Before the Expert Fast-track Panel

FTAA-2511-1150

Under	the Fast-track Approvals Act 2024 (**FTAA**)
And	
In the Matter	of an application for approvals by **MCCALLUM BROTHERS LIMITED** for the Te Ākau Bream Bay Sand Extraction Project located at Te Ākau Bream Bay, Northland

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Evidence of Simon Andrew West on behalf of McCallum Brothers Limited in Response to Invited Comments

(Marine Ecology)

Dated 12 August 2026

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Introduction

1. My name is Simon Andrew West.

2. I am a Marine ecologist. I hold Bachelor of Science with Majors in both Biology and Earth Science from the University of Waikato, and a Master of Science with Honours in Zoology from the University of Auckland (1991).

3. I have been employed by Bioresearches since April 1991. I have 35 years' experience as a marine ecologist and am currently the Technical Director Marine Ecology at Bioresearches. I have conducted ecological surveys on the continental shelf, in coastal waters, harbours, waterways and beaches to monitor the health of the marine environment and gain a measure of the impact of development on land or discharges to the sea. The majority of surveys have been conducted in the North Island but have included some South Island studies. This has involved measuring the levels of pollution and contamination, and the impact of activities like dredging and the effect of its disposal on the coastal environment. My work includes both resource consent applications and consent monitoring. Over the course of my time at Bioresearches my role has changed from conducting directed tasks to designing and leading a team of colleagues.

4. This evidence is provided as part of McCallum Brothers Limited's (**MBL**) response to comments from invited persons namely Northland Regional Council (NRC) on the Te Ākau Bream Bay Sand Extraction Project (**Project**).

5. I prepared and or reviewed the following material lodged in support of MBL's application:

    a. Report titled Assessment of Ecological Effects dated 17 December 2025 included as Attachment 12 to the MBL Assessment of Environmental Effects.

    b. Report titled Pre Sand Extraction Assessment Report, February - March 2024, dated 9 December 2025 included as Appendix C in Attachment 29 to the MBL Assessment of Environmental Effects.

c. Environmental Monitoring Management Plan ("EMMP") plan dated 4 July 2025 included as Attachment 29 to the MBL Assessment of Environmental Effects.

d. I reviewed the Cup Coral Management Plan (CCMP) dated 28 October 2025 included as Attachment 30 to the MBL Assessment of Environmental Effects.

e. I am the author of all the maps in the reports and attachments with the Bioresearches logo.

Code of Conduct

6. Although this is not a hearing before the Environment Court, I confirm that:

   a. I have read and am familiar with the Environment Court's Code of Conduct for Expert Witnesses as specified in the Environment Court's Practice Note 2023 (**Code**); and

   b. The reports and other relevant documents referred to above authored by me:

      i. Are within my area of expertise (except where I state that I rely upon the technical reports of other expert witnesses provided in support of the application);

      ii. Have been prepared in accordance with the Code; and

      iii. I have not omitted to consider any material facts known to me that might alter or detract from the opinions expressed.

Scope of Evidence

7. My evidence focuses on marine ecological matters, particularly benthic ecology. Where I refer to coastal processes, underwater noise, fish and fisheries, marine mammals or seabirds, I do so only to the extent that those matters interact with benthic ecology and otherwise rely on the specialist assessments prepared for MBL.

8. I have identified the following parties as having provided comments that relate to marine ecology issues which I respond to in this evidence:

   a. Regulators:

      i. Northland Regional Council; and

      ii. Department of Conservation.

   b. Others:

      i. Endangered Species Foundation – Tāngaro Tuia te Ora;

      ii. Ocean Beach Residents Association;

      iii. Ruakākā Reserve Board Inc;

      iv. Bream Bay Coastal Care Trust;

      v. Te Rerenga Parāoa Rohe Moana Kaitiaki;

      vi. Waipū Cove Reserve Board;

      vii. Langs Beach Society Inc;

      viii. Bream Bay Guardians (**BBG**);

      ix. Northland Conservation Board (Te Rūnanga Papa Atawhai o Te Tai Tokerau);

      x. Te Kauika o Patuharakeke Waka Ama Incorporated;

      xi. Whangarei Heads Citizens Association (**WHCA**);

      xii. Kōwhai Te Awhina Hapū o Te Parawhau Hapū Incorporation;

      xiii. New Zealand Conservation Authority (**NZCA**);

      xiv. Ruakākā Residents and Ratepayers Association Inc. (**RRRA**);

      xv. Langs Cove Residents Association Inc. (**LCRA**);

xvi. Parliamentary Commissioner for the Environment;

xvii. Waipū Boat & Fishing Club Inc;

xviii. Patuharakeke Te Iwi Trust Board & Ngātiwai Trust Board;

xix. Forest & Bird; and

xx. Te Parawhau ki Tai applicant, Marina Fletcher.

9. Given the substantial volume of comments from invited parties that relate to marine ecology, I have grouped my responses into themes.

10. Where relevant, I have identified whether those themes also relate to the Panel's Requests for Information made under section 67 of the Fast track Approvals Act 2024, on 30 April 2026 and 8 May 2026. The following table summarises the list of themes which I have responded to.

Table 1 Theme groups for responses

Theme groupings for responses	Comments Received / Related Panel RFIs
1. Ecological value of benthic habitat and fish	NRC / De Luca; BBG / eCoast
2. Baseline adequacy and later survey information	BBG / eCoast; NRC
3. Future environment and scallop recovery	Panel Minutes 4 and 6; BBG; Patuharakeke / Ngātiwai
4. Direct effects on benthic fauna and survivorship	Bulmer; NRC; BBG
5. Scallop avoidance and scallop management	Parsons; eCoast; submitters
6. Protected cup corals and sensitive taxa	NRC; DOC; BBG; Forest & Bird

Theme groupings for responses	Comments Received / Related Panel RFIs
7. Peat reef / patchy sensitive habitat	BBG / eCoast
8. Benthic prey biomass and food-web effects	Parsons; Patuharakeke / Ngātiwai
9. Seabed recovery and functional recovery	NRC; Bulmer; BBG
10. Monitoring design and control sites	NRC / De Luca
11. Seabed Adaptive management and trigger refinement	NRC; Bulmer
12. Cumulative benthic effects	WHCA; BBG; NRC; multiple submitters
13. Overall conclusions	All submitter themes

11. I address each of these themes in turn below. In addition, I record that where I cross-reference relevant management or operational plans as lodged with the application, my cross-references to those documents take account of any amendments proposed as part of the Applicant's response to comments.

Theme 1: Ecological Value Assessment (Benthic Habitat & Fish)

12. Northland Regional Council, through its reviewer Dr De Luca, has raised concerns that the ecological values of the benthic invertebrate communities and associated fish assemblages have been understated, or that the methodology used to determine ecological value is inadequate. Those concerns are set out in:

    a. NRC Attachment 1, Marine Ecology Peer Review, 15 September 2025, section 3 “Ecological values” at BM 1 page 2, and are retained in Dr De Luca’s 26 February 2026 memo, section 1 “Benthic habitat and fish ecological values are understated – MODERATE concern” at BM250630 pages 1–2.

b. Bream Bay Guardians, relying on the eCoast *Bream Bay First Order Ecological Survey – Phase 2*, also raise related concerns about the ecological importance of the proposed extraction area, including in the Executive Summary at pages i–iii and in section 1.1 at pages 4–6.

13. In my opinion, the benthic habitat is appropriately classified as having Moderate ecological value. This is because the habitat is representative rather than distinctive, does not contain Threatened or At Risk benthic taxa, and does not contain extensive biogenic habitat-forming features such as horse mussel beds. Protected solitary cup corals are addressed separately below.

14. I consider the EIANZ guidelines to be a useful framework for ecological value assessment. However, in my opinion, the current marine soft sediment criteria are more readily applied to estuarine and enclosed harbour settings than to exposed open coast sandy habitats such as Te Ākau Bream Bay. In that context, professional judgment remains important. Open coast sandy habitats are often more physically uniform than estuarine environments, where value gradients may be more strongly associated with sediment type, shellfish abundance, and contaminant status. For that reason, I do not consider that the presence of clean sandy habitat in an open coast setting should, of itself, result in a high ecological value classification.

15. I also note that the examples provided in the guideline document appear to relate primarily to estuarine or enclosed harbour environments, rather than exposed open coast soft sediment habitats. In my view, that reinforces the need to apply the framework carefully and with regard to the characteristics of this setting.

16. As set out in Section 5.3 of the Assessment of Benthic Ecological Effects (Attachment 12), I have applied expert judgment informed by my 35 years of experience of sampling comparable habitats around New Zealand and remain of the view that the benthic habitat in Te Ākau Bream Bay is appropriately assessed as moderate ecological value.

17. While the sand extraction area supports a diverse community, averaging 26.7 taxa per sample, that diversity is typical of the wider Whangārei Heads area and is not unique to the extraction footprint. The taxa recorded are nationally and locally common, and no Threatened or At Risk species were identified. In addition, the area has been subject to longstanding modification from commercial scallop fishing, other bottom-contact fishing methods, and nearby port anchorage activities. In my opinion, those characteristics support a moderate, rather than high, ecological value classification.

18. If the area supported dense shellfish concentrations or biogenic habitat-forming species, such as horse mussels, I would regard that as increasing ecological value. However, those features are not present here, and for that reason I do not consider a classification above moderate to be justified.

19. Dr De Luca also raised concern that "functional importance, trophic role, connectivity and contribution to broader ecological processes have not been adequately considered in the assessment". That concern is set out in Dr De Luca's 26 February 2026 memo, section 1 "Benthic habitat and fish ecological values are understated – MODERATE concern", BM250630 pages 1–2. It follows Dr De Luca's earlier Marine Ecology Peer Review dated 15 September 2025, section 3 "Ecological values", BM 1 page 2, where she identifies matters relevant to ecological value including benthic invertebrate abundance and diversity, sediment grain size and quality, water quality, fish communities, degree of modification and protected cup corals.

20. I do not agree that functional importance, trophic role, connectivity, and broader ecological processes were omitted from the assessment. Those matters were specifically addressed in the additional food web assessment included as Appendix C to the Assessment of Benthic Ecological Effects (Attachment 12), which was prepared in response to a similar concern raised during NRC's pre-lodgement review feedback. My responses to those concerns are illustrated in Attachment 5 – Consultation Summary, Pre-Lodgement Submission Response to Northland Regional Council (Pages 57-66).

21. Appendix C evaluates how the proposed extraction activity may influence the structure and function of the local marine food web. It considers the pathways

by which energy is transferred from primary producers, including phytoplankton and benthic microalgae, through benthic infauna and zooplankton to fish, seabirds, and marine mammals.

22. Appendix C also addresses the functional role of benthic biota in nutrient recycling, bioturbation, bioirrigation and benthic-pelagic coupling. It evaluates how temporary removal or disturbance of benthic organisms within the extraction area may locally reduce those functions for a period.

23. Appendix C explains the importance of benthic-pelagic coupling as a mechanism linking primary production, nutrient cycling, and secondary production in coastal ecosystems. This process connects seabed communities with the overlying water column through the exchange of nutrients such as ammonium, nitrate, and phosphate.

24. The Assessment of Benthic Ecological Effects report (Attachment 12) notes that these sandy habitats are naturally dynamic and that their benthic communities are adapted to physical disturbance. In that context, the functional properties of the habitat are expected to show resilience and to recover once disturbance ceases.

25. I accept that ecological function should be considered as part of ecological value and effects assessment. However, in my opinion, the functional role of the proposed extraction area is not unique or disproportionate at the scale of Te Ākau Bream Bay. The extraction area forms part of a wider open coast soft sediment system, and the functions identified above are expected to occur across that broader habitat type.

26. Accordingly, while extraction may temporarily affect benthic ecological functions at a local scale, the net effect on ecological functioning at the scale of the wider Te Ākau Bream Bay embayment, including nutrient recycling, benthic-pelagic coupling and food-web support, is expected to be minor relative to natural variability. In my opinion, these broader ecological functions and processes have been adequately considered.

27. Dr De Luca also considers that the ecological values of fish communities have been understated, relying too heavily on the fact that fish species present are

common. Dr De Luca further considers it is inappropriate to separate the assessment of fish community composition from the benthic environment ecological value assessment, because those components are assessed collectively under the EIANZ soft sediment marine ecological value framework and are ecologically connected in the near-benthic environment. That concern is set out in Dr De Luca's 26 February 2026 memo, section 1 "Benthic habitat and fish ecological values are understated – MODERATE concern", BM250630 pages 1–2. It is also consistent with Dr De Luca's earlier Marine Ecology Peer Review dated 15 September 2025, section 3 "Ecological values", BM 1 page 2, where she considered the fish assemblage to be at least of Moderate / High ecological value.

28. I accept that benthic dwelling fish can appropriately be considered alongside the benthic habitat assessment. However, in my opinion, the available information does not support a moderate or high ecological value classification for fish within the extraction footprint.

29. The Assessment of Benthic Ecological Effects (Attachment 12) records four species of benthic-dwelling fish within the sand extraction area. The numbers recorded were low and diversity was limited. The assessment of these fish is also methodologically difficult because such species are naturally cryptic, are not readily attracted to baited underwater video systems, and are not easily detected by static camera methods. At this site, benthic fish were recorded only incidentally in grab and dredge tow samples.

30. Seabed camera methods used in other studies, including at Mangawhai[1], have previously detected features such as short-finned worm eel (*Scolecenchelys australis*) gardens; however, no such features were identified within the extraction area.

31. Fish were assessed separately in order to also consider the more mobile larger bottom dwelling, mid-water, and pelagic species present in Te Ākau Bream Bay. Mr Boyd's Assessment of Fish and Fisheries Effects (Attachment 16), which drew on trawl survey data from the wider Tīkapa Moana – Te Moananui-

[1] Bioresearches (2016) Hawaiki Submarine Cable NZ, Environment Assessment of the Benthic Ecology of the Cable Route. For Mortimer Consulting. 49 p.

o-Toi (Hauraki Gulf), did not identify any unusual fish assemblage patterns in the Te Ākau Bream Bay area. Rather, the fish community was reported to be dominated by tāmure (snapper), with much lower abundances of the next most commercially important species, kuparu (John dory) and kumukumu (gurnard), indicating a relatively low-diversity assemblage.

32. Commercial and non-commercial fishing occurs throughout Te Ākau Bream Bay, including within the application area, although both fishing effort and catch are lower than elsewhere in the wider Tīkapa Moana – Te Moananui-o-Toi (Hauraki Gulf). In my view, that is consistent with the extraction footprint not functioning as an area of particularly high fish abundance or unique ecological importance.

33. I also note that the functional importance, trophic role, connectivity, and broader ecological contribution of fish were considered in Appendix C to the Assessment of Benthic Ecological Effects (Attachment 12). In addition, the habitat does not appear to function as a unique nursery or spawning ground of regional significance, and no Threatened or At Risk resident fish species are known to depend on this footprint.

34. For those reasons, I remain of the view that the ecological value of fish within the extraction footprint is appropriately assessed as low. If the Panel prefers that benthic fish be considered as part of the benthic habitat assessment rather than assessed separately, I do not consider that this would materially alter my overall conclusion that the benthic habitat remains of moderate ecological value.

35. In summary, I remain of the view that the benthic habitat within the proposed extraction area is appropriately assessed as having Moderate ecological value, and that the fish assemblage associated with the extraction footprint is appropriately assessed as Low ecological value. The comments received do not alter my opinion on ecological value, although they support ensuring that monitoring includes functional indicators and not only species richness or abundance.

Theme 2: Baseline adequacy and later survey information

36. Bream Bay Guardians, relying on the eCoast *Bream Bay First Order Ecological Survey – Phase 2*, have raised concerns that the baseline ecological data used to support the application are inadequate or incomplete. Those concerns are addressed in the eCoast Executive Summary at pages i–iii and section 1.1 at pages 4–6, where eCoast comments on the ecological importance of the proposed extraction area, scallops, shell material, benthic diversity, peat reef and the adequacy of the assessment. Northland Regional Council also raises related concerns about ecological value, control sites and monitoring in NRC Attachment 1, Marine Ecology Peer Review, 15 September 2025, BM 1 pages 2–7, and in Dr De Luca's 26 February 2026 memo, sections 1–3, BM250630 pages 1–3.

37. I accept that additional survey data can improve understanding of natural variability, particularly in open coast soft sediment environments where benthic communities may vary seasonally and interannually. However, in my opinion, the March 2024 baseline survey provides an appropriate basis for the assessment of marine ecological effects when considered together with the monitoring and adaptive management framework proposed for the Project.

38. The MBL Bream Bay baseline ecology data were limited to one sampling event in March 2024. That survey was deliberately timed for late summer, when benthic abundance and diversity in sandy open-coast environments would be expected to be relatively high.

39. Sandy open coast benthic communities, particularly macrofauna such as polychaetes, amphipods, bivalves and crustaceans, typically show higher abundance and diversity during warmer months, driven by temperature-dependent recruitment, increased food availability and reduced physical disturbance. That is consistent with the literature on sandy shore and sandy

sediment communities (Defeo & McLachlan 2005[2], Coppo *et al*. 2024[3], Barboza & Defeo 2015[4], McLachlan & Defeo 2017[5]).

40. In my opinion, a winter survey would likely have recorded lower densities and fewer taxa. Similar seasonal variability was observed in the Pākiri recovery monitoring study[6], where seasonal change was a dominant component of the monitoring results.

41. Additional seasonal sampling would provide further information on natural variability. However, the March 2024 survey was deliberately timed for a period when benthic abundance and diversity were expected to be relatively high. Ongoing monitoring in multiple control areas is proposed to address temporal variability using consistent seasonal timing.

42. The proposed monitoring approach is also intended to reduce the effect of seasonal variability by monitoring during the same general seasonal period. In my opinion, this is important because comparison of samples collected in different seasons could make it more difficult to distinguish natural seasonal change from extraction-related effects.

43. The baseline survey was not limited to one form of sampling. It included multiple methods relevant to benthic ecology, including sediment sampling, benthic macrofauna sampling, epibenthic dredge tows, drop-camera imagery and high-resolution bathymetric survey information. In my opinion, that combination of methods provides a reasonable baseline for the purposes of assessing benthic habitat and fauna in an offshore sandy environment.

44. I also accept that later survey information, including the eCoast material, is useful supplementary information. It provides additional observations of seabed conditions, scallops, shell material, biological features and possible

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[2] Defeo, O., & McLachlan, A. (2005). Patterns, processes and regulatory mechanisms in sandy beach macrofauna: A multi-scale analysis. *Marine Ecology Progress Series, 295*, 1–20.
Link: http://falk.ucsd.edu/reading/defeo2005.pdf

[3] Coppo, G. C., Pereira, A. P., Netto, S. A., & Bernardino, A. F. (2024). Meiofauna at a tropical sandy beach: The influence of seasonality on diversity. *PeerJ, 12*, e17727. https://doi.org/10.7717/peerj.17727

[4] Barboza, F. R., & Defeo, O. (2015). Global diversity patterns in sandy beach macrofauna: A biogeographic analysis. *Scientific Reports, 5*, 14515. https://doi.org/10.1038/srep14515

[5] McLachlan, A., & Defeo, O. (2017). *The ecology of sandy shores* (3rd ed.). Academic Press.

[6] Bioresearches (2025b). Recovery Monitoring – Area 1, 2023 – 2024. Report for McCallum Bros Limited pp 122.

low-relief habitat features. I have considered that material in forming my responses to the comments.

45. In my opinion, the later information does not demonstrate that the original baseline assessment materially understated the general benthic values of the proposed extraction area. However, it does support the importance of ongoing monitoring for patchy or changing features, including scallop recruitment, shellfish aggregations, cup corals, bryozoans, tubeworm-associated communities, and any low-relief reef or consolidated substrate features.

46. Some submitters have suggested that video transects should have been used more extensively. I agree that video transects can be a useful tool for describing seabed features, especially where low relief or patchy habitats may be present. However, dredge tows and grab samples were also used because they provide information that video cannot provide, including the ability to identify and measure collected biota and to obtain quantitative benthic community data.

47. For example, scallops observed in video can generally be reported as total observed density only, whereas physical sampling can provide size information. Size information is relevant to assessing population structure and recovery. In my opinion, video methods and physical sampling are therefore complementary rather than interchangeable.

48. The March 2024 MBL baseline survey included high resolution MBES imagery of the extraction area and control areas, together with drop-camera imagery. No extensive reef, dense shellfish bed, horse mussel bed, or other large biogenic habitat-forming feature was identified within the proposed extraction area through those methods.

49. I accept that small, low relief or temporary features may be more difficult to identify, particularly where features are intermittently exposed by sand movement. For that reason, I support the use of video and drop camera methods as part of ongoing monitoring where practicable, particularly where monitoring indicates possible patchy sensitive habitat or changes in seabed character.

Theme 3: Future environment and Scallop recovery

50. The Panel in its Requests for Information, Bream Bay Guardians relying on the eCoast material, Whangarei Heads Citizens Association, and Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board through the evidence of Dr Parsons, have raised whether the future environment should be assessed as a recovering benthic and scallop environment, rather than as a static baseline. Relevant matters are raised in Minute 4, paragraph [4], Minute 6, paragraph [3], the eCoast Executive Summary at pages i–iii and section 1.1 at pages 4–6, WHCA section 4.2 "Impacts on Marine Ecosystems" and section 6 "Cumulative Effects and Future Development", and Dr Parsons' evidence at paragraphs 2.3, 4.15–4.18 and 7.1–7.3. I accept that this is a relevant consideration.

51. I accept that this is a relevant consideration. However, the key issue is whether available information demonstrates that recovery is occurring in a manner that materially changes the effects assessment, and how any future recovery should be managed if it occurs within extraction cells.

52. I do not discount the ability of scallops or other benthic biota to recover if the pressure affecting their population is removed or reduced. At the time the Assessment of Benthic Ecological Effects (Attachment 12) was prepared, there was no other data before me to indicate that scallop recovery was or had occurred within the proposed extraction area.

53. The latest Fisheries New Zealand report[7] stated that "The 2024 survey findings provide evidence of some localised scallop population recovery since the last surveys in 2021 in Eastern Coromandel and in Whangarei Harbour, but there was no evidence of recovery elsewhere. Compared with historical estimates, recruitment strength was low in 2024, except for in Eastern Coromandel and Whangarei Harbour."

54. The Assessment of Benthic Ecological Effects (Attachment 12) also considered the relevance of Pākiri monitoring to scallop recovery. In section 6.1 of

[7] Williams, J.R.; Underwood, M.J.; Rensen, T.; Hughes, R.; Bian, R.; Middleton, C.; Evans, O.; Middleton, I. (2025). Camera, dive, and dredge surveys of scallops in SCA 1 and SCA CS, 2024. New Zealand Fisheries Assessment Report 2025/16. 72 p.

Attachment 12, I compared 2023 and 2025 benthic biota survey data from the Pākiri extraction area and control areas. That comparison showed that scallop numbers increased in both the extraction area and the control areas despite ongoing sand extraction within the Pākiri extraction area. In my opinion, that indicates that sand extraction is not necessarily incompatible with scallop presence or an increase in scallop abundance, although I accept that the extent, rate and location of scallop recovery remain site specific and uncertain. For Bream Bay, I therefore consider the appropriate response is not to assume either no recovery or inevitable recovery, but to monitor scallop density, size classes and recruitment over time and apply cell based management if localised scallop recovery areas are identified.

55. The survey data presented by Bream Bay Guardians in the eCoast report suggests that numbers of juvenile scallops may have increased between the March 2024 MBL survey and the eCoast surveys between December 2025 and January 2026. This matter is addressed in the eCoast Executive Summary at pages i–iii and section 1.1 at pages 4–6.

56. In my opinion, some increase in juvenile scallop observations is expected in a system where scallop harvesting pressure has largely been removed by Fisheries New Zealand's closure on 1 April 2022 until further notice, of the Quota Management Area SCA 1 – Northland scallop fishery[8]. The closure applies to both commercial and recreational fishers. It does not restrict the taking of scallops for customary purposes.

57. In stock assessment surveys scallops are described in three categories based on shell length: juveniles (20–69 mm), pre-recruits (70–99 mm), and recruited scallops (100 mm or larger). In SCA 1 stock assessments, the commercial (fishable) stock is defined as the "recruited" or exploitable component of the population, which corresponds to scallops at or above the minimum legal size of 100 mm shell length. Smaller scallops (<100 mm) are treated as pre-recruits that contribute to future stock rebuilding. Thus, stock assessments distinguish between total abundance and the subset of legally harvestable scallops, with management and fishery viability primarily focused on the biomass of this

[8] Fisheries (SCA 1 Closure) Notice 2022 (MPI 1455) - 2022-go1122 | New Zealand Gazette

recruited (≥100 mm) size class[9]. There is no specific density of scallops that defines a commercial bed[10].

58. The eCoast material does not demonstrate that the proposed extraction area currently supports a dense harvestable adult scallop bed. While the eCoast material reported densities exceeding four individuals per 100 m^2, the majority of scallops recorded were less than 100 mm in shell length. As such, these densities are not indicative of a dense adult scallop bed and should not be interpreted as demonstrating the presence of a commercially viable scallop population within the proposed extraction area.

59. The 2025 Fisheries New Zealand report also noted that juvenile scallop numbers were good at Smugglers Bay in 2021 but did not translate into adult populations in 2024. The report speculated that the bed may have been affected by Cyclone Gabrielle. In my opinion, this illustrates that juvenile scallop recruitment does not necessarily translate into adult scallop recovery, particularly in an open coast environment subject to storm disturbance and natural variability.

60. The new information therefore does not demonstrate that the proposed extraction area currently supports a dense or commercially viable scallop bed. However, it does indicate that scallop recruitment and recovery should remain a specific monitoring focus.

61. If future monitoring identifies materially increased scallop density, juvenile recruitment, or localised scallop recovery areas within extraction cells, that information should inform cell management, including closure or avoidance of affected cells where appropriate.

62. Appendix F of the EMMP (Attachment 29) already identifies beds of large bivalve molluscs, including scallops, as sensitive benthic communities for the purpose of excluding areas from sand extraction. In my opinion, because scallop recovery may occur through recruitment before a dense adult bed is

[9] Williams, J.R.; Underwood, M.J.; Rensen, T.; Hughes, R.; Bian, R.; Middleton, C.; Evans, O.; Middleton, I. (2025). Camera, dive, and dredge surveys of scallops in SCA 1 and SCA CS, 2024. New Zealand Fisheries Assessment Report 2025/16. 72 p.

[10] Williams, J.R.; Underwood, M.J. (2026). Review of reference points (management targets and limits) for scallops. New Zealand Fisheries Assessment Report 2026/13. 30 p.

present, it would be useful to apply size specific scallop indicators when considering whether a cell should be excluded or reviewed. As a practical approach, I would treat an average density of legal or near legal scallops, being scallops greater than 100 mm shell width, of 0.1 scallops/m² or greater as indicating a scallop bed requiring cell exclusion. This density should be revised when Fisheries New Zealand publish a commercially viable bed density. For sublegal scallops between 70 mm and 99 mm shell width, I would treat an average density of 0.2 scallops/m² or greater as an indicator of a developing bed requiring review. For juvenile scallops less than 70 mm shell width, I would not use a single observation as an exclusion trigger but would treat repeated observations showing a clear recruitment pulse or an average density of approximately 1 scallop/m² or greater across a cell or part cell as requiring further assessment and, if confirmed, cell exclusion or avoidance. These thresholds should be applied using the combined results of video / photographic observations and epibenthic dredge tow data, with particular weight given to consistent results across multiple samples rather than isolated individuals.

63. The sand dredge will remove scallops of all sizes from the dredge path where scallops are present. These scallops will be returned to the seabed via the oversize material discharge ports under the vessel. It is expected that some of those scallops will be damaged or killed.

64. When the survivorship study surveys were conducted at Pākiri, scallops were not present in high densities and therefore scallops were not captured in sufficient numbers to assess scallop-specific survivorship.

65. For that reason, in my opinion, scallop effects should not be assessed on the basis that scallops will reliably survive or avoid the dredge. The more appropriate approach is to manage scallop risk spatially through monitoring, cell management and avoidance of dense or recovering scallop areas if they are identified.

66. In assessing the future environment, I consider it important to distinguish between potential recovery of the wider Te Ākau Bream Bay scallop population and confirmed recovery within the proposed extraction footprint.

The former is relevant context; the latter is the matter most relevant to direct benthic effects from the proposed extraction.

67. In my opinion, the available information supports a cautious monitoring response, rather than a change to the conclusion that the extraction area is not presently a dense scallop bed. The future environment should therefore be addressed through monitoring for scallop recruitment and density, and through adaptive cell management if scallop recovery areas become established within the extraction area.

68. In summary, I accept that scallop recovery is a relevant future environment issue. The current information does not demonstrate that the proposed extraction area contains a dense or commercially viable scallop bed, but it does support scallop specific monitoring and cell based management. If future monitoring identifies scallop recovery areas, those areas should be managed through the PSEAR / SEMR and cell closure processes.

Theme 4: Direct effects on benthic fauna, survivorship and mortality

69. Dr Bulmer, for Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, has raised concerns about the direct effects of extraction on benthic fauna and the survivorship assumptions used in the Assessment of Benthic Ecological Effects (Attachment 12). Those concerns are set out in Dr Bulmer's evidence at paragraphs 1.5, 2.1–2.5, section 4 and section 5. Similar concerns about direct disturbance to benthic organisms are also raised in the Bream Bay Guardians / eCoast material, including the eCoast Executive Summary at pages i–iii and section 1.1 at pages 4–6.

70. Direct effects on benthic fauna arise primarily from the physical interaction between the draghead, seabed sediments and benthic organisms. The assessment of these effects depends on the area disturbed, the taxa present, the proportion of organisms retained or returned, and the likely survival of organisms after passage through the extraction and screening system.

71. Dr Bulmer suggests that the 86% survivorship estimate for benthic organisms passing through the dredge, which was derived from assessments at Pākiri, cannot reasonably be generalised to the full benthic community. He also considers that survivorship is likely to be very low or zero for many sensitive and habitat-forming taxa. That concern is set out in Dr Bulmer's evidence at paragraphs 2.2, 5.1–5.3 and 6.1–6.2.

72. In part I agree with Dr Bulmar as I stated in Section 6.1.2 of the Assessment of Benthic Ecological Effects (Attachment 12), "Large fragile thin shelled biota are more likely to be affected by passage through the TSHD and screening equipment than robust biota. Smaller, less robust biota may potentially be damaged by impact with hard surfaces on passage through the draghead, pump, pipes and screen."

73. The level of damage will vary among species and sizes, from minor scratches and chips to mortal cracks and dismemberment. Some species are able to recover and repair shell damage, such as clams and other bivalve shellfish. The ability varies between species and is not well understood for all taxa."

74. The 86% survivorship estimate is derived from studies conducted at Pākiri in February 2020, with the sand extraction dredge *William Fraser* operating along the offshore edge of the inshore consent area and along the inshore edge of the offshore sand extraction area. Those studies found that 93% of assessed biota survived passage through the dredge and across the screen.

75. The Pākiri study did not directly account for mortality during the return trip to the seabed. International literature[11] on the impacts and survivorship of clam dredging suggests that mortality during passage from the vessel to the seabed may be in the order of a further 7%. That additional value was applied to derive the 86% survivorship estimate.

76. Biota smaller than the screen size are expected to be captured in the sand hopper, with a high percentage likely dying. McCallum Bros Limited report that

[11] Bargione G., Barone G., Virgili M., & Lucchetti A. (2023). Evaluation and quantification of shell damage and survival of the striped venus clam (Chamelea gallina) harvested by hydraulic dredges. Marine Environmental Research, 187, 105954.

operations of the weir boards had to be altered to allow the worms and other small biota to pass out and be returned to the sea. The screen size has been modified from 2.5 mm at Pākiri to 2.0 mm for Bream Bay. Biota larger than the screen size are expected to be returned to the seabed with the oversize material. The purpose of the survivorship studies was to attempt to quantify survival of that returned material.

77. The study aimed to collect a volume of oversize material being discharged below the *William Fraser*. The sand extraction intake pump was run at normal stable operating speed as per standard extraction. Sampling from water level below the discharge point would best capture all potential effects on macrofauna of passing through the dredge during normal operation. Due to the design of the *William Fraser*, this was not possible.

78. The volume of water, sediment, shell fragments and biota being returned to the sea creates significant practical and safety difficulties for sampling. As I stated in RFI 3 (Paragraph 53), approximately 56% of dredged material is returned to the sea. To put that in context, the *William Fraser* takes approximately six seconds to cover a 6 m track. The track is approximately 1.6 m wide and, on average, 0.1 m deep. That means that approximately 1 m^3 of sediment is extracted every six seconds, and approximately 0.56 m^3 is returned to the sea. Note these numbers are based on Pākiri offshore seabed conditions and site specific numbers will need to be generated for Bream Bay. McCallum Bros Limited anticipate based on their experience dredging in different sandy environments that the efficiency of collection will be greater at Bream Bay with less oversized material discharged.

79. That returned material is made up of coarse sand that did not pass through the 2.0 mm screen, shell fragments, whole shell, small stones, and biota larger than 2.0 mm.

80. A number of compromises were therefore needed to safely collect samples of raw discharge material. The 2020 study used a 1 m wide box net with 9 mm square mesh, inserted flush with the top of the 2.5 mm screen for approximately 5 to 10 seconds in order to collect sufficient sample. This resulted in about 50 litres of raw sample.

81. Smaller mesh sizes would have resulted in too large a sample to be safely collected manually. Smaller box nets would have limited the volume collected and may have introduced additional variation across the screening deck.

82. The material collected in each net was retrieved, photographed, and all live macrofauna were collected, bagged with site labels and chilled before damage assessment on shore. Each sample was sorted by species and level of damage, and the size of individuals was recorded or estimated depending on damage.

83. Each individual was assigned a damage level following criterion based on Moschino *et al.*, 2003[12]. Three damage states were assessed:

    a. “no damage” for intact fauna;

    b. “sub-lethal” for fauna with a small level of damage such as shells with small chips; and

    c. “lethal” for fauna with broken shells or missing body parts.

84. In my opinion, the survivorship assessment is the best available information for the type of dredge, extraction process and return pathway involved. However, I do not rely on the 86% survivorship estimate as applying uniformly to all taxa. It is most relevant to larger and more robust organisms represented in the Pākiri samples. More fragile taxa, smaller organisms, scallops, horse mussels, cup corals and other sensitive organisms require more conservative assessment and, where appropriate, management by avoidance, monitoring and cell exclusion.

85. Biota between 2.5 mm and 9 mm, which could include small stony corals, were not sampled in the Pākiri study. There was, and remains, no safe and practicable way that I am aware of to sample those biota directly from the discharge in sufficient volume during normal operation. Some less dense biota, such as brachiopods and scallops, were not observed in the five representative samples collected at each depth. Horse mussel beds were avoided by design and therefore horse mussels were also not sampled.

[12] Moschino, V., Deppieri, M., & Marin, M. G. (2003). Evaluation of shell damage to the clam Chamelea gallina captured by hydraulic dredging in the Northern Adriatic Sea. ICES Journal of Marine Science, 60(2), 393-401.

86. I agree with Dr Bulmer that horse mussels would not be expected to survive passage through the dredge and screening deck. They are fragile and are not able to rebury themselves if returned to the seabed. However, horse mussel beds have not been identified within the proposed extraction area, and the extraction and monitoring framework would require such sensitive benthic communities to be avoided if identified.

87. Only one scallop was observed in the 2020 Pākiri survivorship test, and it was classed as surviving. That is not sufficient to support a scallop specific survivorship estimate. For that reason, scallop effects should be assessed more conservatively and managed through spatial avoidance of dense or recovering scallop areas, rather than relying on scallop survivorship.

88. The two species of stony cup corals found alive in the Te Ākau Bream Bay sand area are from the family Turbinoliidae. While no survivorship studies have been conducted for those species, other species in the family have shown the ability to move within sediment and repair damaged skeleton. It is therefore possible that some individuals could survive disturbance and return to the seabed, but that should not be assumed for all individuals encountered by the draghead.

89. I agree with Dr Bulmer that return trip mortality was not studied directly as part of the Pākiri studies. Conducting such a study in situ would be very difficult at Pākiri and in Te Ākau Bream Bay, and I am not aware of laboratory based studies for the relevant New Zealand taxa. As stated above, international literature was used to derive a further mortality value, which was included in the assessment.

90. The percentage survivorship at Te Ākau Bream Bay would need to be assessed on site to provide site specific certainty. That cannot occur before consent is granted because the extraction activity has not commenced. If consent is granted, such studies could be required to improve understanding. If those studies indicated materially higher mortality than assumed, that should inform whether extraction can increase beyond the initial volume and whether additional management responses are required.

91. In my opinion, the direct mortality effects are appropriately assessed as localised within the extraction footprint. The effect is likely to vary by taxon. For robust and common soft sediment taxa, effects are likely to be Low where recovery occurs as expected. For fragile, sensitive, or less mobile taxa, the local effect may be Low to Moderate and should be managed through monitoring, cell closure (Condition 20) and avoidance where relevant.

92. In summary, I accept that the survivorship estimate has limitations and should not be applied uniformly to all taxa. However, it remains the best available empirical information for the *William Fraser* extraction system. The appropriate response is to apply the estimate cautiously, assess sensitive taxa more conservatively, and use monitoring and cell based management to respond if site-specific survivorship or recovery differs from that predicted.

Theme 5: Scallop avoidance and Scallop management

93. Bream Bay Guardians, relying on the eCoast material, and Dr Parsons for Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, have raised concerns about whether scallops can avoid the sand dredge by swimming away. The eCoast material addresses this issue in the Executive Summary at pages i–iii and section 1.1 at pages 4–6. Dr Parsons addresses scallop recovery and uncertainty in his evidence at paragraphs 2.3, 4.15–4.18 and 7.1–7.3.

94. In my opinion, scallop avoidance should not be relied on as a primary mitigation measure.

95. Scallop swimming is short duration, directional control is limited, and reported peak swimming speeds are in the order of 0.5 m/s, which is slower than the draghead during operation, which is approximately 1.0 m/s.

96. Because scallops lack the rapid and sustained swimming capability of fish or marine mammals, there are no mechanical "startle" or engineering methods that are typically deployed on a dredge head to encourage them to clear the dredge path.

97. Acoustic pingers, bubble curtains and mechanical tickler chains are unlikely to be effective as primary mitigation measures for scallops. A scallop's escape

response consists of short, erratic hydro-propulsion bursts caused by clapping the shell valves together. That response usually spans only a few metres and may not move the animal in the direction needed to avoid the draghead.

98. I understand that international dragheads can be up to approximately 6 m wide, which makes mechanical avoidance measures impracticable for scallops. Whereas the draghead on the *William Fraser* is much narrower, at approximately 1.6 m suggesting that mechanical avoidance measures may have some limited effectiveness. However, while the reduced width of the *William Fraser's* draghead may decrease the number of scallops encountered during an individual pass, this does not provide sufficient basis to assume that scallops within the dredge path will actively avoid the draghead.

99. Thus with the ineffectuality of mechanical avoidance measures, the most reliable and widely used method to protect scallop beds from sand extraction is preventative spatial avoidance.

100. The proposed environmental monitoring framework requires pre-extraction and ongoing assessment of the benthic environment. That includes methods capable of identifying benthic habitat features and biological communities relevant to cell management.

101. If a dense or viable population of scallops, or other important biogenic habitat such as horse mussel beds or bryozoan fields, is identified within a cell, that cell should be reviewed for exclusion from extraction. In my opinion, that is the appropriate management response because it avoids the need to rely on untested behavioural avoidance by scallops.

102. Some regulatory approaches use geographical buffers around dense shellfish beds to prevent direct physical destruction and minimise localised sediment smothering. In this case, a cell based management approach provides a practical mechanism for avoidance by closing cells in which such habitats are identified, and, where necessary, adjacent cells if monitoring indicates a risk of sedimentation or edge effects.

103. I accept that the current information does not provide a scallop specific survivorship estimate for the *William Fraser*. I also accept that scallops

encountered by the draghead may be damaged or killed. Accordingly, my assessment does not rely on scallops being able to avoid the dredge or reliably survive passage through the dredge and screening system.

104. The more appropriate management approach is to monitor scallop density, size classes and recruitment over time, and to use that information to inform cell closure, avoidance or adaptive management.

105. In summary, scallop avoidance behaviour should not be treated as a primary mitigation measure. The primary mitigation for scallops should be spatial management. If monitoring identifies a dense scallop aggregation, localised recovery area, or materially increased recruitment within a cell, then that cell should be reviewed for closure or avoidance through the PSEAR / SEMR process, as required by Condition 20.

Theme 6: Protected cup corals and sensitive benthic taxa

106. The Department of Conservation, Northland Regional Council, Bream Bay Guardians, Forest & Bird, and other submitters have raised concerns about protected cup corals and other sensitive benthic taxa within the proposed extraction area. NRC's concerns are set out in NRC Attachment 1, Marine Ecology Peer Review, 15 September 2025, section 3 "Ecological values", BM 1 page 2, and Table 1 at BM 1 pages 6–7, where Dr De Luca addresses cup corals and ecological value. WHCA also refers to DOC concerns about protected cup corals in section 2.1 and section 4.2 of its submission. I address those matters separately because they are relevant both to ecological value and to the assessment of localised direct effects.

107. Protected cup corals have been recorded within the proposed extraction area and are addressed in the application material, including the cup coral assessment and management material. I accept that their presence is relevant to the ecological assessment because all Scleractinia are protected under the Wildlife Act 1953. I rely on the evidence of Dr Jennifer Beaumont for the specialist assessment of scleractinian cup coral taxonomy, abundance, distribution, population-level effects, resilience to disturbance, and monitoring.

108. Dr Beaumont's evidence identifies the invited parties that raised issues relating to scleractinian corals, including the Northland Conservation Board, WHCA, NZCA, Langs Cove Residents Association, DOC, Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, and Forest & Bird. Her evidence responds to those comments under themes including abundance and distribution, population-level effects, resilience to disturbance, cumulative effects, ecological value and monitoring.

109. In my opinion, the presence of small solitary cup corals does not, of itself, mean that the extraction area should be treated as high value biogenic reef habitat. The cup corals recorded are small solitary forms associated with mobile sediments, rather than complex reef forming structures.

110. On the information available, the proposed extraction area appears to represent only a small part of the wider potential habitat available for those taxa. For that reason, I consider that population level effects are unlikely to be significant.

111. I understand from Dr Beaumont's evidence that the estimated live densities within the proposed sand extraction area are low for the small solitary cup corals recorded. Dr Beaumont also explains that there has been a correction to the identification of some dead specimens, with two specimens previously identified as dead *Kionotrochus suteri* now identified as *Culicia rubeola*. That correction does not alter my overall benthic ecological assessment, but it reinforces the need to rely on Dr Beaumont's specialist coral evidence for coral specific taxonomy and abundance.

112. However, I accept that localised effects may occur where individual cup corals are encountered by the draghead. Individuals may be damaged, killed, displaced, or returned to the seabed with oversize material. I rely on Dr Beaumont's evidence in relation to the likely resilience of the recorded cup coral species to disturbance, including the potential for some individuals to move through sediments, self right, burrow, or regenerate following damage or fragmentation. I also accept that there remains uncertainty and that survival should not be assumed for all individuals.

113. For that reason, I consider the appropriate assessment is to distinguish between local effects on individuals or cell scale occurrences, and wider population level effects. Local effects may be Low to Moderate where individuals are damaged or killed, but wider population level effects are expected to be minor or negligible.

114. Dr Beaumont addresses DOC's concerns regarding population level effects, connectivity, depth structuring, local population size, and the relationship between corals within the extraction area and those in surrounding habitats. I rely on her evidence for those coral specific matters. From a broader benthic ecology perspective, I consider that the appropriate distinction is between localised effects on individual corals or cell scale occurrences, and wider population level effects.

115. Other sensitive benthic taxa also require consideration. These include horse mussels, brachiopods, bryozoans, soft corals, scallops, tubeworm-associated communities and any other taxa or assemblages that may indicate elevated habitat value or slower recovery.

116. Horse mussel beds have not been identified within the proposed extraction area. If horse mussel beds, dense shellfish beds, high density living cup coral areas, bryozoan fields, or other sensitive benthic communities are identified in future monitoring, then those areas should be reviewed for cell closure or avoidance.

117. In my opinion, the presence of protected cup corals and other sensitive taxa does not alter the overall assessment that the general soft sediment habitat is of Moderate ecological value. However, it supports the need for targeted monitoring and cell based management for localised sensitive features.

118. I also note Dr Beaumont's evidence that DOC raised potential ecological function roles for cup corals, including carbon cycling, seabed structure, microhabitats and nutrient cycling. Dr Beaumont's evidence is that there is no species specific information on those roles for the three coral species recorded within the proposed extraction area, and that because the corals are small and present at low densities, their contribution to those roles is expected to be small relative to the infaunal community as a whole. That is consistent with my

opinion that the presence of cup corals should be specifically monitored and managed but does not change the overall ecological value classification of the wider soft sediment habitat.

119. If future monitoring identifies areas of higher cup coral density or sensitive benthic communities, those areas should be addressed through further investigation, cell based management, or exclusion from extraction where appropriate, through the PSEAR / SEMR process, as required by Condition 20.

120. In summary, I assess potential effects on protected cup corals and sensitive benthic taxa as localised. Effects on individual organisms or local cell scale occurrences may be Low to Moderate, depending on density and recovery, but I rely on Dr Beaumont's specialist evidence that effects on the Aotearoa New Zealand population of the recorded stony corals are expected to be minor to negligible. Monitoring and adaptive management provide the appropriate mechanism to identify and avoid higher value sensitive benthic features if they are found.

Theme 7: Potential Peat reef areas and patchy sensitive habitat

121. Bream Bay Guardians, relying on the eCoast *Bream Bay First Order Ecological Survey – Phase 2*, have suggested the presence of peat reef or reef-like habitat on or near the northern boundary of the proposed extraction area. That issue is raised in the eCoast Executive Summary at pages i–iii and in the survey results / habitat discussion, including section 3 and Table 3.1.

122. Concerns about patchy or sensitive benthic habitat are also relevant to comments made by Northland Regional Council regarding ecological value and monitoring adequacy, including NRC Attachment 1, Marine Ecology Peer Review, 15 September 2025, BM 1 pages 2–7, and Dr De Luca's 26 February 2026 memo, sections 1–3, BM250630 pages 1–3.

123. I accept that low relief, patchy or intermittently exposed seabed features can be relevant to benthic ecological value and effects assessment. Such features

may provide localised habitat complexity and may support algae, sponges, shellfish, bryozoans, fish or other associated fauna where exposed.

124. The eCoast material does not provide precise GPS co-ordinates for the features described, apart from a low resolution map. That limits the ability to confirm whether those features are located within the proposed extraction area, adjacent to it, or outside it.

125. I agree that video transects provide a useful tool for describing seabed surface features. Video methods can be particularly useful for identifying low relief or patchy habitat features that may not be fully represented by drop camera or grab sampling alone.

126. Dredge tows were selected as part of MBL’s survey methodology because they allow collection, identification and measurement of biota, including size measurements. Size class information is important because it helps distinguish recent recruitment from older animals, shows whether juveniles are surviving into sublegal and adult size classes, and indicates whether observations are likely to represent a transient recruitment pulse or a developing bed. It also assists in assessing reproductive relevance, because larger adult scallops make a greater contribution to spawning biomass than small juveniles, and in determining whether a cell contains a bed that may warrant avoidance or exclusion from extraction. Video transects are useful for describing seabed surface features and broad habitat patterns, but they do not provide the same ability to confirm species identification, measure shell height reliably, or assess biological condition. In my opinion, video transects and dredge tows provide different types of information and should be regarded as complementary methods rather than alternatives.

127. I note that the video transects reported in Table 3.1 of the eCoast report do not record “peat reef” as a habitat category. “Rock rubble” is reported from transect 23 and transect 22 appears to have no data recorded. Without precise locations, detailed habitat descriptions or georeferenced imagery, I am unable to confirm from that material whether peat reef occurs within the proposed extraction area.

128. The March 2024 MBL baseline survey included high resolution MBES imagery and backscatter maps of the proposed extraction area and control areas, as well as drop camera imagery covering the same area. The baseline survey did not identify extensive peat reef, reef like habitat, or consolidated seabed features within the proposed extraction area.

129. It is possible that some low relief or consolidated features may be temporary or intermittently exposed as a result of sand movement. Some features shown in the eCoast video material appear to have short algal cover and some sponges, while other areas appear to have little or no biological growth. In my opinion, that may indicate relatively recent exposure, although I cannot determine that conclusively from the information provided.

130. On the information currently available, I do not consider that the eCoast material confirms the presence, extent or location of peat reef within the proposed extraction area with sufficient precision to require a change to the effects assessment.

131. However, I accept that video transects are useful for identifying low relief or patchy seabed features. I support incorporating video survey methods into future monitoring where practicable, particularly where MBES, backscatter, drop camera images, dredge tows or other monitoring indicate possible low relief reef, consolidated substrate, shell hash concentration or other patchy sensitive habitat.

132. If future monitoring confirms the presence of peat reef, consolidated substrate, shellfish beds, bryozoan fields, or other sensitive benthic habitat within a proposed extraction cell, then that cell should be reviewed for closure, avoidance or further assessment before extraction proceeds (as per Condition 20).

133. In summary, the current information does not confirm peat reef within the proposed extraction area with sufficient spatial precision to alter my assessment of ecological value or effects. However, the issue supports the use of visual monitoring methods and cell based management to identify and avoid any localised sensitive benthic features if they are confirmed.

Theme 8: Benthic prey biomass and food web effects

134. Dr Parsons, for Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, considers that the conclusion that impacts on benthic food resources for fish will be negligible lacks quantitative support. He suggests calculating annual loss of benthic productivity by combining edible benthic biomass, mortality rates and annual extraction area. That issue is raised in Dr Parsons' evidence at paragraphs 2.4, 7.1–7.3 and section 7.3.

135. Similar food-web concerns are also raised more generally by Northland Regional Council through Dr De Luca, who considers that functional importance, trophic role, connectivity and broader ecological processes have not been adequately considered. That concern is set out in Dr De Luca's 26 February 2026 memo, section 1, BM250630 pages 1–2.

136. I accept that a quantitative or semi-quantitative estimate of the benthic prey biomass affected by extraction provides a more robust basis for assessing food resource effects than relying only on qualitative statements about localised disturbance.

137. The biomass of benthic biota in the proposed Te Ākau Bream Bay sand extraction area has therefore been estimated using the benthic biota abundance data from the Pre-Sand Extraction Assessment Report, included as Appendix C to Attachment 29.

138. The Pre-Sand Extraction Assessment Report records 231 Ponar grab samples from the proposed sand extraction area, with raw benthic biota data presented for the sand area monitoring cells. These samples recorded numbers of individuals by taxon but did not directly measure biomass.

139. Biomass was therefore estimated from abundance data by assigning each taxon a representative body size from trait data and converting that body size to an estimated weight using a published benthic macrofauna size biomass relationship. For each taxon in each sample, the number of individuals was multiplied by the estimated biomass per individual.

140. Across the proposed sand extraction area, the estimated mean biomass was approximately 21.5 g green flesh weight /m^2. Green flesh weight is the more relevant expression for fish prey because it represents wet edible soft tissue rather than shell, sediment or inorganic ash.

141. The proposed sand extraction area contains 77 monitoring cells, each 200 m by 1000 m, giving a total area of approximately 15.4 km^2. Applying the estimated biomass density to that area gives an estimated total standing stock of approximately 331 tonnes green flesh weight of benthic biota across the entire proposed sand extraction area.

142. That estimate applies to all benthic biota included in the PONAR grab biomass model, the taxa that are likely to be eaten by pelagic fish species such as tāmure (snapper), which dominate the fish community in Bream Bay are a subset of this total grab biomass.

143. I also estimated this more specific subset representing benthic fauna likely to be relevant as snapper prey. For this purpose, I treated polychaete worms, amphipods and other small crustaceans, bivalves, gastropods, nemerteans and similar soft-bodied or shelled benthic invertebrates as core snapper prey. These taxa are consistent with prey types used by demersal fishes such as snapper.

144. I excluded taxa that are unlikely to represent meaningful snapper prey, including sponges, bryozoans, hydroids, corals, ascidians, foraminifera and nematodes. Echinoderms and lancelets were treated as possible or occasional prey but were not included in the central snapper prey estimate.

145. On that basis, the estimated standing stock of core snapper prey within the whole proposed sand extraction area is approximately 281 tonnes green flesh weight. This represents approximately 85% of the whole biota green flesh biomass estimate. The high proportion reflects the fact that much of the benthic community biomass is made up of taxa that are plausible snapper prey, particularly polychaetes, amphipods and other crustaceans, bivalves and gastropods.

146. The proposed extraction method affects only a portion of the sand extraction area each year. Based on the information available, each dredging event affects an estimated 13,000 m by 1.6 m of seabed, which is 20,800 m^2. Each such event extracts approximately 923 m^3 of sand.

147. At the proposed annual extraction limit of 150,000 m^3/year, this equates to approximately 162.5 equivalent dredging events per year and an annual seabed footprint of approximately 3.38 km^2/year. This is equivalent to about 22% of the whole proposed sand extraction area.

148. For all benthic biota, this annual footprint is estimated to entrain or disturb approximately 72.6 tonnes green flesh weight per year. After accounting for the 2 mm screen, return of oversize material to the seabed, and mortality or survival based on survivorship and fragility assumptions, approximately 46.9 tonnes green flesh weight per year is estimated to be lost from the living benthic prey pool.

149. That 46.9 tonnes comprises approximately 1.5 tonnes green flesh weight per year which will be extracted with the sand and then washed over the weir boards and returned to the sea in a poor state and assumed to be dead. Approximately 45.3 tonnes green flesh weight per year of oversized biota is returned to the seabed but assumed to be killed or no longer part of the living prey pool. Approximately 25.7 tonnes green flesh weight per year is estimated to be returned alive to the seabed.

150. For the core snapper prey subset, the annual dredging footprint is estimated to entrain or disturb approximately 61.6 tonnes green flesh weight per year. After accounting for screening, return, survivorship and fragility, the central estimate of snapper prey biomass lost from the living prey pool is approximately 39.7 tonnes green flesh weight per year.

151. That 39.7 tonnes comprises approximately 1.5 tonnes green flesh weight per year which will be extracted with the sand and then washed over the weir boards and returned to the sea in a poor state and assumed to be dead. Approximately 38.2 tonnes green flesh weight per year of oversized biota is returned to the seabed but assumed to be killed through fragility or dredge /

screen damage. Approximately 22.0 tonnes green flesh weight per year of core snapper prey biomass is estimated to be returned alive to the seabed.

152. These estimates should be interpreted in the context of the whole proposed sand extraction area. The annual dredging footprint affects approximately 22% of the proposed sand extraction area and disturbs approximately 22% of the estimated standing stock of core snapper prey. The estimated annual loss of 39.7 tonnes green flesh weight represents approximately 14% of the estimated 281 tonnes green flesh weight of core snapper prey standing stock within the whole proposed sand extraction area.

153. At an increased extraction rate of 250,000 m^3/year, the annual dredging footprint would increase to approximately 5.63 km^2/year, or about 37% of the 15.4 km^2 proposed sand extraction area.

154. On the same biomass assumptions, total benthic biota disturbed or entrained would increase to approximately 121 tonnes green flesh weight per year, with approximately 78 tonnes green flesh weight per year estimated to be removed or killed from the living benthic prey pool.

155. For the core snapper prey subset at 250,000 m^3/year, approximately 103 tonnes green flesh weight per year would be disturbed or entrained, of which approximately 66 tonnes green flesh weight per year is estimated to be lost from the living snapper prey pool.

156. In the context of the whole proposed sand extraction area, this annual core snapper prey loss would represent approximately 24% of the estimated 281 tonnes green flesh weight standing stock of core snapper prey within the proposed sand extraction area.

157. These calculations show that the effect is not a complete annual removal of the benthic prey resource from the whole sand extraction area. However, nor is the effect negligible in quantitative terms within the annual extraction footprint.

158. It is also relevant that snapper are opportunistic feeders and that discharge of dead or dying prey from under the *William Fraser* may represent a short-term

food source during or immediately after extraction. Accordingly, some of the biomass marked as removed from the living prey pool could still be consumed in the short term.

159. This calculation does not mean that all of the lost biomass would otherwise have been eaten by tāmure (snapper). Actual prey use will depend on factors including prey size, accessibility, behaviour, local prey density and foraging conditions. Mr Boyd addresses the broader fisheries implications of the estimated prey loss, including snapper mobility, the availability of alternative habitat, seasonal food demand and the scale of the loss relative to the wider Hauraki Gulf population. However, available information does not allow the proportion of the affected biomass that would otherwise have been consumed, or the resulting effect on snapper growth or productivity, to be quantified.

160. In my opinion, the calculation quantifies the annual reduction in the living benthic prey pool made up of taxa relevant to snapper feeding. It provides a more robust basis for assessing effects on fish food resources than assuming effects on benthic prey availability are negligible without estimating the biomass affected.

161. The estimate represents a reduction in the living benthic prey pool within the annual extraction footprint, not a direct estimate of fish food limitation or fish population response.

162. Given the availability of wider soft sediment habitat, fish mobility, partial return of material to the seabed, short term availability of dead or injured prey, and expected recovery of benthic communities, I assess the effect on fish food resources as Low within the extraction area and Negligible to Low at the wider Te Ākau Bream Bay scale.

163. Monitoring of benthic community recovery will also provide information relevant to recovery of benthic prey resources. In my opinion, monitoring should include taxa and functional groups relevant to fish prey, rather than only total taxa richness or abundance.

164. In summary, I accept Dr Parsons' point that a quantitative prey biomass estimate is useful. The calculation shows that annual extraction will affect a measurable quantity of benthic prey biomass within the extraction footprint. However, when considered in the context of the wider available habitat, fish mobility, temporary nature of the effect, partial return of material, and expected benthic recovery, I assess the effect on fish food resources as Low locally and Negligible to Low in the context of the wider embayment.

Theme 9: Seabed recovery and functional recovery

165. Bream Bay Guardians, Dr Bulmer for Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, and Northland Regional Council through Dr De Luca have commented on how seabed recovery should be defined and assessed. The eCoast material raises recovery-related concerns in the Executive Summary at pages i–iii and section 1.1 at pages 4–6. Dr Bulmer raises recovery and effects-scale concerns at paragraphs 2.1–2.5, 4.1–4.4 and section 6. Dr De Luca addresses recovery and monitoring in NRC Attachment 1, Marine Ecology Peer Review, 15 September 2025, BM 1 page 2, and in the 26 February 2026 memo, sections 1 and 3, BM250630 pages 1–3.

166. Dr Bulmer and Bream Bay Guardians raise concerns about whether recovery should be assessed by reference to simple abundance or species richness, or whether it should include community composition, function and slower-recovering taxa. Northland Regional Council has also raised concerns about whether monitoring can verify recovery in the active extraction area, including in Dr De Luca's 26 February 2026 memo, section 3 "Post disturbance monitoring of benthic habitat within the sand extraction area – HIGH concern", BM250630 page 3.

167. In section 6.1.1.1 of the Assessment of Ecological Effects (Attachment 12), I proposed an ideal sampling plan that could determine fine scale recovery if sand extraction stopped. I accept that such an approach would provide detailed information on recovery, but it is not practicable as the primary monitoring method during ongoing extraction.

168. I also recognise that because benthic community composition and abundance vary interannually and seasonally, it is difficult to apply fixed absolute numbers to define recovery. If species and biomass are removed as part of extraction in one year, and the benthic community also changes naturally at control sites, recovery back to the original extraction area composition and abundance may not be the most appropriate recovery test.

169. In section 6.1.1.1, I suggested 80% similarity as a target. More recent literature[13] has suggested a more testable definition of recovery, namely that recovery is achieved when the benthic community within the extraction area is statistically indistinguishable from control or reference sites in terms of structure, composition and function.

170. In my opinion, that is a better recovery definition than requiring an exact return to the original baseline. It recognises natural variability and focuses on whether the extraction area has converged with appropriate reference conditions.

171. Under that approach, recovery may be assessed using:

    a. sediment characteristics converging with control or reference sites;

    b. diversity and abundance within the control mean ± 95% confidence interval;

    c. no statistically significant difference in community composition between extraction and control areas, as measured by PERMANOVA or equivalent multivariate analysis; and

    d. additional tests for community function, where practicable.

172. This form of statistical convergence threshold is preferable to a fixed numerical trigger because it accounts for natural spatial and temporal variability in open coast soft sediment communities.

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[13] McIlwaine, P. S., Barry, P. J., Curtis, M., & Cooper, K. M. (2025). Tracking long-term benthic recovery at a disused marine aggregate extraction site using monitoring tools developed for the marine aggregate industry. Estuarine, Coastal and Shelf Science, 319, 109278.

173. Dr De Luca has raised a high level of concern regarding the adequacy of proposed monitoring within the active extraction area, including whether MBL relies too heavily on unverified assumptions of natural recovery over a period greater than three years. That concern is set out in Dr De Luca's 26 February 2026 memo, section 3 "Post disturbance monitoring of benthic habitat within the sand extraction area – HIGH concern", BM250630 page 3. It is also reflected in Appendix 1 to that memo, particularly item 10 "Post-disturbance recovery monitoring", BM250630 pages 7–8.

174. At the time the Assessment of benthic Ecological Effects (Attachment 12) was prepared, recovery estimates were based primarily on published literature and earlier monitoring of the Pākiri Temporary Sand Extraction Area (TSEA)[14].

175. Since that time, a dedicated recovery study has been completed at Pākiri[15]. That study provides empirical data on post extraction sediment and benthic community dynamics at approximately 1, 7 and 13 months following cessation of extraction in July 2023. The monitoring was conducted in accordance with the EMMP for Area 1 at Pākiri[16].

176. The Pākiri study evaluated recovery using three complementary datasets:

    a. sediment grain size;

    b. infaunal benthic assemblages; and

    c. epibenthic tow assemblages.

177. Sediment grain size composition showed no significant differences over time or between recovery and control sites, indicating that physical habitat characteristics remained stable following extraction.

178. Benthic infauna exhibited strong and statistically significant temporal variation, driven primarily by seasonal changes. Changes in the abundance of

[14] Bioresearches (2025a). 2025 Sand Extraction Ecological Assessment, Temporary Pākiri Offshore Sand Area. Report for McCallum Bros Limited pp 128.

[15] Bioresearches (2025b). Recovery Monitoring – Area 1, 2023 – 2024. Report for McCallum Bros Limited pp 122.

[16] Kaipara Limited (2003). Coastal permit RCAN0621 (ARC 20795) Environmental Monitoring Management Plan, Deep Water Area 1.

characteristic taxa, including polychaetes, amphipods and cumaceans, were broadly similar between recovery and control sites.

179. Importantly, the standard monitoring analysis did not identify a significant *Time × Area* interaction. In my opinion, that indicates there was no detectable directional change in the recovery area relative to controls under that analysis, and therefore no detectable persistent extraction related effect at the scale of the study.

180. Epibenthic assemblages showed a similar pattern, with strong temporal variability but relatively weak spatial differences. Within each survey, recovery and control areas did not differ significantly, and no consistent trend indicative of continuing impact was observed.

181. Across those datasets, the dominant signal was seasonal variation rather than a persistent extraction effect.

182. The combined evidence indicates that benthic habitats in the Pākiri embayment were either not measurably affected by extraction at the scale of the study, or that any initial effects were rapidly ameliorated. Over the 13 month monitoring period, the recovery area remained comparable to control sites in terms of sediment characteristics and biological communities.

183. Following completion of the Pākiri study, additional analytical tools developed for the UK marine aggregate industry were identified[17] and applied to the dataset to more formally evaluate recovery processes.

184. These tools adopt a multi-metric convergence approach, which assesses recovery as the point at which impacted sites become statistically indistinguishable from control conditions. This includes:

    a. comparison of sediment characteristics;

    b. analysis of community structure and composition; and

[17] McIlwaine, P. S., Barry, P. J., Curtis, M., & Cooper, K. M. (2025). Tracking long-term benthic recovery at a disused marine aggregate extraction site using monitoring tools developed for the marine aggregate industry. Estuarine, Coastal and Shelf Science, 319, 109278.

c. evaluation of univariate ecological metrics such as richness and abundance.

185. The standard Pākiri monitoring analysis did not detect a persistent adverse extraction effect relative to controls. The later convergence style analysis provides an additional way of interpreting recovery and indicates that, when assessed against sediment and biological convergence metrics, physical convergence may occur over approximately two years and biological abundance / richness may recover more rapidly.

186. Application of the convergence approach indicates that sediment characteristics show progressive convergence toward control conditions, with a recovery trajectory of approximately two years, and that biological communities recover rapidly in terms of abundance and diversity, reaching approximately 95–98% equivalence with control conditions within 13 months.

187. While overall abundance and richness appear to recover relatively quickly, some slower growing or structure forming taxa remain underrepresented in the short term, reflecting normal successional processes rather than necessarily indicating a persistent ecological impact.

188. On the basis of this empirical evidence, recovery of abundance and richness in comparable open coast sandy habitats subject to sand extraction is expected to occur within approximately 1 to 3 years. This is broadly consistent with, and refines, the recovery assumption in section 6.1 of the Assessment of benthic Ecological Effects (Attachment 12), where benthic biota were expected to recover within approximately 2 to 3 years. The updated range does not change the ecological value assigned to the benthic habitat and fauna in the Assessment of benthic Ecological Effects (Attachment 12), which remains Moderate. Rather, it informs the magnitude and duration of effect. In my opinion, the recovery evidence supports the Assessment of benthic Ecological Effects (Attachment 12) conclusion that effects on common soft sediment benthic communities are likely to be temporary and recoverable, but it also supports monitoring of community composition and functional or structural taxa to confirm that recovery is occurring as predicted.

189. I accept that recovery should not be defined solely by total abundance or taxa richness. A disturbed area may recover numerically while still differing in community composition or functional structure.

190. For that reason, I consider it appropriate to distinguish between short term numerical recovery and longer term functional recovery. The Pākiri recovery information supports relatively rapid recovery of abundance and richness in a high energy sandy environment, but it also indicates that some architect, encrusting or structural taxa may take longer to return to control like conditions.

191. For Te Ākau Bream Bay, this means that monitoring reporting should include not only total taxa, abundance and diversity, but also community composition, functional groups, bryozoans, tubeworm associated taxa, shell associated taxa, scallops and cup corals. The monitoring currently set out in the EMMP will provide the raw data required to be grouped and divided into subsets for reporting.

192. In my opinion, this does not change the conclusion that general soft sediment communities are likely to recover. However, it supports a more conservative approach to functional and structural components of the benthic assemblage.

193. I also acknowledge that temporary loss of habitat and benthic biota can represent an adverse effect, particularly where habitats of high ecological value are affected.

194. In this case, the proposed extraction footprint has been assessed as Moderate ecological value and does not contain confirmed extensive high value biogenic habitat forming features such as horse mussel beds. In addition, the monitoring and management framework requires ongoing assessment of the seabed, and where higher value habitats are identified, adaptive management measures can require that extraction avoids those areas.

195. Accordingly, while temporary effects will occur, they are expected to be localised, **reversible** for common soft sediment taxa, and capable of being managed through the proposed monitoring and cell management framework.

196. In summary, I consider that recovery should be assessed using a convergence based approach that accounts for natural variability and compares the extraction area with appropriate controls. The available Pākiri evidence supports relatively rapid recovery of sediment condition, abundance and richness in comparable high energy sandy habitats. However, functional and structural recovery should also be monitored because some taxa or functional groups may recover more slowly than total abundance or richness. That distinction should inform the SEMR monitoring and any decision to increase extraction volume.

Theme 10: Monitoring design and control sites

197. Northland Regional Council, through Dr De Luca, has raised concerns about the proposed monitoring design, the comparability of control sites, and whether temporal trends and natural variability can be accurately assessed over time. Those concerns are set out in NRC Attachment 1, Marine Ecology Peer Review, 15 September 2025, BM 1 pages 1–7, and in Dr De Luca's 26 February 2026 memo, section 2 "Differences in benthic biota composition between control and impact sites – MODERATE concern", BM250630 page 2, and section 3 "Post disturbance monitoring of benthic habitat within the sand extraction area – HIGH concern", BM250630 page 3. Related monitoring concerns are also raised by Dr Bulmer at paragraphs 2.4–2.5 and section 7.

198. Section 2 of the Assessment of benthic Ecological Effects (Attachment 12) reported that benthic biota composition and abundance varied between the northern and southern ends of the initially surveyed sand extraction area. As a result, the northern control area was carved out of the original survey area to provide a more representative control area.

199. I accept that pre-existing differences between the extraction area and control sites limit the ability to directly compare absolute assemblage composition among sites over time. However, that does not mean the control sites are unsuitable for monitoring.

200. The control site locations represent the most suitable available options within the Te Ākau Bream Bay region. They were selected to provide the closest

practicable match to the proposed extraction area in terms of seabed topography, water depth and sediment characteristics.

201. The control areas occur in water depths of approximately 22 m to 32 m, which is comparable to the water depths within the proposed extraction area. After initial surveys revealed a north-to-south gradient in benthic community composition, MBL adapted the monitoring design by reclassifying the northernmost 1 km of the extraction area into a Northern Control Area.

202. Baseline spatial differences between extraction and control sites are expected in open-coast environments because benthic communities vary naturally across environmental gradients. That issue was recognised in Assessment of benthic Ecological Effects (Attachment 12), section 2 “Ecological Input into Key Design Elements”, where I noted that perfect similarity between control and impact sites is rare in practice and that natural variability in benthic communities can arise from sediment type, depth, hydrodynamics and other ecological factors. Attachment 12 also recorded that the initial benthic surveys identified a distinct north - south gradient in benthic community composition and abundance, and that the northernmost 1 km of the original extraction area was therefore reclassified as a northern control area to improve ecological representativeness. In my opinion, the monitoring design should therefore focus less on whether the extraction and control areas are identical at baseline, and more on whether the extraction area changes through time in a way that differs from the range of natural change shown by the controls.

203. To address this, MBL proposes to use an asymmetrical Beyond BACI[18] design. This approach is better suited than a simple Before After Control Impact comparison because it can account for natural spatial and temporal variation, particularly over large areas and over multiple years.

204. The proposed statistical framework focuses on isolating and comparing temporal trajectories. The key question is whether the benthic community in the extraction area shifts through time in a direction or magnitude that differs from natural changes observed in the control areas.

[18] BACI: Before After Control Impact

205. The proposed assessment methods include asymmetrical PERMANOVA using a zero-adjusted Bray-Curtis similarity matrix. This allows spatial variance to be partitioned by separating “among controls” variation, which represents natural regional variability, from “impact versus control” variation.

206. The primary indicator of a project related effect would be a significant *Time × Treatment* interaction term. That would indicate that the extraction area is changing at a rate or in a direction that differs from natural regional trends shown by the control sites.

207. Spatial stratification will also be used to address the north - south gradient observed in the baseline data. The extraction area and adjacent controls can be subdivided into North and South blocks. Incorporating a fixed Position factor allows the analysis to isolate gradient effects and test for a *Time × Treatment × Position* interaction, which would indicate whether any effects are localised or uniform.

208. Multivariate trajectory analysis will also be used. Benthic community shifts can be mapped using Principal Coordinates Ordination or nMDS tracking vectors. If changes are driven by natural variability, extraction and control site vectors should move in broadly similar directions. A project induced effect would be expected to manifest as divergence in the extraction area trajectory relative to controls.

209. In my opinion, this combination of asymmetrical Beyond BACI, PERMANOVA, spatial blocking and trajectory analysis provides an appropriate framework for detecting ecologically meaningful change in a naturally variable open coast soft sediment environment.

210. The monitoring design should also include univariate indicators such as taxa richness, abundance, diversity, key taxa and sediment texture as recommended in Section 6.10 of the EMMP (Attachment 29) proposed criteria to determine ecological change. Those measures are useful because they provide a simpler and more interpretable indication of ecological change alongside the multivariate analyses.

211. The monitoring question is therefore not whether the control and extraction areas are identical at baseline. The question is whether the extraction area changes through time in a way that is outside the range of natural change shown by the controls. In my opinion, the proposed asymmetrical Beyond BACI and trajectory based approach is appropriate for that purpose.

<u>Monitoring within the active extraction area</u>

212. Dr De Luca has also expressed concern about the adequacy of proposed monitoring within the active extraction area, including whether recovery assumptions can be verified. That concern is set out in Dr De Luca's 26 February 2026 memo, section 3 "Post disturbance monitoring of benthic habitat within the sand extraction area – HIGH concern", BM250630 page 3, and Appendix 1 item 10 at BM250630 pages 7–8.

213. I accept that monitoring recovery is important because the effects assessment relies on recovery occurring within predicted timeframes. Dr De Luca did not have access to the Pākiri recovery monitoring when she reviewed the project. The recovery rate has been confirmed by broadscale monitoring following the cessation of sand extraction at Pākiri. The proposed monitoring framework is designed to detect whether benthic communities, sediment characteristics and key taxa are diverging from control sites.

214. NRC, through Dr De Luca, has recommended direct sampling of dredge tracks within the active extraction area to verify recovery processes. That recommendation is set out in Dr De Luca's 26 February 2026 memo, section 3 "Post disturbance monitoring of benthic habitat within the sand extraction area – HIGH concern", BM250630 page 3. It is also reflected in Appendix 1 to that memo, particularly item 10 "Post-disturbance recovery monitoring", BM250630 pages 7–8. In section 6.1.1.1 of the Assessment of Ecological Effects (attachment 12), I described an idealised sampling approach that could be implemented to determine fine scale recovery if extraction stopped. That approach is similar in some respects to what NRC has suggested.

215. In my opinion, however, direct grab sampling of individual dredge tracks is not practicable as the primary monitoring method. Dredge tracks are narrow,

approximately 1.6 m wide, occur in water depths of 20 m to 30 m, and are only visually distinguishable for a limited period. Even with high precision positioning, it would be virtually impossible to target such features using grab sampling from a vessel.

216. Alternative methods, such as diver based benthic sampling, would present very significant operational and safety constraints at those depths. Those constraints are particularly relevant in the deeper areas of the sand extraction area.

217. The recovery evidence from Pākiri verifies the literature based recovery rates and reduces the need for track specific grab sampling as the primary recovery tool. A more practicable approach is cell scale monitoring, supported where appropriate by MBES, drop camera and or video methods to confirm seabed condition and recovery trends by lack of divergence with control sites.

218. Cell scale monitoring is also more relevant to management because extraction decisions are made at the cell scale. If cell scale monitoring shows delayed recovery, sediment change, sensitive habitat, or divergence from control sites, then management responses can be applied to the relevant cell or group of cells.

219. In my opinion, monitoring focused on broader spatial patterns and temporal trends, as set out in the EMMP (Attachment 29), provides a more reliable and practicable method for assessing effects during ongoing extraction than attempting to repeatedly sample individual narrow tracks.

220. However, I support the use of visual methods, including MBES, drop camera imagery and video transects, to supplement cell scale monitoring where they can assist in identifying dredge track condition, low relief features, scallop aggregations, cup coral concentrations or other sensitive benthic features.

221. In summary, I accept that monitoring must be capable of verifying recovery and detecting adverse trends. I do not consider direct grab sampling of individual dredge tracks to be practicable as the primary monitoring method. In my opinion, the appropriate approach is cell scale monitoring using a

Beyond BACI framework, supported where practicable by visual seabed methods and clear management triggers.

Theme 11: Seabed Adaptive management and trigger refinements

222. Dr Bulmer, for Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, has raised concerns that the EMMP does not set out sufficiently clear quantitative ecological thresholds or adaptive triggers requiring specific management responses. That concern is set out in Dr Bulmer's evidence at paragraphs 2.4–2.5 and section 7. Northland Regional Council has also raised related concerns about how monitoring results would be translated into management action, including in Dr De Luca's 26 February 2026 memo, Appendix 1 item 12 "Trigger level monitoring", BM250630 page 8.

223. I accept that the management responses linked to ecological triggers can be made clearer. In my opinion, the appropriate framework is to distinguish between early warning triggers, which require further analysis, and action triggers, which require a management response.

224. Section 6.10 of the EMMP (Attachment 29) proposed criteria to determine ecological change. Those criteria were set in relation to baseline variability, ecological significance and natural variability. For that reason, they cannot always be expressed as fixed absolute values.

225. The lodged EMMP generally required an ecological trigger to be met or exceeded on two consecutive surveys before management action was taken. I consider that persistence remains an important indicator of an extraction-related effect. However, it should not be an absolute prerequisite where a single SEMR identifies a substantial effect, a sensitive benthic habitat or protected-taxa trigger, a clear sediment or community-composition shift, or another ecologically meaningful change that is likely attributable to sand extraction.

226. In my opinion, the trigger framework should therefore address both the magnitude and persistence of change, while allowing an immediate

management response where a serious and clearly attributable effect is identified without waiting for a second monitoring event.

227. The spatial extent of any change should be assessed at the individual cell, ecologically justified cell group, and whole extraction area scales, as appropriate to the monitoring design and the observed pattern. Any grouping or pooling of cells for analysis should be explained and statistically justified in the SEMR.

228. I accept that the lodged EMMP did not fully specify the investigation and management response associated with each type of ecological change. In response, I have drafted revisions to the EMMP that classify ecological monitoring results into defined response levels and link each level to proportionate investigation, monitoring and management action.

229. The revised EMMP incorporates a structured ecological trigger-response framework. The framework distinguishes early-warning changes requiring further investigation from confirmed adverse changes requiring management action. Its purpose is to ensure that monitoring results are not merely reported, but are classified and linked to proportionate investigation, monitoring and management responses where that change is attributable to sand extraction.

230. The purpose of the trigger-response framework is to distinguish between:

   a. monitoring results showing no ecological concern or satisfactory recovery;

   b. an early-warning change requiring further investigation;

   c. a developing or repeated change requiring increased or targeted monitoring; and

   d. a substantial, persistent or otherwise ecologically meaningful change requiring management action.

231. Because benthic communities in open-coast sandy environments vary naturally through space and time, the primary reference for this assessment is

the control site envelope and the trajectory of change through time. The pre-extraction baseline remains important for interpreting change, but the central question is whether the extraction cells are changing in a different direction or to a materially greater degree than the control sites.

232. For univariate indicators, including taxa richness, abundance, Shannon diversity, key taxa, functional groups and sediment texture, the control site envelope may be expressed as a 95% prediction interval, plus or minus two pooled or modelled within-control standard deviations where that is statistically appropriate, or another statistically justified control site reference range. A confidence interval around the control mean may be reported but should not be used by itself as the ecological trigger range because it estimates uncertainty around the mean rather than the range of natural observations.

233. The control site envelope should not be applied mechanically using the results of a single monitoring event. Where the control data for an event are unusually homogeneous, unusually variable, affected by an outlier, or inconsistent with previous control site behaviour, the SEMR should use pooled same season control data, baseline control information, previous SEMR data, a mixed effects model, or another statistically justified approach. Where the apparent within control variance is unusually small, a conservative variance floor based on pooled or historical control variability should be applied unless the narrower range is demonstrated to be ecologically representative.

234. Before a result is classified as a Trigger / Increased Monitoring or Action response, the SEMR should undertake a control site diagnostic and weight of evidence assessment. That assessment should consider:

    a. the magnitude, persistence and spatial extent of the change;

    b. the number and ecological relevance of the indicators affected;

    c. the direction of change relative to the control site trajectory;

    d. community composition and functional group responses;

    e. sediment and habitat conditions;

f. the extraction history of the affected cell or cells;

g. storm events, seasonal effects and other activities or environmental pressures; and

h. whether the observed change is likely attributable to sand extraction.

235. The revised EMMP incorporates the ecological trigger-response framework summarised in Table 2.

Table 2 Ecological trigger-response framework

Response level	Meaning	Indicative test	Required response
No concern / satisfactory Recovery trajectory	There is no evidence of an adverse extraction related trajectory. An extraction cell remains within the expected control site envelope and changes broadly with the controls, or a previously disturbed cell is showing consistent convergence toward the envelope without an unresolved adverse trend.	Univariate indicators are within the statistically justified control site reference range and no adverse directional trend is present; or multi-metric evidence demonstrates a consistent recovery trajectory. Multivariate community composition remains within, or is converging toward, the control condition.	Continue monitoring in accordance with the EMMP. Convergence while a cell remains outside the control site envelope may demonstrate that recovery is underway, but does not by itself establish recovery for the purpose of reopening a closed cell.
Watch / early warning	One indicator shows a possible adverse departure, or one or more indicators are approaching the edge of the control site envelope, but the pattern is not persistent or clearly attributable to extraction.	One indicator falls outside, or approaches the edge of, the control site envelope on one monitoring event; or a weak adverse directional trend is apparent but is not yet persistent.	Investigate the result in the SEMR. Review the representativeness of the control site envelope, sediment conditions, storm history, seasonal factors, extraction history, other activities and control site trends. Maintain or shorten the monitoring interval where appropriate.
Trigger / increased monitoring	Multiple indicators show early warning responses, or the same or related indicators repeatedly depart from the control site envelope, indicating a developing divergent trajectory that may be attributable to extraction.	The same or related indicators fall outside the control site envelope over two monitoring events; several indicators move adversely relative to the control site trajectory; or multivariate and univariate results together indicate a developing effect.	Undertake targeted analysis and maintain or increase monitoring frequency. Review the extraction pattern, recovery status of the affected cells, and the need for targeted sampling, precautionary cell management or temporary avoidance.

Response level	Meaning	Indicative test	Required response
Action	A substantial, persistent or otherwise ecologically meaningful extraction related divergence is identified, including delayed recovery, effects on sensitive habitat or protected taxa, a substantial sediment or habitat shift, or a clear adverse community level change.	A substantial departure from the control site envelope; a statistically significant and ecologically meaningful Time × Treatment interaction; clear multivariate divergence beyond the variation recorded among controls; a sensitive habitat or protected taxa trigger; delayed recovery; or another serious adverse change likely attributable to extraction.	Implement one or more management responses. These may include closing affected cells, applying an adjacent cell buffer, extending the recovery period, reducing extraction intensity, changing the spatial extraction pattern, reducing annual extraction volume, temporarily suspending extraction in the affected area, or reviewing the EMMP or relevant consent conditions.

236. The numerical values identified in the revised EMMP are management guideposts rather than fixed ecological thresholds. These include an approximately 30% decline in taxa richness or Shannon diversity (expressed as Hill diversity of order 1) relative to the control site trajectory, an approximately 30% shift in the composition or representation of functional groups, and an approximately 50% reduction in the abundance of key taxa. Those values indicate that a change is potentially substantial, but they should be interpreted together with persistence, spatial extent, ecological significance, natural variation, the control site trajectory and evidence of attribution to sand extraction.

237. While published marine benthic monitoring literature does not identify 30% and 50% as universal ecological thresholds. However, changes of that order are consistent with critical or detectable effect sizes used in environmental monitoring. In my opinion, an approximately 30% decline can therefore be used as a precautionary early warning guidepost, while a persistent reduction of approximately 50% in the abundance or biomass of a prespecified key taxon or functional group represents a large effect guidepost that may warrant management action. These values are not determinative and do not replace the control site envelope. They must be interpreted having regard to the statistical power of the monitoring design, the magnitude, persistence and spatial extent of the change, the ecological relevance of the affected indicator, the control site trajectory and whether the change is likely attributable to sand extraction.

238. A management guidepost should not be applied in isolation. A change exceeding one of those values would not automatically establish an adverse extraction effect if, for example, a comparable change was also occurring at the control sites. Equally, an adverse effect may be identified without one of those numerical values being exceeded where several indicators show a consistent directional divergence, or where the change involves sensitive benthic habitat, protected taxa, sediment condition or an ecologically important functional group.

239. Variables to be assessed should include community structure, community composition and ecosystem function. The variables should not be treated as exhaustive and can be expanded if monitoring identifies other useful indicators. I consider that the SEMR should report on indicators relevant to the submitter comments, including:

a. taxa richness;

b. total abundance;

c. Shannon diversity / Hill diversity of order 1;

d. community composition;

e. sediment texture and shell material;

f. scallop density, recruitment and size classes;

g. cup coral records;

h. bryozoans and tubeworm associated taxa;

i. functional groups, including suspension feeders, deposit feeders, bioturbators, tube builders and shell associated taxa;

j. benthic prey resource indicators;

k. the abundance and distribution of key taxa; and

l. the recovery status of previously disturbed cells.

240. Where PERMANOVA or an equivalent multivariate test identifies a significant result, that result should be interpreted alongside the magnitude and direction of the change and an assessment of multivariate dispersion, rather than being treated as a standalone trigger.

241. An Action response may result in a recommendation in the SEMR that a cell or part of a cell be excluded from the Approved Sand Extraction Area under Condition 20. Where a cell has been closed because of an adverse ecological effect, I consider that recovery for the purpose of reopening should require the relevant indicators to have returned to within the control site envelope or an equivalent statistically justified reference condition, with no unresolved adverse trajectory. Evidence that a cell is merely converging toward the envelope while remaining outside it may demonstrate that recovery is underway, but should not, by itself, be sufficient to establish recovery or permit reopening under the PSEAR process.

242. I have drafted a package of statistical methods, control site reference ranges, indicative management guideposts, ecological response levels and associated management responses, which have been incorporated into the revised draft EMMP. In my opinion, this framework is appropriate because it distinguishes between results requiring further investigation, results requiring increased or targeted monitoring, and ecologically meaningful changes requiring management action. It also requires the magnitude, persistence and spatial extent of any change, its ecological significance, and whether it is likely attributable to sand extraction to be assessed through a weight of evidence approach. The detailed choice between equivalent statistical methods may be refined as the monitoring dataset increases, but the core response framework should not be deferred for later determination. Any substantive amendment to the framework would be subject to NRC certification in accordance with the proposed consent conditions.

243. I also support the requirement that any increase from 150,000 m^3/year to 250,000 m^3/year be assessed using monitoring undertaken during three consecutive years in which extraction exceeded 145,000 m^3/year. The increase should not occur where there is an unresolved Action response, a developing cumulative adverse trajectory, delayed recovery, persistent divergence in

sediment or benthic community condition, or an unresolved effect involving scallops, cup corals, sensitive taxa, benthic prey resources or functional community structure.

244. In my opinion, the revised framework addresses the concern that monitoring could otherwise be observational rather than management focused. It provides a clear pathway from initial investigation, through increased monitoring and precautionary management, to cell closure, reduced extraction or suspension where a substantial or persistent extraction related effect are identified.

245. In summary, I accept that the ecological trigger response provisions in the lodged EMMP required greater specificity. The revised EMMP now provides clearer response levels, statistically justified control site reference ranges, protection against anomalous single event control results, management guideposts, a weight of evidence assessment and proportionate management responses. In my opinion, those revisions materially strengthen the ability to identify and manage benthic ecological effects over the life of the consent.

Theme 12: Cumulative benthic effects

246. Whangarei Heads Citizens Association, Bream Bay Guardians, Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, and other submitters have raised concerns about cumulative effects. Whangarei Heads Citizens Association raises cumulative effects in the Executive Summary item 6, at page 2, and in section 6 “Cumulative Effects and Future Development”, pages 14–15. Dr Parsons raises cumulative food-resource effects in his evidence at paragraphs 2.4 and section 7.3. Dr Bulmer raises repeated disturbance and cumulative scale concerns at paragraphs 2.1–2.5 and section 4. Those concerns have been expressed in different ways, including cumulative industrialisation, cumulative benthic disturbance, cumulative effects on fisheries recovery, cumulative food-web effects, cumulative coastal-process effects, and cumulative governance or monitoring risk.

247. Whangarei Heads Citizens Association states in its Executive Summary item 6, page 2, that the proposal cannot be assessed in isolation from Northport

expansion or from the cumulative trajectory of industrial development planned for the coastline and describes the issue as “death by a thousand cuts” for an already stressed ecosystem.

248. Whangarei Heads Citizens Association also identifies Northport expansion and industrialisation in section 6.1 of its submission, pages 14–15, as involving dredging, reclamation and changes to coastal processes, and says McCallum Bros Limited has not considered how combined long-term industrial activity and vessel traffic will affect marine and surrounding environments.

249. I accept that cumulative effects are a relevant consideration. However, in my opinion, cumulative effects should be assessed by reference to actual ecological interaction pathways, rather than by assuming that all activities in the wider coastal environment necessarily combine to produce a significant benthic ecological effect.

250. The key questions for benthic ecology are:

   a. whether other activities overlap spatially with the proposed extraction area;

   b. whether other activities overlap temporally with sand extraction;

   c. whether other activities affect the same benthic receptors, sediment system, water quality pathways or recovery processes;

   d. whether the effects of those activities are additive or interacting; and

   e. whether the proposed monitoring framework in the Environmental Monitoring Management Plan (Attachment 29) (incorporating any amendments proposed as part of the Applicant's response to comments) is capable of detecting cumulative trends over time.

251. The proposed activity is spatially confined to the offshore extraction area, which is located in water depths of approximately 20–30 m and at least 4.7 km offshore. The extraction method involves narrow, shallow extraction tracks rather than broad-scale removal of contiguous seabed habitat.

252. The Sand Extraction Operation Plan (Attachment 27) provides for extraction to be spatially distributed across defined cells, with extraction volumes and locations recorded. This approach is designed to avoid repeated extraction of the same seabed area within short timeframes and to allow recovery between extraction events.

253. I understand from MBL's operational personnel that the pre-planned track lines identified in the SEOP are navigation guides intended to achieve an even spatial distribution of extraction. They are not intended to imply that the vessel and draghead can follow each line with absolute positional precision. The Master will seek to follow the allocated line as closely as practicable, but minor lateral deviations and short sections of partial overlap with a previously extracted track may occur as a result of prevailing sea conditions, vessel manoeuvring and safe operating requirements. The planned track lines are spaced approximately 4 m apart, whereas the extraction track is approximately 1.6 m wide, leaving a nominal separation of approximately 2.4 m between adjacent planned tracks. My understanding is that the adjacent planned tracks are not to be extracted consecutively but would be extracted such that the time interval between extraction of adjacent tracks was maximised.

254. In my opinion, occasional minor and incidental overlap would not materially alter my assessment of benthic ecological effects. For a given recorded track length, overlap would reduce the unique area of seabed disturbed, although it would increase the intensity of disturbance locally within the overlapped portion. The relevant ecological concern is therefore not any minor geometric overlap, but systematic or extensive overlap that results in repeated disturbance before recovery, materially deeper or persistent trenching, or a concentration of extraction within a cell.

255. Actual extraction tracks and extraction volumes within each cell will be electronically recorded and used in planning subsequent trips. That information enables repeated overlap or an uneven concentration of extraction to be identified and avoided. Where the recorded extraction pattern, bathymetric monitoring or ecological monitoring identifies material repeated overlap, persistent trenching or delayed recovery, the extraction

pattern should be altered and the affected cell managed through the SEOP and EMMP. Subject to those safeguards, I consider that minor incidental overlap is consistent with the overall purpose of spatially distributing extraction and providing opportunities for seabed recovery.

256. I acknowledge that cumulative effects can arise over time even where individual extraction events are localised. For that reason, the cumulative benthic effects assessment should not be limited to the footprint of a single extraction track.

257. The cumulative benthic effects assessment also needs to consider the annual extraction pattern, staged extraction volumes, recovery of benthic communities, the proposed monitoring framework in the Environmental Monitoring Management Plan (Attachment 29), and the potential for trends to develop over time.

258. The Environmental Monitoring Management Plan (Attachment 29) provides for monitoring of benthic ecology, sediment texture, bathymetry and trends over the consent period, including assessment of cumulative or accumulative changes relative to control sites.

259. In my opinion, the principal cumulative benthic effect of the proposed activity is repeated seabed disturbance over time within the extraction area. The magnitude of that effect depends on the annual area disturbed, the time between extraction events in the same cell, and whether recovery occurs before re-disturbance.

260. The available recovery information, including the Pakiri recovery information discussed earlier in this evidence, indicates that, in comparable high energy sandy environments, short term physical recovery and recovery of benthic abundance and taxa richness can occur over approximately one to three years. This supports the Assessment of benthic Ecological Effects (Attachment 12) assessment that common soft sediment benthic communities are likely to recover following disturbance, particularly where extraction is spatially distributed and surrounding undisturbed habitat remains available for recolonisation.

261. I accept, however, that recovery of community composition and some functional or structural components may take longer than recovery of abundance or richness. For that reason, the cumulative benthic effects assessment in this evidence should not rely solely on numerical recovery. Monitoring under the Environmental Monitoring Management Plan (Attachment 29) should also include community composition, key taxa, sediment texture and evidence of functional recovery.

262. Submitters, including WHCA, Bream Bay Guardians, and Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, have referred to other marine activities in the broader environment, including port-related activity, dredging, vessel traffic, stormwater discharges, fishing history and fisheries closures. WHCA addresses these matters in section 4.2 "Impacts on Marine Ecosystems", pages 8–10, and section 6 "Cumulative Effects and Future Development", pages 14–15. Dr Parsons addresses fisheries and scallop recovery matters at paragraphs 2.3, 4.15–4.18 and 7.3. I accept that these matters form part of the wider receiving-environment context.

263. However, in my opinion, the available information indicates that the proposed sand extraction will make a localised contribution to benthic disturbance within the extraction area, rather than creating a broad scale benthic effect across the wider Te Ākau Bream Bay environment.

264. Where other activities, such as port dredging, occur at different times from sand extraction, the likelihood of simultaneous cumulative effects is reduced. In particular, there is reduced potential for overlapping turbidity plumes, concurrent deposition, combined underwater noise, and simultaneous disturbance to mobile fauna.

265. For assessment of these I defer other MBL experts including Peter Wilson and Emily Jones for turbidity and water quality, Eddie Beetham and Richard Reinen-Hamill for coastal processes, Matt Pine for underwater noise, Helen McConnell for marine mammals and Rick Boyd for pelagic fishes.

266. Temporal separation does not remove the need for cumulative assessment. Rather, it changes the nature of the assessment from simultaneous combined exposure to sequential disturbance and recovery.

267. For benthic ecology, the most relevant question is whether the receiving environment, or the relevant benthic receptor, has had sufficient time to recover before the next disturbance occurs.

268. In my opinion, where adequate recovery time is available between activities, the likelihood of material cumulative benthic effects is reduced. Conversely, if multiple activities affect the same receptor or recovery pathway before recovery has occurred, the cumulative effect could be greater.

269. In relation to scallops, I recognise the concerns raised by Bream Bay Guardians, WHCA, and Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board that scallop recovery is a relevant future-environment and cumulative-effects issue. Relevant matters are raised in the eCoast Executive Summary at pages i–iii and section 1.1 at pages 4–6, WHCA section 4.2 at pages 8–10, and Dr Parsons' evidence at paragraphs 2.3 and 4.15–4.18. The proposed extraction area is not currently identified as a dense scallop bed. However, if monitoring identifies localised scallop recovery areas or materially increased scallop density within extraction cells, that information should inform cell management and adaptive responses.

270. In relation to protected cup corals and other sensitive benthic taxa, I recognise the concerns raised by the Department of Conservation, Northland Regional Council, Bream Bay Guardians and Forest & Bird. NRC's concern is recorded in NRC Attachment 1, Marine Ecology Peer Review, 15 September 2025, section 3 "Ecological values", BM 1 page 2, and Table 1 at BM 1 pages 6–7. WHCA refers to DOC concerns about protected cup corals in section 2.1 and section 4.2 of its submission. The Assessment of benthic Ecological Effects (Attachment 12), together with Dr Beaumont's specialist cup coral evidence, recognises that local effects may occur where individuals are encountered. However, effects at the wider population scale are expected to be minor or negligible given the localised nature of the extraction footprint and the availability of wider potential habitat.

271. In relation to benthic prey resources, I recognise the concerns raised by Dr Parsons for Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board. That concern is set out in Dr Parsons' evidence at paragraphs 2.4 and section 7.3.

The prey biomass assessment in this evidence shows that extraction will affect a measurable quantity of prey biomass within the annual extraction footprint. However, in my opinion, the cumulative effect on fish food resources is expected to remain Low within the extraction area and Negligible to Low at the wider Te Ākau Bream Bay scale, given the availability of wider soft sediment habitat, fish mobility, partial return of material to the seabed and expected recovery.

272. In relation to sediment texture and seabed habitat, the cumulative effect is expected to be Low where sediment characteristics remain within the range of natural variability and where recovery occurs before re-disturbance. If monitoring identifies persistent divergence from control areas, that will require further assessment and management response.

273. In relation to sediment texture and seabed habitat, the Assessment of benthic Ecological Effects (Attachment 12) effects assessment and the monitoring framework in the Environmental Monitoring Management Plan (Attachment 29) rely on sediment characteristics remaining within the range of natural variability and on recovery occurring before re-disturbance. On that basis, I assess the cumulative effect on sediment texture and seabed habitat as Low. If monitoring identifies persistent divergence from control areas, that will require further assessment and a management response under the EMMP.

274. I accept that the level of confidence is lower for some receptors, including scallops, protected cup corals, bryozoans, tubeworm-associated taxa, and other structural or functional components of the benthic community. For those receptors, a conservative Low to Moderate local cumulative effect rating is appropriate within the extraction area.

275. I consider that those potential effects are capable of being monitored and managed through the proposed EMMP (Attachment 29), the SEOP and the cell based extraction framework, provided that the monitoring and trigger response framework is refined as described above.

276. The cumulative interaction with other activities should also be reviewed through the SEMR process required under the Environmental Monitoring Management Plan (Attachment 29). In my opinion, each SEMR should identify

any known major sediment disturbing activities, dredging activities, disposal activities, significant storm events or other relevant environmental pressures during the monitoring period, where that information is available.

277. Each SEMR should also report the annual and cumulative area disturbed, the cells in recovery, recovery status of previously disturbed cells, benthic community trends, sediment texture trends, scallop records, cup coral records, and trends in bryozoans, tubeworm-associated taxa and other relevant functional groups.

278. I therefore assess cumulative effects on general soft sediment benthic communities as Low within the extraction area and Negligible to Low in the wider Te Ākau Bream Bay environment.

279. For general soft sediment benthic communities, this is consistent with the Assessment of benthic Ecological Effects (Attachment 12) conclusion that effects are Low within the sand extraction area and Negligible to Low in the wider Te Ākau Bream Bay environment. However, for particular receptors and pathways where there is greater uncertainty, including scallops, protected cup corals, bryozoans, tubeworm-associated taxa, benthic prey resources and functional recovery, I assess local cumulative effects more conservatively as Low to Moderate, subject to monitoring and adaptive management. This reflects a receptor specific refinement of the Attachment 12 assessment rather than a change to the overall benthic effects conclusion.

280. Those conclusions should be reviewed if monitoring identifies delayed recovery, persistent divergence from controls, sensitive habitat development, or adverse trends before any increase in extraction volume.

281. Accordingly, I do not agree that the proposal should be declined on the basis of cumulative benthic effects. The more appropriate response is to ensure that cumulative effects are expressly addressed through monitoring and reporting, that any increase from 150,000 m^3/year to 250,000 m^3/year is informed by monitoring results, and that management responses are available if monitoring identifies delayed recovery or adverse trends.

282. On that basis, I consider that cumulative benthic effects can be appropriately avoided, remedied, mitigated and managed over the life of the consent.

Overall conclusions

283. I have considered the comments made by invited parties and the Panel's RFIs insofar as they relate to marine ecology and benthic ecology, including comments from Northland Regional Council, the Department of Conservation, Bream Bay Guardians, Whangarei Heads Citizens Association, Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, Forest & Bird, and other submitters identified in the scope of this evidence. The key submitter material I have addressed includes NRC Attachment 1 and Dr De Luca's 26 February 2026 memo, the eCoast report commissioned by Bream Bay Guardians, the evidence of Dr Bulmer and Dr Parsons for Patuharakeke Te Iwi Trust Board and Ngātiwai Trust Board, and WHCA's submission sections 4 and 6.

284. In my opinion, the comments do not change my overall conclusion that effects on general soft sediment benthic communities are likely to be Low within the extraction area and Negligible to Low in the wider Te Ākau Bream Bay environment.

285. However, the comments have identified matters where a more conservative and explicit assessment is appropriate. These include scallop recovery, protected cup corals, bryozoans and other structural or functional taxa, benthic prey biomass, recovery definitions, adaptive management triggers and cumulative effects.

286. I have addressed those matters in this evidence. In my opinion, they can be appropriately managed through the proposed cell based extraction framework, the EMMP, the SEOP, specific monitoring of key benthic receptors, and clearer trigger response mechanisms.

287. In particular, any increase from 150,000 m^3/year to 250,000 m^3/year should be informed by monitoring results and should not occur if there is an unresolved adverse trend in benthic recovery, sediment condition, scallop recovery, sensitive taxa or functional community structure.

288. In my opinion, the proposed monitoring should include not only general benthic community metrics such as abundance, taxa richness and diversity, but also community composition, functional groups, scallop density and size classes, cup coral records, bryozoans, tubeworm-associated taxa, sediment texture, shell material and benthic prey resource indicators.

289. Where monitoring identifies sensitive benthic habitat, dense scallop aggregations, materially increased scallop recruitment, high cup coral density, horse mussel beds, bryozoan fields, peat or consolidated habitat, or other higher value benthic features, those areas should be reviewed for cell closure, avoidance or further assessment before extraction proceeds.

290. Subject to those measures, I remain of the view that the proposed activity can be managed so that adverse marine ecological effects are avoided, remedied or mitigated to an acceptable level.

291. Nothing in the comments received causes me to change my conclusion that the proposed activity is capable of being managed through the proposed operational controls, monitoring and adaptive management framework, as refined in this evidence.

Simon West

12 August 2026