR SHALL BE PERMITTED TO USE ROCK TRAYS FOR PLACEMENT OF THE UNDERLAYER.
5. ARMOUR AND ARCHITECTURAL ROCK SHALL BE INDIVIDUALLY PLACED PIECE BY PIECE INTO THE STRUCTURE TO ACHIEVE A MINIMUM 3-POINT SUPPORT AND BE STABLE TO THE LINES AND LEVELS SHOWN ON THE DRAWINGS. THE STONE SHALL BE DEPOSITED CAREFULLY SO THAT THE GEOTEXTILE FABRIC IS NOT PUNCTURED. THE DROP TEST BREAKAGE INDEX BASED ON SAMPLING AND TESTING AS DESCRIBED IN CIRIA C683 SHALL BE LESS THAN 5%.

TOLERANCES

6. HORIZONTAL TOLERANCE FOR THE BREAKWATER AXIS AND FOOTPRINT TO BE ±0.50m.
7. THE VERTICAL TOLERANCES FOLLOW ACCORDING TO ROCK CLASS AND LOCATION:

LEVEL OF PLACING	QUARRY RUN CORE	ARMOUR, UNDERLAYER AND ARCHITECTURAL ROCK	
		ON INDIVIDUAL MEASUREMENTS (m)	DESIGN PROFILE TO ACTUAL MEAN PROFILE (m)
ABOVE CHART DATUM (0m CD)	± 0.20m	± 0.33m x D_{n50}	+ 0.25m x D_{n50} -0.25m x D_{n50}
BELOW CHART DATUM (0m CD)	+ 0.30m -0.30m	± 0.53m x D_{n50}	+ 0.60m x D_{n50} -0.40m x D_{n50}

NOTWITHSTANDING THE TOLERANCES ABOVE, THE FOLLOWING SHALL APPLY TO ARMOUR LAYERS:

- THE TOLERANCES ON TWO CONSECUTIVE MEAN ACTUAL PROFILES SHALL NOT BE NEGATIVE.
- NOTWITHSTANDING ANY ACCUMULATION OF POSITIVE TOLERANCES, ON UNDERLYING LAYERS, THE THICKNESS OF THE LAYER SHALL NOT BE LESS THAN 80% OF THE NOMINAL THICKNESS SHOWN ON THE DRAWINGS WHEN CALCULATED USING MEAN PROFILES.
- THE ACTUAL MEAN PROFILE IS THE LINE TAKEN AT THE BOTTOM OF THE SLOPE AND AT THE TOP OF THE SLOPE.

GEOTEXTILE

1. GEOTEXTILE TO BE TEXCEL 300R OR EQUIVALENT.
2. THE GEOTEXTILE FABRIC SHALL BE PLACED AT THE LOCATIONS SHOWN ON THE DRAWINGS. THE SITE SHALL BE PREPARED BY CLEARING AND GRADING THE AREA REQUIRED. ALL SHARP OBJECTS AND STONES SHALL BE REMOVED. GEOTEXTILES SHALL BE PLACED JUST AHEAD OF ASSOCIATED ADVANCING CONSTRUCTION WORK AND BE COVERED BY THE UNDERLAYER WITHIN 48 HOURS OF BEING PLACED AND WITHOUT PUNCTURES OR TEARS.
3. GEOTEXTILE SHALL BE STABILISED AGAINST ULTRAVIOLET LIGHT AND SHALL NOT BE PERMANENTLY IMPAIRED BY TEMPORARY EXPOSURE TO DIRECT SUNLIGHT DURING CONSTRUCTION. GEOTEXTILE SHALL BE SUPPLIED IN ROLLS AT LEAST 4.5M WIDE.
4. THE GEOTEXTILE SHALL BE KEPT IN ITS PROTECTIVE WRAPPING ON THE SITE AND STORED OUT OF DIRECT SUNLIGHT SO IT IS NOT EXPOSED TO ULTRA-VIOLET LIGHT PRIOR TO INSTALLATION. GEOTEXTILE THAT IS NOT IMMEDIATELY COVERED AFTER INSTALLATION SHALL BE COVERED WITH AN APPROVED MATERIAL OF SUFFICIENT THICKNESS TO PROTECT IT FROM ULTRA-VIOLET LIGHT. GEOTEXTILE THAT IS DAMAGED SHALL BE REJECTED AND REMOVED FROM SITE.
5. THE LAP WIDTH OF ADJACENT STRIPS OF GEOTEXTILE SHALL DEPEND ON THE METHOD OF JOINTING AS FOLLOWS:

JOINT METHOD	MINIMUM LAP WIDTH (mm)
FACTORY STITCHED	150
LAP ONLY	1,000

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REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
ROCK SPECIFICATION	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-025	1

FIBRE REINFORCED CONCRETE SPECIFICATION

1. GENERAL

THIS SPECIFICATION COVERS THE CONSTRUCTION AND CURING OF POLYPROPYLENE FIBRE REINFORCED PORTLAND CEMENT CONCRETE FOR THE LANDWARD SECTION OF THE WESTERN ABUTMENT AT PAIHIA WATERFRONT.

2. STANDARDS

THIS SPECIFICATION SHALL BE READ IN CONJUNCTION WITH THE FOLLOWING STANDARDS, WHICH ARE DEEMED TO FORM A PART OF THIS SPECIFICATION. ALL MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE RELEVANT STANDARD UNLESS EXPRESSLY NOTED OTHERWISE.

IN THE EVENT OF THIS SPECIFICATION BEING AT VARIANCE WITH ANY PROVISION OF A STANDARD, THE REQUIREMENTS OF THIS SPECIFICATION TAKE PRECEDENCE OVER THE PROVISIONS OF THE STANDARD.

THE FOLLOWING STANDARDS SHALL APPLY:

NZS 3101	CONCRETE STRUCTURES STANDARD
NZS 3104	SPECIFICATION FOR CONCRETE PRODUCTION
NZS 3111	METHODS OF TEST - WATER AND AGGREGATE
NZS 3112	METHODS OF TEST - FOR CONCRETE
NZS 3113	CHEMICAL ADMIXTURES FOR CONCRETE
NZS 3114	CONCRETE SURFACE FINISHES
NZS 3121	WATER AND AGGREGATE FOR CONCRETE
NZS 3122	PORTLAND AND BLENDED CEMENTS
NZS 3109	CONCRETE CONSTRUCTION
NZS 9000	QUALITY MANAGEMENT SYSTEMS
ASTM C309	LIQUID MEMBRANE - FORMING COMPOUNDS FOR CURING CONCRETE
EN 14845-1	TEST METHODS FOR FIBRES IN CONCRETE - PART 1: REFERENCE CONCRETES
EN 14845-2	TEST METHODS FOR FIBRES IN CONCRETE - PART 2: EFFECT ON CONCRETE
EN14889-2	FIBRES FOR CONCRETE - PART 2: POLYMER FIBRES
EN 12390-6	TESTING HARDENED CONCRETE - TENSILE SPLITTING STRENGTH OF TEST SPECIMENS

3. MATERIALS

3.1 POLYPROPYLENE FIBRES

SYNTHETIC MONO-FILAMENT, NON-FIBRILLATING POLYPROPYLENE MACRO FIBRES (CLASS II) SHALL BE USED AS CONCRETE REINFORCEMENT FOR THE 52m LANDWARD SECTION OF THE WESTERN ABUTMENT.

THE POLYPROPYLENE FIBRE SHALL COMPLY WITH EN 14889-2.

THE CONTRACTOR SHALL NOMINATE THE TYPE OF FIBRE AND THE FIBRE REQUIREMENTS FOR THE CONCRETE MIX USED FOR THE ABUTMENT CORE. THIS INFORMATION SHALL BE PROVIDED FOR REVIEW BY THE ENGINEER AT LEAST 3 WEEKS PRIOR TO POURING ANY WESTERN ABUTMENT CONCRETE ON SITE.

SPECIMENS OF FIBRES, WHEN SAMPLED AND MEASURED IN ACCORDANCE WITH EN 14889-2 SHALL NOT DEVIATE FROM THE DECLARED VALUE BY MORE THAN THE TOLERANCES GIVEN IN TABLE 1 OF EN 14889-2.

THE CONFORMITY OF A FIBRE TO THE REQUIREMENTS OF EN 14889-2 AND WITH THE DECLARED VALUES SHALL BE DEMONSTRATED BY THE MANUFACTURER BY CARRYING OUT INITIAL TYPE TESTING OF THE PRODUCT AND FACTORY PRODUCTION CONTROL. THE CONTRACTOR SHALL PROVIDE THE RESULTS OF TESTING AND DETAILS OF PRODUCTION CONTROL TO THE ENGINEER AT LEAST 3 WEEKS PRIOR TO POURING ANY CONCRETE ON SITE.

3.2 CONCRETE

3.2.1 GENERAL

CONCRETE SHALL BE SPECIAL CONCRETE AS DEFINED IN NZS 3104.

THE SUPPLY AND PRODUCTION OF CONCRETE SHALL BE IN ACCORDANCE WITH NZS 3104. CONCRETE SHALL BE SUPPLIED FROM A PLANT POSSESSING A CURRENT CERTIFICATE OF AUDIT. THE CONCRETE SHALL BE SUPPLIED AS PREMIXED CONCRETE FROM A PLANT THAT QUALIFIES FOR PRODUCTION ASSESSMENT IN COMPLIANCE WITH NZS 3101.

THE CONTRACTOR SHALL PROVIDE DETAILS OF THE CONCRETE SUPPLY PLANT AND THE PLANT'S CERTIFICATE OF AUDIT TO THE ENGINEER AT LEAST 3 WEEKS PRIOR TO POURING ANY CONCRETE ON SITE.

3.2.2 WATER AND AGGREGATES

WATER AND AGGREGATES FOR CONCRETE SHALL COMPLY WITH NZS 3121.

3.2.3 BINDER MATERIALS

CEMENT SHALL COMPLY WITH NZS 3122, TYPE GP. THE TEMPERATURE OF THE CEMENT AT TIME OF MIXING SHALL NOT EXCEED 69°C.

3.2.4 ADMIXTURES

THE CONTRACTOR SHALL SPECIFY ANY ADMIXTURES (LIKE ACCELERATORS, SUPERPLASTICISER, PUMP AID ETC.) THAT NEEDS TO BE DESIGNED INTO THE MIX DESIGN FOR THE CONCRETE MIX TO INCREASE THE SETTING, INCREASE STRENGTH GAIN, KEEP SLUMPS WITHIN THE WORKABLE RANGE, RESISTING WASHING OUT OF CONCRETE BEING PLACED UNDERWATER

THE ENGINEER SHALL REVIEW ANY ADMIXTURES PROPOSED.

ADMIXTURES AND THEIR USE SHALL COMPLY WITH AS 1478.

3.2.5 CONCRETE STRENGTH

THE CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS SHALL BE 40 MPa (BEFORE ADDITION OF FIBRES), UNLESS STATED OTHERWISE ON THE CONTRACT DRAWINGS.

3.2.6 ALKALI SILICA REACTION

THE FOLLOWING PRECAUTIONS ARE REQUIRED TO REDUCE THE RISK AND CONSEQUENCES OF ALKALI-SILICA REACTION (ASR) IN THE CONCRETE TO AN ACCEPTABLE LEVEL. THEY ARE ADDITIONAL TO ALL REQUIREMENTS OF NZS 3121, NZS 3122 AND NZS 3104. REFERENCE IS MADE IN THE FOLLOWING TO CCANZ TECHNICAL REPORT TR 3 ALKALI SILICA REACTION: MINIMISING THE RISK OF DAMAGE TO CONCRETE, GUIDANCE NOTES AND RECOMMENDED PRACTICE (SECOND EDITION (2003) INCORPORATING AMENDMENT 1 2012) REFERRED TO IN THE BELOW AS TR3 (2003). THE PRECAUTIONS ARE BASED ON THE MODEL SPECIFICATION CLAUSES CONTAINED IN TR3 BUT CONTAIN SOME DIFFERENCES.

SPECIAL CONCRETE:

THE REACTIVITY OF THE FINE AND COARSE AGGREGATES PROPOSED FOR USE IN A PARTICULAR CONCRETE MIX SHALL BE DETERMINED BY PETROGRAPHIC EXAMINATION, ACCELERATED LABORATORY TESTING OR FIELD EXPERIENCE AS DESCRIBED IN SECTION 6.1 OF TR3 (2003).

IF THE CONCRETE PRODUCER CAN CONFIRM THAT THE PROPOSED AGGREGATES ARE NON-REACTIVE, AS DEFINED IN CLAUSE 6.1 OF TR3 (2003), THEN NO FURTHER PRECAUTIONS NEED BE APPLIED. THE PRODUCER SHALL PROVIDE EVIDENCE OF THE NON-REACTIVITY OF THE AGGREGATES.

IF THE CONCRETE PRODUCER CAN CONFIRM THAT THE PROPOSED AGGREGATES ARE NON-REACTIVE, AS DEFINED IN CLAUSE 6.1 OF TR3 (2003), THEN NO FURTHER PRECAUTIONS NEED BE APPLIED. THE PRODUCER SHALL PROVIDE EVIDENCE OF THE NON-REACTIVITY OF THE AGGREGATES.

IF THE CONCRETE PRODUCER CANNOT CONFIRM THAT THE PROPOSED AGGREGATES ARE NON-REACTIVE, AS DEFINED IN CLAUSE 6.1 OF TR3 (2003), THEN THE PRODUCER SHALL THEN SELECT APPROPRIATE PREVENTATIVE MEASURES ACCORDING TO CLAUSE 2.2.6 OF TR3 (2003), BASED ON THE REQUIRED LEVEL OF PRECAUTION FOR THE CONCRETE SPECIFIED IN TABLE C6(2) A, AND SHALL PROVIDE SUPPORTING EVIDENCE SUCH AS CALCULATIONS AND/OR TEST RESULTS TO DEMONSTRATE THAT THE SELECTED PREVENTATIVE MEASURES WILL BE EFFECTIVE.

ALKALI-RELEASING NATURAL AGGREGATES SHALL ONLY BE USED IN CONCRETE WHERE ALL AGGREGATES ARE CONFIRMED AS NON-REACTIVE.

THE CONCRETE PRODUCER SHALL GIVE IMMEDIATE NOTICE OF ANY CHANGE IN THE MIX DESIGN WHICH MAY INCREASE EITHER THE AVERAGE REACTIVE ALKALI CONTENT OR THE POTENTIAL REACTIVITY OF THE AGGREGATE, AND SHALL SUBMIT A REVISED MIX DESIGN TOGETHER WITH SUPPORTING EVIDENCE, IF REQUESTED TO DO SO.

TESTING NECESSARY TO DEMONSTRATE COMPLIANCE WITH THE REQUIREMENTS OF THIS SPECIFICATION SECTION, AND PROVISION OF EVIDENTIAL DOCUMENTATION, SHALL BE BY AN INDEPENDENT IANZ ACCREDITED LABORATORY UNLESS AGREED OTHERWISE.

3.2.7 REINFORCEMENT

POLYPROPYLENE FIBRES SHALL BE USED FOR THE CONCRETE MIX. REFER TO SECTION 3.1.

4. MIX DESIGN

4.1 THE CONTRACTOR AND CONCRETE SUPPLIER ARE RESPONSIBLE FOR THE MIX DESIGN AND THE PRODUCTION OF THE CONCRETE IN CONFORMITY WITH THIS SPECIFICATION AND THE CONTRACT DRAWINGS.

4.2 MIXING INSTRUCTIONS SHALL BE SUPPLIED BY THE MANUFACTURER WHICH RECOMMEND THE MIXING SEQUENCE TO BE ADOPTED WHEN INTRODUCING THE FIBRE INTO THE CONCRETE MIX.

4.3 AN EXPERIENCED MIXING PROFESSIONAL SHALL BE RESPONSIBLE FOR MIXING POLYPROPYLENE FIBRES INTO BATCHED CONCRETE TO ENSURE CORRECT DENSITY AND EVEN DISTRIBUTION OF FIBRES.

4.4 THE FRC MIX DESIGN SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AT LEAST 3 WEEKS PRIOR TO ANY CONCRETE BEING POURED (REFER TO SECTION 6.1.1). THE SUBMITTED MIX SHALL NOT BE VARIED WITHOUT PERMISSION FROM THE ENGINEER.

MIX SUBMISSIONS SHALL CONSIST OF:

- THE MIX DESIGN
- A SUMMARY OF INITIAL AND PROPOSED ONGOING COMPLIANCE TESTING IN ACCORDANCE WITH THIS SPECIFICATION
- THE PROPOSED METHODOLOGY FOR ADDRESSING ALKALI SILICA REACTIVITY AND ASSOCIATED DOCUMENTARY EVIDENCE
- EVIDENCE OF COMPLIANCE WITH THE ADDITIONAL SPECIFIED PERFORMANCE REQUIREMENTS FOR SPECIAL CONCRETE INCLUDING TRIAL MIXES AND PLACEMENT, ON-SITE SAMPLING AND TESTING OF THESE SAMPLES

4.5 SITE MIXING WILL ONLY BE ALLOWED IN AN EMERGENCY AND WITH THE WRITTEN PERMISSION OF THE ENGINEER. HAND MIXING WILL NOT BE ALLOWED.

4.6 ADDING WATER AFTER DELIVERY OF CONCRETE TO SITE IS NOT PERMITTED.

4.7 RE-TEMPERED FRC SHALL NOT BE USED IN THE WORKS.

4.8 THE MIX REQUIREMENTS FOR POLYPROPYLENE FIBRE REINFORCED CONCRETE ARE AS FOLLOWS:

TABLE 1: CONCRETE MIX DESIGN REQUIREMENTS

CONCRETE COMPRESSIVE STRENGTH (AT 28 DAYS)	40 MPa (BEFORE ADDITION OF FIBRES)
MINIMUM CEMENT CONTENT	350 kg/m³
WATER-CEMENT RATIO	0.4
MAXIMUM AGGREGATE SIZE	40 mm
SLUMP	NOMINATED BY CONTRACTOR FOR REVIEW BY ENGINEER
SPREAD (SLUMP FLOW)	NOMINATED BY CONTRACTOR FOR REVIEW BY ENGINEER
METHOD OF PLACEMENT	NOMINATED BY CONTRACTOR FOR REVIEW BY ENGINEER
POLYPROPYLENE FIBRE TYPE USED IN DESIGN	SYNTHETIC NON-FOR REVIEW BY ENGINEER MACRO FIBRES (CLASS II)
POLYPROPYLENE FIBRE DOSAGE USED IN DESIGN	3 kg/m³ OF CONCRETE
MICROSILICA / SILICA FUME	BINDER TO INCLUDE 8% MICRO SILICA

5. CONSTRUCTION

CONCRETE MANUFACTURE & CONSTRUCTION SHALL COMPLY WITH NZS 3109.

5.1 TRIAL PLACEMENT

TO CONFIRM THE SUITABILITY OF THE FRC MIX, AT LEAST 4 WEEKS PRIOR TO POURING ANY CONCRETE ON SITE THE CONTRACTOR SHALL PLACE THE FRC AS A TRIAL WITH TRANSPORT, HANDLING, DIMENSIONS AND MATERIALS TYPICAL OF THE WORKS. THE TRIAL SHALL COMPRISE NOT LESS THAN 2m³ OF CONCRETE, IF MOULDS ARE TO BE USED, THESE SHALL ALSO BE TYPICAL OF THE WORKS AND THE SIDES OF THE MOULD SHALL BE SO CONSTRUCTED THAT THEY CAN BE STRIPPED WITHOUT SHOCK OR DISTURBANCE OF THE CONCRETE PLACED THEREIN. THE SUITABILITY OF THE CONCRETE MIX SHALL BE JUDGED BY THE SURFACE APPEARANCE AND COMPACTION OBTAINED. IF REQUIRED BY THE ENGINEER, CORES SHALL BE TAKEN TO CONFIRM COMPACTION IS OBTAINED.

IN THE EVENT THAT THE ENGINEER IS NOT SATISFIED THAT THE CONCRETE BEING PRODUCED CONFORMS TO THE SPECIFICATIONS, THE CONTRACTOR SHALL CONTINUE TO PROPOSE AND UNDERTAKE WHATEVER ADDITIONAL TESTING IS REQUIRED TO SATISFY THE ENGINEER AS TO THE CALIBRATION OF THE PLANT AND THE QUALITY OF CONCRETE BEING PRODUCED.

5.2 PLACEMENT OF FRC ON SITE

THE CONTRACTOR IS WHOLLY RESPONSIBLE FOR THE SUCCESSFUL PLACEMENT OF THE FRC, ABOVE AND UNDER WATER. THE RATE OF PLACEMENT SHALL BE AS FAST AS POSSIBLE TO ENSURE THE BEST QUALITY OF FRC.

THE CONTRACTOR SHALL RECOMMEND THE CONSTRUCTION PROCEDURES AND METHODOLOGY INCLUDING FRC PLACEMENT (INCL. METHOD FOR PLACING UNDERWATER AND TIDAL WORKING), CONSTRUCTION SEQUENCE, ADEQUACY OF ALL TYE EQUIPMENT, USE OF FORMWORK, VERTICAL CONSTRUCTION JOINTS (IF ANY) (NO LAMINAR HORIZONTAL JOINTS SHALL BE PERMITTED), PRECAUTIONS TO PREVENT ANY DAMAGE TO THE WORKS DUE TO FLOOD TIDES, WAVES OR OTHER ABNORMAL CAUSES, AND PUMP EFFICIENCY (HOSE DIAMETER > 1.5 x FIBRE LENGTH) FOR REVIEW BY THE ENGINEER.

LOOSE SILTY SANDS TO BE REMOVED PRIOR TO CONSTRUCTION OF THE ABUTMENT AND PLACED IN FRONT OF THE TOE. SANDSTONE/SILTSTONE LEVEL TO BE INSPECTED AND ACCEPTED BY THE ENGINEER PRIOR TO CONSTRUCTION OF THE ABUTMENT. IMMEDIATELY PRIOR TO PLACING CONCRETE, THE SANDSTONE/SILTSTONE SURFACE SHALL BE THOROUGHLY WETTED BY WATER.

CARE SHALL BE TAKEN THAT NO SHOCK OR VIBRATION REACHES CONCRETE AFTER IT'S INITIAL SET UNTIL IT IS AT LEAST THREE DAYS OLD.

5.3 JOINTS

ANY AND ALL CONSTRUCTION JOINTS SHALL BE PREPARED AND CONSTRUCTED TO MEET THE REQUIREMENTS FOR TYPE B CONSTRUCTION JOINTS IN ACCORDANCE WITH NZS 3109.

5.4 CURING

CURING COMPOUNDS SHALL BE COMPATIBLE WITH THE SHOTCRETE FINISH SPECIFIED TO THE CONCRETE (REFER TO SECTION 5.6). CURING COMPOUNDS SHALL CONFORM TO ASTM C309. FRC SHALL BE KEPT CONTINUOUSLY WET AND SHALL BE THOROUGHLY PROTECTED FROM THE DIRECT RAYS OF THE SUN AND DRYING WINDS FOR THE CURING PERIOD.

THE CONTRACTOR'S METHOD OF CURING, INCLUDING ANY PROPOSED CURING COMPOUNDS AND METHODS OF APPLICATION, SHALL BE SUBMITTED WITH THE TENDER FOR REVIEW BY THE ENGINEER. THE CURING METHOD USED SHALL COMPLY WITH NZS3109.

ACCELERATED CURING PROCESSES, IF USED, SHALL COMPLY WITH APPENDIX A OF THE CONCRETE INSTITUTE OF AUSTRALIA RECOMMENDED PRACTICE FOR CURING OF CONCRETE, 1999.

THE FRC SURFACE SHALL BE CURED FOR A MINIMUM PERIOD OF 14 DAYS AFTER POURING UNLESS INSTRUCTED OTHERWISE. AT NO TIME DURING THIS PERIOD SHALL ANY SURFACE BE ALLOWED TO DRY OUT.

THE CURED CONCRETE ABUTMENT SHALL BE INSPECTED BY THE CONCRETE WORKS INSPECTOR. IF THE FRC HAS NOT CORRECTLY CURED, THE CONCRETE SHALL BE REMOVED, REPLACED AND CORRECTLY CURED BY THE CONTRACTOR.

5.5 FRC FINISH

THE FINISH REQUIRED IS F1 IN ACCORDANCE WITH NZS 3114. THE FRC IS OVERLAID WITH GEOTEXTILE AND SHOTCRETE (REFER TO DRAWING 3235491-CA-023).

5.6 UNFAVOURABLE CONDITIONS

UNFAVOURABLE CONDITIONS SHALL BE CONSIDERED TO EXIST PER NZS 3109 CLAUSE 7.2.7 AND, UNLESS DEMONSTRATED OTHERWISE, WHEN THE OUTDOOR SHADE AIR TEMPERATURE IS LESS THAN 10°C, OR MORE THAN 30°C.

IT IS THE CONTRACTOR'S RESPONSIBILITY AT ALL TIMES TO DETERMINE WHETHER THE WEATHER AND MARINE CONDITIONS ARE SUITABLE FOR PLACING FRC WHICH CONFORMS TO THE SPECIFICATION. SHOULD THE CONTRACTOR CONSIDER THOSE CONDITIONS TO BE UNSUITABLE FOR PLACING CONCRETE, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY AND SHALL NOT POUR ANY CONCRETE UNLESS A WRITTEN INSTRUCTION IS RECEIVED FROM THE ENGINEER TO PROCEED.

SPECIAL CARE MAY NEED TO BE TAKEN WHEN THE OUTDOOR SHADE AIR TEMPERATURE IS LESS THAN 10°C OR MORE THAN 30°C IN WINDY CONDITIONS OR CONDITIONS THAT MAY LEAD TO EVAPORATION OF THE MIX WATER FROM THE SURFACE OF FRESHLY PLACED FRC. STEPS SHALL BE TAKEN TO PREVENT SUCH EVAPORATION FROM OCCURRING. THESE MEASURES MAY INCLUDE THE PROVISION OF WINDBREAKS OR THE APPLICATION OF A FINE MIST SPRAY DURING CONCRETING OPERATIONS. SUCH A MIST SHALL BE OF ADEQUATE DENSITY TO NEGATE LOSS OF WATER DUE TO EVAPORATION BUT SHALL BE LIMITED SO THAT NO EXTRA WATER IS ADDED TO THE FRC MIX.

IN ALL INSTANCES WHERE EXCESSIVE RAIN FALLS ON THEN NEW FRC, THE CONTRACTOR WILL BE REQUIRED TO REMOVE THIS FRC, DURING RAIN AND WHEN RAIN IS IMPENDING, APPROVED PROTECTIVE MEASURES SHALL BE TAKEN BY THE CONTRACTOR.

5.7 PROTECTION OF FRC

NO LIGHT VEHICULAR OR PEDESTRIAN TRAFFIC CAPABLE OF DAMAGING EITHER THE FRC OR THE CURING SYSTEM SHALL BE PERMITTED ON THE ABUTMENT FOR 7 DAYS.

5.8 DEFECTIVE OR POTENTIALLY DEFECTIVE CONCRETE

MATERIALS SUPPLIED FOUND TO NOT COMPLY WITH THE REQUIREMENTS OF THIS SPECIFICATION, SHALL BE DEEMED TO BE DEFECTIVE MATERIALS. MATERIALS WHICH ARE SUSPECTED OF BEING DEFECTIVE, OR ARE UNABLE TO BE SHOWN TO BE COMPLIANT, SHALL BE DEEMED TO BE POTENTIALLY DEFECTIVE. DEFECTIVE OR POTENTIALLY DEFECTIVE MATERIALS SHALL NOT KNOWINGLY BE INCORPORATED INTO THE WORKS.

THE CONTRACTOR SHALL ADVISE THE ENGINEER AS SOON AS PRACTICABLE OF THE PRESENCE OF ANY DEFECTIVE OR POTENTIALLY DEFECTIVE CONCRETE AND DOCUMENT IT IN ACCORDANCE WITH THE REQUIREMENTS OF THE PROJECT QUALITY SYSTEM. INVESTIGATION SHALL BE UNDERTAKEN BY THE CONTRACTOR AS INSTRUCTED BY THE ENGINEER. THE CONTRACTOR SHALL AGREE WITH THE ENGINEER WHETHER THE DEFECTIVE OR POTENTIALLY DEFECTIVE CONCRETE CONSTRUCTION SHALL BE REPAIRED OR REPLACED. NO REPAIRS SHALL BE UNDERTAKEN WITHOUT THE EXPRESSED ACCEPTANCE OF THE ENGINEER.

CONTINUE ON DRAWING 3235491-CA-025.

NORTHLAND REGIONAL COUNCIL

Plan Number 5091/12

Filename:

Plot Date: 29/03/2022 2:44:38 pm

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REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	20-0057 PAIHIA WATERFRONT
SHEET DESCRIPTION	FIBRE REINFORCED CONCRETE SPECIFICATION 1/2

STATUS		
FOR CONSENT		
DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	CA-027	1

FIBRE REINFORCED CONCRETE SPECIFICATION

5.9 DEFECTIVE CONCRETE (CONT.)

A METHOD STATEMENT SHALL BE PREPARED BY THE CONTRACTOR AND AGREED WITH THE ENGINEER PRIOR TO COMMENCING ANY REPAIRS TO CONCRETE. THE METHOD STATEMENT SHALL INCLUDE APPROPRIATE DETAILS OF THE EXTENT OF REPAIR WORK PROPOSED, THE EXTENT AND TYPE OF PREPARATION, TYPE OF REPAIR MATERIALS AND METHOD OF APPLICATION, PROTECTION AND CURING METHODS, STANDARD OF FINISH WHICH WILL BE ACHIEVED AND OTHER RELEVANT DETAILS.

COMPLETED REPAIR WORKS SHALL COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATION AND SHALL BE SIGNED OFF BY THE CONCRETE WORKS INSPECTOR.

COMPLETED AREAS SHALL BE FINISHED CONSISTENT WITH THE SURROUNDING AREAS. SPECIAL ATTENTION MAY BE REQUIRED TO ACHIEVE ACCEPTABLE LONG-TERM SURFACE FINISH MATCH TO VISIBLE AREAS, SUCH AS COLOUR AND TEXTURE MATCHING.

THE ENTIRE COST OF REMOVAL AND RESTRUCTION OF REJECTED CONCRETE SHALL BE BORNE BY THE CONTRACTOR.

6. COMPLIANCE

6.1 QUALITY ASSURANCE

6.1.1 WORK PLAN

THE QUALITY ASSURANCE PROCEDURES SHALL COMPLY WITH THE NEW ZEALAND STANDARDS NZS 9000 SERIES.

A DETAILED WORK PLAN SHALL BE PREPARED FOR THE WESTERN ABUTMENT CONCRETING OPERATION. THE WORK PLAN, AND INSPECTION AND TEST SCHEDULE SHALL BE PREPARED AND SUBMITTED BY THE CONTRACTOR TO THE ENGINEER AT LEAST 3 WEEKS PRIOR TO COMMENCING THE CONCRETING OPERATION ON SITE.

WORK PLANS, AND INSPECTION AND TESTING SCHEDULES SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:

- ACTIVE HAZARD AND RISK ASSESSMENT.
- MATERIAL SUPPLY PLANTS AND COPY OF CERTIFICATE OF AUDIT.
- PROPOSED FRC MIXING PROFESSIONAL, MIXING METHOD, MIX DESIGN AND MIX DESIGN REFERENCE NUMBER.
- QUALITY CONTROL RECORDS OF MATERIALS USED IN MIX.
- TRANSPORTING MATERIALS TO SITE.
- A METHOD STATEMENT DETAILING THE METHOD OF CONCRETE PLACEMENT, INCLUDING CONSTRUCTION JOINTS AND ANY USE OF FORMWORK.
- PRECAUTIONS FOR CONCRETING IN UNFAVOURABLE CONDITIONS.
- METHODOLOGY FOR CONCRETE CURING.
- INSPECTION SCHEDULES FOR INSPECTION PRIOR TO PLACEMENT OF CONCRETE, AT THE COMPLETION OF THE POUR, AFTER STRIPPING OF FORMWORK AND AFTER COMPLETION OF CURING (INSPECTIONS TO BE RECORDED ON CONCRETE PLACEMENT CARDS).
- PROPOSED TOLERANCE CHECKS OF CRITICAL ITEMS.
- TEST PLANS AND REGIMES INCLUDING INCLUDING:
  - A SUMMARY OF INITIAL AND PROPOSED ONGOING COMPLIANCE TESTING IN ACCORDANCE WITH THIS SPECIFICATION.
  - THE PROPOSED METHODOLOGY FOR COMPLYING WITH ALKALI SILICA REACTIVITY SPECIFICATIONS AND ASSOCIATED DOCUMENTARY EVIDENCE;
  - EVIDENCE OF COMPLIANCE WITH THE ADDITIONAL SPECIFIED PERFORMANCE REQUIREMENTS FOR SPECIAL CONCRETE INCLUDING TRIAL MIXES AND PLACEMENT, ON-SITE SAMPLING AND TESTING OF THESE SAMPLES.
- INSPECTION AND ACCEPTANCE REGIMES FOR MATERIALS DELIVERED TO SITE.
- ENGINEER'S INSPECTION.

NO WORK SHALL COMMENCE PRIOR TO THE ENGINEER'S REVIEW OF THE WORK PLAN AND UNTIL THE ENGINEER HAS HAD THE OPPORTUNITY TO OBSERVE THAT THE DRAWINGS AND SPECIFICATIONS HAVE BEEN COMPLIED WITH.

THE CONTRACTOR SHALL GIVE THE ENGINEER AT LEAST TWO WORKING DAYS NOTICE OF WHEN HE WILL POUR CONCRETE.

6.1.2 CONCRETE WORKS INSPECTOR

THE CONTRACTOR SHALL APPOINT A "CONCRETE WORKS INSPECTOR" TO BE RESPONSIBLE FOR QUALITY CONTROL OF ALL CONCRETE WORKS. THIS SHALL INCLUDE INSPECTION OF ALL ASPECTS OF CONCRETE WORK PRIOR TO ALL CONCRETE POURS, INSPECTION OF CONCRETE PLACEMENT, INSPECTION OF COMPLETED WORK AND RECORD KEEPING.

THE CONCRETE WORKS INSPECTOR SHALL HOLD A MINIMUM LEVEL 3 NATIONAL CERTIFICATE IN CONCRETE CONSTRUCTION (PLACING AND FINISHING), OR BE ABLE TO DEMONSTRATE 10 YEARS OF EXPERIENCE OF CONCRETE CONSTRUCTION RELEVANT TO THE CONCRETE WORK SPECIFIED, OR BE AN ENGINEER WITH A PROFESSIONAL QUALIFICATION AND A MINIMUM OF 5 YEARS OF EXPERIENCE OF CONCRETE CONSTRUCTION RELEVANT TO THE CONCRETE WORK SPECIFIED.

THE DETAILS OF THE SELECTED CONCRETE WORKS INSPECTOR, INCLUDING THEIR RELEVANT EXPERIENCE, QUALIFICATIONS, SHALL BE SUPPLIED TOGETHER WITH THE WORK PLAN TO THE ENGINEER FOR REVIEW PRIOR TO THE WORKS COMMENCING.

6.1.3 CONCRETE PLACEMENT CARD

THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR REVIEW, WITH THE QUALITY ASSURANCE WORK PLAN, THE FORM AND CONTENT OF A PROPOSED CONCRETE PLACEMENT CARD TO BE COMPLETED AND SIGNED BY THE CONCRETE WORKS INSPECTOR. THE MINIMUM INFORMATION REQUIRED INCLUDE:

- INSPECTION DETAILS (DATE)
- POUR DETAILS (VOLUME, LOCATION, CHECKS)
- FIBRE TYPE AND DOSAGE
- MIX DESIGN (INCLUDING ANY ADDITIVES USED)
- FORMWORK DESIGN AND INSPECTION CERTIFICATION
- CONSTRUCTION JOINT DETAILS (IF APPLICABLE)
- DEFECTS
- CURING COMPLETED
- TESTING DETAILS AND RESULTS
- AS-BUILT SURVEY
- ANY NON-CONFORMANCE AND CLOSE OUT ACTIONS

THE CONCRETE WORKS INSPECTOR SHALL COMPLETE AN INSPECTION AND SIGN THE CONCRETE PLACEMENT CARD PRIOR TO THE COMMENCEMENT OF THE POUR, FOLLOWING COMPLETION OF THE POUR, AFTER STRIPPING OF THE FORMWORK (IF ANY) AND AFTER COMPLETION OF CURING. THE SIGNING OF THE CONCRETE PLACEMENT CARD SHALL CONFIRM (UNLESS NOTED OTHERWISE) THAT ALL WORK RELATED TO THE POUR IN QUESTION HAS BEEN SATISFACTORILY COMPLETED, AND THE DRAWINGS AND SPECIFICATION HAVE BEEN COMPLIED WITH.

THE COMPLETED CONCRETE PLACEMENT CARD SHALL BE MADE AVAILABLE TO THE ENGINEER UPON REQUEST.

ANY OCCURRENCES OF NON-COMPLIANCE OF THE COMPLETED WORKS WITH THE SPECIFICATION OR THE STANDARDS REFERENCED, SHALL BE NOTED ON THE CONCRETE PLACEMENT CARD, AND AGREED WITH THE ENGINEER FOR REVIEW VIA THE QUALITY SYSTEM AS SET OUT IN 5.7.

6.2 INSPECTION AND TESTING

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF ALL TESTING AND INSPECTIONS REQUIRED IN THE SPECIFICATION.

THE FREQUENCY OF TESTING SHALL BE AS DETAILED IN THE SPECIFICATION. IF NO MINIMUM FREQUENCY IS STATED, THE CONTRACTOR SHALL NOMINATE APPROPRIATE INDUSTRY FREQUENCY.

6.2.1 CONCRETE PRODUCTION AND DELIVERY

THE CONCRETE PRODUCTION PROCESS, INCLUDING TESTING SHALL COMPLY WITH NZS 3104.

THE CONCRETE SUPPLIER SHALL MAKE A RECORD OF THE MATERIAL QUANTITIES USED IN EACH CONCRETE BATCH. THE CONTRACTOR IS TO ENSURE THAT THE PRE-MIXED CONCRETE SUPPLIER COMPLIES WITH THE SPECIFICATION AND THAT EACH TRUCK OF READY MIXED CONCRETE IS ACCOMPANIED BY AN IDENTIFICATION CERTIFICATE.

THE CONTRACTOR SHALL KEEP UP-TO-DATE RECORDS OF ALL TEST DATA PERTAINING TO THE PRODUCTION AND SUPPLY OF CONCRETE FOR THE ABUTMENT, SO THAT COMPLIANCE WITH THE REQUIREMENTS OF THIS SPECIFICATION AND CONSISTENCY OF THE SUPPLY CAN BE VERIFIED, AT ANY TIME.

BATCH RECORDS AND REPORTS ON CONCRETE TESTING SHALL BE MADE AVAILABLE BY THE CONTRACTOR TO THE ENGINEER IN A TIMELY MANNER OR AS REQUESTED BY THE ENGINEER, AND COPIES SENT TO THE SUPPLIER AT REGULAR INTERVALS.

6.2.2 ON-SITE FRC ACCEPTANCE, SAMPLING AND TESTING

a. DOCUMENTATION CHECKS

ALL FRC DELIVERED TO SITE SHALL BE ACCOMPANIED BY FRC DISPATCH DOCKETS, CLEARLY IDENTIFYING THE POUR REFERENCE NUMBER, MIX DESIGN REFERENCE NUMBER, THE PLANT WHERE THE FRC WAS BATCHED, THE TIME OF BATCHING AND THE TARGET SLUMP. THE CONTRACTOR SHALL CHECK THE DISPATCH DOCUMENTATION TO CONFIRM THAT THE MATERIALS COMPLY WITH THE SPECIFIED REQUIREMENTS. THE DISPATCH DOCUMENTS SHALL BE MADE AVAILABLE TO THE ENGINEER UPON REQUEST.

b. DISCHARGE

THE DISCHARGE, FINAL PLACEMENT AND VIBRATION OF FRC SHALL BE COMPLETED WITHIN 1 HOUR 30 MINUTES OF BATCHING, UNLESS AN ALTERNATIVE ELAPSED TIME HAS BEEN DOCUMENTED IN THE WORK PLAN AND AGREED BY THE ENGINEER.

c. CONTROL OF ADDITIONS

NO MATERIALS (INCLUDING WATER) OR ADMIXTURES SHALL BE ADDED TO THE FRC ON SITE, UNLESS BY PRIOR AGREEMENT VIA THE WORK PLAN, AND UNDER CAREFULLY CONTROLLED CIRCUMSTANCES.

d. ON-SITE SAMPLING AND TESTING OF FRC

TEST SAMPLES SHALL BE TAKEN ON SITE BY THE SUPPLIER (IN ADDITION TO THE SUPPLIER'S PLANT TESTING PROGRAMME) AS FOLLOWS:

- **SLUMP AND SPREAD (SLUMP FLOW) TESTS**

  CONCRETE SLUMP AND SPREAD TESTS SHALL BE CARRIED OUT (IN ACCORDANCE WITH NZS 3112 PART 1).

  SLUMP/SPREAD TESTS SHALL BE MADE IMMEDIATELY BEFORE CONCRETING IS COMMENCED, AND AT TIMES WHEN COMPRESSION TEST SAMPLES ARE TAKEN. SLUMP/SPREAD TESTS SHALL BE COMPLETED FOR EACH TRUCK DELIVERED, OR PART THEREOF, PLACED IN ANY ONE CONCRETING OPERATION.

  SLUMP/SPREAD TESTS SHALL BE COMPLETED ON SNATCH SAMPLES TAKEN IN ACCORDANCE WITH NZS 3112 PART 1. SNATCH SAMPLES SHALL BE TAKEN FROM THE DISCHARGE CHUTE OF THE CONCRETE MIXER OR AGITATOR. SNATCH SAMPLES SHALL NOT BE TAKEN FROM CONCRETE THAT IS VISIBLY SEGREGATED, FROM THE FIRST OR LAST 0.1 m^3 OF CONCRETE DISCHARGED FROM THE MIXER OR AGITATOR, OR FROM CONCRETE THAT HAS BEEN PLACED IN ITS FINAL LOCATION.

  TWO SLUMP/SPREAD TESTS SHALL BE COMPLETED FOR EACH SNATCH SAMPLE. THE AVERAGE OF THE TWO SLUMP/SPREADS IS THE VALUE TAKEN TO CHECK COMPLIANCE WITH THIS SPECIFICATION.

  CONCRETE HAVING A SLUMP VALUE OUTSIDE THE NOMINATED AND REVIEWED TOLERANCE LIMITS (REFER DRAWING 0354911-CA-027) OR CLAUSE 5.4 OF NZS 3109 SHALL BE CONSIDERED POTENTIALLY DEFECTIVE.

  SLUMP AND SPREAD TEST RESULTS SHALL BE MADE AVAILABLE TO THE ENGINEER UPON REQUEST.

- **COMPRESSION TESTS**

  CONCRETE COMPRESSION STRENGTH SHALL BE TESTED IN ACCORDANCE WITH NZS 3112.

  A SET OF TESTS SHALL CONSIST OF 3 SPECIMENS MADE FROM EACH SAMPLE OF CONCRETE. EACH DAY DURING CONCRETE PLACEMENT ON SITE, MINIMUM ONE SAMPLE SHALL BE TAKEN FOR EACH 100m^3 OF CONCRETE PLACED (OR PART THEREOF). SHOULD SAMPLES BE REQUIRED FOR EARLY AGE OR FIELD CURING TESTS THESE SHALL BE IN ADDITION TO THE ABOVE REQUIREMENTS.

  ALL SAMPLES AND SPECIMENS SHALL BE RECORDED, LINKED TO BATCH RECORDS, DATED AND NUMBERED FOR ACCEPTANCE OF THE CONCRETE.

  ONE SPECIMEN FROM EACH SET OF THREE SHALL BE TESTED AT 7 DAYS, AND THE OTHER TWO AT 28 DAYS. A TEST REPORT SHALL BE PREPARED FOR EACH BATCH OF CONCRETE TESTS, INCLUDING SOURCE OF CONCRETE, MIX IDENTIFICATION, SPECIFIED COMPRESSIVE STRENGTH, POUR REFERENCE NUMBER, LOCATION IN STRUCTURE, BATCH OR TRUCK NUMBER, TIME AND DATE OF PLACEMENT, TIME OF SPECIMEN PREPARATION, SLUMP OF CONCRETE, TIME AND DATE OF LABORATORY CURING, TIME AND DATE OF SPECIMEN TESTING, COMPRESSIVE STRENGTH TO NEAREST 0.5 MPa AND COMMENTS REGARDING THE FRACTURED SPECIMEN.

  THE FULL TEST REPORT SHALL BE SUPPLIED TO THE ENGINEER UPON REQUEST, WITHIN 5 DAYS OF CARRYING OUT THE 28 DAY TESTS. SEVEN DAY RESULTS SHALL ALSO BE SUPPLIED UPON REQUEST, WITHIN 1 DAY OF BEING CARRIED OUT. SHOULD A STRENGTH TEST RESULT FALL BELOW THE SPECIFIED COMPRESSIVE STRENGTH, THE SUPPLIER, CONTRACTOR AND ENGINEER SHALL BE ADVISED AS SOON AS IS PRACTICABLE. SHOULD THE RESULT ALSO FALL BELOW THE REPRESENTATIVE SAMPLE REJECTION LIMITS GIVEN IN CLAUSE 8.4.1 OF NZS 3109, THE CONCRETE REPRESENTED BY THE TEST RESULT SHALL BE CONSIDERED DEFECTIVE.

  SHOULD THE RESULT FALL BETWEEN THE REJECTION LIMITS AND THE SPECIFIED COMPRESSION STRENGTH, THE SUPPLIER SHALL CONFIRM THAT THE CAUTIONARY LIMITS GIVEN IN TABLE 2.6A OR 2.6B OF NZS 3104 ARE BEING EQUALLED OR EXCEEDED, AND IF NOT, SHALL TAKE CORRECTIVE ACTION AND ADVISE THE ACTION BEING TAKEN.

- **RESULTS BELOW THE SPECIFIED COMPRESSIVE STRENGTH**

  SHOULD A STRENGTH TEST RESULT FALL BELOW (OR ABOVE, WHERE APPLICABLE) THE SPECIFIED COMPRESSIVE STRENGTH, THE SUPPLIER, CONTRACTOR AND ENGINEER SHALL BE ADVISED AS SOON AS PRACTICABLE.

- **WASHOUT TESTS**

  THE CONTRACTOR SHALL RECORD THAT THE CORRECT POLYPROPYLENE FIBRE TYPE AND QUANTITY WAS MEASURED IN THE MIX ARRIVING AT SITE BY CARRYING OUT WASHOUT TESTS IN ACCORDANCE WITH AS3600. THE RESULTS OF THE WASH-OUT TEST SHALL BE PROVIDED TO THE ENGINEER. CONCRETE THAT DOES NOT PASS THE WASHOUT TEST SHALL BE REJECTED. THE FREQUENCY OF TESTING SHALL BE THE FIRST TRUCK DELIVERING MIX TO SITE EACH DAY AND EVERY 50m^3 OF MIX DELIVERED TO SITE FOR MANUAL FIBRE DOSING OR EVERY 150m^3 DELIVERED TO SITE FOR AUTOMATIC FIBRE DOSING. CONCRETE SHALL BE REJECTED IF WASH OUT TESTS OF CONCRETE AFTER POLYPROPYLENE FIBRE MIXING DO NOT SHOW THE CORRECT WEIGHT OF FIBRES IN THE TEST SAMPLE.

6.3 TOLERANCES

a. HORIZONTAL TOLERANCE FOR THE ABUTMENT AXIS AND FOOTPRINT TO BE ±0.50m.

b. VERTICAL TOLERANCE FOR THE ABUTMENT TO BE ±0.20m (ABOVE CHART DATUM) AND ±0.30m (BELOW CHART DATUM).

NORTHLAND REGIONAL COUNCIL

Plan Number 5091/13

Plot Date: 29/03/2022 2:44:36 pm

Filename:

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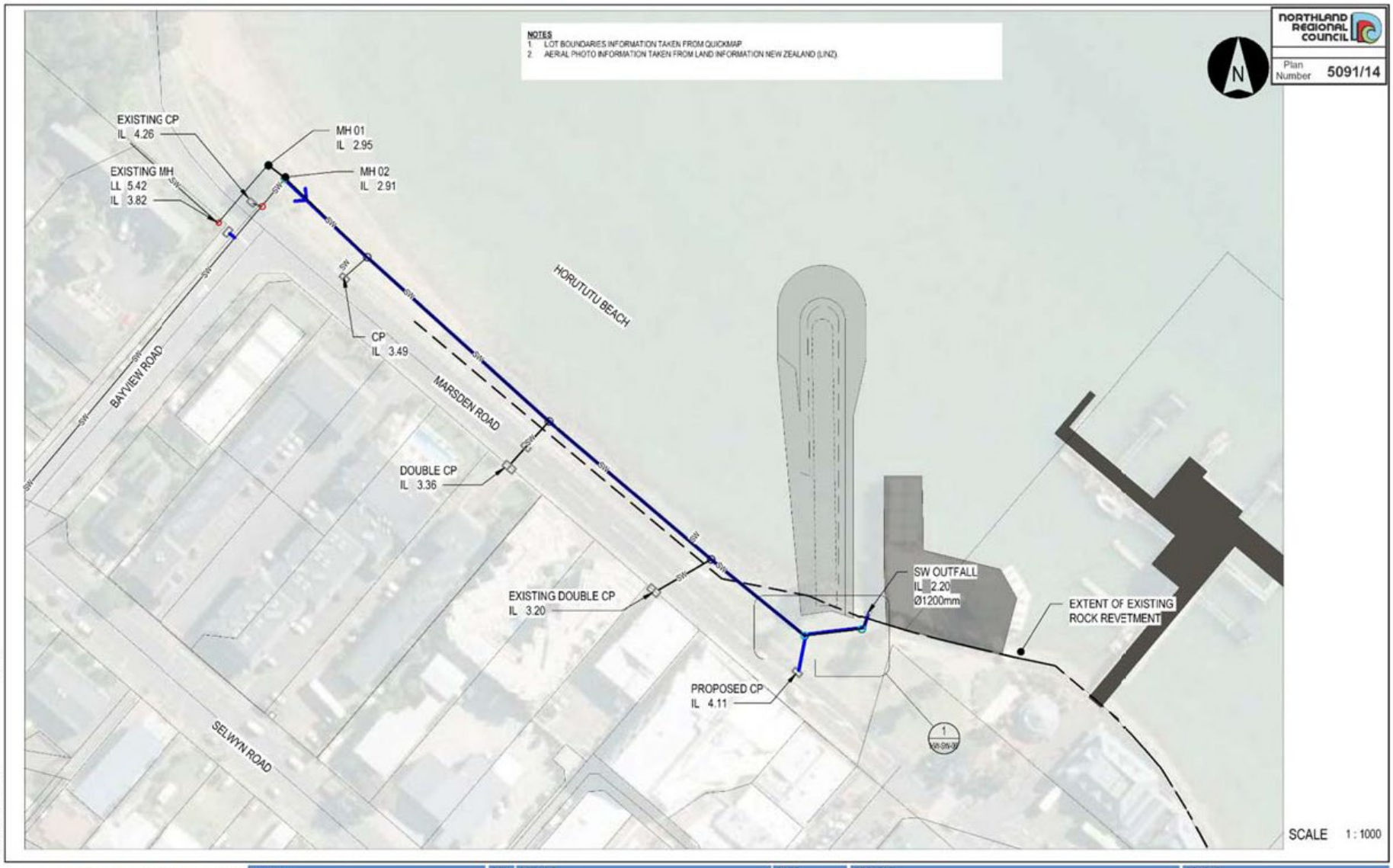
LITTORALIS LANDSCAPE ARCHITECTURE

CLIENT

Far North Holdings Limited

REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
FIBRE REINFORCED CONCRETE SPECIFICATION 2/2	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	CA-028	1



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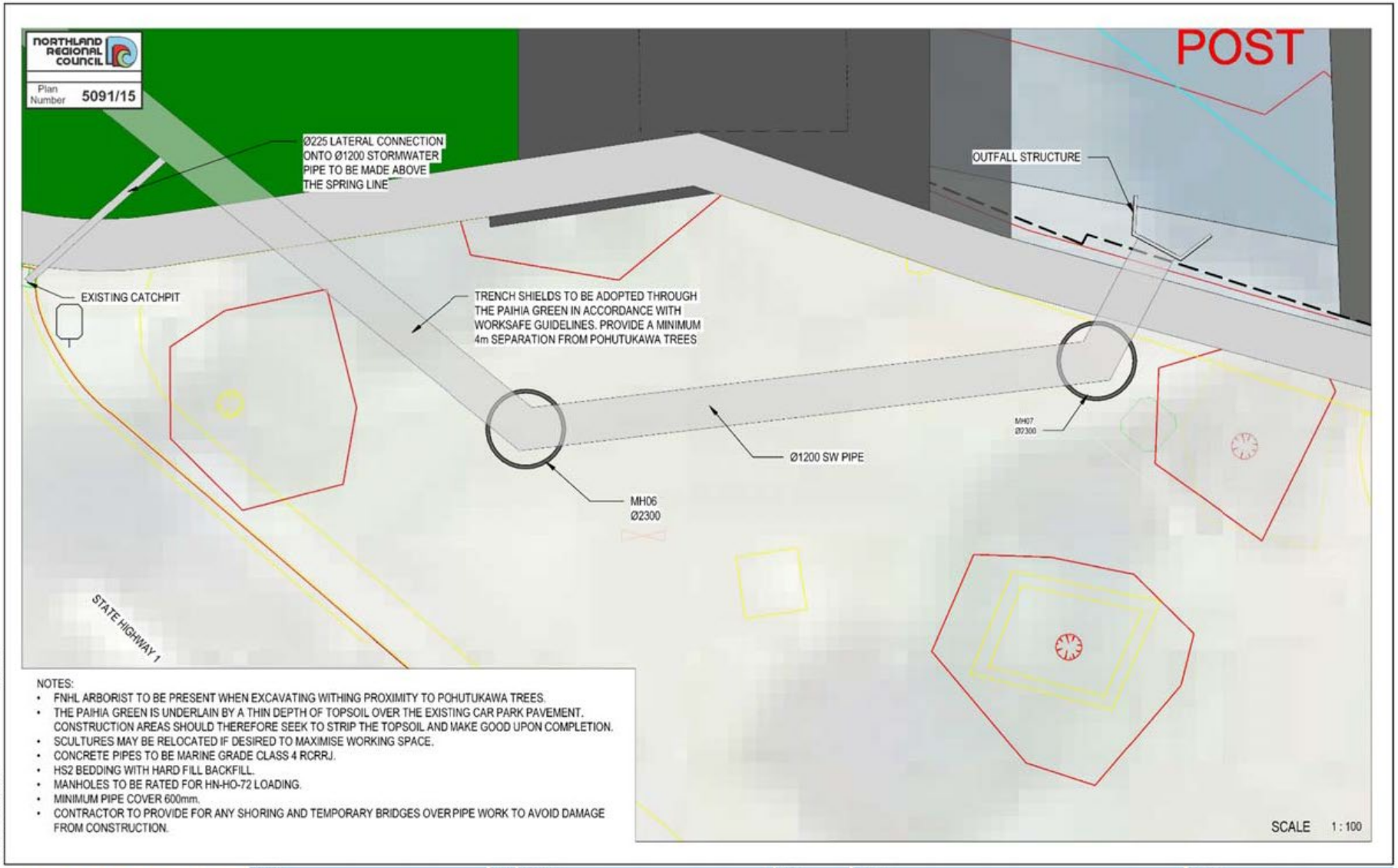
REV	DETAILS	DATE
0	RE-ISSUED FOR TENDER	09/02/2022
1	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT: 20-0057 PAIHIA WATERFRONT
SHEET DESCRIPTION: PROPOSED STORMWATER MANAGEMENT PLAN

STATUS: FOR CONSENT

DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	HW-SW-04	1



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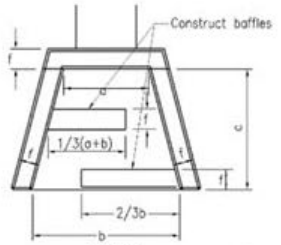
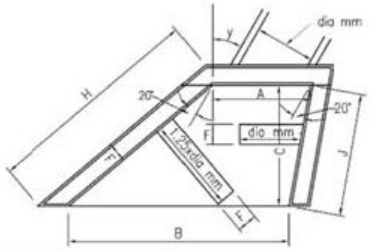
CLIENT: Far North Holdings Limited

REV	DETAILS	DATE
0	ISSUED FOR TENDER	22/12/2021
1	RE-ISSUED FOR CONSENT	29/03/2022

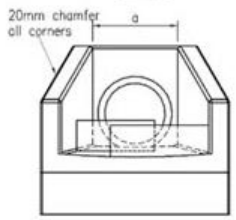
PROJECT: 20-0057 PAIHIA WATERFRONT
SHEET DESCRIPTION: MH 06 AND MH 0 DETAIL PLAN
STATUS: FOR CONSENT

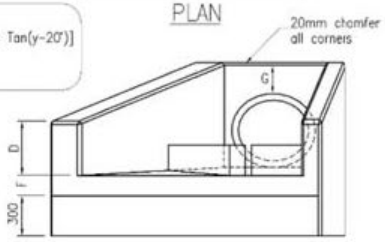
DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	HW-SW-06	1

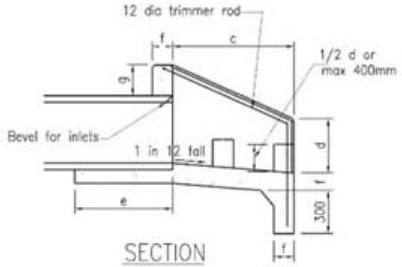




A. Sec y x (o)
B. C Tan (y+20°) + [A-C Tan(y-20°)]
H. C x Sec (y + 20°)
J. C x Sec (y − 20°)







PRINCIPAL DIMENSIONS (mm)							
DIA OF PIPE	a	b	c C	d D	e E	f F	g G
150	300	450	600	200	325	100	150
230	380	600	700	250	425	100	150
300	450	750	750	300	525	100	150
375	550	900	850	350	625	100	150
450	630	1100	900	400	725	150	230
525	700	1200	1000	450	825	150	230
600	800	1400	1100	550	900	150	230
750	1000	1700	1200	600	1050	150	300
900	1170	2000	1450	650	1225	150	300
1050	1380	2300	1700	750	1375	150	300
1200	1520	2600	2100	750	1550	150	450
1350	1680	2800	2400	750	1725	150	450

NOTE:

1. Reinforce floors & walls with:
   150 – 375 665 mesh
   450 – 600 633 mesh or D10 rods at 250 crs.
   675 – 900 D12 rods at 250 crs.
   1050 – 1350 D12 rods at 150 crs.
2. All reinforcement shall be placed centrally in walls and floor, and shall be continuous between walls and floor.
3. Laps in structural grade bars to be 300 min.
4. There shall be at least 2 bars – whether mesh or M.S. over the top of the pipe.
5. Concrete is to be 20MPa at 28 days as per NZS 3104:2013.
6. Baffles are to be constructed as shown when outlet velocities and soil conditions dictate, in extreme cases specific design may be required by the Council.
7. Inlet structures shall have reverse apron fall and no baffles.

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Plan Number 5091/16

Filename:

Plot Date: 29/03/2022 2:45:02 pm

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REV	DETAILS	DATE
0	RE-ISSUED FOR TENDER	09/12/2021
1	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT: 20-0057 PAIHIA WATERFRONT

SHEET DESCRIPTION: OUTFALL STRUCTURE

STATUS: FOR CONSENT

DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	HW-SW-08	1

NOTES:

1. LEVELS ARE CHART DATUM (PSD). SUBTRACT 1.58m TO BRING IT TO ONE TREE DATUM).
2. CONCRETE PIPES TO BE MARINE GRADE CLASS 4 RCRRJ.
3. HS2 BEDDING WITH HARD FILL BACKFILL.
4. MANHOLES TO BE RATED FOR HN-HO-72 LOADING.
5. MINIMUM PIPE COVER 600mm.
6. CONTRACTOR TO PROVIDE FOR ANY SHORING AND TEMPORARY BRIDGES OVER PIPE WORK TO AVOID DAMAGE FROM CONSTRUCTION.

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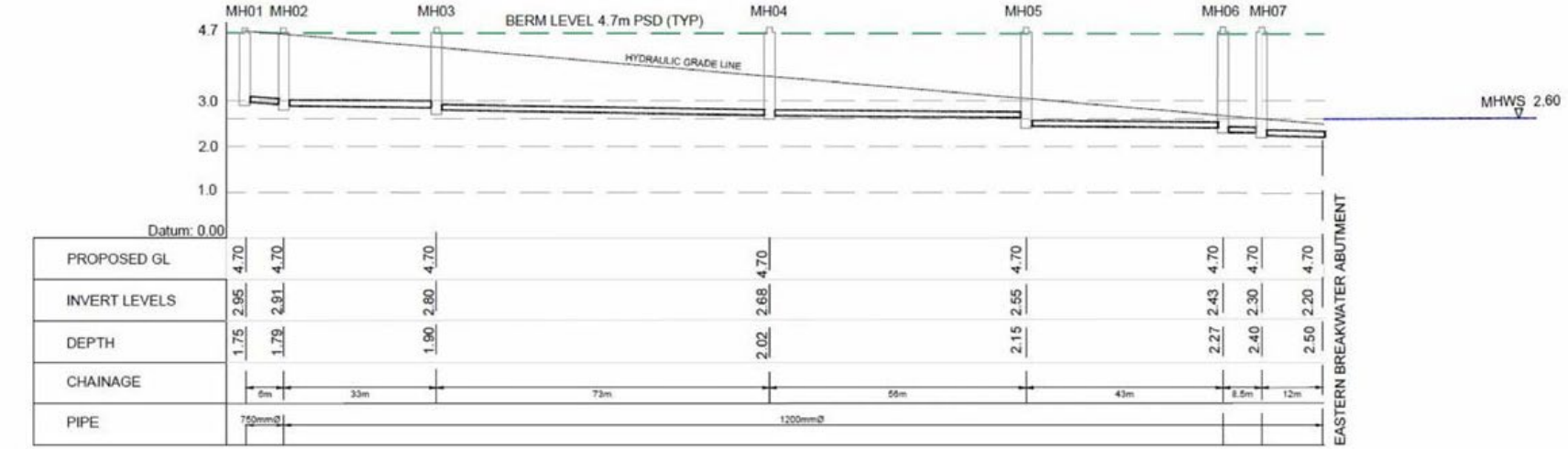
Plan Number 5091/17



Filename:

Plot Date: 29/03/2022 2:41:59 pm

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CLIENT: Far North Holdings Limited

REV	DETAILS	DATE
0	RE-ISSUED FOR CONSENT	29/03/2022

PROJECT: 20-0057 PAIHIA WATERFRONT

SHEET DESCRIPTION: PROPOSED STORMWATER LONG SECTION

STATUS: FOR CONSENT

DRAWN BY	APPROVED BY	SHT
MW	RB	A3
PROJECT NO.	SHEET NO.	REV
20-0057	HW-SW-05	0

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REV	DETAILS	DATE
2	RE-ISSUED FOR REVIEW	30/06/2021
3	RE-ISSUED FOR REVIEW	06/07/2021
4	ISSUED FOR REVIEW	21/07/2021
5	ISSUED FOR CONSENT	30/08/2021
6	RE-ISSUED WITH UPDATED PLANS	08/03/2022
7	RE-ISSUED FOR CONSENT	01/04/2022

PROJECT	STATUS		
20-0057 PAIHIA WATERFRONT	FOR CONSENT		
SHEET DESCRIPTION	DRAWN BY	APPROVED BY	SHT
MASTER PLAN	MW	RB	A3
	PROJECT NO.	SHEET NO.	REV
	20-0057	-M002	7