BEFORE THE WHANGAREI DISTRICT COUNCIL AND NORTHLAND REGIONAL COUNCIL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of a resource consent application by Northport Limited under section 88 of the Resource Management 1991 for a port expansion project at Marsden Point
APPLICATION NO.	APP.005055.38.01 LU 2200107

STATEMENT OF EVIDENCE OF RICHARD ANTHONY REINEN-HAMILL

COASTAL PROCESSES

24 August 2023

Counsel instructed:
Kitt Littlejohn
Quay Chambers
Level 7
2 Commerce Street
Auckland 1010

Solicitors acting:
CH Simmons / SJ Mutch
ChanceryGreen
223 Ponsonby Road
Auckland 1011

INTRODUCTION

Qualifications and experience

1. My name is Richard Anthony Reinen-Hamill.

2. I am a Technical Director of coastal engineering for Tonkin & Taylor Limited, a Chartered Professional Engineer and a Fellow of Engineering New Zealand. I have a BE (Hons) and a ME from the University of Auckland, which included a thesis studying the coastal processes of Mission Bay, Auckland and focussed on transport of sediments under tide and wave conditions. I also have a certificate of competency in multi-hazard risk assessment from the University of Twente. I have more than 30 years' experience as a coastal engineer. In my role as a consulting engineer, I have authored more than 800 technical assessments, design and review reports and I have 15 published papers and have assisted in the preparation of four regional and national guidance notes.

3. From 1990 to 1993 I was a research and project engineer in the Harbours and Coast division of the Specialist Coastal and Hydraulic Consultants, Delft Hydraulics Centre (now named Deltares) in the Netherlands. In this role I developed particular skills in evaluating sediment transport and coastal processes, including the use of physical and numerical models where appropriate. I carried out assessment of the effects of dredged channels and assessed sedimentation rates of harbour and access channels for major harbours in Holland, India and the UK.

4. Since joining Tonkin + Taylor in 1994 I have been responsible for numerous technical and management studies of the effects of changes coastal processes resulting from modifications to the coastal environment. Projects of particular relevance to this present assessment include:

   (a) **Crude Shipping Project, Marsden Point NZ**: I led the coastal process assessment for the proposed channel deepening and dredge disposal studies for Refining NZ. This included technical assessments, reviews of hydrodynamic studies (completed by others) and a detailed technical effects assessment and presentation of evidence.

   (b) **Marsden Cove, NZ:** Coastal process and hydraulic modelling study on the proposed development at Marsden Cove to support the consent application, including the access channel.

(c) **Centreport dredging effects assessment, Wellington, NZ:** Technical reviewer of the hydrodynamic studies (completed by others) and a detailed technical assessment of the effects of proposed channel deepening at the entrance to Wellington Harbour on the shorelines adjacent to the proposal.

(d) **Northland Regional Coastal Hazard Assessment, NZ:** Technical reviewer and Project Director for the coastal erosion hazard zone assessment for selected Northland Sites including Marsden Cove, Marsden Point and the open coast from Marsden Point to Ruakaka.

(e) **Clifford Bay Ferry Terminal, Marlborough, NZ:** Detailed technical review of consent application concerning the potential effects of a new port and ferry terminal at Clifford Bay that extends 2 km into the bay and occupies 20 ha of the seabed on behalf of an affected party.

(f) **Westgate Transport Ltd Dredging and Spoil Disposal Consent, NZ:** Technical assistance in the field of hydrodynamics and sedimentation with respect for Westgate Transport Ltd proposed application to annually dredge 100,000 cubic metres of sand for maintenance and dispose of in the nearshore.

(g) **Port of Tauranga Dredging and Spoil Disposal Consent, NZ:** Technical assistance in the field of hydrodynamics and sedimentation with respect for the Port of Tauranga's proposed application to dredge 650,000 cubic metres of sand for part enhancement and ongoing maintenance and disposal in the nearshore, including dispersal and diffusion assessments.

5. My role in the current Northport application was to assess the potential effects of the proposed activities on coastal processes, including whether the proposed activities could result in increased erosion or shoreline change. I was also responsible for the siting and preliminary design of the proposed bird roost.

6. I am familiar with the application site and the surrounding locality. I have read the relevant parts of the application; submissions; and the Section 42A Report.

Code of Conduct

7. I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note (2023) and I agree to comply with it. In that regard, I confirm that this evidence is written within my expertise, except where I state that I am

relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

8. I have relied on descriptions of the proposal prepared by WSP and my consideration of coastal process effects were based on the field investigations and numerical modelling carried out by the wider team and in particular Dr Brett Beamsley and the MetOcean Solutions team.

SCOPE OF EVIDENCE

9. In my evidence, I:

(a) provide an executive summary of my key conclusions;

(b) summarise the relevant aspects of the Project;

(c) describe the existing physical coastal environment;

(d) summarise the Proposal's effects on the physical coastal environment;

(e) respond to submissions raised;

(f) comment on draft proposed conditions advanced by Northport;

(g) respond to the s42A report; and

(h) summarise my conclusions.

EXECUTIVE SUMMARY

10. The detailed assessment of the existing physical processes through analysis of historic information and newly acquired field investigations together with calibrated and verified numerical modelling have enabled an analysis of the effects of the proposal.

11. The extension of an existing consented port reclamation and the proposed reclamations that are aligned with the existing face of the reclamation minimises potential adverse effects on tidal flows and sediment transport. The proposed developments add to the increased occupation of the CMA in this area and increase the spatial extent of effects on the seabed and shoreline due to the increased occupation. The effects on tidal currents and sediment transport adjacent to the area of occupation extend eastward along the existing channel to the Channel Infrastructure ("CINZ") jetty. Due to the changes to the currents and wave climate as a result of the eastern reclamation the overall cumulative effect on coastal processes access is moderate in this area. The

effects on coastal processes for the other inner harbour, inlet and Bream Bay areas are minor.

12. The proposed bird roost is provided for avifauna mitigation. It is in a relatively low energy environment and over the long term the inclusion of sand and the ongoing top-ups will have a beneficial effect on coastal processes by increasing the sediment budget within Marsden Bay, offsetting to some degree sea level rise effects and will potentially reduce the overwash and landward retreat of the existing barrier beach.

13. I have reviewed the findings of the Section 42A report with respect to coastal process effects and note that the Council's conclusions of the effects on coastal processes is negligible-more than minor, subject to the successful implementation of recommended mitigation proposed by their reviewer Mr Doug Treloar that I support. In my opinion, these proposed mitigations that include more detailed monitoring and investigation of changes within Marsden Bay address many of the concerns raised by submitters. The proposed consent conditions also provide mechanisms for identifying and addressing potential adverse effects that might affect coastal processes.

VISION FOR GROWTH PROJECT OVERVIEW

14. The proposed eastern reclamation for Berth 5 consists of a reclamation of around 11.7 hectares within the CMA and an additional occupation above MHWS of around 1.8 hectares. The reclamation extends an additional 250 metres eastward extensions for Berth 5 from the already consented Berth 4 extension. Dredging is also proposed to deepen the berth and manoeuvring area. The dredge volumes to achieve the required navigable depth is around 1,720,000 cubic metres with the dredged volumes used to form the reclamation.

15. There will be a need for maintenance dredging within the dredged area. This dredging will be done by cutter suction, or a barge mounted hydraulic excavator. Dredging will be used for raising land levels within the port, made available for beneficial reuse (such as beach nourishment) or disposed of to an approved disposal site.

THE EXISTING ENVIRONMENT

Coastal setting

16. NorthPort is situated on Marsden Point on the southern shores of the tidal inlet at the entrance to Whangarei Harbour. Whangarei Harbour is located at the northern end of

Bream Bay on the northeast coast of the North Island and is a mesotidal[1] drowned river valley.

17. The harbour is relatively shallow due to extensive intertidal flats. The harbour is accessed through a relatively narrow tidal inlet which is around 680 metres wide and 32 metres at its deepest point and extends to around the 20 metre depth contour. The inlet is bounded by Tertiary volcanic rocks on the northern side and a Holocene prograded sandy barrier spit on the southern side, which forms Marsden Point.

18. Marsden Bay immediately to the west of the existing port is a low lying and dynamic system, with recorded erosion in the vicinity of Blacksmiths Creek occurring from the late 1950's to the late 1990's[2] that resulted in the retreat of the spit and mangrove stranding seaward of the retreating spit through a process of cyclone induced overwash and alongshore drift from east to west. During this time, it was also observed that the creek shallowing significantly migrating to the west enhancing erosion[3] and there was progressive construction of seawalls along the bay and along the creek inlet from the 1960's. A training groyne was constructed at the western side of Blacksmiths Creek in the late 1990's that along with the nourishment of Marsden Bay as part of the Marina development has naturalised the majority of the bay.

19. The southern harbour shoreline from Marden Bay to One Tree Point is a sandy beach system backed by weakly consolidated cliffs that are also prone to erosion. The sandy beach comprises fine sand fronted by intertidal flats which range in width between 30 m and 200 m out to the deeper channel. Across the harbour several bays indent the northern shoreline of the lower harbour to Reotahi Point opposite Marsden Point. These include McLeod Bay, Shoal Bay and Parua Bay. Snake Bank and McDonald Bank are the two main flood-tidal deltas located within the harbour inlet embayment.

20. The northern shoreline indents from Reotahi Point to Home Point with Calliope Bay situated on the southern edge of the inlet. From Home Point the northern shoreline that extends into Bream Bay comprises volcanoclastic cliffs with narrow alluvial beach at Home Point and a wider sandy beach within Smugglers Bay. The cliff shorelines from Home Point to Busby Head are typically characterised as stable features due to the nature of the underlying geology with low rates of change compared to sandy coasts.

[1] Mesotidal estuaries are characterised by large sand bodies deposited and moulded by tidal currents and, to a lesser extent, by waves.
[2] Gibb, J.G. 1998 Coastal hazard zone for the One Tree Point – Marsden Bay Area. Report prepared for Whangarei District Council, December 1998.
[3] Gibb, J.G. 1998. Coastal hazards and solutions for eastern One Tree Point, Whangarei Harbour, Whangarei District. Report prepared for Whangarei District Council, June 1988.

21. Mair Bank is situated off Marsden Point, largely situated on the intertidal and subaerial portion of the southern ebb tide delta. The open coast that extends southward from Marsden Point to the Ruakaka River mouth comprises a narrow dry beach with a width of approximately 5 m above the high tide line.

22. The sediments within the tidal inlet largely comprise medium to fine sands with a reasonable proportion of shell and low levels of silt which is typical of high energy locations. Typically, the suspended sediment concentration values within the tidal channel are low (around 6 mg/L). Concentrations of up to 30 mg/L on the intertidal areas of the harbour occur during moderate to low energy conditions. Significantly higher suspended sediment concentrations within Bream Bay can occur during more energetic wave conditions (100 – 1,000+ mg/l), particularly in shallower water depths where waves act with greater force on the seabed.

Hydrodynamic features

23. The mean tide range is 2.3 metres during spring tide and 1.5 metres during neaps and water levels can reach around 1.1 metres RL at MHWS[4] and 0.7 metres RL at MHWN[5]. These tidal water level changes drive tidal currents through the relatively narrow and deep tidal inlet, and these currents gradually decrease up-harbour, from around 1 metre per second (around 2 knots) at Marsden Point to 0.8 metres per second (around 1.5 knots) at Limestone Island, which is situated close to Port Whangarei in the upper harbour. Tidal currents are strongest in the constricted tidal areas between Home Point and Reotahi Point, where rates up to 1.5 metres per second (around 3 knots) may be experienced.

24. The Whangarei Harbour inlet entrance is in a zone of relatively low wave energy that provides natural stability to the inlet. Wave activity inside the harbour is mostly locally generated wind waves at high tides, when the water depth is greatest, although some ocean swell refracts and diffracts to reach the port vicinity. Numerical modelling results shows the sheltering effect of Whangarei Heads and the influence of the ebb tide delta in locally reducing wave heights. Even during extreme onshore storms wave heights are generally less than 5 m offshore from the delta and reduce to less than 0.5 m at Marsden Point. Offshore average significant wave heights are typically between 0.7 and 1.0 m.

25. During onshore storm events there is an increase in sea levels generated by tides due to storm surge. It is predicted that storm surge can reach 1.83 metres for a 100-year

[4] MHWS is Mean High Water Springs, and the level is the average of the higher spring tides.
[5] MHWN is Mean High Water Neaps and the level is the average of the lower neap tides.

return period event, some 0.8 metres higher than MHWS. This can allow greater wave energy to act on the open coast as the greater water depth reduces wave breaking until closer to the shore but does not significantly change the wave heights at Marsden Point. The increased water depth within the harbour can also allow larger wind generated waves, but this is dependent on both the wind direction and the length of the fetch.

Climate change

26. Climate change effects include changes to sea level and potential effects on storms, wind, storm-tide and wind.

27. Historic sea level rise in New Zealand has averaged 1.81 ± 0.05 mm/year from around 1900 to the present, with the rate doubling to 2.44 mm/year for the period 1961 to 2018 compared to data from 1900 to 1960 (Bell and Hannah, 2019). Climate change is predicted to accelerate this rate of sea level rise into the future with the change largely dependent on the rate of carbon emissions into the environment.

28. The Intergovernmental Panel on Climate Change (IPCC) has produced the latest climate change projections (IPCC AR6, 2021). The new IPCC assessment included seven emission scenarios of 1.9, 2.6, 3.4, 4.5, 6.0, 7.0 and 8.5 watts per metre squared of radiative forcing (W/m^2). Of these the 1.9, 2.6, 4.5 7 and 8.5 emission scenarios have been downscaled by NIWA and has been made available on the NZ SeaRise website. The 2.6, 4.5, and 8.5 W/m^2 emission scenarios are similar to those in the previous IPCC (AR5) report, although the new 8.5 scenario does include 20% higher CO2 emissions by the end of the century and lower emissions of other greenhouse gases. The IPCC AR6 modelling projects slightly more warming for a given pathway than AR5 scenarios. Vertical Land Movement (VLM) is also low in this area, with estimated rates of change of less than -0.5 mm/yr. This means that there may be slight increases in sea level rise of in the order of 10 to 20 cm at 2150 for the high emission scenario combined with VLM and smaller amounts (several centimetres) of change for the lower emission scenarios.

29. NIWA investigated possible future changes to storm surge and wave climate around New Zealand for present day conditions and then with future scenarios of climate change based on the IPCC AR5 emission projections and more recent assessments of climate change effects have been recently published by University of Auckland, but also using the AR5 emission projections[6]. The results of these assessments suggest while the southern and western New Zealand regions could expect increases in 99 percentile

[6] Albuquerque, J., J. Antolinez, R. Gorman, F. Mendez, G. Coco (2022) On the projected changes in New Zealand's wave climate and its main drivers, New Zealand Journal of Marine and Freshwater Research, November 2022.

significant wave height of up to 10% by the end of the century. There could also be decreases in 99 percentile annual significant wave height along the east cost of the North Island of between 5 and 20%, although there may be no significant change from present day during the winter storm period. Due to the sheltered site location and the relatively small changes in wave heigh, the most critical matter to consider regarding climate change for this project is the effect of sea level rise.

Tsunami

30. I have relied upon published modelling for the understanding of tsunami effect. Two credible sources have been modelled for this area: one for a South American origin with a return period 50-100 years, and a less frequent tsunami event with moment magnitude scale (M*) 8.5 and M* 9.0 from the Tonga/Kermadec Trench. The return period of the Tonga/Kermadec Trench events is much longer (500-2,000+ years) and represents a likely worst-case scenario for a tsunami striking the Northland coast.

31. Modelling of the tsunami was carried out at Mean High Water Spring (MHWS) and for MHWS + 50 cm to assess potential effects of sea level rise. The results show relatively low levels of inundation in the vicinity of the harbour entrance and that inundation is greater for the South American tsunami. Similarly, velocities within the tidal inlet are higher, with velocities of up to 3 m/s, approximately double the tidal velocities. The additional 0.5 m of sea level rise from climate change results in small increases in velocities.

32. The large velocities that occur because of tsunami are capable of causing large scale changes to the physical system. This is likely to manifest in scour along the inlet and along Mair Bank and deposition both within the inner harbour and offshore. Over time a proportion of the transported sand may return to the ebb tide shoal system, but there may also be some volume that is not able to be returned as it may either be too far up on the inner harbour system, or in too deep water within Bream Bay. Even in the present-day situation this is likely to require inspection of the channel and inlet to confirm the safe operability of vessels accessing the port and jetty and it is likely that some maintenance dredging may be required to maintain operability.

Coastal processes

33. The Whangarei Harbour entrance is stable, controlled by Whangarei Heads to the north and the large ebb delta to the south. The northward directed net longshore sediment transport on the open coast of Bream Bay is very small in comparison with the sediment

flux that enters and exits the harbour because of tidal exchange. Therefore, the inlet is tide dominated, with tidal flows significantly greater than the net littoral transport which results in a stable inlet.

34. The seabed within the tidal inlet in the vicinity of the Port also appears relatively stable, with localised areas of erosion and accretion. The main movement being relatively slow migration of sand bars from Snake Bank into the current port dredged area. The historic flood bar has progressively welded to the coast to the east of the port, and this, combined with relatively small sediment transport from the open coast, has resulted in accretion of the beach areas between the port and the CINZ jetty.

35. The analysis of historic bathymetric data shows that over the 76-year period there has been no significant change to the ebb tide delta with the feature dynamically stable, with natural fluctuations in the surface topography in the order of ± 1 m (vertical) and ± 2 m (horizontally) as banks and channels shift in response to storm events and tidal currents.

36. Ongoing and accelerated sea level rise may result in increased erosion pressure on the ebb tide shoal with changes in tidal asymmetry increasing sediment transport potential into the harbour that could increase erosion pressure along the open coast shoreline over a period of decades to centuries.

SUMMARY OF COASTAL PROCESS EFFECT

37. I have considered effects on coastal processes for both construction and the long-term impacts of the proposed development informed by both my review of previous studies and assessments as well as the hydrodynamic and morphodynamic modelling carried out by MetOcean Solutions Ltd (MOS) for this study. Their modelling was done without the CINZ channel deepening project being in effect. However, earlier modelling carried out by MOS (2018) report on morphological response to capital dredging and land reclamation considered morphological change both with, and without, the CINZ channel deepening. They concluded there was little difference and did not expect either situation to measurably change morphological change in the vicinity of the NPL project. Therefore, I am confident that the findings and conclusion presented in their reports for this study will apply whether the channel deepening project is realised.

Construction effects

38. Construction elements within and adjacent to the CMA are the forming of the reclamations and the seawalls that protect them, the dredging to locally deepen part of the port area and the formation of the bird roost.

Reclamation and seawalls

39. These components will be built using a combination of land-based equipment and barge mounted equipment. The potential effects of construction of these components are diversion of tidal currents and waves due to the location of the completed structures, their occupation of the seabed and the increase in suspended sediment plumes into the CMA during construction. Provided the rocks used for the rock revetment are relatively free from dirt and contaminants and effective construction controls are used during the reclamation process the likelihood of any significant sediment plume extending beyond the port development boundary is low. Construction effects on physical coastal processes outside the port area for the reclamation and seawalls is considered negligible.

Dredging

40. Dredging of the channel is within the predominantly fine to medium sand layers that overlies predominantly clay and silts and bedrock situated well below the base of the basin. The main impact of dredging from a coastal process perspective is the suspended sediment resulting in sedimentation and accretion in areas outside the area to be dredged due high suspended sediment loads. Based on the modelling carried out by MOS, the overwash and release of fines are largely limited to the dredge footprint and along the main channel immediately to the west of the dredging areas. Modelling (Figure 5.1 and 5.2 of the Coastal Process Assessment Report) shows no sediment deposition on the intertidal area. However, if sedimentation did occur on these areas, longer term accumulation of sediment of the intertidal areas are unlikely as tidal forces and the small wave action that occurs on these intertidal areas is likely to move return the deposited finer sediments towards the main channels. Also, with the slight dominance of ebb currents immediately to the west of the dredged areas, it is likely that any sediment deposited in the channels will slowly migrate back to the dredged area.

41. Construction effects can be managed by effective controls during construction to reduce the release of fines which in turn will reduce the likelihood of sedimentation in areas outside the dredged area. With these controls, construction effects on physical coastal

processes outside the port area for the reclamation and seawalls are considered negligible.

42. However, I recommend that monitoring should be included in the construction management plan to determine the actual level of plume extent and concentration. Mitigation for the potential risk could include sediment curtains around the dredge vessel or operating during limited periods associated with low tidal flows if required.

Bird roost

43. The purpose of the bird roost is to mitigate for the area of upper beach area lost due to the eastern reclamation that is used by birds for foraging which has been estimated to be an area of around 1,220m^2. The location of the bird roost was informed by both coastal processes as well as advice from marine ecologists, the avifauna expert, planning requirements and constructability considerations. Sand of a suitable grading and colour will be sourced either from the dredging process or from the beach area to be occupied by the eastern reclamation or an alternative source.

44. The construction of the roost would need to be completed prior to the commencement of the construction of the eastern reclamation to avoid effects on roosting birds. The preferred construction approach is with sand brought to the area at high tides with shallow draft barges, and the sand unloaded and shaped with hydraulic excavators during low tides. This would need to be done between March and August to avoid disturbance of machinery to any bird nesting in the vicinity of the bird roost.

45. There is the potential for damage to the seabed with the operating plant and machinery and for accidental discharges. Keeping plant and machinery in good order and avoiding refuelling or the like in the CMA will reduce the likelihood of accidental discharges. It is anticipated that each barge brought in at a high tide would be fully unloaded during the low tide. However, it is possible that the barge would need to be kept at the site and be secured at this location with some mooring blocks or piles. Retaining the barge at the roost location during low tides will enable the plant to be returned to the barge during higher stages of the tide. Maintenance top-ups using the same method as the initial construction of the roost is also anticipated. These top-ups would also need to be carried out between March and August to miss bird roosting activities.

Long term effects

Reclamation and dredging

46. Based on my review of historic data and information I am of the opinion that the physical environment within the Whangarei Harbour inlet has changed relatively little since the original port construction, although there have been localised effects, including increased accumulation of sand to the immediate east of the port, between the CINZ Jetty and the port reclamation although to my knowledge, this accumulation has not affected the CINZ jetty. Within Marsden Bay there have been changes to a small degree with the original port construction due to the removal of (relatively low) wave and current action on the intertidal area from the east and slight changes in sediment transport, although due to the low energy environment, key features observed historically are still present, so changes have been relatively small scale. However, there has been a landward movement of the spit at the western end of the bay due to infrequent wave energy from the northerly fetches at higher stages of the tide, possibly affected by a reduction in small quantities of alongshore transport from east to west. The landward movement of the spit, particularly the distal (western most) part may have assisted in moving the creek outlet further to the southwest which is resulting in erosion along part of the coastal edge on the left back of the creek.

47. The proposal is an extension of an existing consented port reclamation moving the eastern corner some 500 m to the east from the present port reclamation and dredging of the basin. The proposed reclamation is aligned with the existing face of the reclamation, with no additional extension into the tidal channel. Combined with the required dredging of this area to provide sufficient draft, this means that the channel cross section is not significantly changed. The relatively small change in cross section is reflected in the modelling carried out by MetOcean Solutions, which shows only modest increases in peak tidal currents of 0.1 to 0.2 m/s along the face of the proposed reclamation and an associated decrease in tidal currents along the intertidal area to the east of the reclamation.

48. The proposed eastern reclamation increases occupation of the CMA in the entrance to the harbour and increases the spatial extent of effects on the seabed and shoreline due to the increased occupation towards the CINZ jetty. This reduces the length of the intertidal beach between along this area. The reduction in currents to the immediate east of the reclamation is also likely to affect sediment transport patterns in this area as the reduced currents are likely to support sedimentation. Sedimentation may occur which

has the potential to block stormwater outlets, access to CINZ jetty and locally increase sedimentation within the port mooring area which may require ongoing maintenance effort to clear the outlets from time to time. No significant sediment transport change is observed further to the east of the CINZ jetty.

49. To the west of the existing port there is also likely to occur small changes within Marsden Bay with reduced tidal currents during ebb tides and increased currents during flood tide. However, the changes in velocity do not result in any observable changes in seabed levels based on the morphological modelling.

Bird roost

50. The proposed bird roost is situated in a low energy environment, with no significant tidal currents and only wind generated waves during higher stages of the tide which would largely be generated by strong winds from the west and north. The wind generated wave are expected to cause some impact on the bird roost over time. It is expected that the placed sand will gradually deflate and lower due to wave overtopping, and the sand moving landwards. This will result in locally raising seabed levels in the lee of the roost and potentially merging with the spit that is present landward adding sand to the spit. However, due to the sheltered location it is not anticipated that sand would move from this general intertidal and spit area. High tide roosting habitat will be maintained through 'topping up' of sand material, as required.

RESPONSE TO SUBMISSIONS RAISED

51. A number of submissions have raised potential effects of the proposed development on physical coastal processes. I will present the issues raised and my assessment.

Channel Infrastructure New Zealand Ltd (CINZ)

52. CINZ raised that the application has the potential to adversely affect Channel Infrastructure's Import Terminal System and operations, including sedimentation/accretion and erosion effects (para 22(a)(i)). It is important to note that there are existing natural processes that result in sedimentation and accretion to the seabed and foreshore in the vicinity of the CINZ with sand overwash from the open coast coming over Marsden Bank and into the channel and intertidal areas, then flood tides and wave action bring the sediment into the entrance to Whangarei Harbour. These existing processes are indicated in the sketch shown in Figure 4-9 of the coastal process assessment report and replicated in the figure below.

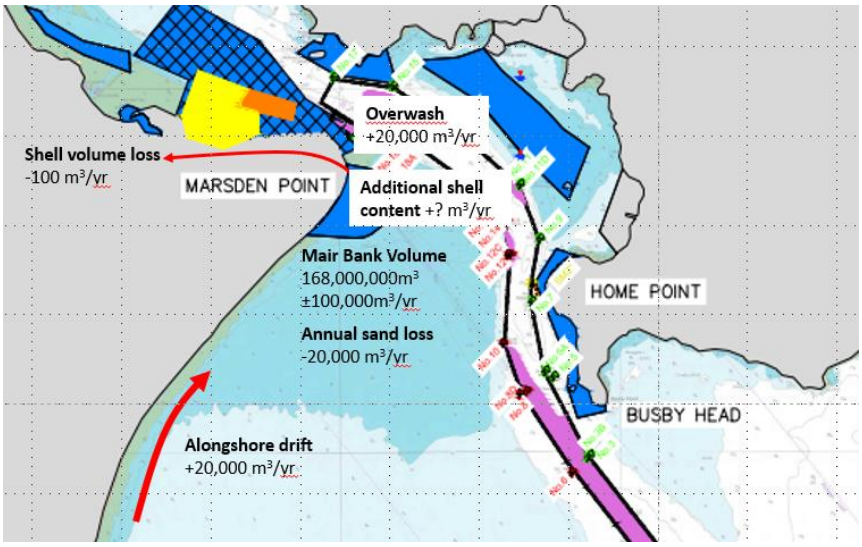

Figure 1: Copy of figure 4-9 from the Coastal Process Assessment report showing the sediment budget for the existing situation and specifically the overwash volumes from the open coast that enter the channel and inlet in the vicinity of the CINZ infrastructure

53. Modelling work carried out by MOS of the differences in tidal currents show that there will be a reduction in tidal currents to the east of the reclamation. Based on the model results, the reduction in peak currents from around 0.9m/s to 0.6 m/s within the channel still result in conditions favourable to sediment transport, but the reductions in currents in the intertidal area reduce velocities to conditions where entrainment of sediment into the water column may not occur. These reductions in current are likely to result in a more favourable environment for sedimentation and the morphological modelling carried out by MOS support this hypothesis with modelling showing small changes in seabed levels along the edge of the channel (Figure 5-5 of the Coastal Process Assessment Report). I concluded that sedimentation in this area will be greater than has occurred historically on the assumption that the overwash transport from the open coast entering an area remains constant but that both a reduced current and a smaller planform area is likely to result in greater levels of sedimentation. This is a matter that requires seabed level and coastal process monitoring and response strategies (i.e., maintenance dredging) should these effects affect the operability of assets in this location.

54. CINZ raises concerns on the effects on the structural integrity and functionality of the marine infrastructure to these possible changes in seabed levels (CINZ para 22(b)). These matters would need to be assessed based on an understanding of the original design criteria - although I would have assumed that design forces for the marine infrastructure would have been calculated with allowance for scour and seabed level changes. However, sedimentation management to ensure spillways and operability of pump intakes remain working would be required and would need to be part of a monitoring and adaptive action plan.

55. CINZ (para 22(c)(i)) also identifies a potential effect resulting from the changes in hydrodynamics and tidal currents affecting sedimentation patterns within the deepwater shipping channel, ship turning basin and the CI berths. I do not agree that that shipping movements will be impacted by sedimentation resulting from changes in hydrodynamics in the channel and turning basin areas. The modelling results (see Figure 5-3 of the coastal process assessment report) shows small increases in tidal current (from 0.05 to 0.5m/s in the vicinity of CI berthing. The high currents in the main channel in this area is likely to maintain the existing depths, and the small increases in current will only reinforce that process. However, as I have noted above the reduced currents along the shallower banks adjacent to the main channel may affect sedimentation within the berthing areas.

56. Paragraph 22(c)(ii) and (iii) of CINZ submission is not a matter I have expertise in and will be addressed by navigation experts.

57. In summary I have predicted changes to coastal processes in this area and that they could be a combination of accretion and localised scour. It will need monitoring and a consideration of responses to the operation of the assets which will depend on the findings. The proposed monitoring consent conditions and review are sufficient to enable this to occur.

Department of Conservation

58. The Director-General is concerned with the impact on sediment movement on the western side of Northport. In particular, they believe the deflation and reduction of the spit at Blacksmiths Creek (DOC Wildlife Refuge) needs consideration independent of the bird roost and as a part of cumulative effects. As I have identified in paragraph 16, Marsden Bay and in particular, the spit at Blacksmiths Creek had experienced significant landward retreat and movement from the 1950's to the late 1990's while during the period since the port was constructed there has been changes to the spit in the vicinity of Blacksmiths Creek (paragraph 43 of my evidence). I accept that there has been change at this location but do not believe the port has had a large negative effect, and instead is likely to have reduced coastal processes, effectively sheltering the area from tropical cyclone wave action that previously occurred.

59. The Director-General has also claimed that the proposed activity is considered contrary to a range of objectives and policies from the New Zealand Coastal Policy Statement (NZCPS), without providing any detailed explanation for that assertion (para 31). I defer any assessment of Northport's proposal against the relevant provisions of the NZCPS to

Messrs Hood and Mitchell. However, to support their assessment with respect to coastal processes, I summarise relevant findings from my assessment as follows:

(a) Coastal processes are dynamic, complex, and interdependent. The proposal will result in some localised changes to these processes, including current speeds and small areas of sedimentation and accretion - but those effects are relatively minor and will not affect the integrity, functioning or resilience of the coastal environment.

(b) Coastal hazard risk has been carefully considered, including taking account of the possible future effects associated with climate change and specifically sea level rise. In my opinion coastal hazard risk can be adequately managed.

(c) I have had specific regard to the potential impacts of the form and design of the proposed reclamation on natural hazards, including consequential erosion and accretion.

(d) While localised areas of accretion and scour may result from the proposal, in my view the proposed consent conditions are sufficient to enable monitoring and, if necessary, responses to avoid any material implications of these coastal process changes – including for operation of other infrastructure assets.

60. In my view the proposal will not materially affect, and in some ways will enhance, natural defences against coastal hazards.

Forest and Bird

61. Forest and Bird present concerns that there will be adverse effects on the coastal environment including coastal processes, landscape, natural character and natural features (para 5 a) although they provide no specific detail on the type of adverse effect on coastal processes to be expected, apart from the occupation to the east and disturbance due to dredging and the formation of the bird roost.

62. I have presented earlier in my evidence my findings on the effects of the proposed development on coastal processes and confirm that my assessment of the scale of effects is not modified by the contents of this submission.

63. Forest and Bird raise concerns that mitigation measures to address sediment plumage during dredging and deposition will result greater than predicted (being negligible to low) effects on seabird food supply and foraging activity (para 13 of their submission). While Ms Bull will address effects on avifauna in more detail in her evidence, I identify in

paragraph 38 of my evidence that the dredging of largely clean sands will result in some overwash of the finer sediments, but that these will largely settle in the channel and dredged areas. This can be seen in Figure 5.1 and 5.2 of the coastal process report which shows no deposition on the intertidal areas. However, if small quantities of fines did settle on the intertidal areas, it is likely that they would be resuspended with rising or falling tides and wave action and be returned to deeper water.

64. Forest and Bird consider it is important that the effects of climate change on this proposal is critically analysed and accommodated not just in terms of the proposed extension but also in terms of any measures to avoid, remedy or mitigate adverse effects on the environment (para 33 of their submission). They identify as an example the proposed sandbank island and the potential loss of the habitat on the eastern side of the port facility which could add to the wider loss of habitat as a result of sea level rise within the harbour.

65. In my assessment of effects, I have considered the effects of climate change in relation to both the effect the proposed development will have on the processes, and the changing processes that will occur as a result of climate change. In my view, the proposed development in general will not change the effect of increased sea levels on reducing spatial extents of the intertidal area, although the slight accumulation expected at the eastern side might locally increase intertidal and sub-aerial areas. I have identified that the bird roost will require top-ups and the addition of sand in this area will have an overall positive effect on increasing seabed levels in this area.

Patuharakeke Te Iwi Trust Board (PTITB)

66. PTITB in their submission:

(a) identify the potential for significant adverse effects on the sensitive coastal environment,

(b) do not support the proposed bird roost as mitigation to replace the loss of the high tide habitat,

(c) present concerns on the risk of climate change and the impact of the proposed development on those climate change risks, and

(d) express concerns regarding the cumulative effects of dredging with current dredging programmes.

67. I have already considered and responded to issues (a)-(c) in my response to previous submitters. With regard to cumulative effects of dredging, I note that historic rates of maintenance dredging are low, and based both on the observed historic evidence and the result of the morphodynamic modelling would consider that maintenance dredging would continue to be relatively infrequent. The proposed monitoring conditions will enable any potential issues to be identified and addressed, and this could include approaches for beneficial uses of maintenance dredging material.

C. J. Coutts (Submission 53)

68. Mr Coutts raises a concern that the volume of dredged material could cause sand drift from harbour beaches throughout Bream Bay, leaving unsightly beaches and shifting banks. Based on the extensive modelling carried out, primarily by MetOcean Solutions, and my assessment of the effects of the coastal process changes as a result of the proposed development, there is no physical process I can determine that will result in that outcome.

S Neal (Submission 85)

69. Mr Neal's submission is that there might be movement of sand from a greater area within and outside the harbour that has the potential to affect larger areas of the seabed. I do not support this submission. As the results of the extensive modelling undertaken for this project, supported by the evidence from previous dredging and development for the original port, and empirical/observed changes since that time, is that changes are limited and localised to within close proximity to where changes are proposed.

Te Hononga Whakaruruhau O Whangarei Terenga Paraoa (Submission 171)

70. This submitter opposes the extension of the port as they believe it will have an impact on the Whangarei Harbour Marine Reserve, Motukaroro/Reotahi site, particularly with regard to increasing water movement and changing tidal movement and increasing sedimentation within the reserve. The submitters also raise concerns regarding the proposals potential exacerbating effects on climate change.

71. Regarding increased and changing water movement, I note that this is an area that currently experiences strong tidal currents and back eddies, as identified on the poster for this reserve[7]. The numerical modelling carried out by MOS show that there are strong peak flows around Motukaroro Island (Figure 3-11 of the CPA report) and that the area

[7] Whangarei Harbour Marine Reserve - Motukaroro poster (doc.govt.nz).

is dynamic morphologically with both positive and negative changes in seabed levels, indicative of a ripple/dune seabed morphology adjusting to the tidal flows (Figure 3-15 of the CPA report). However, the changes in peak tidal flow within the reserve area resulting from the proposed works is small, potentially with a slight reduction in velocities during flood tide, but no observable changes during ebb tide (Figure 5-3 of CPA report). These small changes in tidal currents result in only small changes in seabed levels, with a mix of very small-scale accretion and erosion (Figure 5-5, CPA report). The high tidal currents and the sediment properties of the material being dredged also reduce the extent of effects and suspended sediment plume, with modelling showing no significant effect on the reserve (Figure 5-2, CPA report). Based on the results of the modelling, I do not expect significant impact on the reserve in terms of changing water movement and sedimentation.

72. I have provided some commentary on climate change impact on coastal processes (Section 4.1.8 of CPA report) and acknowledge that increased sea level rise and the effect of sea level rise on tidal deltas is not well understood. However, this process is not significantly affected by the proposed development that is within the tidal inlet throat with no significant change in cross-sectional area.

Marsden Cove Canals Management Ltd (Submission 179)

73. This submission includes concerns regarding coastal effects and in particular the potential for increased sedimentation of the access channel. A range of issues have been identified by their consultant Craig Davis and the submitter wishes to see more detailed information on these issues and to have appropriate monitoring conditions relating to the access channel, and that any adverse effects are mitigated by the applicant. The requirement to include monitoring conditions within Marsden Bay, that would include the access channel to Marsden Cove, is also raised by the Council's reviewer Mr Doug Treloar with a recommendation of long-term monitoring and appropriate remedial action which I support (refer my paragraph 78). I will provide responses to other matters raised by this submission in the paragraphs below.

74. Mr Davis suggests that the bird roost is in an area of significant, or measurable currents. I note that currents in this area will be a combination of wind/wave generated and tide generated. Figure 3-11 in the CPA report show modelled tidal currents being around 0.05 to 0.25 m/s which are low. While currents are measurable, I do not agree that currents are significant or that they have been significantly changed from the existing situation. Figure 5-4 in the CPA which shows the change in velocity in the vicinity of the proposed

development, including Marsden Bay also shows that there is very little change in current in the vicinity of the bird roost (Point 6) as well as within the intertidal extents of Marsden Cove (Points 3, 4, and 7) and within the access channel (Points 1 and 2). The results from the modelling that indicate low currents in this area and no significant change from the existing situation and that with the proposed development. In terms of wave climate, the main wave climate is likely from the northwest, as the existing port reclamation shelters Marsden Bay from swells that might otherwise have entered the harbour. Based on my analysis (CPA Section 3.8), wave heights in this shallow intertidal area are generally less than 0.33 apart from during significant winds where wave heights may reach 0.8 m should they combine with the highest tide levels. This informed my assessment of this area and my conclusion that the bird roost was situated in an area relatively sheltered from tidal currents and wave energy.

75. Mr Davis considers that the drawings provided showing the proposed deposition footprint, that I have assume it will remain in-situ, but he also raises the risk that sand placed at the bird roost site will be transported by wave energy and could block the access channel to Marsden Cove. I have described my expectation that the bird roost would adjust and flatten, moving landward towards the existing spit (refer CPA Section 2.3.6). I deduced the movement of sand due to the direction of the incident waves being largely from the north-west and the low tidal currents present in this area. This incident wave direction makes it highly unlikely for the sand deposited to migrate to the west towards the access channel.

After a careful review of this submission, I support the requirement for more detailed assessment and monitoring as set out my Mr Treloar but am confident with my assessment of likely effects of the proposed port development including the bird roost.

Mountains to the Sea Conservation Trust

76. The MSCT submission raises concerns similar to Submission 171 with regard to increasing water movement and changes to tidal eddies and the risk of increased sedimentation including the cumulative effects of this dredging with the current dredging programme. I have discussed these matters in paragraph 69 of my evidence. With regard to cumulative effects of dredging, I note that historic rates of maintenance dredging are low, and based both on the observed historic evidence and the result of the morphodynamic modelling would consider that maintenance dredging would continue to be relatively infrequent. The proposed monitoring conditions will enable any potential

issues to be identified and addressed, and this could include approaches for beneficial uses of maintenance dredging material.

COMMENT ON DRAFT PROPOSED CONDITIONS ADVANCED BY NORTHPORT

77. I have reviewed the draft conditions proposed by Northport for Northland Regional Council regarding coastal process effect monitoring and management. I am satisfied that the proposed consents will provide sufficient information to identify and address potential effects on coastal processes and include the requirements recommended by Mr Treloar.

RESPONSE TO THE SECTION 42A REPORT

78. I have reviewed the findings of the Section 42 A report with respect to coastal process effects and note that the Council's conclusion of the effects on coastal processes is negligible-more than minor, subject to the successful implementation of recommended mitigation proposed by their reviewer Mr Doug Treloar.

79. Mr Doug Treloar reviewed the CPA on behalf of the Councils and concurred with the assessment methodology used and largely agreed with effects conclusions reached. However, Mr Treloar considers that the effects of the proposed intertidal bird roost within Marsden Bay had not been thoroughly assessed and recommended amendments to conditions relating to the long-term coastal shoreline monitoring of the Marsden Bay and Blacksmiths Creek area to address these matters. This includes detailed pre- and post-works surveys of the Marsden Bay and Blacksmiths Creek area followed by ongoing regular surveys. He includes additional detail in consent conditions 120, 124 and 125 for monitoring locations as well as additional specification in consent condition 126 that I support.

Richard Anthony Reinen-Hamill
Tonkin + Taylor

24 August 2023