IN THE ENVIRONMENT COURT
AUCKLAND REGISTRY

I TE KŌTI TAIAO O AOTEAROA
TĀMAKI MAKAURAU ROHE

ENV-2021-AKL-000153

IN THE MATTER	of the Resource Management Act 1991 (**Act**)
A N D	
IN THE MATTER	of applications by Port of Tauranga Limited for resource consents associated with Stella Passage for direct referral pursuant to section 87G of the Act
BETWEEN	**Port of Tauranga Limited**
	Applicant
A N D	**Bay of Plenty Regional Council**
	Respondent

MEMORANDUM OF COUNSEL ON BEHALF OF PORT OF TAURANGA LIMITED

DATED 30 SEPTEMBER 2024

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MAY IT PLEASE THE COURT:

1. The key purpose of this memorandum is to file the documents prepared to address the Interim Decision (**Decision**), and a set of conditions proposed for Stage One (as signalled in our Memorandum of Counsel dated 27 June 2024). This memorandum provides the package of documents to the Court, and provides necessary context in relation to the documents filed.

2. Port of Tauranga Limited's (**POTL**) submission is that it has complied with the directions as far as possible in the circumstances, and in light of the level of willingness of other parties to engage with POTL on the directions since the Decision.

3. POTL continues to seek consent at the earliest opportunity, particularly due to the ongoing urgency for Stage One and the Court's direction that the Stage One dredging consent can be granted for a term to 6 June 2027.[1] In light of this and as signalled in our Memorandum of Counsel dated 27 June 2024, POTL now respectfully requests that the Court endorses the documents filed and issues consent for Stage One of the Stella Passage development.

Engagement

4. As previously advised, POTL has been very focused on engagement with the parties to the proceedings since the Decision was released. Many meetings have been held, phone calls made and emails exchanged. The timeline attached at **Appendix 1** represents a summary of this engagement.

[1] [23] of the Decision.

5. A package of draft documents largely reflecting the ones filed with the Court today was circulated to the parties on 16 July 2024, and feedback on those documents was requested.

6. On 30 August 2024, a follow up email was sent to the parties resharing the link to the documents and confirming that the interim Te Paritaha survey results and the 'State of the Environment' report were within that package of documents. This was in accordance with the Court's directions to circulate those documents to parties for feedback by 31 August 2024.[2]

7. On 10 September 2024, POTL shared the updated draft conditions with parties and re-shared all documents again, reiterating its willingness to receive feedback on any of the documents.

8. POTL acknowledges the efforts of Mr Hope as a facilitator but unfortunately his work has not resulted in any feedback in relation to the documents required to be produced as part of the directions.

9. On 26 September 2024, a draft of this memorandum was circulated to all parties to the proceedings, and the documents referred to in this memorandum were re-shared. The only response received from any of the tangata whenua parties was from counsel for Ngāti Kuku and Whareroa Marae, which recorded their position in relation to the consent conditions. That response is set out below.

10. Bay of Plenty Regional Council (**BOPRC**) has confirmed that it has reviewed the memorandum and all documents provided. Subject to some minor amendments which have now been agreed between POTL and BOPRC, BOPRC is comfortable that the documents and conditions filed by POTL are appropriate, certain, and enforceable.

[2] Court Minute dated 16 February 2024 at [5].

Resourcing

11. POTL has provided significant resourcing to both Ngā Tai Ki Mauao (**NTKM**) and Ngāti Ranginui since the Decision was issued, for the purpose of enabling these groups to respond to the directions in the Decision. This resourcing was provided following discussions between the parties and funding proposals being received by POTL. On 24 June 2024, POTL received a separate approach from the Ngāti Ranginui Fisheries Trust (**NRFT**) regarding resourcing. POTL has since engaged with representatives of the NRFT, and met with NRFT on 13 September 2024 to discuss resourcing. These discussions are ongoing.

12. We now address each direction relevant to Stage One and outline the process since the Decision was released, and the outcome of that process.

Direction 1: Southern Te Awanui Harbour Health Plan (STAHHP) Detailed Scope

Process

13. POTL has engaged with both NTKM and Ngāti Ranginui since February 2024.[3] An initial meeting was held between POTL and NTKM on 13 February 2024 relating to the response to all directions, and weekly meetings between POTL and NTKM consultants commenced on 27 February 2024. On 15 March 2024, a meeting between POTL, NTKM and BOPRC representatives was held to discuss the scope. On 27 March 2024 a 'framework for a framework' document was circulated to NTKM, suggesting a process for developing the STAHHP scope. This was aimed at setting dates for actions to be undertaken, to ensure that the timeframe to produce the scope could be met.

[3] As set out above, prior to 24 June 2024 POTL had not received any correspondence separately from the Ngāti Ranginui Fisheries Trust.

14. On 4 April 2024, a meeting between POTL and Ngāti Ranginui was held to discuss the STAHHP scope, and some high level feedback was provided. On 30 April 2024, a meeting between POTL, BOPRC and Ngāti Ranginui representatives was held to discuss the STAHHP scope.

15. On 31 May 2024, POTL received a presentation of the Pātiki model from NTKM. During the course of further discussions regarding the Pātiki model, it became clear that the Pātiki model was intended by NTKM to be used to develop the STAHHP, rather than being the STAHHP scope or the STAHHP itself. POTL considered that in light of this, the Pātiki model could not fulfill the role of being a 'detailed scope' as anticipated by the Court. POTL was also concerned that the model did not have support from Ngāti Ranginui, and had been advised that Ngāti Ranginui were developing their own model.

16. Up to this point in time, some six months after the Decision was released, POTL had been careful not to prepare or circulate a draft so as to ensure that any feedback received could be taken into account. However, it could not leave it any later given the reporting date to the Court of 30 June 2024. For this reason, on 13 June 2024 POTL circulated a draft scope for the STAHHP. No feedback was received on the scope that was circulated. On 27 June 2024, POTL filed that draft scope with the Court, in accordance with the Court's directions. The scope was recirculated on 16 July 2024, 30 August 2024 and 10 September 2024. No feedback has been received by POTL on that draft scope since it was filed, other than the feedback that was contained in the memoranda of NTKM and Ngāti Ranginui.

17. POTL has considered the feedback from Ngāti Ranginui that the STAHHP scope does not expressly provide for mātauranga Maori and western science to work together on the topic of erosion and sedimentation in

other areas of Te Awanui.[4] POTL considers that while it is possible that this type of topic will be addressed in the STAHHP, POTL did not consider that it was appropriate to provide that level of detail when it confirmed the structure of the plan at Appendix 1 of the STAHHP scope (given the absence of feedback on topics to be addressed). There are therefore no specific topics listed, and POTL does not consider that it would be appropriate to include erosion and sedimentation as the only one.

Outcome

18. The scope filed with this memorandum is the same as the one filed on 27 June 2024. It sets out the engagement undertaken in relation to the scoping document, the framework for the plan, the method for developing the plan and provides details in relation to the kaitiaki role, which is discussed further below. Counsel submits that the scope meets the requirements of the Court's direction.

19. POTL is supportive of the Pātiki model but is unclear whether the Court anticipates a model that does not have full iwi/hapū support. For this reason, the scope preserves the opportunity for the Pātiki model to be used to develop the plan itself, and reflects the principles of the Pātiki model. It also incorporates high level feedback received from NTKM, Ngāti Ranginui and Ngāti Pukenga.

20. POTL's submission is that it has made all reasonable efforts to engage with tangata whenua in relation to the scope. It has been prepared cooperatively with tangata whenua and BOPRC, to the extent that this has been possible given the differing views of parties and level of feedback received.[5] The scope will facilitate the preparation of an STAHHP that will promote integrated management, and have an ultimate

[4] Paragraph 10.12 of the Ngāti Ranginui Memorandum of Counsel dated 17 July 2024.
[5] [618] of the Decision.

goal of improving the health of Te Awanui.[6] Counsel's submission is that the STAHHP scope is in accordance with the direction contained in the Decision.

Direction 2: Kaitiaki Role

Process

21. The kaitiaki role has been canvased along with the STAHHP scope during engagement. It was specifically raised at meetings with NTKM representatives on 13 February and 8 March 2024, and NTKM advised that they would provide a proposal which did not eventuate. General feedback from NTKM was that the role should be fulfilled by a group, comprised of individuals with various technical skill sets, and would be a combination of iwi/hapū, councils and experts. It was specifically raised in a meeting with Ngāti Ranginui on 5 June 2024, but no feedback was received.

22. POTL proposed a kaitiaki role within the STAHHP, and shared this proposal with tangata whenua when it shared the scope on 13 June 2024. Again, the reason that the proposal was not formulated or shared prior to this time was because POTL considered that this role needed to be proposed by tangata whenua. It had hoped that a proposal would come from them. However, in the absence of feedback or suggestions, it engaged Beca's cultural advisor to assist with a review of how other roles had been fulfilled and provide a proposal as a starting point for discussion.

23. No feedback was provided in between the scope being shared on 13 June 2024, and filed with the Court on 27 June 2024. No feedback has been provided to POTL since 27 June 2024, other than what was contained in

[6] [135] of the Decision.

the memoranda filed with the Court by NTKM on 2 July 2024 and Ngāti Ranginui on 17 July 2024.

24. POTL has considered the feedback from Ngāti Ranginui in its memorandum regarding funding for the kaitiaki role.[7] POTL's position on this issue is that the funding of $100,000 to be provided to tangata whenua , along with the contribution of funding from BOPRC (as set out in the STAHHP scope at 3.4), is intended to fund tangata whenua carrying out their kaitiaki role in the development of the STAHHP.

25. In relation to ongoing funding of tangata whenua's kaitiaki role during the longer term implementation phase for the STAHHP, POTL's view is that this is more appropriately addressed during the development of the plan itself. There are other potential funding streams for the parties to consider, and crossover with other projects, such as the Tauranga Moana Advisory Group's preparation of a Tauranga Moana Framework which is currently on pause pending the outcome of this process.

Outcome

26. The scope reviews examples of other kaitiaki roles in relation to other projects, and proposes a group known as Te Rōpū Tiaki (kaitiaki group), made up of representatives of local iwi and hapū to be involved in the development of the STAHHP, cultural monitoring and provision of cultural advice. The proposal is consistent with the general feedback received from NTKM and POTL did not consider that it was appropriate to go further than it has in the proposal without more detailed feedback from tangata whenua being incorporated. For this reason, the proposal is broad so that it can be adapted within the STAHHP itself if further feedback is provided.

[7] Paragraph 17.7, Ngāti Ranginui Memorandum of Counsel dated 17 July 2024.

27. The proposal is meaningful and will promote the objectives and policies of the Regional Coastal Environmental Plan.[8] It provides a form of management structure by proposing that the group would join a collective with councils and POTL to allow for participation in the development of, and decision making for, the STAHHP.[9] POTL has attempted to take a collaborative approach to developing the proposal with limited success.[10] Counsel's submission is that the kaitiaki role proposed meets the requirements of the Court's directions to the extent possible and can be developed further with tangata whenua through the development of the plan itself.

Direction 4: Interim Te Paritaha Surveys

Process

28. Three Te Paritaha surveys have been undertaken. The first was undertaken prior to the Decision being released in November 2023, the second in March 2024 and the third in May 2024. Prior to the November 2023 survey, a number of tangata whenua representatives were provided with a summary of the survey methodology and invited to participate in the survey. Prior to the March and May 2024 surveys being undertaken, POTL advised all parties to the proceedings of the survey, and invited their participation and feedback on the methodology to be used. No parties to the proceedings participated in any survey.[11] Feedback that site selection for the surveys could be informed by tangata whenua was communicated to POTL by NTKM in early discussions, but no details of sites to be used were given, and no other feedback was provided on the methodology.

[8] [C(2)] of the Decision.
[9] [C(2)] of the Decision.
[10] [C(2)] of the Decision.
[11] The surveys were carried out in conjunction with the Tauranga Moana Iwi Customary Fisheries Trust (**TMICFT**) in accordance with the capital dredging consent conditions, and a TMICFT representative participated in the surveys.

29. Parties were asked for their views in relation to Te Paritaha prior to receiving the survey results, in accordance with the Court's directions, on 9 May 2024, and again on 5 June 2024.

30. The survey results are presented in a report titled 'Te Paritaha Pipi Monitoring – May 2024 data summmary', dated 26 June 2024. This report was shared with parties to the proceedings on 16 July 2024, and feedback on the Te Paritaha survey results was requested. No feedback was received. A reminder of the direction from the Court, the documents circulated and a further request for feedback was sent on 30 August 2024. The documents were re-circulated on 10 September 2024.

Outcome

31. The report, prepared by Dr Sharon De Luca at Boffa Miskell, includes the methodology used for the three surveys, the results and the conclusions. Conclusions include that mid size juvenile individuals are the dominant size class across the study area. The report notes that numbers were at a record high in 2023, but this declined in 2024, which was not unexpected due to high-post settlement mortality being known for species such as pipi. Adult pipi were confined to subtidal areas, and in some parts of the survey area adult numbers declined, while in other areas numbers significantly increased, which the report states could be due to the mobility of the species.

32. The report states that despite the number of adult pipi remaining stable during the completion of the capital dredging, between 2016/17 and 2022 there has been a large decline in the abundance of adult pipis, and this pattern has been observed in intertidal populations across the upper North Island with the reasons remaining unknown. Furthermore despite the decline in juveniles in May 2024 compared to November 2023 and

March 2024, the May 2024 abundance of intertidal juvenile pipi continued to be higher than those in the pre-2015 capital dredging surveys. The report concludes that given the high recruitment observed in 2023, followed by the growth of those recruits into juveniles seen in March and May 2024, there is potential for the replenishment of adult stocks over time.

33. Three surveys have been undertaken, one prior to the Decision being released and two in the six months following the decision.[12] Parties to the proceedings were notified of these surveys, and in the absence of feedback on the methodology used or participation in the surveys, the surveys were undertaken in accordance with previous protocols.[13] Counsel submits that on the basis of the survey results, the direction in relation to interim Te Paritaha surveys has been satisfied.

Direction 5: Wider Harbour Kaimoana Survey Plan

Process

34. POTL engaged Dr Sharon De Luca of Boffa Miskell to prepare a formal wider harbour survey methodology in early 2024. The methodology sets out the methods used in the 2022 and 2023 surveys undertaken to fulfil the requirements of the Kaimoana Restoration Programme contained within the capital dredging conditions. POTL did not create a forward looking 'plan' at this time, as it wanted to receive mātauranga inputs and feedback from tangata whenua before doing so.

35. The methodology was shared with tangata whenua on 28 March 2024, and feedback on the methodology and mātauranga inputs for inclusion in the methodology for the future were invited. No feedback or

[12] [C(4)] of the Decision.
[13] [567] of the Decision.

mātauranga inputs were provided. The methodology was again shared on 16 July 2024, and feedback and mātauranga inputs were again requested. The methodology was shared again on 30 August 2024 and 10 September 2024. No responses were received.

36. In early September, in light of the lack of any feedback received, POTL had the methodology updated to reflect that it would be the methodology used in the future, and to include reference to monitoring of whether kaimoana would be safe to eat in accordance with the Court's directions. This was shared with tangata whenua again on 17 September 2024 and feedback was invited. No further feedback was received.

Outcome

37. The methodology includes an introduction which confirms that the methodologies used for the 2022, 2023 and 2024 surveys will continue to be used in the future, and then records the methodologies. It includes new reference to assessment of the extent to which kaimoana sampled is safe to eat. The report does not contain mātauranga Māori inputs from the parties to the proceedings, as none have been provided. The methodology does record that, as part of the Kaimoana Restoration Programme requirements, the surveys undertaken are fundamentally informed by mātauranga Māori, as interviews with participating Tauranga Moana iwi representatives including kaumātua were carried out in 2013 to identify cultural sites of significance in the Tauranga Moana Mātaitai Reserve.

38. The methodology has been shared with Professor Chris Battershill in light of the Court's directions that it take into account his recommendations and he has confirmed that he agrees with the methodology.[14]

[14] [566] of the Decision.

39. The methodology provides for a comprehensive survey of kaimoana within parts of Te Awanui affected by POTL operations to be undertaken, which will assess whether the kaimoana is safe to eat, and provide the Court with a detailed baseline survey as well as a methodology for future follow up surveys.[15] Counsel submits that this methodology and the survey that it will inform meets the requirements of the Court's direction, to the extent that it is possible for POTL to do so given it is not capable of providing mātauranga Māori inputs itself.[16]

Direction 6: Comprehensive State of the Environment Report

Process

40. Work began on a 'State of the Environment' report early in 2024, and Beca was responsible for pulling the report together based on existing literature and with assistance from a number of experts. Conversations with tangata whenua occurred regarding the report, in the context of wider discussions about the directions generally. Feedback was received during these discussions on the geographic extent that the report should cover, and the need for it to include information not currently held, for example in relation to matters of mātauranga. This feedback challenged POTL, given the time limitations, but also the commentary in the Interim Decision that "currently available information can form the basis of the report".[17]

41. The draft 'State of the Environment' report was shared with all parties to the proceedings on 5 June 2024 and feedback was sought. It was noted in POTL's correspondence that the report was missing the Te Paritaha survey results which would be incorporated once available. It was then discussed with NTKM at the hui on 15 June 2024. NTKM raised concerns

[15] [436] and [566] of the Decision.
[16] [567] of the Decision.
[17] [569].

that without the inclusion of mātauranga Māori, the report could not be properly referred to or used as a 'baseline' or representation of the current 'state' of the environment in the future. POTL agreed to change the name of the report to reflect that the report summarised western science only, and included some wording around the report not encompassing the Māori world view.

42. The report was therefore renamed the 'Summary of Scientific Environment Data' report, updated to include some commentary in the introduction regarding the scope of the report and to include Te Paritaha survey results. It was re-circulated on 16 July 2024 along with a number of other documents. Feedback was sought again on 30 August 2024, in an email which contained a reminder of the Court's direction in relation to the report. The document was again circulated on 10 September 2024. No feedback was provided in response.

Outcome

43. The report covers water quality, marine ecology, sediment quality, avifauna, marine mammals and air quality. The geographical scope is focused on areas potentially affected by Port operations within Te Awanui, which means that the geographical scope does differ between the topics covered. The report acknowledges that it does not encompass mātauranga Māori or the Māori world view.

44. The report is comprehensive, in that it addresses all scientific effects on the marine environment of the Port of Tauranga's operations, and is based on currently available information.[18] From POTL's perspective, the report covers the areas which are affected by Port operations.[19] It includes the interim survey results for Te Paritaha, but does not include

[18] [569] of the Decision.
[19] [437] of the Decision.

the views of tangata whenua prior to or following those surveys being undertaken as these were not provided.[20] Counsel's submission is that the report fulfils the Court's direction.

Direction 8: Updated Blue Penguin and Avian Management Plan (BPAMP)

Process

45. POTL commenced engagement on the BPAMP following the Judicial Conference held in April which clarified the position in relation to the sand pile (discussed further below). On 9 April 2024 an email was sent out to all parties to the proceedings offering an opportunity to discuss the BPAMP, and POTL contacted the Department of Conservation (**DOC**) on 23 April 2024 requesting an opportunity to meet and discuss the plan.

46. POTL and NTKM discussed the plan on 7 May 2024, and the updated plan combining the Sand Pile Management Plan and the original Blue Penguin and Avian Management Plan was circulated to NTKM representatives on 9 May 2024, and shared to all parties to the proceedings on 14 May 2024. On 4 June 2024, a memorandum from NTKM was received containing feedback on the plan, followed by a mark up of the plan on 5 June 2024, and a meeting was held between POTL and NTKM representatives to discuss the feedback on 10 June 2024.

47. The plan was updated in late June to incorporate the feedback received from NTKM and circulated to NTKM in early July. A memorandum was received from NTKM on 16 July 2024 setting out its position in respect of the plan. That memorandum from NTKM is attached to the back of the final BPAMP filed.

[20] [437] of the Decision.

48. On 11 June 2024, POTL met with John Heaphy from DOC and on 25 June 2024, feedback from DOC was received on the plan. A further meeting was held with Mr Heaphy from DOC on 26 July 2024 to work through the DOC feedback on the plan. This feedback has been incorporated in to a second update to the plan.

49. On 9 August 2024, POTL met with Ngāti Ranginui to discuss the proposed development, the effects on birds and the plan as well as other matters. No feedback was received by POTL following this meeting.

50. POTL has been working through the plan and comments on the plan from both NKTM and DOC. It circulated an updated version of the plan on 17 September 2024 to all parties to the proceedings. The plan incorporates the feedback of NTKM and DOC to the extent that POTL and its expert agree that specific feedback is appropriate.

Outcome

51. The plan first addresses the sand pile, and summarises the species present at the sandpile and how the sand pile will be managed including in relation to noise, pest animals, pest plants and monitoring. It then addresses kororā/blue penguins and tarāpunga/red billed gulls, summarising these species, the potential effects of the development on them and how these effects will be managed. The plan then turns to the monitoring and management of coastal birds at the Port, and finally the effects and management of lighting on avifauna.

52. Counsel submits that the plan meets the Court's direction. The plan now incorporates the previously separate sandpile management plan content and has been updated in consultation with DOC and tangata whenua.[21] Feedback from tangata whenua and DOC has been incorporated, for

[21] [572] of the Decision.

example in relation to wider bird monitoring of the Port area and the effects of artificial lighting of the Port on birds, which have been included as additional sections in the plan at the request of NTKM. The Plan confirms, as required by the Court's decision that the sand pile will be protected by way of the management measures set out in the plan on a year-round basis and will not be used for port operational purposes.[22]

53. While not all matters are agreed between the parties, POTL considers that it has made reasonable efforts to consult with and respond to feedback from the parties (and DOC) which is consistent with the direction. As such, counsel submits that the direction in relation to the updating of the BPAMP has been met.

54. The other part of Direction 8 required "some restoration of the area of the sand pile towards the area available at the time of the 2011 consent".[23] POTL's response to that part of the direction is discussed further below.

Direction 8: Restoration of the sand pile

Process

55. Our Memorandum of Counsel dated 3 April 2024 raised that POTL wished to explore whether there was an alternative way to address the effect that expansion of the sand pile was intended to mitigate.[24] The area of the sand pile today is just over 0.5 hectares while in 2011 it was 1.65 hectares. Therefore, extending the sand pile to its 2011 size would require the retirement of at least one hectare of operational Port land which POTL submits is significant. The Court's minute of 26 April 2024 confirmed that before considering a proposal, engagement with s 274

[22] [571] of the Decision.
[23] [498] of the Decision.
[24] Memorandum of Counsel dated 3 April 2024 at [7].

parties would be required, and the outcomes could be reported to the Court at the appropriate time.[25]

56. Since the Court's minute, POTL has been engaging with tangata whenua in relation to a suitable alternative to extending the sand pile to its 2011 size. Options have been explored with a number of parties, but no outcome has been agreed. POTL understands that the view of NTKM is that the sand pile should be expanded as directed by the Court in the Decision. On 10 September 2024, POTL again requested that parties offer any suggestions they may have in relation to alternatives, and suggested a possible contribution to a fund as a potential option. No response was received.

Outcome

57. As POTL has set out, the implications of expanding the sand pile in to the operational area of the Port are significant, with at least one hectare of operational Port land being required. As such, and in light of the lack of feedback from other parties, it has developed a proposal as an alternative. The proposal is to include a consent condition in the structures conditions that establishes a $150,000 fund, to be administered by the Te Awanui Advisory Group and to be used for the purpose of assessing and developing opportunities to enhance avifauna habitat in and around Te Awanui.[26]

58. POTL's position is that the alternative proposed addresses any effect that expansion of the sandpile was intended by the Court to mitigate. Counsel submits that this direction is appropriately satisfied.

[25] Court Minute dated 26 April 2024 at [6].
[26] This has been included as condition 15.4 of the Stage One Structures consent conditions.

Direction 9: Wānanga

Process

59. On 21 December 2023, POTL first proposed a wānanga with the parties to the proceedings, as a starting point for determining how tangata whenua would like to be engaged with on the directions from the Court. A further email on 23 January 2024 again proposed a wānanga and suggested a date of 13 February 2024. On 5 February 2024, Ngāti Ranginui requested that POTL wait for an invitation from them to meet. On 13 February 2024, POTL held its first formal meeting with NTKM. Many meetings ensued with NTKM as set out in this memorandum and the timeline attached. POTL regularly raised the need for a wānanga with NTKM, and with Ngāti Ranginui once they reached out to meet with POTL.

60. NTKM agreed that a wānanga was appropriate, and organised one for 15 June 2024, to be held at Huria Marae. In accordance with tikanga, the marae that was to host the wānanga was responsible for inviting all parties to the wānanga. Unfortunately, Ngāti Ranginui representatives declined to attend the wānanga, and the venue of the wānanga then changed and became a hui.

61. Following the hui, POTL has continued to try and convene a wānanga with all parties to the proceedings. POTL has raised with Mr Hope whether an all parties meeting could be convened and facilitated. POTL understands that this may be able to occur at some point, but has not occurred to date.

Outcome

62. In accordance with the Court's directions, a hui was held on 15 June 2024 at Wairoa Marae. The hui was attended by tangata whenua including

representatives of NTKM, the Wairoa Marae, BOPRC and POTL. Te Pā Pātiki model referred to above was presented to the group at the hui, and useful discussions were had in relation to the STAHHP and the 'State of the Environment' report. Meetings have since been held with Ngāti Ranginui, but no 'wānanga' has occurred.

63. Counsel submits that the 15 June 2024 hui should be considered by the Court to satisfy the Court's direction. The hui was convened and all parties to the proceedings were invited to attend (to the extent that it was appropriate to do so in accordance with tikanga), and the work produced as a result of the directions was discussed at that hui.[27] While it is unfortunate that not all parties did attend, POTL could not compel any party to be present.

Stage One conditions

64. POTL has produced two sets of Stage One conditions, one shown as tracked changes against the version of the conditions filed in reply following the hearing on 6 April 2023, and a clean set of Stage One conditions with relevant plans attached. Amendments to the conditions have been limited to ensuring that they relate only to Stage One, and creating consistency with the Court's directions. Minor administrative additions are required to the clean set of conditions, and an updated version will be filed once the relevant information is provided by BOPRC.

65. The conditions were shared with the parties to the proceedings on 10 September 2024. Counsel for Ngāti Kuku and Whareroa Marae has confirmed that the conditions are not agreed by these parties.

66. We note that reference to the Tupuna Trust has been removed from the consent conditions. Unfortunately, since the passing of Patrick Nicholas

[27] [438] of the Decision.

POTL has not been able to locate an alternative contact for the Tupuna Trust. POTL has made inquiries with the Māori Land Court, which confirmed that Patrick Nicholas was the sole trustee for the Tupuna Trust. The Māori Land Court did not hold the constitution for the Trust. We asked the other parties if they could provide any alternative contact details, but none have been provided to date.

Conclusion

67. Attached to this memorandum, the Court now has:

(a) A detailed scope of the STAHHP including a kaitiaki role proposal (Appendix 2);

(b) Three interim Te Paritaha surveys (Appendix 3);

(c) A wider harbour kaimoana survey methodology (Appendix 4);

(d) A Summary of Scientific Data report (Appendix 5);

(e) An updated Blue Penguin and Avian Management plan (including NTKM memorandum on the plan) (Appendix 6);

(f) A set of draft Stage One conditions, in both tracked and clean format (with accompanying plans), that reflect the Decision and the documents set out (Appendix 7).

68. These documents, other than the draft conditions, have been updated to 'final' before filing. This is to reflect that these documents have been circulated in draft and in response to feedback have been amended as appropriate, and are now final and therefore able to be endorsed by the Court as satisfying the corresponding direction.

69. In addition to providing the Court with these documents, this memorandum sets out the process POTL has undertaken to engage with the parties to the proceedings in relation to the Interim Decision directions, the outcomes of that engagement, and the work that POTL has undertaken across the last 9 months. Counsel submits that POTL has made every reasonable effort across the last nine months to engage with tangata whenua and work collaboratively on addressing the Court's directions. POTL will continue to engage with tangata whenua in relation to Stage Two of the development. In relation to Stage One, counsel invites the Court to form the view that POTL has met the directions to the Court's satisfaction, for the reasons set out in this memorandum.

70. As such, Counsel respectfully requests that the Court endorses the documents and consent conditions filed and issues consent for Stage One of the Stella Passage development.

DATED this 30th September 2024

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Vanessa Hamm/Laura Murphy
Counsel for Port of Tauranga Limited

Stella Passage Engagement Post Interim Decision

KEY
- General consultation and wānanga/hui
- Southern Te Awanui Harbour Health Plan Detailed Scope
- Kaitiaki Role
- Ngāti Kuku specific discussions
- Te Paritaha monitoring
- Wider harbour monitoring plan
- State of the Environment Report
- Blue Penguin and Avian Management Plan

December 2023

21 - Email from POTL to all parties proposing a wānanga.

January 2024

23 - Email from POTL to all parties proposing wānanga on 13 February 2024.

February 2024

1 - Meeting between POTL and Ngā Tai Ki Mauao (**NTKM**) discussing directions.

5 - Email from Ngāti Ranginui requesting POTL wait for invitation to meet.

13 - Meeting between POTL and NTKM at POTL offices.

14 - Email from POTL to all parties advising of second Te Paritaha interim survey and inviting participation and feedback.

22 - Email from POTL to Ngāti Kuku/Whareroa representatives requesting a hui.

27 - Weekly meetings between POTL and Catalyst Group representatives commence.

March 2024

1 - Meeting of POTL and NTKM planners regarding STAHHP.

8 - Meeting between POTL and NTKM, NTKM advised that they will provide kaitiaki proposal.

13 - Meeting between POTL and Ngāti Ranginui representatives.

15 - Meeting between POTL, NTKM and BOPRC representatives to discuss the STAHHP scope.

19 - Resourcing proposal received by POTL from NTKM.

27 - 'Framework for a framework' document suggesting a process for developing the STAHHP scope shared by POTL with NTKM.

28 - Email from POTL to all parties regarding the third interim Te Paritaha survey inviting participation and feedback.

28 - Email from POTL to all parties providing the annual kaimoana survey methodology and inviting feedback and mātauranga inputs.

April 2024

4 - Meeting between POTL representatives and Ngāti Ranginui regarding STAHHP scope and SOE Report.

5 - Meeting between POTL representatives and NTKM where POTL responded to resourcing proposal.

9 - Email from POTL to all parties regarding the Blue Penguin and Avian Management Plan (**BPAMP**) consultation process.

9 - Email from POTL to Ngāti Kuku/Whareroa representative following up on meeting regarding Court directions.

24 - Email from counsel for POTL to counsel for Ngāti Kuku/Whareroa Marae requesting engagement. Response received confirming engagement sought.

30 - Meeting between POTL, BOPRC and Ngāti Ranginui representatives on STAHHP scope.

May 2024

7 - Meeting between POTL and NTKM representatives regarding BPAMP.

9 - Update email from POTL sent to all parties, and views on Te Paritaha prior to survey results sought.

9 - Email from POTL to NTKM with an updated version of the BPAMP.

14 - Follow up email from POTL to all parties in advance of the third Te Paritaha interim survey inviting participation and feedback.

14 - Email from POTL to all parties with updated draft BPAMP following general feedback from NTKM.

29 - Meeting between POTL and Ngāti Ranginui representatives.

31 - Meeting between POTL and NTKM representatives for presentation of the Pātiki model.

31 - Letter received from counsel for Ngāti Kuku/Whareroa seeking Rangatira level meeting with POTL.

June 2024

4 - Meeting between POTL and NTKM representatives for further presentation of the Pātiki model.

4 - Email from NTKM representative to POTL with BPAMP feedback.

5 - Mark up of BPAMP received by POTL from NTKM.

5 - Meeting between POTL and Ngāti Ranginui representatives. Feedback requested by POTL on the kaitiaki role.

5 - Email from POTL to all parties sending out draft SOE report for feedback.

10 - Meeting between POTL and NTKM representatives to discuss BPAMP feedback.

11 - Meeting between POTL and DOC representatives to discuss feedback on BPAMP.

13 - Email from POTL to all parties sending out draft STAHHP scope for feedback.

14 - Email from Ngāti Ranginui to POTL confirming that representatives will not attend the hui on 15 June 2024, and that Ngāti Ranginui is developing its own plan.

15 - Hui held on Wairoa Marae attended by NTKM, Wairoa Marae, POTL and BOPRC representatives.

25 - Feedback received by POTL from DOC on the BPAMP.

26 - Meeting between POTL and Ngāti Ranginui representatives.

27 - Meeting between NTKM and POTL representatives to discuss BPAMP feedback received.

July 2024

9 - Meeting between POTL and NTKM representatives regarding the BPAMP and the sandpile.

16 - Email from POTL to all parties circulating all documents produced to address the directions including Te Paritaha survey results for the first time, and inviting feedback.

19 - Meeting between POTL and NTKM representatives to discuss Court reporting.

26 - Meeting between POTL and DOC representatives to work through DOC feedback on the BPAMP.

29 - Meeting between Ngāti Kuku/Whareroa Marae and POTL representatives.

August 2024

9 - Meeting between POTL and Ngāti Ranginui representatives to discuss BPAMP.

30 - Email from POTL representative to all parties reminding of documents circulated and Te Paritaha survey results and SOE report in Sharepoint, and inviting feedback.

September 2024

3 - POTL meeting with Alex Hope (facilitator).

10 - Email from POTL representative to all parties sharing draft conditions, re-sharing all documents, and requesting feedback on alternatives to sand pile expansion.

13 - Meeting between POTL and the Ngāti Ranginui Fisheries Trust representatives.

Scoping Document – Southern Tauranga Harbour (Te Awanui) Management Plan

FINAL

30 September 2024

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1 Background to Scoping Document

As part of its long-term strategy to meet the growing demand for port services, Port of Tauranga Limited (POTL) has applied for resource consent to extend the existing wharves and undertake associated dredging in Stella Passage. The proposed project will increase the port's capacity and provide resilience for New Zealand exporters and importers.

In December 2023, the Environment Court (under a direct referral of the consent application) issued an interim decision[1] and associated directions in regard to the project. Among other matters, the directions required POTL to ***(1) file and serve within six months of the date of this decision a detailed scope of the proposed Southern Te Awanui Harbour Health Plan as referred to and described in this decision at [135], [391], [464] and [615] prepared cooperatively with tangata whenua (subject to their willingness to participate) and the Regional Council.***

The directions also required **(2) Either as part of the Southern Te Awanui Harbour Health Plan or separately, POTL is directed to propose a meaningful kaitiaki role for tangata whenua as referred to and described in this decision at [392] to promote the objectives and policies of the Bay of Plenty Regional Coastal Environment Plan including in relation to planning, implementing and reviewing monitoring programmes and contributing to management decisions arising from implementation of these programmes. These details should include a management structure which recognises the relationships between POTL and tangata whenua and how the implementation of the plan is to be funded.**

Where [392] states:

[392] ….A collaborative approach is highly desirable, recognising the strength of tangata whenua's view that they should determine how their involvement will best be incorporated.

1.1 Scope of this Document

This document outlines the scope of a Southern Te Awanui Harbour Health Plan (hereafter referred to a 'Plan'). It is evident through engagement that there is a complex array of work programmes, plans and monitoring underway and planned in relation to Tauranga Harbour that will need consideration as part of the final Plan development (i.e. how to provide connections across the varied work programmes).

This document also outlines the method for development of the Plan (**Section 3**) as required by the Court directions, the development of which is to be a collaborative and adaptive process.

The court direction (1) also recognised the role of the tangata whenua and Bay of Plenty Regional Council (BoPRC) in the planning and decision-making for the harbour, and the need to involve the wider community and stakeholders in this process. This report documents the engagement undertaken in the development of the Plan scope and identifies a process for the development of the Plan that can be staged over time to include a wide variety of stakeholders (Section 3). In addition to the complex array of work programmes mentioned above, engagement has also highlighted the there is a strong desire from tangata whenua that they lead the preparation and implementation of the Plan.

1.2 Relationship between the Plan and the Stella Passage Consent Process

There are a number of work programmes occurring in parallel that overlap with the Plan as described in Section 3.2 of this Scoping Document. For example, the Tauranga Moana Advisory Group, consisting of

[1] Decision [2023] NZEnvC 270, dated 13 December 2023

representatives of Tauranga Moana iwi, local councils and the regional council, have been advancing work on a Tauranga Moana Framework for the Tauranga Harbour as part of preparations for settlement with the Crown. It is also evident through engagement with tangata whenua over the scope of the Plan that the desire is for it to not be limited to the Southern Harbour and for it to be an enduring Plan that is implemented by many parties over a long timeframe. For these reasons, it has been discussed with some parties that the Plan sit outside of the Port resource consents. This will enable greater flexibility in the Plan, both in terms of the timeframes for preparation and implementation and to allow greater involvement by others (such as tangata whenua) to take a leadership role in the development of the Plan as has been expressed as desired through engagement[2]. The POTL agree that having the Plan prepared by tangata whenua themselves and using a framework that is appropriate for them to be able to reflect their perspectives is a good approach. However, this document provides a scope for the Plan as directed by the Court and POTL remain committed to contributing to Plan development with either a tangata whenua-led approach or if the POTL has a requirement to develop the Plan as part of their resource consents.

Section 4 of this document proposes a kaitiaki role, drawing on research and through engagement with tangata whenua, and the role in the development and delivery of the Plan.

1.3 Process for Development of this Scoping Document

The Port has engaged with several hapū and iwi groups who have an interest in the harbour and its management as well as the Regional Council and the Tauranga Moana Advisory Group (consisting of representatives of the Tauranga Moana iwi, the Regional Council, Tauranga City Council and Western Bay of Plenty District Council) in the development of this scoping document.

Of particular note is the Ngā Tai ki Mauao collective who have taken a very proactive role and have undertaken a series of wananga to collate the views of tangata whenua with an interest in the harbour to build a suggested framework for the Plan that reflects their aspirations.

In addition to the engagement, there has been a review of related and similar work programmes, other example Plans and iwi planning documents (such as the Tauranga Moana Iwi Management Plan 2016-2026).

1.4 Engagement on Plan Scope

Parties that POTL have engaged with in this scoping process include:

- Ngā Tai ki Mauao collective, which includes:
  - Ngā Hapū o Ngā Moutere Trust (collection of Matakana hapū)
  - Ngāti Kuku
  - Whareroa Marae
  - Ngāti Hē
  - Ngāti Kaahu a Tamapahore
  - Ngāti Tapu
  - Ngāti Kahu (ki Wairoa)
- Ngāti Ranginui iwi
- Ngāti Pūkenga iwi
- Ngāi Tamarawaho
- Bay of Plenty Regional Council (BoPRC)

[2] It is noted that resource consent conditions can only obligate the consent holder in relation to actions under the consent and cannot impose requirements on third parties. For this reason, a resource consent condition requiring Plan preparation by another party is ultra vires.

POTL and the Regional Council have presented a draft scoping to the Tauranga Moana Advisory Group to both inform and seek their views. It is important to note that a plan for improving the harbour health is not a new concept. Indeed, as part of the ongoing settlement process, the Tauranga Moana Collective indicated the preparation of a Tauranga Moana Framework - Ngā Tai Ki Mauao (see **Appendix B**). Early work that had been started by the Tauranga Moana Advisory Group ahead of settlement on the development of the Tauranga Moana framework referenced in the deed document (**Appendix B**) has been put on pause whilst this process has been ongoing in recognition of the similarities and potential overlapping nature.

The following describes the engagement results with the various groups on the development of this scope for the Plan.

Ngāi Te Rangi iwi

Ngāi Te Rangi Leadership has advised POTL they are leaving engagement on these matters to the hapū.

Ngāti Ranginui iwi

POTL and Ngāti Ranginui have had two hui specifically relating to the Plan. A number of other hui have been held to discuss additional matters that were outside of the scope of developing the scope of the Plan.

At the hui held on 30 April 2024 the relationship between the State of Environment (SOE) report and the Plan was discussed extensively with representatives of Ngāti Ranginui, with the understanding that the SOE currently under preparation would be able to inform the contents of the Plan by giving a baseline of the 'current state'. There was discussion around how any gaps could be filled by being incorporated as actions/work programmes in the Plan.

Ngāti Ranginui provided POTL with some examples of what they would like covered in any Plan, including:

- Identification of areas to be prioritised
- Overall, an integrated approach to management
- Nurturing kohanga
- Kaimoana
- Fish
- Pockets with potential to be impacted by flows
- Creation of safe areas for mokopuna
- Protection of coast lines
- Pest control
- Bio security
- Ecosystem
- Cultural indicators

Ngāti Ranginui expressed an interest in having continuing involvement in the development of the Plan including into timeframes outlined within the Plan relating to actions, monitoring of those actions, and any review periods (of the Plan itself) given the proposed adaptive approach. As well as input for how monitoring and progress against objectives is reported. Ngāti Ranginui have advised by e-mail (received 14/06/24) that they are currently in the process of developing a framework that can be used in the development of the Plan. The framework has not yet been shared with other parties.

Ngāti Pūkenga iwi and Ngāi Tamarawaho

POTL engaged with Ngāti Pūkenga iwi and Ngai Tamarawaho. Primary correspondence has been through email.

POTL were provided with an existing draft Proposed Tauranga Harbour Environment Restoration and Enhancement Plan that covered a number of items relevant to the scope of the Plan. The key themes included:

- The vision being for a *thriving, sustainable Tauranga Harbour environment that while maintaining it's position as the base for the largest import/export port in the country nevertheless enriches the community and which seeks to restore, maintain and take every opportunity to enhance the harbour ecosystem*.
- The need for a baseline survey to identify factors contributing to degradation and establish a baseline for future actions to be measure against. This is largely in line with the SOE report currently underway.
- The creation of an 'entity' to formulate and implement a plan addressing identified actions. This last theme is wholly in line with the proposed approach for this Plan.

Other themes from within the document provided included the need for regular reporting around activities undertaken and tracking against objectives, and creation of opportunities for community groups and wider public to participate in the programme (i.e., kura).

Ngā Tai ki Mauao Collective

Ngā Tai ki Mauao and POTL held several hui relating to the development of the Plan scope as well as a number of other broader relationship matters. Ngā Tai ki Mauao have also held several of their own internal wananga to progress a framework for the Plan.

A Wānanga was held at Wairoa Marae on Saturday the 15th June 2024 where the Te Pa Patiki framework was presented by Ngā Tai ki Mauao to attendees (including the Regional Council and POTL).

Ngā Tai ki Mauao have advised a desired vision for the plan would include abundance and focus not only on the environmental health of the harbour but also the wellbeing and resilience of the community. Any final framework would ideally set out principles to guide the implementation of the Plan.

The POTL and the Regional Council agree with the overall idea of the Te Pa Patiki Framework for use in development of the Plan, however both have noted that other tangata whenua groups would need to agree to the use of the framework in Plan development given it is a Plan that reflect the aspirations of many parties. .

Bay of Plenty Regional Council

BoPRC has been involved in various hui to discuss the scoping of the Plan. BoPRC have stated that their role in the process is to support iwi and hapū in whatever way they may think appropriate. The Regional Council provided some examples of other plans that may serve as examples of what a Plan structure could [look like, including the Kaipara Restoration program (discussed in Section 4.4).

Tauranga Moana Advisory Group

A draft of this scoping document has been provided to Tauranga Moana Advisory Group for information and to seek their views.

2 Framework of the Plan

This framework is based on the results of engagement and a review of other collaborative plans. There are common themes for the structure of the Plan arising from the engagement described in **Section 1**.

The following sections provide a proposed scope for the Plan and an indicative structure that will be further developed based on the method set out in **Section 3.** The proposed structure of the plan is provided in **Appendix A**.

2.1 Vision and Objectives

The vision will set out the overarching ideal for the future of the harbour. From the engagement on the Plan, the vision should include components of the following:

- Abundance – resilient communities as well as harbour health.
- A thriving, sustainable Tauranga Harbour environment

Objectives, to be developed further, likely include:

- To protect and enhance the mauri and biodiversity of the harbour and its catchment.
- To support and enable the social, cultural, and economic development of the harbour community and the iwi.

2.2 Purpose

The purpose of the Plan was outlined in the proposed condition consent as follows:

> *The purpose of the Southern Te Awanui Harbour Health Plan is to foster a partnership approach between the Port of Tauranga Limited, councils and iwi in setting the direction for the management of Southern Te Awanui and associated catchments to achieve an overall improvement in the health of Te Awanui over time. The Plan will:*
>
> *a) Identify a long term vision and key principles for improvement of the ecological and cultural health of Te Awanui.*
>
> *b) Identify priority focus areas and describe the current state versus future desired state.*
>
> *c) Recommend actions and roles/ responsibilities to achieve the future desired state.*

Whilst the requirement for the Plan (and this scoping document) was through a court direction associated with Port development, it is clear through engagement that the purpose of the Plan would be further reaching than an individual organisation responsibility for implementation or outcomes sought from a resource consent process. The Plan needs to be enduring and involve actions from a number of parties with a role or interest in the harbour. This is further apparent when considering interconnected Kaupapa such as the Tauranga Moana Framework signalled as part of settlement being undertaken by the Tauranga Moana Collective and their associated co-governance aspirations.

Given this, the purpose of the Plan is broadly to:

- be clear on the roles and responsibilities of parties involved and actions that can be taken to achieve the vision, including a proposed kaitiaki role as part of plan development and implementation.
- foster and strengthen the relationships and partnerships among the various stakeholders and users of the harbour, including the local government, tangata whenua, industry, and the public.
- increase the awareness and knowledge of the harbour and its values, issues, and opportunities among the wider community and the decision-makers.

- create actions based on desired outcomes that can then be taken forward and monitored in an adaptive and collaborative manner
- outline how the Plan interfaces with connected work programmes and how it will be implemented (including through regional policy, targeted work programme, etc)

2.3 Principles

There is a common desire amongst parties that were engaged in regards to the Plan that there needs to be a clear set of guiding principles in the Plan. These will guide any uncertainty on implementation of the Plan.

2.4 Geographic Scope

As discussed earlier, there is a strong desire from tangata whenua involved for the Plan to cover the whole harbour and to have an adaptive management approach that can align with a Te Ao Māori worldview.

Ngā Tai ki Mauao is centred around all of those with interests in 'waters that flow past Mauao'. There is potential to frame the geographic scope of the Plan around this concept with specific actions and sub-areas identified where specific stakeholders have interests or specific areas of the harbour need direct action.

It is also noted that a wide geographic scope of the Plan will mean more groups/stakeholders/ hapū that may have an interest in the Plan contents will need to be involved in its development (see Section 3).

2.5 Context

Results from engagement indicate an approach to the Plan that describes the harbour in the context of the past, present and future. This kind of context setting is proposed in the Plan to tell a story of what has happened over time and what a future desired state looks like and can link to actions to achieve a future desired state (links to vision and actions below).

2.6 Actions

It is necessary for the Plan to contain actions and specific roles and responsibilities for the implementation of actions so there is collective understanding of the work planned to achieve the vision and objectives. This is also the place where specific links can be made to associated work programmes underway or planned that do not fit under the Plan but that can come under the umbrella to provide the interconnectedness required. Once the actions are identified, they will be prioritised and assigned to different parties who will be responsible for undertaking them within specific timeframes. It is likely there will be near, medium, and long-term actions for all stakeholders involved in the development of the Plan. It will be necessary to seek agreement of the parties to their specific actions.

It is anticipated that a series of priority actions will be identified in the Plan as essential actions required in order to enable the successful implementation of the Plan. For example, a priority action already identified as being required is the development of baseline 'State of the Environment' information as it relates to Te Ao Māori /mauri/mātauranga. This is essential information to allow ongoing monitoring and review against the vision and objectives of the Plan.

2.7 Monitoring and Review

All parties agree that the Plan will need to be adaptive and be reviewed over time. The Plan will include a requirement for regular review where:

- Monitoring and reporting are undertaken relating to progress against the actions.
- Any changes required to the Plan as learnings through the adaptive management process arise.
- The inclusion of any new actions that may be required based on the review and progress against the initial actions and responsibilities.

The Plan will also detail who is responsible for the monitoring and progress reporting. Ideally the review is undertaken as a collaborative process. Monitoring and progress reporting may be a combination of a collaborative exercise as well as specific reporting that is the responsibility of individual parties depending on the actions identified.

3 Method for Development of the Plan

3.1 Parties involved

Given the geographic size and integrated nature of the Tauranga Harbour with its extensive catchment there are a number of parties who have both an influence on the overall health of the harbour, as well as an interest over its health. This includes iwi and hapū, various industries such as POTL and Ballance, councils including Tauranga City Council and Western Bay of Plenty District Council, the Bay of Plenty Regional Council, Department of Conservation, universities and research organisations (such as NIWA), businesses and the general community.

The establishment of this scoping has been in collaboration with the Regional Council and iwi and hapū. Recognising the limited nature of engagement and the potential broad interest, roles and responsibilities in the Plan a staged approach to its development is proposed.

Stage 1 of Plan development will include the Regional Council, POTL, Tauranga Moana Iwi (Ngāi te Rangi, Ngāti Ranginui Iwi and Ngāti Pūkenga) and the Ngā Tai ki Mauao collective. This early stage involves the groups already working together on this Kaupapa but with more formalisation of roles, responsibilities, and ways of working in relation to the development of the Plan. This also links to the proposed kaitiaki role (see Section 4).

Once an initial draft of a Plan is prepared, the Plan can be expanded and additions to the Plan made in response to wider collaboration. For example, later stages will include inviting other parties (such as DOC, academic agencies, local councils) and community groups to be involved potentially through a public notification process / expressions of interest. This will be important as other stakeholders will have interests in the harbour that should be reflected in the Plan as time goes on.

3.2 Leadership of Plan development

Whilst a collaborative process for the development of the Plan is desired, it is necessary to assign overall leadership in the development of the Plan (i.e. who collates all inputs across all groups involved). This party would be responsible for coordinating the parties involved in the development of the Plan and meeting the expectations around delivery and timeframes.

The Regional Council has a requirement under the Regional Coastal Environment Plan (Method 19A) to work with tangata whenua to carry out a number of tasks that overlap with what the Plan is intended to do.

Method 19A: In consultation with tangata whenua:

- *Review Schedule 6 Areas of Significant Cultural Value;*
- *Identify areas or sites in the coastal environment of significance or special value to Maori;*
- *Identify cultural landscapes and features in a manner consistent with NZCPS Policy 15(c)(viii);*
- *Investigate the planning mechanisms and other methods available to provide protection to identified areas and sites and support customary activities in ASCV;*
- *Investigate the planning mechanisms and other methods available to support the social, economic, cultural and recreational aspirations of tangata whenua in the coastal environment;*
- *Identify options for providing for the expression of the relationship tangata whenua as kaitiaki have with their identified taonga such as water, wahi tapu and kaimoana.*

Given this requirement and the initial work that was to be undertaken by the Tauranga Moana Advisory Group, it is suggested that overall coordination is best led by Regional Council (or their nominated other lead) to provide for the

coordination needed to align the various work streams and provide for an efficient and comprehensive approach to improvement of harbour health.

3.3 Timeframes

It is suggested that a timeframe of 2 years is provided for the first Stage (Stage 1) of Plan development. This timeframe is considered sufficient to allow the collaborative approach in the development of the Plan. Should this timeframe not be sufficient a revised timeframe can be agreed amongst the Stage 1 parties.

3.4 Funding for Plan Development

There will be time and resources required to develop the Plan, in addition to any funding required by parties with specific actions under the Plan.

Given the wider scope of the Plan beyond just the Port development consent, and the connections between the Plan and interconnected work such as the proposed Tauranga Moana Framework proposed under the Settlement deed for the Tauranga Moana Collective, it is suggested that the funding of involvement in the development of Stage 1 of the Plan initially sits with the individual parties contributing to the Plan covering their own costs. In recognition of the limited resources of iwi and hapū, the Regional Council will contribute to the reasonable costs or iwi and hapu participating. In addition to the Regional Council contribution, POTL will contribute $100,000 towards iwi and hapu costs.

4 Kaitiaki Role

Court direction (2) requires POTL to propose a meaningful kaitiaki role for tangata whenua to promote the objectives and policies of the Bay of Plenty Regional Coastal Environment Plan (RCEP) including the following:

- implementing and reviewing monitoring programmes
- contributing to management decisions arising from implementation of these programmes
- a management structure which recognizes the relationships between POTL and tangata whenua
- how the implementation of the Plan is to be funded

Given the specific role of Kaitiaki identified by the Court (to promote the objectives and policies of the RCEP), there is clear overlap with the work of the Regional Council Method 19A requirements in the RCEP. It also overlaps with the Tauranga Moana Advisory Group as part of the settlement process as it was anticipated that the Tauranga Moana Framework eventually inform the Regional Policy Framework, in a similar way to the Kaituna River Document. Whilst it is not intended for the Plan to be a statutory document, there is clear benefits to be gained from giving the Plan implementation 'teeth' through statutory recognition. However, as described in Section 1.2, having it included within a resource consent condition does constrain the Plan in terms of it being enduring, being of wide scope and enabling tangata whenua to take a leadership role in its development.

It has also been raised by Ngā Tai Ki Mauao that there are aspirations to set the foundations for future co-governance arrangements, which is also similar to the Kaituna River framework.

This section covers some mahi that has been done relating to:

- Ngā Tai ki Mauao feedback regarding kaitiaki.
- Describing the understanding of kaitiakitanga and the role of kaitiaki.
- Examples of other kaupapa where kaitiaki roles have been created and/or are evident.
- Initial details relating to the kaitiaki role proposed as part of the Plan and linkages to similar arrangements

4.1 Engagement Results

Ngā Tai ki Mauao have mentioned to POTL that they have given some thought to what the kaitiaki role could look like but details are yet to be provided. They have mentioned that their initial thoughts are that the kaitiaki role could be fulfilled by a rōpū (group) that comprises various technical skillsets. Members of the rōpū will be determined based on the skills they bring and their alignment with skills required to fulfil the role of kaitiaki and Plan implementation. The kaitiaki role would consist of a combination of iwi/hapu, councils and tohunga (experts).

4.2 Kaitiakitanga

The word '**Kaitiakitanga'** is not simply defined, nor does it have one single meaning (Kawharu, 2000), for Te Reo Māori has many layers and has broader connotations. Interpretations of the kupu (word), Kaitiakitanga, stems from the core word 'tiaki' meaning to care for, guard, protect, to keep a watch over and shelter (Marsden & Henare, 1992). The word 'Kai' is a term that signifies a lead role to be undertaken; it is a broad term when applied to 'tiaki' as a prefix because it strengthens the role and translation for example; caretaker, guardian, protector, caregiver, or a trustee (Kawharu, 2000). Including 'tanga', transforms it into the active application of Kaitiaki in practice (Paul-Burke, 2011).

Walker (2016) asserts *"Kaitiakitanga is a concept that is utilised widely throughout the Māori world, for the protection and preservation of cultural aspects to Māori"* (pg 3). The key words, in this context, are protection

and preservation and these principles apply to the practices of Kaitiakitanga. Kaitiakitanga is a term now in general use to denote the practice of guardianship of natural and physical resources by tangata whenua.

4.3 Kaitiaki

Ira tangata (humans) have a role of Kaitiaki (caretaker) and it is an aim to nurture and protect the physical and spiritual well-being of the natural systems that surround and support life. Kaitiaki are agents that perform the task of active guardianship. They are charged with the responsibility to safeguard and manage natural resources for present and future generations. Decisions enacted by kaitiaki are based on the inter-generational observations and experiential understandings of mātauranga Māori or traditional tribal ecological knowledge and pūkenga or informed environmental practitioners and experts.

The role and responsibilities of Kaitiaki are wide and varied, tangible and intangible and all are based on Māori lore relevant to particular Māori groups [iwi, hapū, whānau] and their resources. It is the sole perogative of each group to determine their role and responsibilities as kaitiaki, and their interpretation and applied practice of the concept. These roles, responsibilities and interpretations cannot be defined by any other person, rather they need to be determined by the group according to their values and the circumstances of each case. This process ensures the active engagement and retention of bio-cultural information and ecological management practices into the future.

For this reason, it is suggested that a kaitiaki role is developed and defined by a group of parties with a role and interest over the Plan and its application, particularly in Stage 1. This is further discussed in Section 4.5 below.

4.4 Examples of Kaitiaki Roles

As part of researching kaitiaki and kaitiakitanga, examples were reviewed where tangata whenua have been involved in programmes of work and their mahi may be considered as taking a kaitiaki role in the Kaupapa. **It is noted that although these examples are provided – the nature of a kaitiaki role needs to be specific to the location, tangata whenua and their aspirations**.

Kaipara Remediation Programme

In the Northland Region there is the Kaipara Moana Remediation Programme, where a Memorandum of Understanding (MoU) exists that forms a foundation document for the programme. While this is not a ‘plan’ in the sense of what the purpose of this Plan is, the programme does have some key components around tangata whenua involvement that can be drawn upon to inform what a meaningful kaitiaki role could look like. A key principle of the MoU is noting Kaipara Uri (descendants of three iwi groups) have a role or responsibility as kaitiaki. Tangata whenua therefore have a key role in managing and implementing the programme through community and iwi action. The operational unit is called Kaipara Maurikura that leads the delivery of the programme. This example demonstrates the usefulness of an MoU in clearly outing the role of kaitiaki in the programme, describes who is appropriate in the role for kaitiaki (i.e those with ancestral connections) and the formation of a clear operational unit responsible for implementation.

Te Āti Awa Whakarongotai Kaitiaki Plan

The Kaitiakitanga Plan for Te Ātiawa ki Whakarongotai offers a comprehensive framework for the role of a kaitiaki, focusing on the integration of Māori values, knowledge, and practices in environmental stewardship. It emphasises the deep connection between people and the environment through whakapapa, highlighting the inherited responsibility of the iwi as guardians of their land and waters. The plan also underscores the importance of spiritual well-being (wairua), advocating for practices that ensure safe, clean waterways and support activities that strengthen spiritual ties to the land.

A kaitiaki role, as defined in the plan, is about exercising self-determination (tino rangatiratanga) and ensuring the iwi authority over their lands and resources is respected. This involves active participation in governance

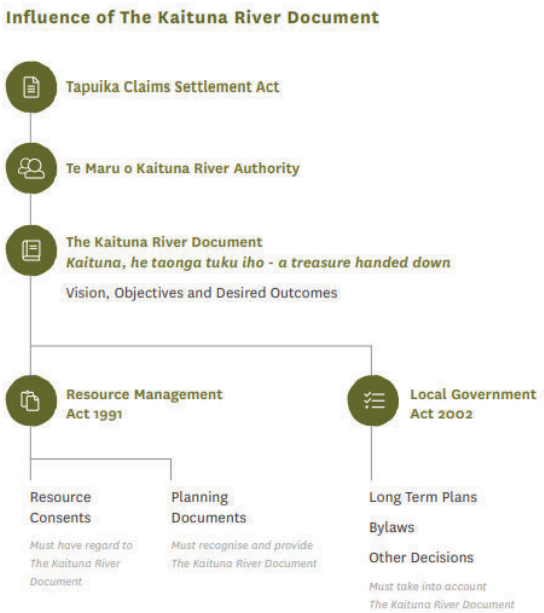
and decision-making, using traditional knowledge to guide policies and practices. Kaitiaki are responsible for implementing adaptive management strategies to address environmental changes, ensuring sustainable resource use, and protecting biodiversity and habitat connectivity. Community engagement and knowledge transfer are also crucial, with a focus on passing down traditional practices and wisdom through generations and recognising specialist knowledge holders.

In the context of this Plan, kaitiaki would play a vital role in developing and implementing the Plan. This involves engaging local Māori in environmental management, utilising traditional knowledge, and promoting sustainable practices. By fostering partnerships that honour Te Tiriti o Waitangi, a kaitiaki would ensure that the cultural and environmental values of the iwi are respected and that they have a significant role in managing and protecting the harbour. This approach supports the harbour's health and sustainability while strengthening the relationship between the Port of Tauranga, Regional Council and the local Māori community.

Kaituna River Authority

Te Maru o Kaituna River Authority is a co-governance partnership made up of iwi representatives from Tapuika Iwi Authority Trust, Te Kapu Ō Waitaha, Te Pumautanga o Te Arawa Trust, Te Tāhuhu o Tawakeheimoa Trust, Ngāti Whakaue, and council representatives from the Bay of Plenty Regional Council Toi Moana, Rotorua Lakes Council, Western Bay of Plenty District Council and Tauranga City Council. It is a permanent joint committee of the four councils. The purpose of Te Maru o Kaituna is the restoration, protection, and enhancement of the environmental, cultural and spiritual health and well-being of the Kaituna River. This group was established under legislation (Tapuika Claims Settlement Act 2014) with a role in the Kaituna River Document.

There are similarities in the Kaituna River process and the settlement deed prepared for Tauranga Moana, that indicates the preparation of a Tauranga Moana Framework. The following diagram indicates how the Kaituna River Document fits in the legislative framework. There are similarities in the requirements of the kaitiaki role as directed by the Court in this Plan scoping process and the Kaituna River Document – namely the inclusion of the document as part of planning documents and the Courts direction for the kaitiaki role to promote the objectives and policies of the Bay of Plenty Regional Coastal Environment Plan (RCEP).



4.5 Proposed Kaitiaki Role

The proposed kaitiaki role draws from the research and examples above. It is not proposed to be an individual, but rather a collection of representatives of groups with an interest over of the harbour and an ancestral connection and who all play a key a role in implementing the Plan and achieving the vision. Although the POTL and Regional Council are not kaitiaki, they consider they also have a role in the protection and preservation of natural and physical resources. For this reason, the proposed kaitiaki role consist of tangata whenua and would remain closely linked with others who have similar values over the harbour such as representatives of the councils and the Port of Tauranga for Stage 1 of the Plan.

The following outlines the specifics of the kaitiaki role:

- Establishing a Te Rōpū Tiaki (kaitiaki group), consisting of representatives from the local iwi and hapū who would join in a collective that includes councils and Port of Tauranga with the purpose of developing and implementing the Plan.
- Include a mix of Tohunga that can be drawn in as required as expert advisors to Te Rōpū Tiaki depending on the specific technical skills relevant to the proposed mahi.
- Te Rōpū Tiaki participation in decision-making processes through Plan development and implementation. The Tohunga technical advisors will be involved in the monitoring of environmental and cultural impacts of the activities within the harbour and provide advice and guidance on best practices and mitigation measures to Te Rōpū Tiaki.
- Te Rōpū Tiaki should be provided with adequate resources, training, and support to carry out their functions effectively and efficiently. See Section 3.4.
- The performance and outcomes of Te Rōpū Tiaki will be reviewed on a regular basis, and any adjustments will be agreed and made as necessary to ensure its relevance and effectiveness. There may be revolving representation by the entities represented on Te Rōpū Tiaki.

The proposed kaitiaki role is intended to link directly to the development and delivery of the Plan, the achievement of the vision and to foster a collaborative and respectful relationship between all parties involved.

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Introduction

Part I

Kaupapa / Purpose of Plan

Whāinga / Goals

Pou / Guiding Principles

The Partners

The Southern Te Awanui / Tauranga Catchment

- Early History
- Present Day
- Future

Part II

Setting / Environmental Aspect

- Summary of different parts of the harbour for focus of restoration such as marine fauna, marine flora, rocky habitat, Te Paritaha, Entrance, etc, etc

Series of Sections describing each ecological band / environmental aspect described in the setting

- Current State of each
- Desired Future State of each
- Action Needed (key priorities and research & monitoring actions)

Part III

Priority Actions / Projects Identified

Complete List of Actions

- Process Diagram
- Key focus areas identified, actions presented in a table with timeframes, lead parties, and other details included.
- Supporting Actions: Research & Monitoring
- General Supporting Actions: Coordination and alignment with other initiatives

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- Oversight

- Review and reporting on the plan

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Harbour Ecological bands / Habitats Map

Glossary

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Boffa Miskell

Te Paritaha Pipi Monitoring

May 2024 data summary
Prepared for Port of Tauranga

26 June 2024

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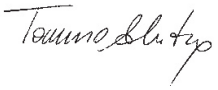
Prepared by:	Dr Tommaso Alestra Ecologist Boffa Miskell Limited	
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1.0 Introduction

As a part of the relatively recent Port of Tauranga Capital Dredging Programme which began in October 2015 and was completed July 2016, approximately 95 m of Te Paritaha shell bank (and associated benthic fauna) was excavated.

This report provides results of the surveys of pipi *(Paphies australis)* populations across Te Paritaha carried out in May 2024 according to the Te Paritaha Monitoring Plan (TPMP), as required under resource consent for Coastal Permit number 65807 (Condition 12).

1.1 Background

In 2022, Boffa Miskell Limited (BML) was engaged by the Port of Tauranga to prepare the Te Paritaha Monitoring Plan (TPMP) to guide the future collection of information/data on temporal trends in the size and abundance of Kaimoana (pipi, *Paphies australis*) on Te Paritaha (Centre Bank).

The original version of the TPMP (Boffa Miskell Ltd, 2022) informed intertidal and subtidal surveys carried out at Te Paritaha in October and December 2022 (Boffa Miskell Ltd, 2023a) based on previous surveys at Te Paritaha. The 2022 surveys showed significant changes in the abundance and population structure of pipi in relation to previous rounds of surveys between 2013 and 2017 (Fairlie et al., 2016; Ross & Culliford, 2018). The changes observed in 2022 included high abundances of intertidal juvenile pipi combined with a large decline in the abundance of adults in comparison to both pre- and post-dredging abundance data (Fairlie et al., 2016; Ross & Culliford, 2018).

The TPMP was revised in 2023 to expand the spatial coverage of the surveys at Te Paritaha. The aim of the revised TPMP (Boffa Miskell Ltd, 2023b; Appendix 1) is to allow the collection of additional information/data, to better understand the mechanisms underlying the 2022 results and to provide a more robust and wider assessment of future changes in the abundance and size of pipi at Te Paritaha.

Key changes between the original version of the TPMP and the revised version include:

- Pipi sampling methods aligned with those of Berkenbusch et al. (2022), where 10 benthic sediment cores are split into five pairs, with the cores within each pair collected adjacent to one another.
- Addition of one subtidal transect (named Transect D) located beside Transects A, B and C.
- Addition of two shallow subtidal grids (named Grid 2 and Grid 3) located to the south and to the west of the original sampling grid (Grid 1) which was established as part of the 2022 surveys.
- Inclusion of sediment and pipi flesh contaminant sampling across all grids and transects.

The November 2023 and March 2024 surveys, which were based on the revised TPMP, confirmed the patterns observed in 2022, with the intertidal area of Te Paritaha dominated by recruit and juvenile pipi, while larger adult individuals were mostly confined to the subtidal sites. There was a large recruitment event between 2022 and 2023, resulting in a significant increase in the abundance of recruit and juvenile pipi. However, the abundance of adult individuals

detected in late 2023 / early 2024 remained lower compared to the abundance levels recorded as part previous studies up to 2016/2017 (Boffa Miskell Ltd, 2024a, 2024b, Ross & Culliford, 2018; Fairlie et al., 2017)).

The results presented in this report compare the abundance and size of pipi recorded in May 2024 against the patterns observed as part of the most recent surveys in 2022-2024 (Boffa Miskell Ltd, 2024a, 2024b) and during previous studies carried out both before and after the dredging between 2013 and 2018 (Ross & Culliford, 2018; Fairlie et al., 2017).

In addition to pipi, mussel (*Perna canaliculus*) beds were also surveyed on Te Paritaha in 2024 as the scope of the TPMP was expanded to include other Kaimoana species after the presence of mussels in the study area was noticed in 2023 following the increase in the spatial coverage of the pipi surveys.

2.0 Pipi

2.1 Significance of pipi

Pipi are an important taonga (treasure) species widely consumed by Māori across Aotearoa (King, 2003). The concept of taonga includes a sacred regard for the whole of nature and a belief that the resources are gifts from the gods and ancestors for which current generations of Māori are their responsible stewards. There is an emphasis on the guardianship of taonga species by Māori and the need to manage these resources (Craig et al., 2012).

A study by Jacomb et al. (2010), based on excavation of a midden on the northern West Coast of the South Island, showed that pipi have long been a food source for Māori. One midden believed to be used between the 15th and 17th century contained primarily pipi and other bivalve species.

2.2 Anatomy and feeding

Pipi are compressed bivalves enclosed by two half hinged shells (Roy et al., 2002). The anatomy of a bivalve includes mantle lobes which secrete two hinged shells that covers the organs, anterior and posterior adductor muscles which control the opening and closing of the shell, a raised mouth position due to becoming laterally compressed over time, and modified gills which allow for the capturing of particle for feeding (Roy et al., 2002).

Pipi are suspension feeders. They actively filter particles from the water column (Smaal, 1994). The mechanics of filter feeding in pipi includes an inhalant siphon which creates a current within the shell siphoning particles. Particles then track over the gills before being transferred to the mouth (labial palp). Particles can be accepted and digested or rejected and become pseudofeces (Kiorboe & Mohlenberg, 1981).

2.3 Distribution

Pipi are found on sheltered beaches, bays, estuaries and harbours in the top few centimetres of coarse sediment (Morton & Miller, 1973).

Pipi are patchily distributed with areas of high densities known (pipi beds) separated by areas with low densities or no pipi. Such dense aggregations are common in bivalves, and probably result from a combination of patchiness in habitat suitability and gregarious settlement (Hooker 1995 a,b).

Pipi have traditionally been thought of as a predominantly intertidal species. As a result, most of the research on pipi has focused on intertidal populations. However, research by Hooker (1995 a,b) found that movement patterns of pipi resulted in juveniles congregating in shallower areas (intertidal), and larger adults found in deeper subtidal beds. Hooker (1995 a,b) also found that as pipi grow, they gradually move to deeper channels within harbours, typically towards the entrance. The trigger for movement is unknown, but this ability to migrate may have important implications to their population dynamics.

2.4 Reproduction and growth

Pipi reproduce by free-spawning gametes, and most individuals are sexually mature at about 40 mm shell length (Hooker & Creese, 1995). Gametogenesis begins in autumn, and by late winter many pipi have mature, ready-to-spawn gonads. Pipi have an extended breeding period from late winter to late summer, with greatest spawning activity occurring in spring and early summer. Fertilised eggs develop into planktotrophic larvae, and settlement and metamorphosis occur about three weeks after spawning (Dickie, 1986; Hooker, 1997).

Juvenile growth appears rapid at first. Hooker (1995 a,b) showed that pipi at Whangateau Harbour (north-eastern New Zealand) grew to about 30 mm in just over one year (16–17 months), reached 50 mm after about three years, and grew very slowly after attaining 50 mm. There is a strong seasonal component to growth, with rapid growth occurring in spring and summer, and little growth in autumn and winter.

Little is known about the natural mortality or maximum longevity of pipi. Estimates of mortality are difficult because of the elevated mobility of pipi. It has been suggested that pipi can live up to 10 years (Haddon, 1989). Post-recruitment mortality is known to be high in juveniles and appears to be related to extremely localised recruitment and high population densities on a small spatial scale (Cole et al., 2000).

3.0 Methods

The methods in the revised TPMP (Boffa Miskell Ltd, 2023b; Appendix 1) are based on those outlined in the original TPMP (Boffa Miskell Ltd, 2022), and by Fairlie et al. (2017) and Ross & Culliford (2018).

3.1 Intertidal surveys

The intertidal surveys in May 2024 were repeated across Grid 1 established as part of the original TPMP and used for the 2022, 2023, and March 2024 surveys (Figure 1). This grid was selected based on input from Tauranga Moana Iwi Customary Fisheries Trust (TMICFT) and following a pre-survey site examination by BML ecologists in 2022.

The layout of the entire survey intertidal and subtidal design comprises three grids and four transects. Grid 1 covers approximately 81,000 m^2 and is divided into 9 subgrids (A – I; Figure 1). Grids 2 and 3 and transect D (in yellow) were sampled for the first time in 2023. Each of the nine subgrids are further divided into 12 areas (A1 – A12; Figure 2). Figure 2 shows the grid partitioned into nine subgrids, each containing 12 areas and with sediment cores collected in pairs from five randomly selected areas within each subgrid.

Intertidal pipi sampling consisted of the collection of ten 10 cm diameter x 15 cm deep sediment cores from each of the nine subgrids. Sediment cores were collected in pairs adjacent to one another[1] from five randomly selected areas within each subgrid (Figure 2).

The excavated sediment was sieved (4 mm mesh) on site and any pipi retained were counted and measured to the nearest mm along the longest axis of the shell before being returned to the seabed.

Where pipi larger than 50 mm were found, they were held on ice and combined into one composite pipi flesh sample[2] used for laboratory analyses of tissue concentrations of heavy metals Polycyclic aromatic hydrocarbons (PAHs) and Polychlorinated biphenyls (PCBs).

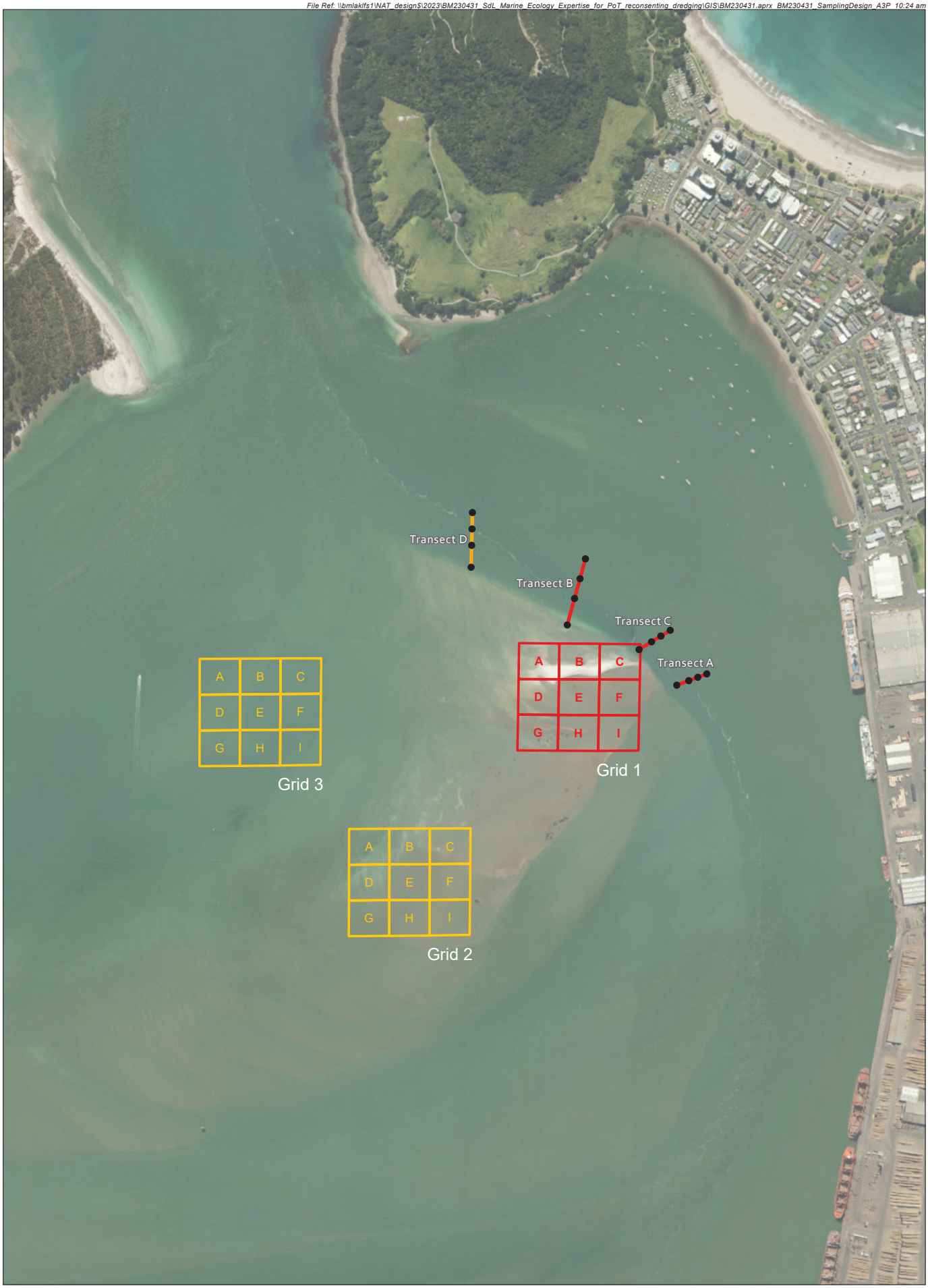
One composite surface sediment sample (top 2-3 cm) was also collected from each of three sets of adjacent subgrids (A-B-C, D-E-H and G-H-I) for laboratory analyses of sediment contamination by heavy metals and polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

In addition, one surface sediment sample (top 2-3cm) was collected from each subgrid (A-I) for laboratory analyses of sediment grain size. This method differs slightly to 2023 when one composite sample was collected from three subsets of adjacent subgrids (A-B-C, D-E-H and G-H-I). The reason for collecting sediment samples from each subgrid was to have more sample power to better assess how variations in the abundance and size of pipi are related to changes in sediment grain size.

Table 1 provides a summary of the measures collected at grids and transects.

[1] Berkenbusch et al. (2022)

[2] 30 g of pipi flesh per sample



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DRAFT

Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Grids
- Existing
- Expansion

Transects
- Existing
- Expansion

TE PARITAHA PIPI MONITORING

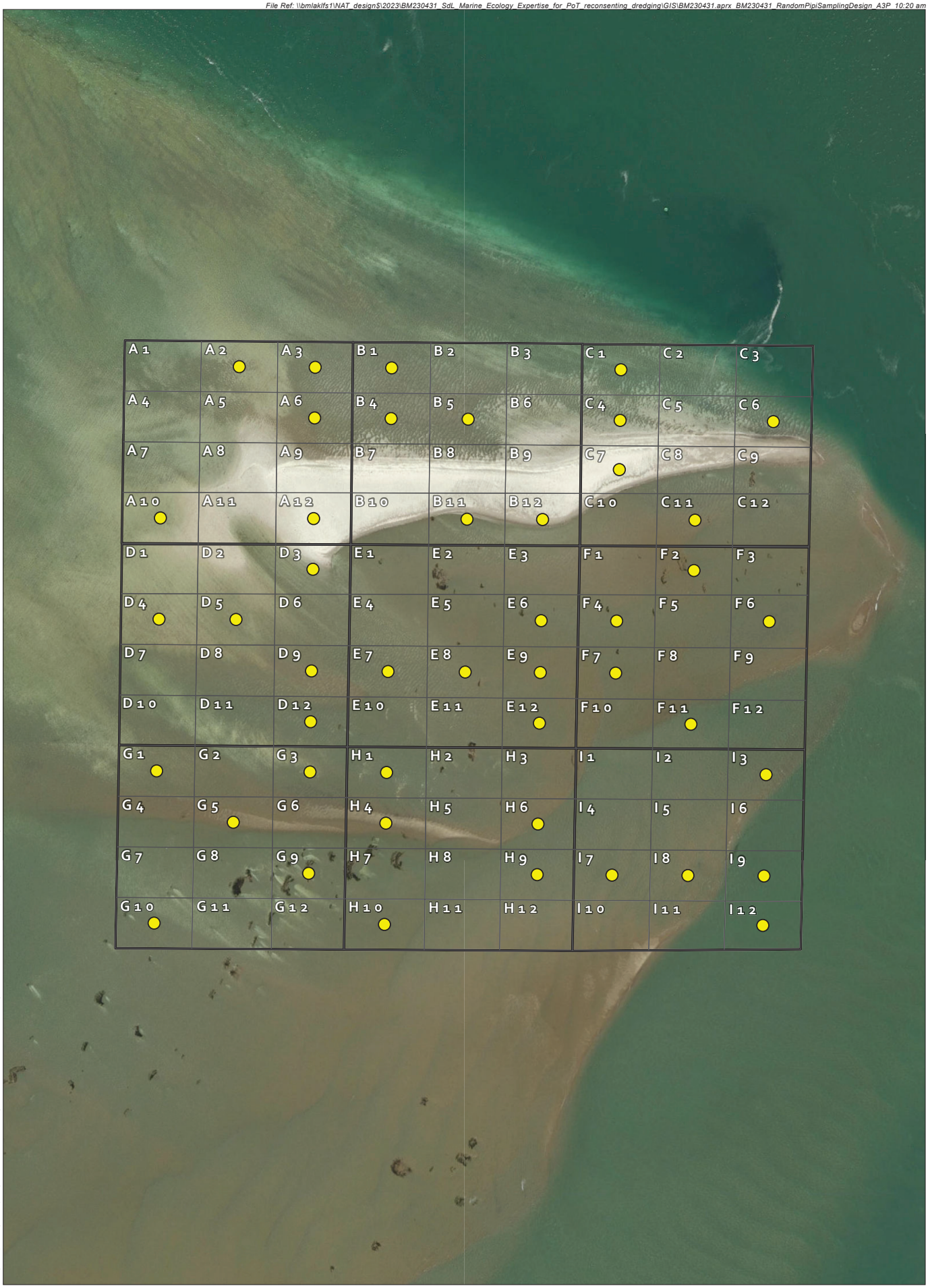
Survey Design

Date: 23 February 2024 | Revision: B

Plan prepared by Boffa Miskell Limited

Project Manager [redacted] | Drawn: JWa | Checked: TKe

Figure 1



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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Sediment Core Sampling Point

TE PARITAHA PIPI MONITORING

Randomised Pipi Sampling Design

Date: 23 February 2024 | Revision: 0

Plan prepared by Boffa Miskell Limited

Project Manager [redacted] Drawn: JWa | Checked: SDe

Figure 2

Table 1. Sampling effort/type collected during the May 2024 surveys.

	Pipi abundance and size (cores)	Sediment grain size samples	Sediment contaminant samples	Pipi flesh contaminant samples
Grid 1 (intertidal)	90	9	3	1
Grid 2	90	9	3	2
Grid 3	90	9	3	3
Transect A	40	2	1	Composite of A,C,D
Transect B	40	2	1	1
Transect C	40	2	1	Composite of A,C,D
Transect D	40	2	1	Composite of A,C,D

3.2 Subtidal surveys

3.2.1 Grid surveys

The subtidal surveys in May 2024 were repeated across the two subtidal sampling grids (Grid 2 and Grid 3) established in 2023. Grid 2 is located in the southern half of Te Paritaha (Figure 1), while Grid 3 is situated in the channel to the west of Te Paritaha (Figure 1), where large aggregations of adult pipi have previously been identified (Gouk, 2001; Hull, 1996). Grid 2 and Grid 3 cover approximately 81,000 m^2 each and are divided into 9 subgrids (A – I; Figure 1). Each of the nine subgrids is further divided into 12 areas (A1 – A12; Figure 2).

Both at Grid 2 and 3:

- Ten 10 cm diameter x 15 cm deep sediment cores were collected from each of the 9 subgrids (A – I), with the cores divided into five pairs[3] and allocated to five randomly selected points within each subgrid (Figure 2). The excavated sediment was sieved (4 mm mesh) on site. Pipi retained in the sieve were counted and measured to the nearest millimetre along the longest axis of the shell before being returned to the seabed.
- One composite surface sediment sample (top 2-3 cm) was collected from each of three sets of adjacent subgrids (A-B-C, D-E-H and G-H-I) for laboratory analyses of sediment contamination by heavy metals PAHs and PCBs.
- One surface sediment sample (top 2-3 cm) was collected from each of the nine subgrids (A-I) for laboratory analysis of sediment grain size.
- Composite pipi flesh samples[3] were collected for laboratory analyses of tissue concentrations of heavy metals and Polychlorinated biphenyls (PCBs). The number of pipi flesh samples varied depending on the availability of large pipi (> 50 mm).

[3] Berkenbusch et al. (2022)

Table 1 above provides a summary of the measures collected at Grid 2 and 3.

3.2.2 Transect surveys

Subtidal surveys were repeated along the same four transects established on the north-east edge of Te Paritaha by Ross and Culliford in 2015 (Transects A, B, C; Ross & Culliford, 2018) and by BML in 2023 (Transect D; Boffa Miskell Ltd, 2023b, 2024).The four transects extend from the upper intertidal slope to the bottom of Cutter Channel at a depth of approximately 15 m. Along each transect there are four sampling stations at 2m, 5m, 10m and 15m depth (Figure 1).

Along all subtidal transects:

- Ten 10 cm diameter x 15 cm deep sediment cores were collected at each station. The excavated sediment was sieved (4 mm mesh) on site. Pipi retained in the sieve were counted and measured to the nearest millimetre along the longest axis of the shell before being returned to the seabed.
- Two surface sediment samples (top 2-3 cm) were collected for laboratory analyses of sediment grain size composition. Samples from two sets of contiguous stations (2m-5m and 10m-15m) were combined into a single composite sample.
- One composite surface sediment sample (top 2-3 cm) was collected combining sediment from all stations per transect and used for laboratory analyses of sediment concentrations of heavy metals and polycyclic aromatic hydrocarbons (PAHs).

One composite pipi flesh sample[4] was collected combining animals from all stations (if large pipi, > 50 mm, were present) and used for laboratory analyses of tissue concentrations of heavy metals, organochlorines, PAHs and PCBs.

Table 1 at provides a summary of the measures collected along the four transects.

3.3 Mussel surveys

The outside perimeters of each of the subgrids within Grids 2 and 3 were expanded by an extra grid in all directions to provide a larger sampling frame for carrying out mussel bed surveys after the presence of mussels was opportunistically recorded during the 2023 pipi surveys (Figure 3). A total of 50 grid sites (c. 81,000 m^2 for the original grid area, plus 144,000 m^2 for the expanded grid area per expanded grid of 225,000 m^2) were surveyed to assess the presence of mussel beds. Where mussel beds greater than 2 m x 2 m were found, a modified rapid assessment of approximate mussel bed size, mussel density and length were carried out using a method developed for use in low to moderate subtidal currents.

3.3.1 Mussel bed size

For each mussel bed, a transect line was deployed along the main axis (Y) between the up-current edge and the downstream end of the bed. At random distances along the Y axis, a series of X axis measurements were taken perpendicular to the Y axis and averaged to calculate the width of the bed. X and Y were then multiplied to provide an estimate of the size of the bed.

[4] 30 g of pipi flesh per sample

3.3.2 Mussel density

Three 25 cm x 25 cm quadrats were randomly placed within each mussel bed. Mussel density was estimated by counting all mussels in each quadrat, averaging the measures from the three quadrats and multiplying by 16 to obtain a per m^2 estimate.

3.3.3 Mussel length

In each of the quadrats sampled within each mussel bed, five mussels were randomly selected and measured along the longest axis of the shell.

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DRAFT

LEGEND

Mussel Grid Expansion

Pipi Sampling Grids

Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

TE PARITAHA PIPI MONITORING

Survey Design - Mussels

Date: 29 May 2024 | Revision: 0

Plan prepared by Boffa Miskell Limited

Project Manager: [redacted] Drawn: JWa | Checked: TKe

Figure 3

4.0 Results

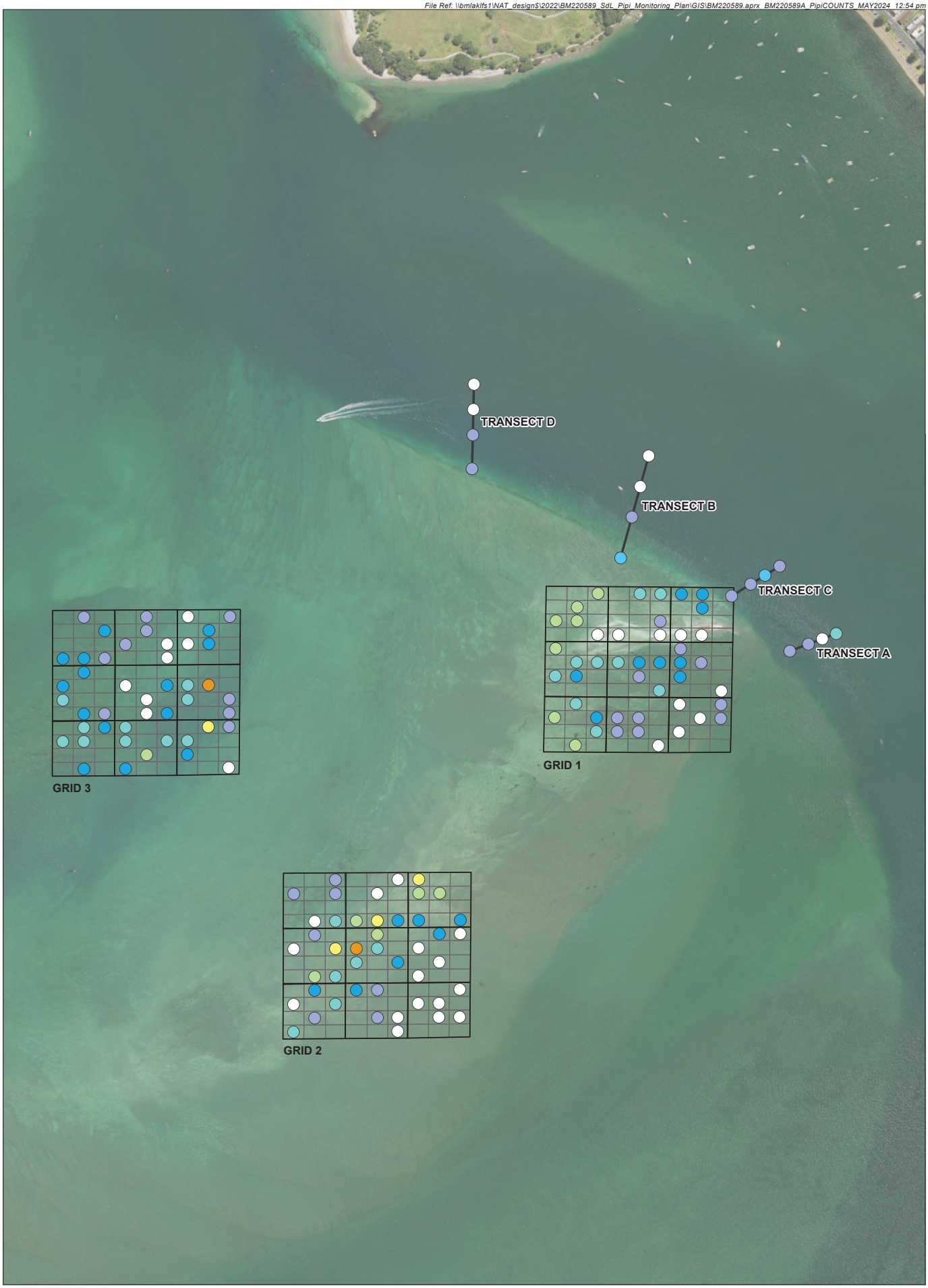
4.1 Pipi abundance and size

In May 2024, Grid 1, 2 and 3 all had similar abundances of pipi, while pipi were less abundant along the subtidal transects, with very few found at Transect B and D (Table 2, Figure 4). Spatial variability across Grid 1 consisted of lower abundances in the south-eastern corner and higher abundances along the western margin (Figure 4).

On average, larger pipi were found at Grid 3 along the western margin and along subtidal transect D (Table 2, Figure 5). These results are similar to that observed in 2023 and is explained in further detail in the following sections.

Table 2. Pipi abundance and size across all grids and transects in May 2024.

	Sampled individuals	**Estimated Density**	**Shell length**		
	Total number across all sampling points	**Mean number per m^2 (± SE)**	**Mean (mm)**	**Mode (mm)**	**Range (mm)**
Grid 1 (intertidal)	1808	2558 (± 390)	23.7	25	5-66
Grid 2	2002	2832 (± 561)	27.6	29	9-60
Grid 3	1732	2450 (± 399)	36.4	30	12-70
Transect A	381	1213 (± 365)	24.2	24	16-50
Transect B	167	532 (± 152)	40.2	30	17-67
Transect C	216	688 (± 149)	25.6	25	14-57
Transect D	5	16 (± 7)	55.2	52	50-67



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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Count of Pipi per Core (0.0079 sqM)

0 | >0 to 10 | >10 to 25 | >25 to 50 | >50 to 75 | >75 to 100 | >100 to 150

2024 PIPI MONITORING

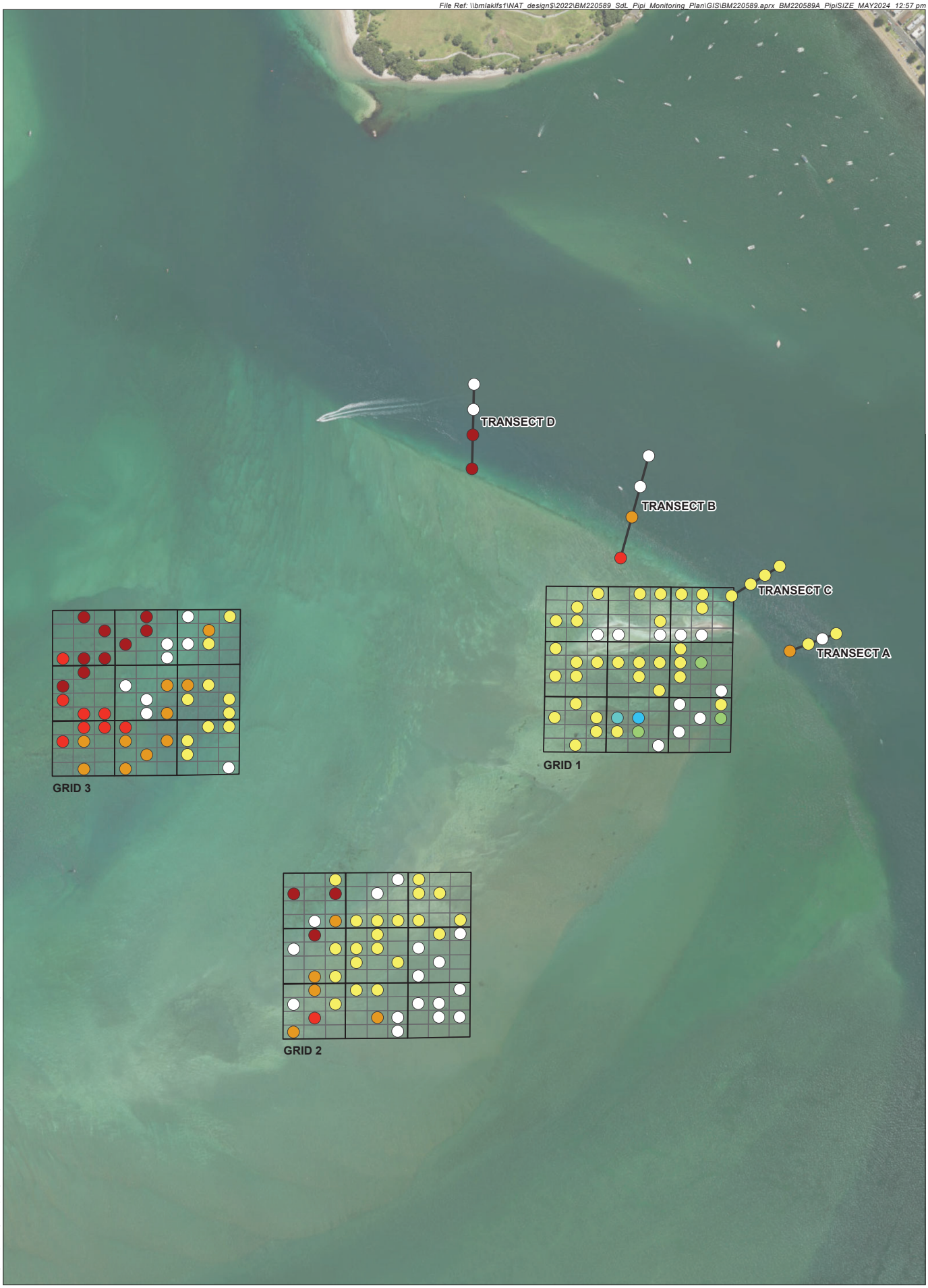
Number of Pipi – May 2024

Date: 24 June 2024 | Revision: 0

Plan prepared by Boffa Miskell Limited

Project [redacted] | Drawn: HCo | Checked: TKe

Figure 4



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0 200 m

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Data Sources: Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

Size (mm)

no pipi | >0 to 5 | >5 to 10 | >10 to 15 | >15 to 20 | >20 to 30 | >30 to 40 | >40 to 50 | >50

2024 PIPI MONITORING

Size of Pipi – May 2024

Date: 24 June 2024 | Revision: 0

Plan prepared by Boffa Miskell Limited

Project Manager: [redacted] | HCo | Checked: TKe

Figure 5

4.2 Intertidal pipi

The total number of pipi in the 90 cores collected across Grid 1 in May 2024 was 1808, lower than March 2024 and November 2023 (2886 and 4848 pipi were recorded, respectively), but higher than in October 2022 (547 pipi were recorded). The estimated average density of pipi in May 2024 was 2558 individuals per m^2 (Table 3). The southeastern corner of Grid 1 contained low abundances of pipi which is consistent with March 2024 findings (Figure 4).

The average pipi shell length in May 2024 was 23.7 mm across a range of 5 to 66 mm. The vast majority of the pipi (88.9%) were juveniles (20-40 mm), 10.7% were recruits (<20 mm), and less than 1% were adults (>40 mm; Table 3). Larger pipi were found along the western margin of Grid 1 and smaller pipi to the east (Figure 5).

The May 2024 data confirm the shift to a population increasingly dominated by mid-size, juvenile individuals (20-40 mm), which began in 2023 and was very evident in March 2024 (Table 3). A progression towards slightly larger sizes can be noticed when comparing the March and May 2024 size frequency distributions, but because of the close proximity of the two sampling events (i.e., only two months apart), there is little separation between the two distributions (Figure 6).

Table 3: Pipi abundance and size at Grid 1 in 2022, 2023 and 2024 (March and May). n = number of individuals.

GRID 1	Sampled individuals	Estimated Density	Shell length			Size classes		
	Total number across 90 cores	Mean number per m^2 (± SE)	Mean (mm)	Mode (mm)	Range (mm)	% Recruits (<20 mm)	% Juveniles (20-40 mm)	% Adults (>40 mm)
2024 (May)	1808	2558 (± 390)	23.7	25	5-66	10.7% (n = 193)	88.9% (n = 1608)	0.4% (n = 7)
2024 (March)	2886	4083 (± 557)	21.5	22	5-49	24.5% (n = 707)	75.4% (n = 2177)	0.1% (n = 2)
2023 (November)	4848	6859 (± 753)	17.1	20	5-57	69.6% (n = 3375)	30.3% (n = 1466)	0.1% (n = 7)
2022 (October)	547	774 (± 104)	14.3	13	5-61	91% (n = 498)	7.7% (n = 42)	1.3% (n = 7)

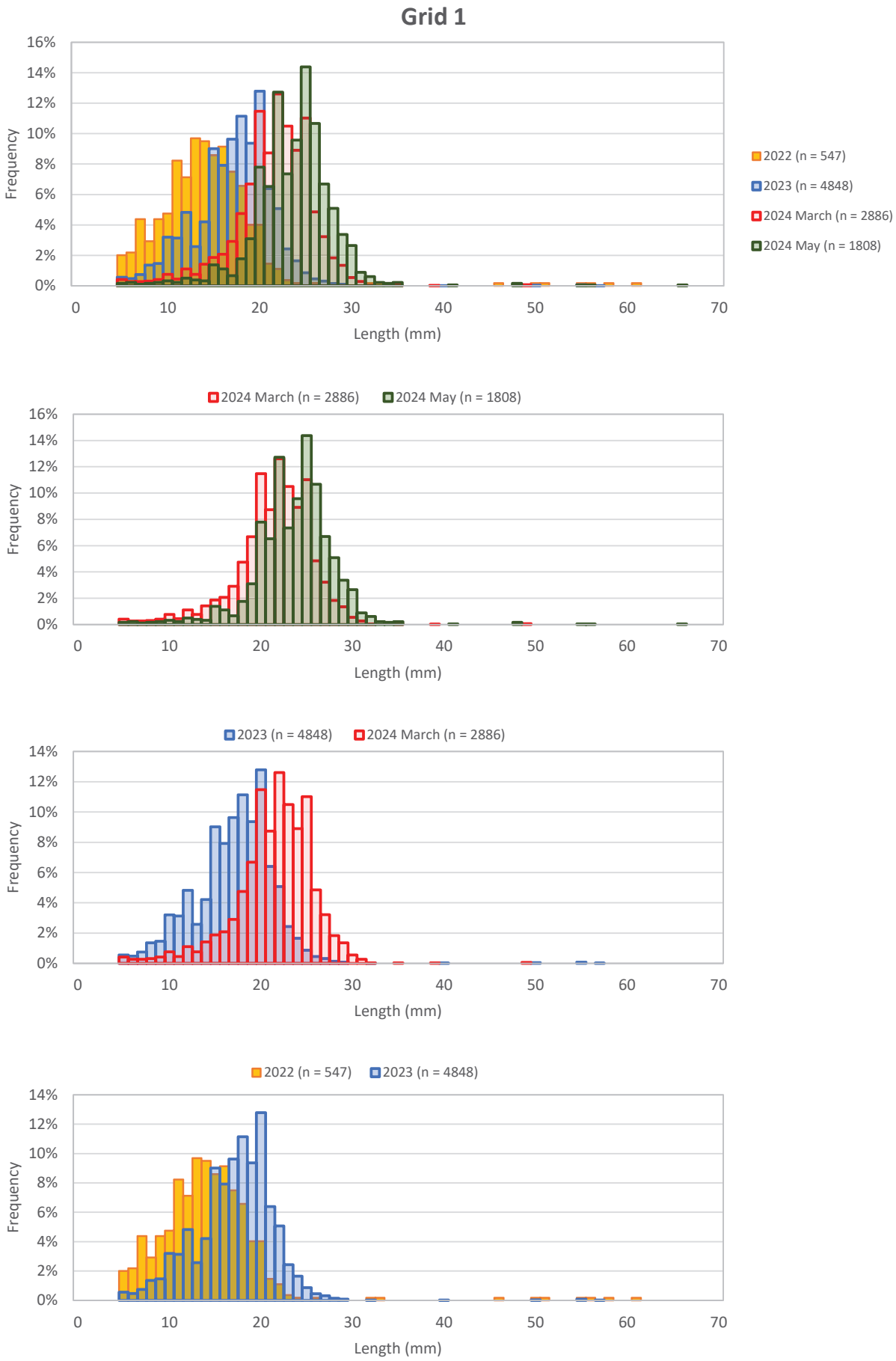

Figure 6: Length-frequency distribution of pipi at Grid 1 in 2022, 2023 and 2024 (March and May). n = number of individuals. For easiness of interpretation, separate comparisons are provided for pairs of consecutive sampling events.

We compared the pipi abundance data collected from Grid 1 in 2022, 2023 and 2024 (in March and May) with the values recorded as part of the previous intertidal surveys by Fairlie et al. (2017). For this comparison in Table 4 we partitioned our data into the size classes used by Fairlie et al. (2017).

The comparison shows that there was a large decline in the abundance of adult pipi (>30 mm shell length) between 2016 and 2022, and that adult numbers in 2023 and 2024 have not returned to the levels recorded in 2016 (Table 4). The 2015-2016 data in the study of Fairlie et al. show that the number of adult pipi remained stable during the completion of the Capital Dredging Programme. On the other hand, we have found few adult pipi from 2022 onwards. The 2024 data show abundance of adult pipi higher than in 2023 and 2022 but still well below those recorded by Fairlie et al. (Table 4).

Despite the decline in juveniles in May 2024 compared to November 2023 and March 2024, the May 2024 abundance of intertidal juvenile pipi (up to 30 mm shell length) continued to be higher than those recorded in the pre-2015 capital dredging surveys(Fairlie et al., 2017) (Table 4).

Table 4. Estimates of mean pipi density per m^2 recorded by Boffa Miskell at Grid 1 in 2022, 2023 and 2024 (March and May), and by Fairlie et al. (2017) between 2013 and 2016 from one site located approximately in the same area. The estimates from Fairlie et al. (2017) are approximations based on visual inspections of graphed data.

	Fairlie et al. 2017 – Site A				**Boffa Miskell – Grid 1**			
	Pre 2015 capital dredging			**Post 2015 capital dredging**				
	Sept 2013	**Mar 2015**	**Sept 2015**	**Sept 2016**	**Oct 2022**	**Nov 2023**	**March 2024**	**May 2024**
Juveniles (up to 30 mm)	377	301	301	8287	799	6846	4065	2494
Adults (31-50 mm)	1130	452	377	226	6	6	18	60
Harvestable Adults (>50 mm)	188	151	75	151	7	7	0	4
All pipi	**1695**	**904**	**753**	**8664**	**774**	**6859**	**4083**	**2558**

4.3 Subtidal pipi

4.3.1 Grid 2

The total number of pipi in the 90 cores collected across Grid 2 in May 2024 was 2002, up from 92 in March 2024 and similar to the 1839 individuals total recorded six months earlier in November 2023. The estimated average density of pipi in May 2024 was 2832 individuals per m^2 (Table 5). The south-eastern corner contained low pipi abundances which is consistent with March 2024 findings (Figure 4).

The average size of pipi in May 2024 was 27.6 mm within a range of 9 to 60 mm. The vast majority of the pipi (93.2%) were juveniles (20-40 mm), 6.2% were recruits (<20 mm), and less than 1% were adults (>40 mm; Table 5). Larger pipi were located in the centre of Grid 2 and smaller pipi to the north-west.

Following a shift to a population with low pipi densities and a bimodal size structure in March 2024, with a cohort of juveniles (20-40 mm) and one of adults (>40 mm), the May 2024 data show a return to a more numerous population with unimodal size structure dominated by juveniles (while recruits were the dominant size class six earlier in November 2023; Table 5, Figure 7). The size of the adult cohort in May 2024 was the smallest recorded across the three sampling events (Table 5).

Table 5. Pipi density and size at Grid 2 in 2023 and 2024 (March and May). n = number of individuals.

GRID 2	Sampled individuals	Estimated Density	Shell length			Size classes		
	Total number across 90 cores	Mean number per m^2 (± SE)	Mean (mm)	Mode (mm)	Range (mm)	% Recruits (<20 mm)	% Juveniles (20-40 mm)	% Adults (>40 mm)
2024 (May)	2002	2832(± 561)	27.6	29	9-60	6.2% (n = 124)	93.2% (n = 1866)	0.6% (n = 12)
2024 (March)	92	130(± 50)	39.8	56	21–66	0% (n = 0)	58.7% (n = 54)	41.3% (n = 38)
2023	1839	2602 (± 491)	17.3	16	6-66	80.8% (n = 1487)	16.4% (n = 301)	2.8% (n = 51)

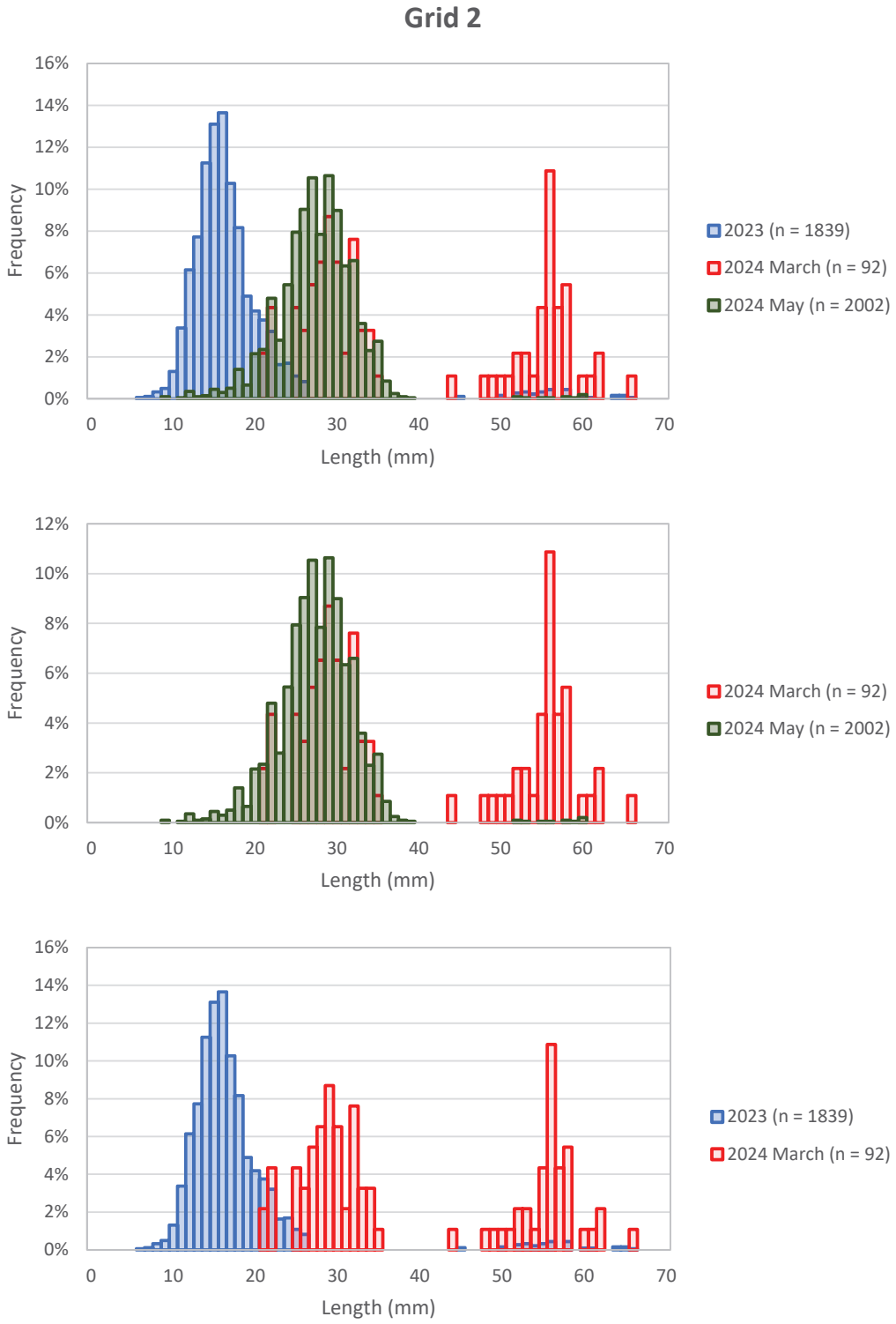

Figure 7: Length-frequency distribution of pipi at Grid 2 in 2022, 2023, and 2024 (March and May). For easiness of interpretation, separate comparisons are provided for pairs of consecutive sampling events.

We compared the pipi abundance data collected from Grid 2 in 2023 and 2024 2024 (in March and May) with the values recorded as part of previous surveys by Fairlie et al. (2017). For this comparison in Table 6 we partitioned our data into the size classes used by Fairlie et al. (2017).

The comparison between Grid 2 and one of the two sites of Fairlie et al. (2017) located in a similar area (Site B) shows that that there was a large decline in the abundance of adult pipi (>30 mm shell length) between 2016 and 2023. Numbers of adults in the 31-50 mm size range have since trended up and in May 2024 were back in line with the abundances observed by Fairlie et al. (2017). However, adults larger than 50 mm were still significantly less abundant than in the period 2013-2016 (Table 6A).

At another site sampled by Fairlie et al. approximately in the same area as our Grid 2 (Site C), the number of adult pipi had already declined during the completion of the Capital Dredging Programme between 2015 and 2016. The May 2024 data show a spike in the abundance of adult pipi in the 31-50 mm size range, which reached the highest level ever recorded at Site C / Grid 2. However, the number of adults larger than 50 mm in May 2024 was the lowest among those recorded at Site C / Grid 2 starting from 2013 (Table 6B).

Table 6. Estimates of pipi mean density per m^2 recorded by Boffa Miskell at Grid 2 in 2023 and 2024 (March and May) and by Fairlie et al. (2017) between 2013 and 2016 from two sites located approximately in the same area. The estimates from Fairlie et al. (2017) are approximations based on visual inspections of graphed data.

A	**Fairlie et al. 2017 – Site B**				**Boffa Miskell – Grid 2**		
	Pre 2015 capital dredging			**Post 2015 capital dredging**			
	Sept 2013	**Mar 2015**	**Sept 2015**	**Sept 2016**	**Nov 2023**	**March 2024**	**May 2024**
Juveniles (up to 30 mm)	136	15	4	60	2530	54	2169
Adults (31-50 mm)	889	362	550	527	7	28	646
Harvestable Adults (>50 mm)	964	512	301	347	65	48	17
All pipi	**1989**	**889**	**855**	**934**	**2602**	**130**	**2832**

B	**Fairlie et al. 2017 – Site C**				**Boffa Miskell – Grid 2**		
	Pre 2015 capital dredging			**Post 2015 capital dredging**			
	Sept 2013	**Mar 2015**	**Sept 2015**	**Sept 2016**	**Nov 2023**	**March 2024**	**May 2024**
Juvenile (up to 30 mm)	8	1	0	0	2530	54	2169
Adults (31-50 mm)	301	23	60	4	7	28	646
Harvestable Adults (>50 mm)	535	241	154	38	65	48	17
All pipi	**844**	**265**	**214**	**41**	**2602**	**130**	**2832**

4.3.2 Grid 3

The total number of pipi recorded in the 90 cores across Grid 3 in May 2024 was 1732, up from 1397 in March 2024 and down from 2194 in November 2023.The estimated average density of pipi was 2455 individuals per m^2 in May 2024 (Table 7). Higher abundances of pipi were found along the southern margin of Grid 3 (Figure 4).

The average size of pipi in May 2024 was 36.5 mm across a range of 12 to 70 mm. Among the sampled individuals, 70.3% were juveniles (20-40 mm), 27.3% were adults (>40 mm), and 2.4% were recruits (<20 mm; Table 7). Larger pipi were found in the north-western corner of Grid 3 and smaller pipi to the north-east (Figure 5).

The May 2024 length-frequency data continue to show a bimodal population size structure, with the population dominated by juveniles (20-40 mm) and an increasing cohort of adults (>40 mm) when compared to March 2024 (Table 7, Figure 8).

Table 7. Pipi density and size at Grid 3 in 2023 and 2024. n = number of individuals.

GRID 3	Sampled individuals	Estimated Density	Shell length			Size classes		
	Total number across 90 cores	Mean number per m^2 (± SE)	Mean (mm)	Mode (mm)	Range (mm)	% Recruits (<20 mm)	% Juveniles (20-40 mm)	% Adults (>40 mm)
2024 (May)	1732	2455(± 399)	36.4	30	12-70	2.4% (n = 41)	70.3% (n = 1218)	27.3% (n = 473)
2024 (March)	1397	1976(± 344)	30.0	28	11-65	2.8% (n = 39)	89.4% (n = 1249)	7.8% (n = 109)
2023	2194	3104 (± 438)	29.8	15	5-70	64.6% (n = 1418)	11.3% (n = 248)	24.1% (n = 528)

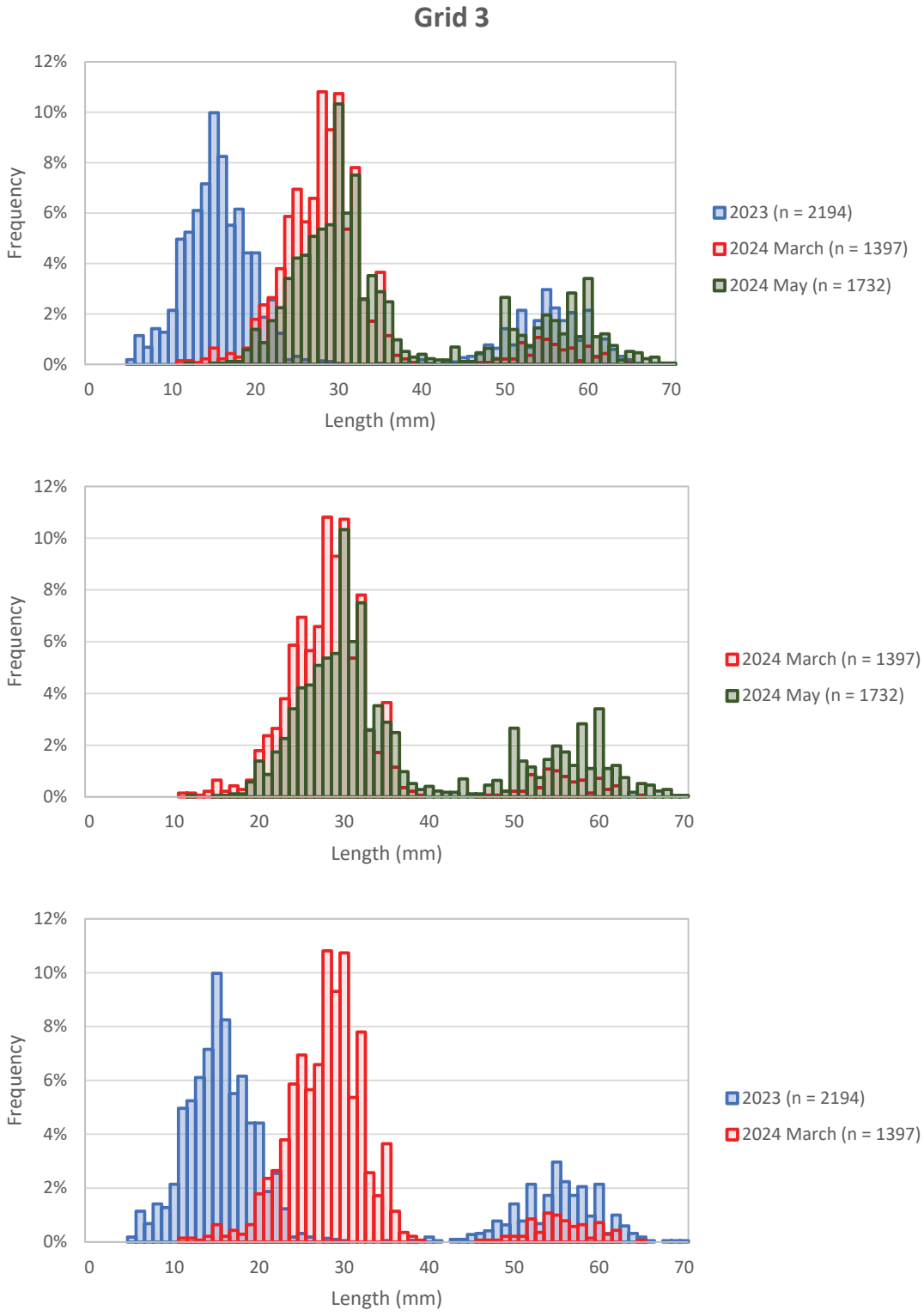

Figure 8. Length-frequency distribution of pipi at Grid 3 in 2022, 2023, and 2024 (March and May). For easiness of interpretation, separate comparisons are provided for pairs of consecutive sampling events.

4.3.3 Transects A, B, C, D

The total number of pipi in the 160 cores collected across the four subtidal transects was 769 in May 2024, down from 1515 and 7386 in March 2024 and November 2023, respectively. The estimated average density of pipi was 612 individuals per m^2 in May 2024 (Table 8).

When pooling the data across the four transects, the deepest station (15 m) had the highest numbers of pipi (Table 9). However, large numbers of pipi at 15 m were only present at Transect A. Along transect B, pipi were more numerous at 2 m, and along transect C at 10 m. There were very few pipi at Transect D (see Figure 4).The highest overall number, (381, equal to 1213 per m^2) was recorded along Transect A and the lowest (5, equal to 16 per m^2) along Transect D (see Figure 4).

The average size of pipi across the four transects was 28.3 mm, with sizes ranging between 14 to 67 mm (Table 8). Over 80% of pipi were juveniles (20-40 mm), 6% were recruits (<20 mm) and 11% were adults (>40 mm). The size of pipi tended to decline with increasing depth (Table 9). The size of pipi was also variable across transects. Transect D had the largest average size (55.2 mm, based on only five pipi) and transect A and C the smallest (24 and 25 mm, respectively; see Figure 5).

The May 2024 data confirm the shift to a population increasingly dominated by mid-size, juvenile individuals (20-40 mm), which was already evident in March 2024 (Table 8). A progression towards slightly larger sizes can be noticed when comparing the March and May 2024 size frequency distributions, but because of the close proximity of the two sampling events (i.e., only two months apart), there is little separation between the two distributions (Figure 9). The size of the adult cohort in May 2024 was the smallest recorded across the three sampling events (Table 8).

Table 8. Pipi density and size across the transects sampled along the north-east edge of Te Paritaha in 2022, 2023 and 2024 (March and May). n = number of individuals.

TRANSECTS	Sampled individuals	Estimated Density	Shell length			Size classes		
	Total number	Mean number per m^2 (± SE)	Mean (mm)	Mode (mm)	Range (mm)	% Recruits (<20 mm)	% Juveniles (20-40 mm)	% Adults (>40 mm)
2024* (May)	769	612 (± 35)	28.3	25	14-67	6.1% (n = 47)	83.1% (n = 639)	10.8% (n = 83)
2024* (March)	1515	1206 (± 64)	28.3	25	5-65	11% (n = 168)	73% (n = 1109)	16% (n = 238)
2023*	7386	5878 (± 227)	15.4	14	5-70	91.7% (n = 6777)	5.1% (n = 375)	3.2% (n = 234)
2022**	280	297 (± 48)	50.8	51	14-61	0.7% (n = 2)	3.2% (n = 9)	96.1% (n = 269)

*Transects A, B, C, D.
**Transects A, B, C.

Table 9. Pipi density and size at increasing depths across the four transects sampled along the north-east edge of Te Paritaha in May 2024.

TRANSECTS	Sampled individuals	Estimated Density	Shell length			Size classes		
	Total number	Mean number per m^2 (± SE)	Mean (mm)	Mode (mm)	Range (mm)	% Recruits (<20 mm)	% Juveniles (20-40 mm)	% Adults (>40 mm)
All depths	**769**	**612 (± 35)**	**28.3**	**25**	**14-67**	6.1%	83.1%	10.8%
2 m	183	583 (± 141)	37.8	55	15-67	3.3%	56.8%	39.9%
5 m	53	169 (± 67)	30.8	32	17-67	9.4%	83%	7.6%
10 m	155	493 (± 157)	26.1	25	14-57	1.3%	95.5%	3.2%
15 m	378	1203 (± 365)	24.2	24	16-50	9%	90.7%	0.3%

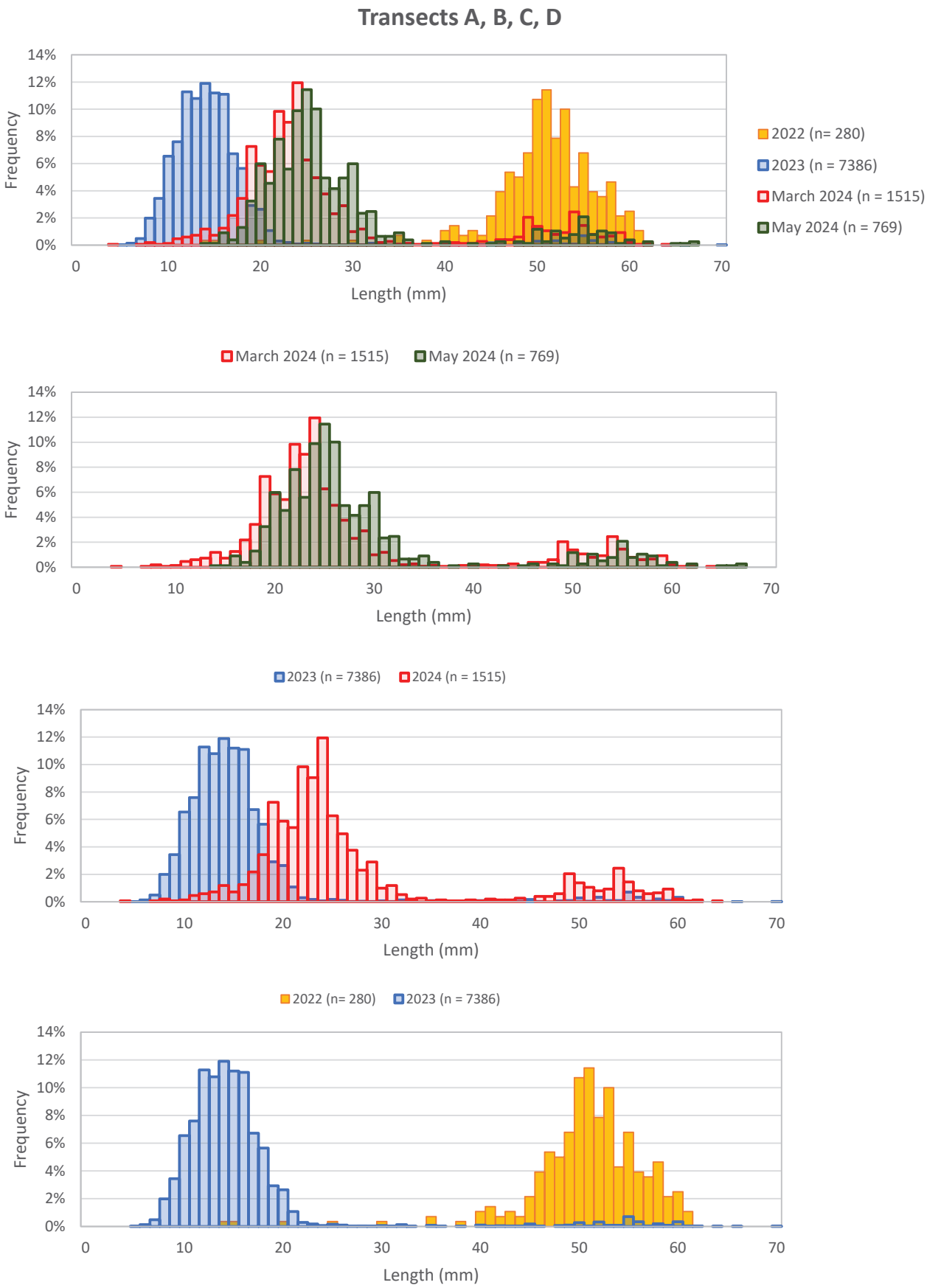

Figure 9: Length-frequency distribution of pipi along the four subtidal transects- in 2022, 2023 and 2024 (March and May). n = number of individuals. For easiness of interpretation, separate comparisons are provided for pairs of consecutive sampling events.

We compared the pipi abundance data collected in 2022, 2023 and 2024 with the values recorded as a part of previous surveys by Ross & Culliford (2018) along transects A, B and C. The 2015-2016 data in the study of Ross & Culliford show that number of adults (>40 mm) declined during the completion of the Capital Dredging Programme in 2016 but increased back to pre-dredging levels by 2017 (Table 10). However, we found the abundance of adult pipi to be below pre-dredging levels between 2022 and 2024, with the May 2024 estimate of number per m^2 being the lowest across the time series (Table 10). On the other hand, after an all-time high in March 2024, the abundance of juveniles (20-40 mm) in May 2024 continued to be high in comparison to previous sampling events (Table 10).

Table 10. Estimates of pipi mean density per m^2 recorded by Boffa Miskell in 2022, 2023 and 2024 (March and May), and by Ross & Culliford between 2015 and 2017 across the four sampled along the north-east edge of Te Paritaha. The estimates from Ross & Culliford (2018) are approximation based on visual inspections of graphed data.

	Ross & Culliford 2018				Boffa Miskell			
	Pre 2015 capital dredging	Post 2015 capital dredging						
	Sept 2015**	Sept 2016**	Mar 2017**	Dec 2017**	Oct 2022**	Nov 2023*	Mar 2024*	May 2024*
Recruits (< 20 mm)	0	255	5	32	2	5393	134	37
Juveniles (20-40 mm)	110	90	711	309	10	299	883	509
Adults (>40 mm)	673	300	529	780	285	186	189	66
All pipi	**783**	**645**	**1245**	**1121**	**297**	**5878**	**1206**	**612**

*Transects A, B, C, D.
**Transects A, B, C.

4.4 Sediment grain size[5]

In May 2024, a combination of medium-coarse sand (i.e., particles between 250 and 2000 µm) dominated Grid 1, Grid 2, Transect A and Transect C. At Grid 3, Transect B and D there was a higher proportion of gravel/shell material (i.e., coarse particles between larger than 2000 µm) dominating the sediment grain size profiles, a result similar to those results found in March 2024. The sediment continues to have very low content of fine sediment fractions (silt and clay; Figure 10) and similar levels of medium-coarse sand. Gravel/shell material has slightly increased compared to previous years.

[5] See Appendix 2 for the laboratory reports.

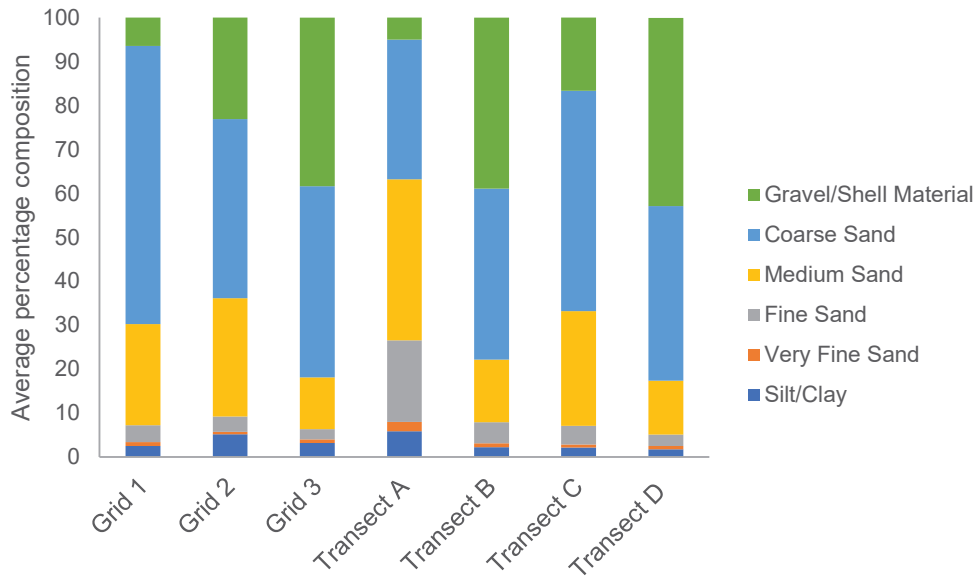

Figure 10. Sediment grain size composition across all grids and transects in May 2024. Mean values are calculated from three replicate samples for Grids 1, 2, 3 and from two samples for Transects A, B, C and D.

A comparison of the sediment grain size data collected from Grid 1 in 2022, 2023, March 2024 and May 2024 showed little change in the physical structure of the intertidal sediment, aside from a slight decrease in the content of gravel/shell material between March and May 2024 (Figure 11).

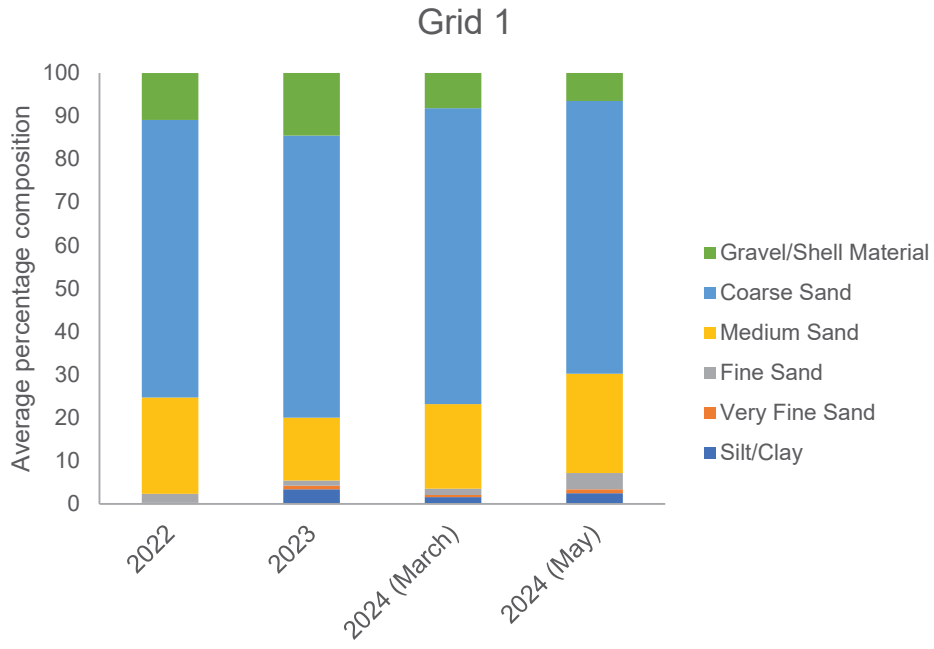

Figure 11. Sediment grain size composition at Grid 1 in 2022, 2023 and 2024.

Sediment grain size analyses at Grids 2 and 3 showed an increase in gravel/shell material between March and May 2024 (Figure 12 and 13). Grid 2 increased from 2.58% gravel/shell material to 23.08%. Similarly, Grid 3 saw an increase from 25% to 38%. Medium sand remains constant across monitoring rounds at both sites and silt/clay level are low. A slight decrease in coarse sand was observed between March and May at Grid 2 (Figure 12).

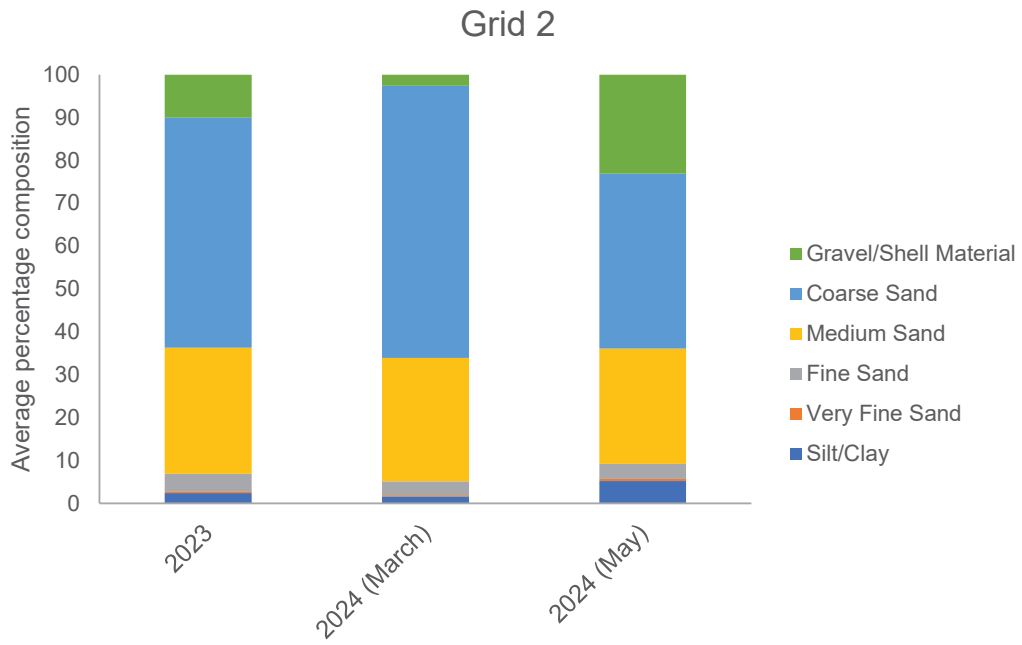

Figure 12. Sediment grain size composition at Grid 2 in 2023 and 2024.

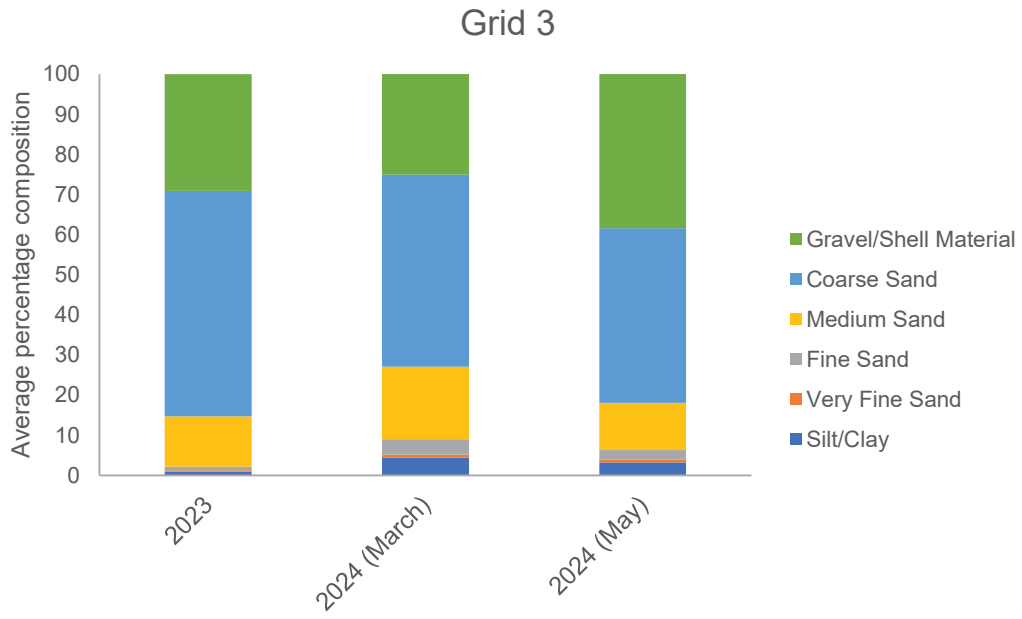

Figure 13. Sediment grain size composition at Grid 3 in 2023 and 2024.

Among the subtidal transects, Transect B saw an increase in the content of gravel/shell material between March and May 2024 (Figure 15). The remaining three transects (A, C and D) saw little change in the sediment grain size structure (Figure 14, 16 & 17).

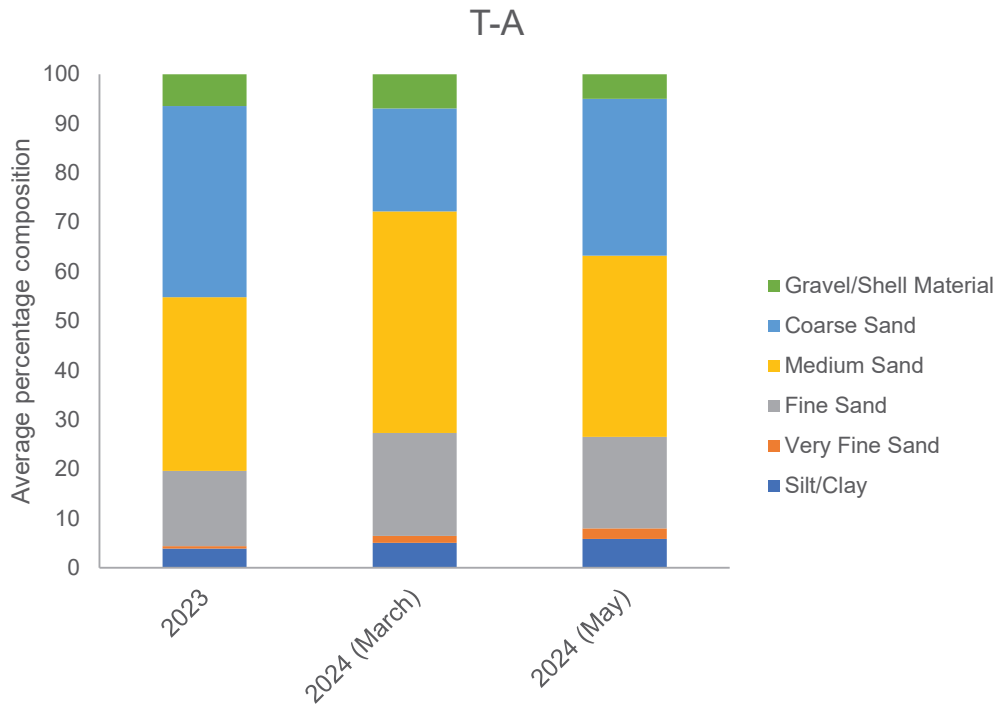

Figure 14. Sediment grain size composition at Transect A in 2023 and 2024.

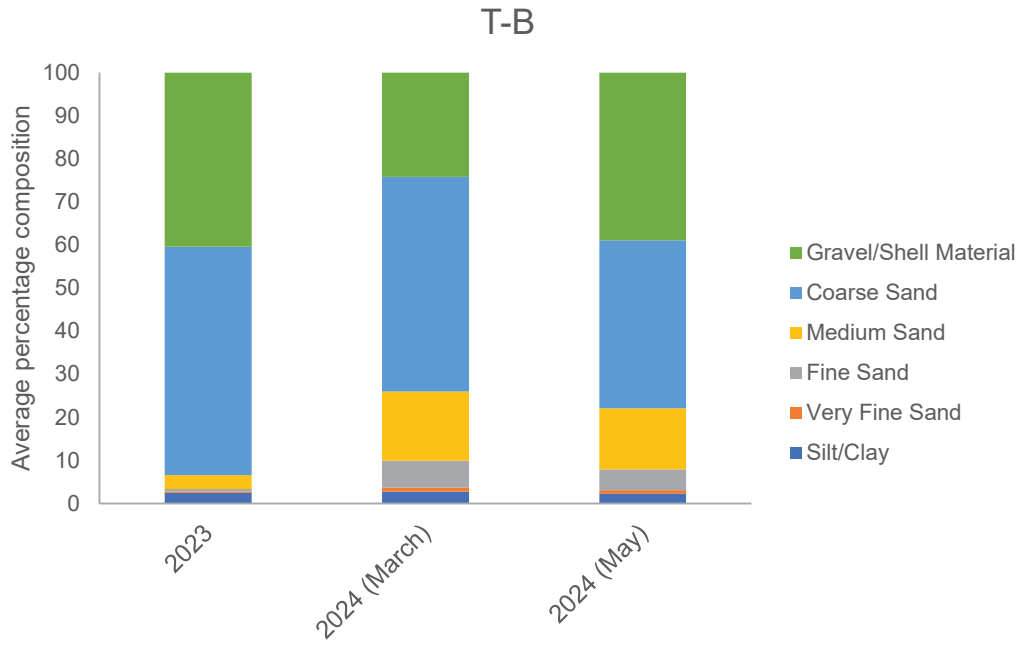

Figure 15. Sediment grain size composition at Transect B in 2023 and 2024.

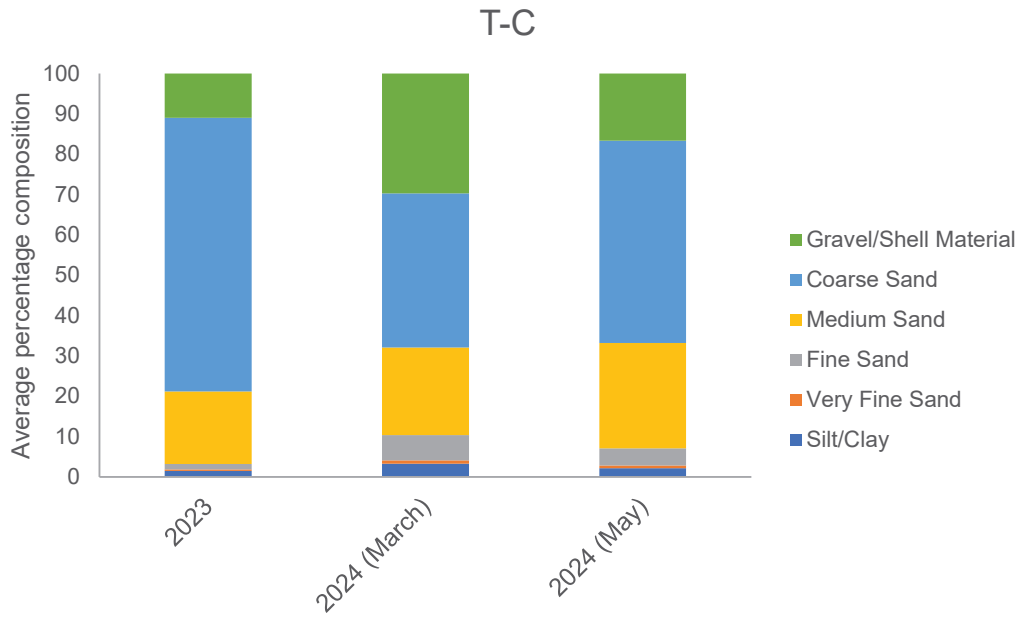

Figure 16. Sediment grain size composition at Transect C in 2023 and 2024.

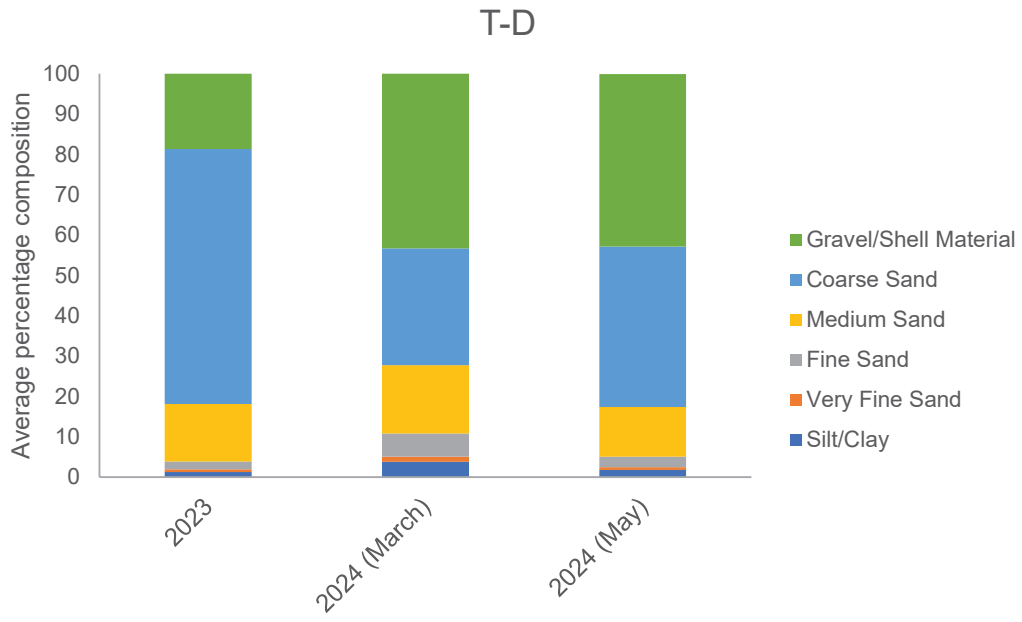

Figure 17. Sediment grain size composition at Transect D in 2023 and 2024.

We used linear regressions to test whether the abundance and size of pipi in May 2024 was related to the content of medium-coarse sand material, the most abundant sediment fraction within the study area in the latest sampling events (2022-2024). We found that variations in the proportion of medium-coarse sand did not explain differences in the total number of pipi ($p = 0.36$, $R^2 = 0.02$; Figure 18), while pipi tended to be smaller where medium-coarse sand was more abundant ($p = 0.02$; $R^2 = 0.14$; Figure 19).

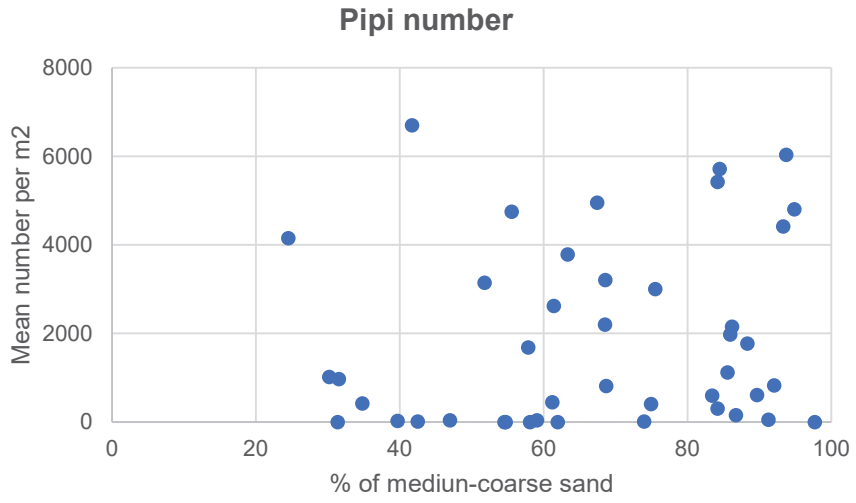

Figure 18. Relationship between the proportion of medium-coarse sand and the abundance of pipi across all grids and transects in May 2024.

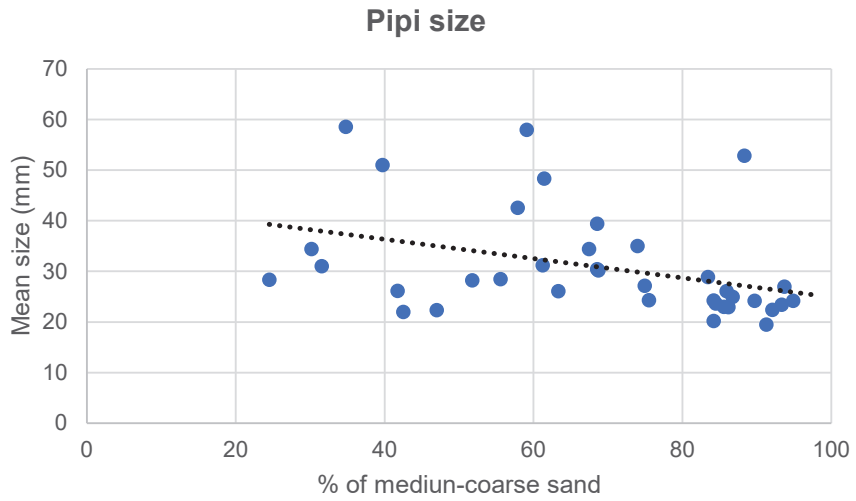

Figure 19. Relationship between the proportion of medium-coarse sand and the size of pipi across all grids and transects in May 2024.

4.5 Sediment contaminants[6]

Analyses of sediment contaminants showed that concentrations of copper, lead, and zinc and high molecular weight polyaromatic hydrocarbons (HMW PAHs) with the in the surface

[6] See Appendix 3 for the laboratory reports.

sediment were below default guideline values (DGV) of the Australian and New Zealand Governments[7] at all grids and transects (Table 11).

Table 11. Concentrations of sediment contaminants in the 13 composite sediment samples collected across all grids and transects. Default guideline values (DGV) are included in each panel. The concentration of high molecular weight polycyclic aromatic hydrocarbons (HMW PAHs) was normalised to 1% of the total content of organic carbon.

	Copper (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)	HMW PAHs (mg/kg, 1% TOC)
Grid/Transect	**DGV = 65**	**DGV = 50**	**DGV = 200**	**DGV = 10**
Grid 1 A-B-C	0.2	1.48	7.9	< 0.05
Grid 1 D-E-F	0.3	1.10	6.9	< 0.05
Grid 1 G-H-I	0.5	1.59	9.5	< 0.05
Grid 2 A-B-C	0.2	1.25	8.3	< 0.06
Grid 2 D-E-F	0.3	1.3	7.9	< 0.06
Grid 2 G-H-I	0.3	1.36	8.2	< 0.06
Grid 3 A-B-C	0.2	1.19	7.2	< 0.06
Grid 3 D-E-F	0.3	1.32	7.7	< 0.06
Grid 3 G-H-I	0.3	1.26	7.2	< 0.06
Transect A	0.4	1.59	9	< 0.06
Transect B	0.3	1.26	8.1	< 0.06
Transect C	0.2	1.38	7.8	< 0.06
Transect D	0.2	1.31	7.4	< 0.06

4.6 Pipi flesh contaminants[8]

Analyses of pipi flesh contaminants showed the concentrations of Arsenic above the default guideline values (DGV) of the Australia and New Zealand Food Standards code[9] across all grids and transects. However, the guideline value refers to inorganic arsenic which is comprises approximately 10% or less of total arsenic.

Concentrations of cadmium, lead, mercury, and PCBs accumulated within pipi were below the DGV (Table 12). The concentration of Polycyclic Aromatic Hydrocarbons (PAHs) was above laboratory detection limits[10] for most species of PAH. There is no DGV in the ANZFS for polycyclic aromatic hydrocarbons in food (ANZFC), however the concentration in pipi flesh in

[7] https://www.waterquality.gov.au/anz-guidelines

[8] See Appendix 3 for the laboratory reports.

[9] https://www.legislation.gov.au/F2015L00454/latest/text

[10] Where the laboratory result was below the laboratory detection limit(s), we have conservatively used half the detection limit as a positive result in our calculations.

May 2024 was below the sediment DGV and for most species of PAH was present in very low concentrations and below laboratory detection limits[11].

In March 2024, the concentration of PAHs in pipi flesh was below laboratory detection limits for pipi from all grids and transects, excluding transect D which had a concentration above detection limits[10] of 0.04 mg/kg and one PAH species in pipi from grid 3 A-C.

The likely source of the PAHs above laboratory detection limits in pipi flesh from all grids (excluding grid 1) and transects is the spill of diesel and heavier oil (estimated less than 100L) on 20/05/2024[12].

It will be important to test pipi for PAH contamination in the routine annual survey in November 2024 to see if pipi have depurated the low PAH concentrations.

Table 12. Concentrations of contaminants (mg/kg) accumulated within the pipi across all grids and transects where it was possible to collect 30 g of pipi flesh. Default guideline values (DGV) are included in each panel.

	Arsenic	Cadmium	Lead	Mercury	Polychlorinated biphenyls	Total Polycyclic Aromatic Hydrocarbons
Grid/Transect	**DGV = 1 (for inorganic arsenic)**	**DGV = 2**	**DGV = 2**	**DGV = 0.5**	**DGV = 0.5**	**No DGV value**
Grid 1	1.43	0.07	< 0.02	< 0.010	< 0.02	Insufficient sample to analyse
Grid 2 A-B-C	2.2	0.092	0.073	0.009	< 0.02	0.02
Grid 2 D-E-F & G-H-I	1.87	0.079	0.022	< 0.010	< 0.02	0.02
Grid 3 A-B-C	1.68	0.101	< 0.02	< 0.010	< 0.02	0.01
Grid 3 D-E-F	1.9	0.113	< 0.019	< 0.010	< 0.02	0.02
Grid 3 G-H-I	1.98	0.12	< 0.02	< 0.010	< 0.02	0.02
Transect A, C & D	1.83	0.117	< 0.02	< 0.010	< 0.02	0.01
Transect B	1.71	0.085	< 0.02	< 0.010	< 0.02	0.02

[11] Where the PAH concentration is reported by Hills as below the laboratory detection limit, we have conservatively used half the detection limit as a positive result.

[11] PAHs that were above the laboratory detection limit included benzo[a]anthracene, benzo[a]pyrene (BAP), benzo[b]fluoranthene + benzo[j]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene and pyrene.

[12] BOPRC staff undertook oil removal by bagging any noticeably impacted sand along the shoreline at Pilot Bay and conducting on-water recovery. Several potential sources were investigated, but the actual source has been identified (source Bay of Plenty Times, 20/05/2024).

4.7 Mussel bed surveys

Results for May 2024 mussel bed surveys consisted of occasional mussels present in subgrids A12, A2, D2, D4, D7, B7 and M10. However, at no sites did mussels constitute a mussel bed of >2 m^2, therefore, no mussel data were recorded.

5.0 Summary and Conclusions

Following high level of recruitment in 2023, the May 2024 results confirmed the patterns seen the previous March, with mid-size, juvenile individuals (20-40 mm) being the dominant size class across the study area.

After the record-high numbers of 2023, the decline in the abundance of pipi, which was already evident in March, continued in May 2024. This is not unexpected because pipi are known to suffer from high post-settlement mortality like many other species of bivalves (Cole et al., 2000). However, there were also declining abundances of adults (> 40 mm) at Grid 2 and along the subtidal transects. In addition to extensive juvenile mortality, the elevated mobility of pipi may have also contributed to declining abundances (Hooker 1995 a,b).

The high mobility of pipi is a likely explanation for the results seen at Grid 2, where pipi became more abundant between March and May 2024, in contrast with the overall decline in abundance observed elsewhere. Increasing abundances at Grid 2 were driven by a large increase in the number of juveniles (20-40 mm; 1866 recorded in May 2024 vs. 54 in March 2024). In addition to very few juveniles, there were also no recruits (<20 mm) in March. The new large cohort of juveniles recorded in May 2024 cannot be solely the result of the growth of the few juveniles present in March and is highly unlikely to have recruited and grown into the 20-40 mm size class in only two months. Therefore, these juvenile individuals are likely to have moved into Grid 2 from other areas. These observations show the value of monitoring with high frequency to capture and correctly interpret these abrupt changes in population abundance and size structure.

In May 2024, adult pipi remained confined to subtidal areas. While Grid 2 and the subtidal transects experienced declining adult abundances between 2023 and 2024, at Grid 3 the number of adults more than quadruplicated between March and May, and it was back in line with the values recorded six months earlier in November 2023. This is another very large change occurred within a relatively short period of time which may have been driven, at least in part, by pipi mobility. In fact, given the slow transition from juveniles to adults observed so far across the study area, it seems unlikely that a four-fold increase in adult numbers in only two months at Grid 3 could have resulted solely from the growth of the local cohort of juveniles.

Because of the increase in adult numbers at Grid 3, combined with the decline at Grid 2 and in the area covered by the subtidal transects, Grid 3 was the area with the highest abundance of adults, with an estimated density of >40 mm per m^2, compared to 17 adults per m^2 at Grid 2 and 66 adults per m^2 along the transect.

Previous monitoring of pipi at Te Paritaha by of Fairlie et al. (2017) and Ross & Culliford (2018) showed that the abundance of large pipi in the early aftermath of the 2015 capital dredging (i.e., in 2016 and 2017) was in line with pre-dredging levels. However, comparisons of our data with the results of Fairlie et al. (2017) and Ross & Culliford (2018) show a large decline in the abundance of adult pipis between 2016/2017 and 2022, with little sign of recovery up to March

2024. The May 2024 data for the first time show abundances of mid-size individuals (31-50 mm based on the classification of Fairlie et al., or 20-40 mm based on the one of Ross & Culliford) back in line with those recorded up to 2016/2017 in some parts of the study area (i.e., at Grid 2 and along the north-eastern edge of the bank covered by the transects).

Patterns of declining abundance of large individuals have been observed in intertidal populations of both pipi and cockles (*Austrovenus stutchburyi*) across the upper North Island (Berkenbusch et al., 2022; Berkenbusch & Hill-Moana, 2023). The reasons for the general decline of large individuals within northern pipi and cockle populations remain unknown, but are likely to include harvesting pressure, changes in the benthic environment (e.g., grain size and topography of the seabed), adverse weather conditions (particularly unusually hot weather), poor water quality, parasites and bacteria (Berkenbusch et al., 2022; Berkenbusch & Hill-Moana, 2023).

Analyses of sediment grain sizes carried out as part of the most recent sampling events (from 2022 onwards) showed a slight increase in gravel/shell material, however, overall, no significant changes in the physical structure of the benthic environment at Te Paritaha. All sites continue to contain low levels of silt and clay. Grids 2, 3 and Transect A saw an increase in gravel/shell material and all other sites remained consistent between March and May 2024. In comparison to Fairlie et al., (2017), the sediment profile of Te Paritaha was dominated by coarse and medium sand previously, however, is shifting to a gravel/shell material dominated sand bank.

Both in 2023, March 2024 and May 2024, we found low levels of contaminants within the sediment and within the pipi, suggesting that the presences of pollutants in the seabed and in the water column is also unlikely to be the main driver for the decline of large pipi at Te Paritaha. This supports the slight increase in pipi sizes occurring across the Te Paritaha monitoring.

Port of Tauranga provided additional surface maps showing changes in bathymetry (bathymetry data collected 2022) in the wider Te Paritaha area and profiles of the subtidal slope in the area of Transects A, B and C (Appendix 4 and 5). Overall, both surface maps and slope profiles show that in the period of the decline of adult pipi (2017-2022) there were no large changes in the bathymetry of the intertidal area and in the profile of the subtidal slope on the north-east edge of Te Paritaha. Changes in bathymetry and slope profiles in the period 2017-2022 also appear in line with the variability observed in the period 2010-2015, before the capital dredging (Appendix 4 and 5).

The second round of mussel bed surveys were conducted in May 2024. Results found zero mussel beds larger than $2m^2$, therefore, no rapid habitat surveys were conducted. Occasional mussels were recorded at seven subtidal subgrids. Images provided by divers (Appendix 6) illustrate the soft substrate the mussel beds are attached to (i.e., sand and other shell material), thus suggesting once mussel growth exceeds a certain size, combined with excessive currents within the harbour, the loss of mussels from Te Paritaha is highly likely via washing away by currents, thus the scattered spatial cover. This result is not surprising given that mussels preferentially attach to hard surfaces, not sandy/gravel substrate.

While the abundances of adult pipi remain lower than pre-dredging levels, the high recruitment observed in 2023, followed by the growth of the recruits into juveniles seen in March and May 2024, show that there is potential for the replenishment of adult stocks over time. Repeating the surveys of pipi according to the revised TPMP will allow to assess whether these high abundances of juveniles can translate into increasing abundances of larger individuals at Te Paritaha.

In addition, we recommend that mussel surveys are continued annually as part of a more comprehensive assessment of Kaimoana in the area.

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Appendix 1: Revised Te Paritaha Pipi Monitoring Plan

Boffa Miskell

Te Paritaha Monitoring Plan

Revised Monitoring Programme
Prepared for Port of Tauranga

29 August 2023

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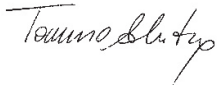
Prepared by:	Dr Tommaso Alestra Ecologist Boffa Miskell Limited	
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1.0 Introduction

As part of the Port of Tauranga's Capital Dredging Programme (CDP), which began in October 2015 and was completed July 2016, approximately 95m of the Te Paritaha shell bank (and associated benthic fauna) was excavated.

In 2022, Boffa Miskell Limited was engaged by the Port of Tauranga to prepare a Te Paritaha Monitoring Plan (TPMP) to guide the collection of information on temporal trends in the size and abundance of kaimoana (pipi) at Te Paritaha.

The original version of the TPMP (Boffa Miskell Ltd, 2022) informed intertidal and subtidal surveys carried out at Te Paritaha in October and December 2022 (Boffa Miskell Ltd, 2023). The 2022 surveys showed significant changes in the abundance and population structure of pipi at Te Paritaha between 2022 and previous sampling events in Fairlie et al., (2016) and Ross & Culliford, (2018); this includes high numbers of juveniles in the intertidal area, but a large decline in the abundance of adults in comparison to both pre- and post-dredging levels.

The TPMP was revised in 2023 which outlines an updated methodology and extended survey locations or the monitoring programme. In addition, sediment and pipi flesh will be collected and analysed for contaminants. The aim of the revised TPMP is to allow the collection of additional information to better understand the mechanisms underlying the results of the 2022 surveys and provide a more robust assessment of future changes in the abundance and size of pipi at Te Paritaha.

2.0 Methods

This revised TPMP is based on the methods outlined in the original TPMP (Boffa Miskell Ltd, 2022) used during the 2022 surveys. These methods build on those used as part of earlier investigations by Fairlie et al., (2017) and Ross & Culliford, (2018).

2.1 Field investigations

2.1.1 Frequency and timing

Field surveys will be carried out once a year between September and December 2023 to maintain consistent timing relative to previous sampling events.

2.1.2 Intertidal surveys

Intertidal surveys will be repeated across the same sampling grid established as part of the 2022 surveys in the northern portion of Te Paritaha (red grid in Figure 1). The sampling grid (81,000m^2) is divided into 9 squares (A - I). Each square contains 12 sampling areas, of which five squares are randomly selected for surveying (Figure 2).

Within each of the 9 squares (A – I), in both grids:

- 10 13 cm diameter x 15 cm deep benthic cores will be excavated (with the cores divided into five pairs[1] and allocated to five of the twelve sampling areas randomly – Figure 2). The excavated sediment will be sieved on site. Pipi retained in the sieve will be counted and measured to the nearest millimetre along the longest axis of the shell.
- One surface composite sediment sample (top 2-3cm) will be collected from each of the five areas in the intertidal grid where pipi are sampled (above) for laboratory analysis of sediment contamination by heavy metals and polycyclic aromatic hydrocarbons (PAHs), total hydrocarbons (THC), total organic carbon (TOC). Samples from each of three sets of contiguous sites (A-B-C, D-E-F, G-H-I) will be combined into three single composite samples.
- Three composite pipi flesh samples[2] shall be collected from the intertidal grid from A-B-C, D-E-F, G-H-I. Pipi flesh samples shall be analysed for heavy metals, polycyclic aromatic hydrocarbons (PAHs), total hydrocarbons (THC), total organic carbon (TOC).

2.1.3 Subtidal surveys

Transect Surveys

Subtidal surveys will be repeated along the same three transects established by Ross & Culliford, (2018) on the north-east edge of Te Paritaha. The three transects extend from the upper intertidal slope to the bottom Cutter Channel at a depth of approximately 15 m. Along each transect there are four pipi sampling stations pat 2 m, 5 m, 10 m and 15 m depth. At each station there are 10 core samples to be collected forming a total of 40 cores per transect.

To extend the spatial coverage of the subtidal survey along the northern edge of Te Paritaha, a fourth transect (D) with the same number of monitoring stations and sampling points will be added to the west of transect B (Figure 1).

At each sampling station along all subtidal transects:

- 10 13 cm diameter x 15 cm deep benthic cores will be excavated. The excavated sediment will be sieved on site. Pipi retained in the sieve will be counted and measured to the nearest millimetre along the longest axis of the shell.
- One surface sediment sample (top 2-3cm) will be collected for laboratory analysis of grain size composition. Samples from each of two sets of contiguous stations (2m-5m and 10m-15m) will be combined into a single composite sample for each of the four transects.
- One composite surface sediment sample (top 2-3cm) will be collected from the four transects at each sampling station (2m, 5m, 10m and 15m) (combined into a single composite sample for each transect) and analysed for heavy metals and polycyclic aromatic hydrocarbons (PAHs), total hydrocarbons (THC), total organic carbon (TOC).
- Four composite pipi flesh samples[3] shall be collected from the each of the four transects (combining flesh from 2m, 5m, 10m, and 15m depth and analysed for heavy metals, polycyclic aromatic hydrocarbons (PAHs), total hydrocarbons (THC), total organic carbon (TOC).

[1] Refer to methods outlined in Berkenbusch et al., (2022)

[2] 30g of shellfish flesh per sample

[3] 30g of shellfish flesh per sample

Grid Surveys

To extend the spatial coverage of the subtidal survey along the western area adjacent to Te Paritaha, where large aggregations of adult pipi have previously been identified (Gouk, 2001; Hull, 1996), two additional subtidal sampling grids have been established (yellow grids in Figure 1). The sampling grids are divided into 9 squares (A – I; Figure 1A), which contain 12 sampling areas. Five randomly selected sampling areas per square will be determined prior to surveying (Figure 2).

Within each of the 9 squares (A – I):

- 10 13 cm diameter x 15 cm deep benthic cores will be excavated (with the cores divided into five pairs[4] and allocated to five of the twelve sampling areas randomly selected; Figure 2). The excavated sediment will be sieved on site. Pipi retained in the sieve will be counted and measured to the nearest millimetre along the longest axis of the shell.
- One surface sediment sample (top 2-3cm) will be collected from each of the five areas in the subtidal grids where pipi are sampled (above) and combined into a single composite sample for each of the contiguous sites (A-B-C, D-E-F, G-H-I) for analysis of sediment grain size.
- One surface composite sediment sample (top 2-3cm) will be collected from each of the five areas in the subtidal grids where pipi are sampled (above) for laboratory analysis of sediment contamination by heavy metals and polycyclic aromatic hydrocarbons (PAHs), total hydrocarbons (THC), total organic carbon (TOC). Samples from each of three sets of contiguous sites (A-B-C, D-E-F, G-H-I) will be combined into three single composite samples.
- Three composite pipi flesh samples[3] shall be collected from the intertidal grid from A-B-C, D-E-F, G-H-I. Pipi flesh samples shall be analysed for heavy metals, polycyclic aromatic hydrocarbons (PAHs), total hydrocarbons (THC), total organic carbon (TOC).

	2x benthic core	Sediment grain size	Sediment contaminant	Pipi body burden
Intertidal grid (1)	✓	✗	✓	✓
Subtidal grid (2)	✓	✓	✓	✓
Subtidal grid (3)	✓	✓	✓	✓
Transect A	✓	✓	✓	✓
Transect B	✓	✓	✓	✓
Transect C	✓	✓	✓	✓
Transect D	✓	✓	✓	✓

[4] Refer to methods outlined in Berkenbusch et al., (2022)

2.2 Data analysis

Data analysis will explore trends in the abundance and size of pipi through time, and also patterns of variability in abundance and size across the study area. The relationship between the abundance and size of pipi and sediment properties (grain size and contamination by heavy metals and organic toxicants) will also be explored.

Figure 1: The expanded sampling design including the new elements outlined in this revised monitoring plan (in yellow).

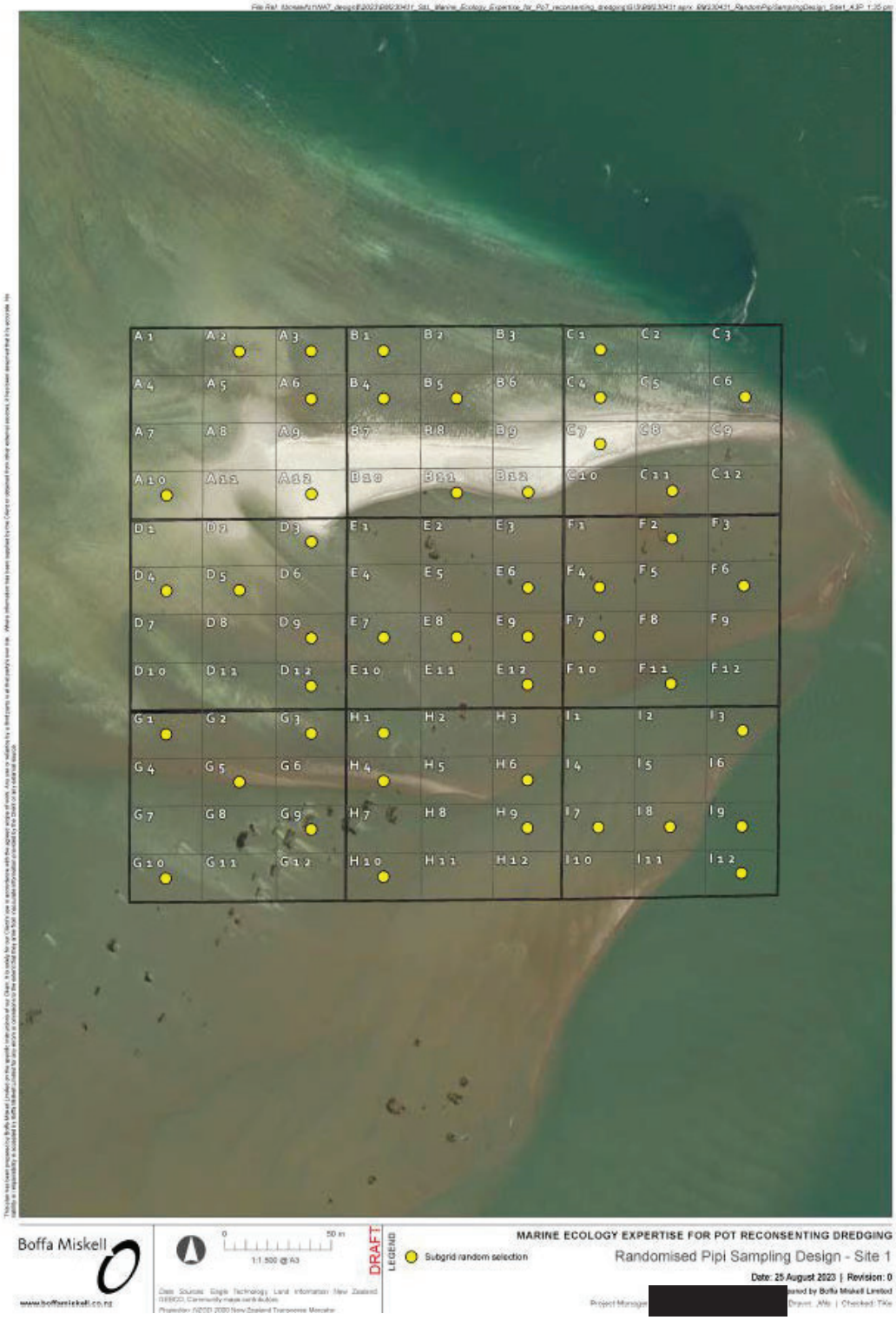

Figure 2: Site 1 - Partitioning of the sampling grids to be used for intertidal and subtidal surveys (Figure 1) into 9 squares (A – I), each further divided into 12 sampling areas. Five random sampling points are allocated each square A-I, two cores will be collected from each sampling point.

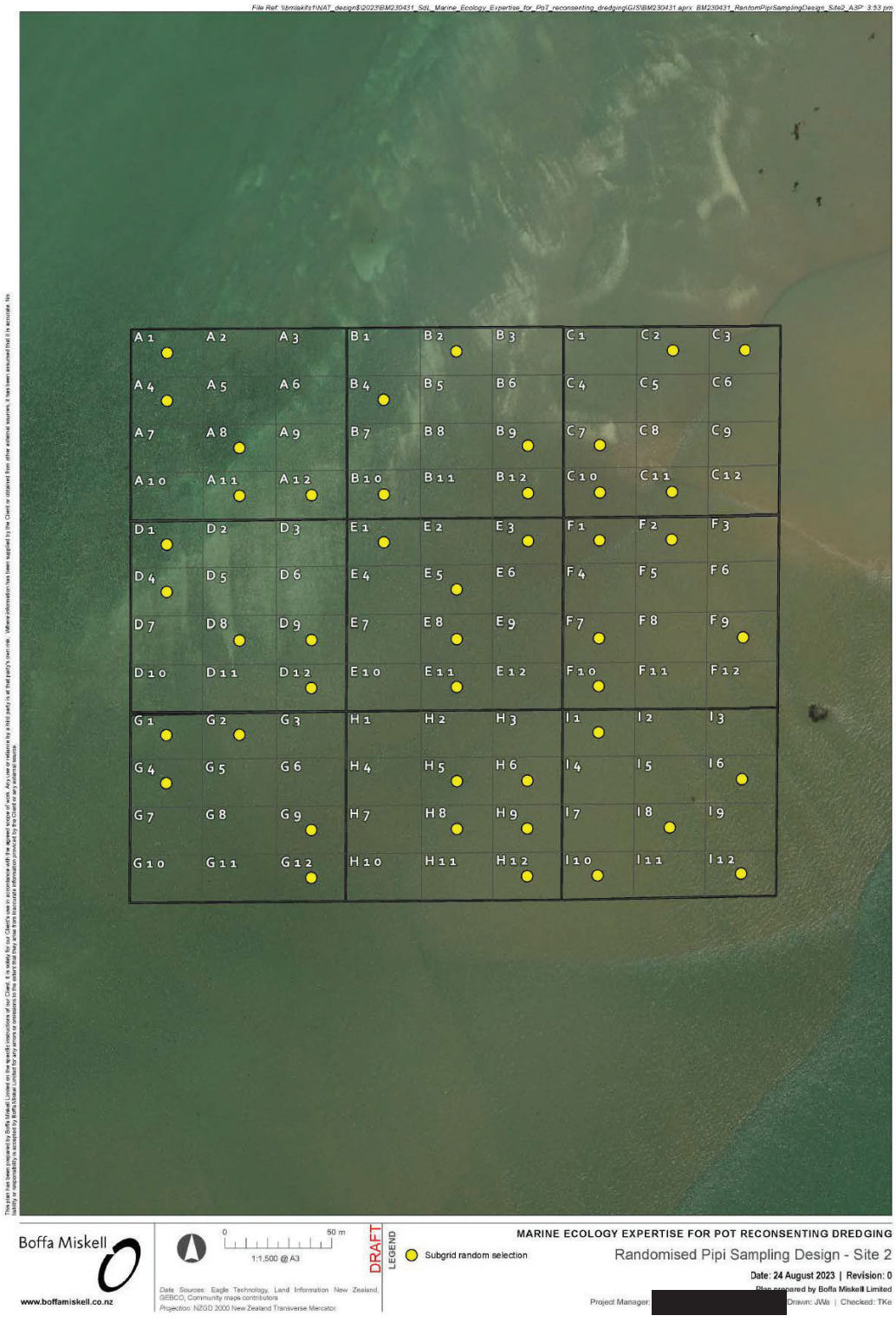

Figure 3: Site 2 - Partitioning of the sampling grids to be used for intertidal and subtidal surveys (Figure 1) into 9 squares (A – I), each further divided into 12 sampling areas. Five random sampling points are allocated each square A-I, two cores will be collected from each sampling point.

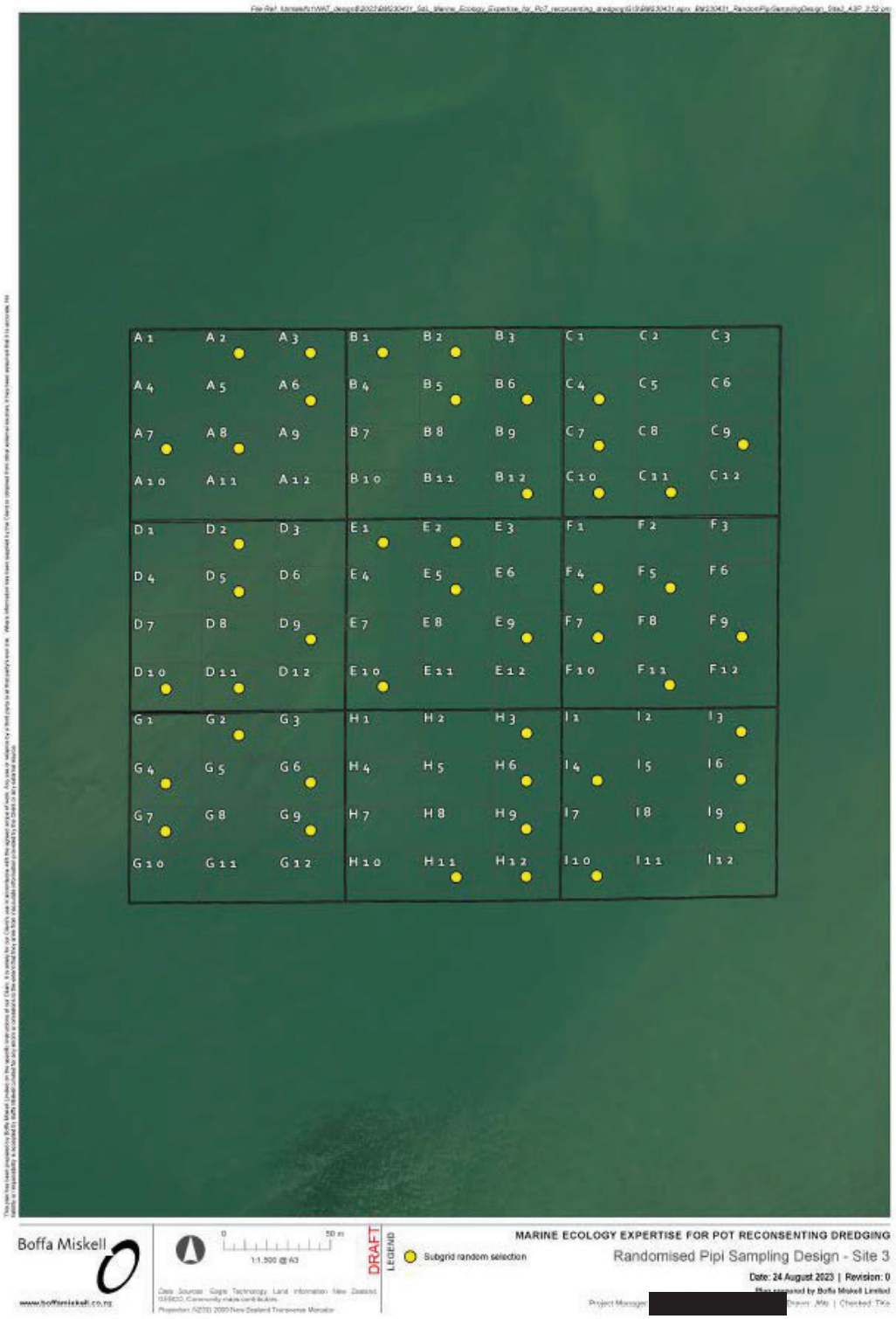

Figure 4: Site 3 - Partitioning of the sampling grids to be used for intertidal and subtidal surveys (Figure 1) into 9 squares (A – I), each further divided into 12 sampling areas. Five random sampling points are allocated each square A-I, two cores will be collected from each sampling point.

2.3 Desktop investigations

To help with the interpretation of the results of future field investigations and of the trends observed so far, the following information will be reviewed:

- Information on the morphology of Te Paritaha (including bathymetry, extent and subtidal slope profile). This information will be provided by the Port of Tauranga annual bathymetric surveys.
- Information on water quality in the Tauranga Harbour and in the surrounding catchments. This information will be accessed from sources including https://www.lawa.org.nz/ and State of the Environment (SOE) reports.
- Information on broad scale trends of pipi populations. This information will be provided by Fisheries New Zealand's northern North Island bivalve monitoring programme[5].

3.0 Plan Review and Update

This revised TPMP will allow a more detailed investigation of the mechanisms underlying the trends in the abundance and size of pipi at Te Paritaha. The TPMP should be seen as a live document which may undergo further revision in light of the results of future investigations.

[5] https://fs.fish.govt.nz/Page.aspx?pk=22&filST=intertidal%20shellfish%20monitoring

4.0 References

Berkenbusch, K., Abraham, E., & Neubauer, P. (2022). *Intertidal shellfish monitoring in the northern North Island region* (New Zealand Fisheries Assessment Report 2022/57). Ministry for Primary Industries.

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Gouk, S. G. (2001). *The Population Dynamics and Production of Paphies australis (pipi) in the Southern Basin, Tauranga Harbour, New Zealand*. University of Waikato.

Hull, P. J. (1996). *The ecology of bivalves on Centre Bank, Tauranga Harbour. MSc Thesis, Department of Earth Sciences* (p. 101). University of Waikato.

Ross, P., & Culliford, D. (2018). *The impact of dredging on the pipi (Paphies australis) of Te Paritaha, Tauranga Harbour.* (p. 12) [Client report prepared for the Port of Tauranga Limited. Environmental Research Institute, Faculty of Science and Engineering, The University of Waikato, Hamilton.].

About Boffa Miskell

Boffa Miskell is a leading New Zealand professional services consultancy with offices in Whangarei, Auckland, Hamilton, Tauranga, Wellington, Christchurch, Dunedin, and Queenstown. We work with a wide range of local and international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, cultural heritage, graphics and mapping. Over the past four decades we have built a reputation for professionalism, innovation and excellence. During this time we have been associated with a significant number of projects that have shaped New Zealand's environment.

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09 358 2526	09 358 2526	07 960 0006	07 571 5511	04 385 9315	03 366 8891	03 441 1670	03 470 0460

Appendix 2: Sediment Grain Size Analyses

Analysis - Under

Malvern Instruments

Malvern

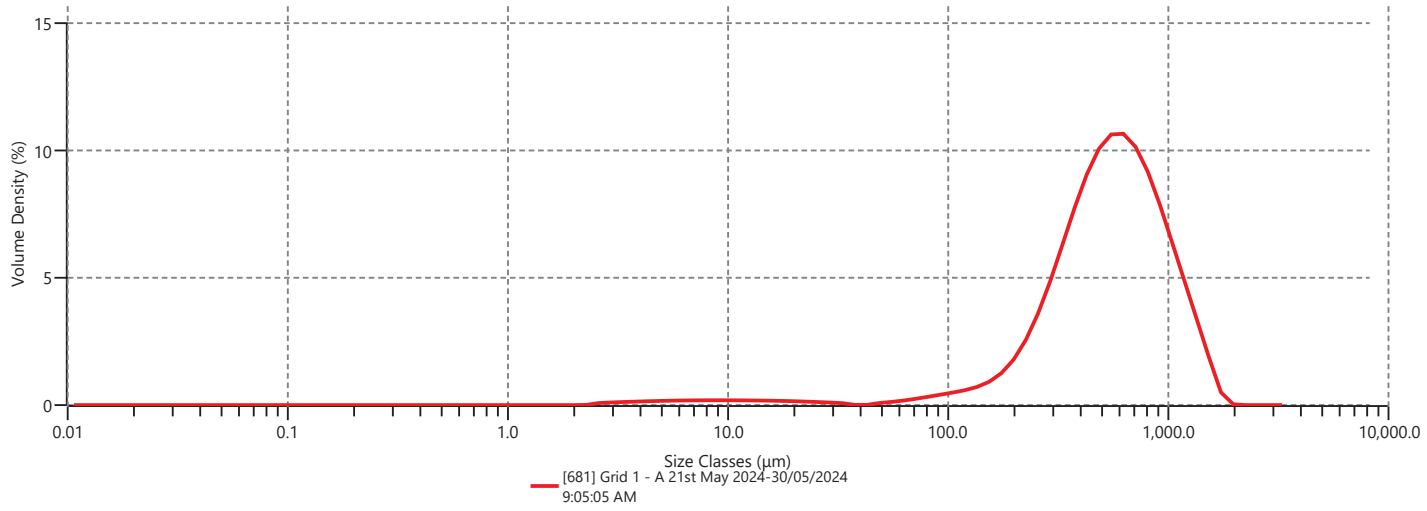
Measurement Details	
Sample Name	Grid 1 - A 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/1
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 9:05:05 AM
Measurement Date Time	30/05/2024 9:05:05 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.58 %
Laser Obscuration	14.39 %

Result	
Concentration	0.3370 %
Span	1.537
Uniformity	0.471
Specific Surface Area	13.38 m^2/kg
D [3,2]	172 µm
D [4,3]	606 µm
Dv (10)	231 µm
Dv (50)	551 µm
Dv (90)	1080 µm
Dv (95)	1250 µm
Volume Below (3) µm	0.13 %
Volume Below (6) µm	0.80 %
Volume Below (20) µm	2.21 %
Volume Below (31) µm	2.57 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.11	88.0	3.49	350	22.68	1410	97.73
0.0600	0.00	15.6	1.95	105	4.00	420	32.30	1680	99.74
0.120	0.00	31.0	2.57	125	4.62	500	43.29	2000	100.00
0.240	0.00	37.0	2.64	149	5.47	590	54.71	2380	100.00
0.490	0.00	44.0	2.64	177	6.66	710	67.43	2830	100.00
0.980	0.00	53.0	2.73	210	8.46	840	77.93	3360	100.00
2.00	0.00	63.0	2.89	250	11.59	1000	86.86		
3.90	0.34	74.0	3.12	300	16.65	1190	93.42		

Analysis - Under

Malvern Instruments

Malvern

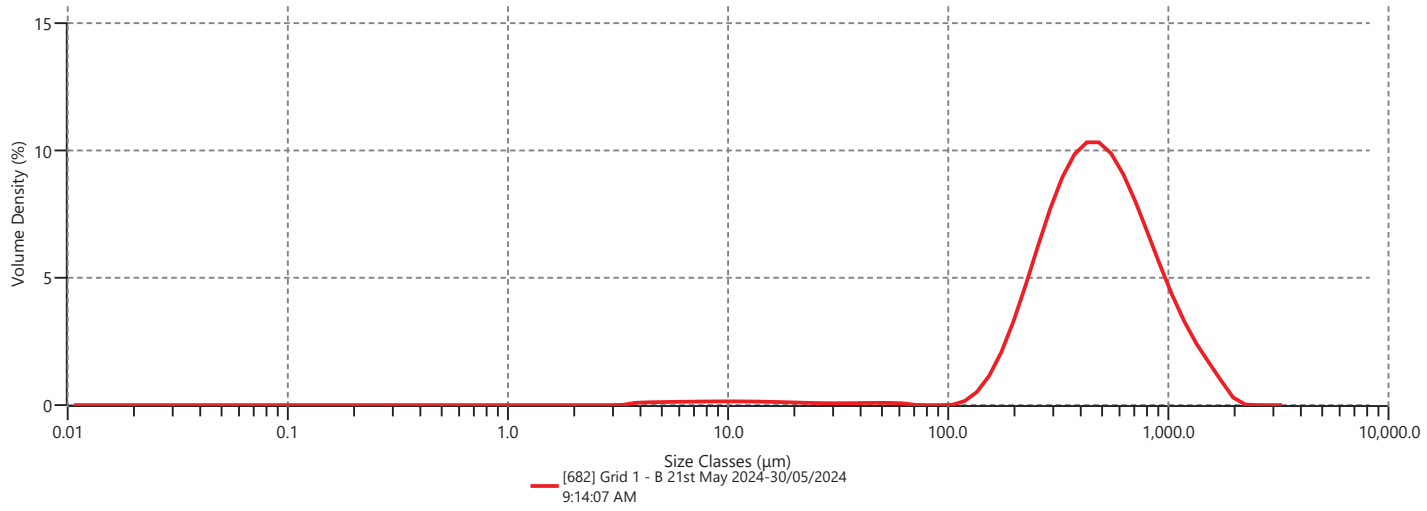
Measurement Details	
Sample Name	Grid 1 - B 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/2
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 9:14:07 AM
Measurement Date Time	30/05/2024 9:14:07 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.34 %
Laser Obscuration	13.62 %

Result	
Concentration	0.4218 %
Span	1.659
Uniformity	0.516
Specific Surface Area	10.16 m²/kg
D [3,2]	227 µm
D [4,3]	549 µm
Dv (10)	225 µm
Dv (50)	468 µm
Dv (90)	1000 µm
Dv (95)	1230 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.39 %
Volume Below (20) µm	1.45 %
Volume Below (31) µm	1.69 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.62	88.0	2.09	350	30.78	1410	97.34
0.0600	0.00	15.6	1.26	105	2.09	420	42.68	1680	99.18
0.120	0.00	31.0	1.69	125	2.20	500	54.47	2000	99.92
0.240	0.00	37.0	1.77	149	2.88	590	65.24	2380	100.00
0.490	0.00	44.0	1.86	177	4.62	710	75.76	2830	100.00
0.980	0.00	53.0	1.97	210	7.89	840	83.69	3360	100.00
2.00	0.00	63.0	2.06	250	13.63	1000	89.95		
3.90	0.06	74.0	2.09	300	22.00	1190	94.36		

Analysis - Under

Malvern Instruments

Malvern

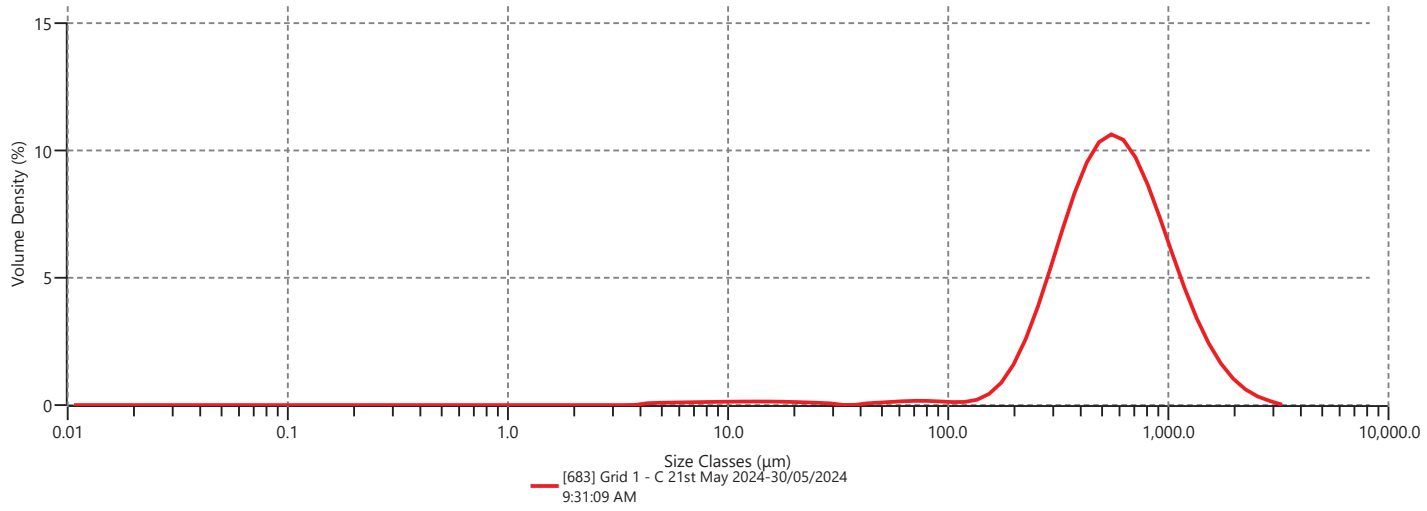
Measurement Details	
Sample Name	Grid 1 - C 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/3
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 9:31:09 AM
Measurement Date Time	30/05/2024 9:31:09 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.54 %
Laser Obscuration	12.75 %

Result	
Concentration	0.4779 %
Span	1.620
Uniformity	0.513
Specific Surface Area	8.355 m²/kg
D [3,2]	276 µm
D [4,3]	656 µm
Dv (10)	268 µm
Dv (50)	561 µm
Dv (90)	1180 µm
Dv (95)	1440 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.23 %
Volume Below (20) µm	1.24 %
Volume Below (31) µm	1.51 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.42	88.0	2.18	350	20.35	1410	94.54
0.0600	0.00	15.6	1.03	105	2.33	420	30.64	1680	97.22
0.120	0.00	31.0	1.51	125	2.47	500	42.03	2000	98.75
0.240	0.00	37.0	1.51	149	2.74	590	53.50	2380	99.58
0.490	0.00	44.0	1.56	177	3.44	710	65.85	2830	99.91
0.980	0.00	53.0	1.67	210	4.97	840	75.82	3360	100.00
2.00	0.00	63.0	1.83	250	8.21	1000	84.17		
3.90	0.00	74.0	2.00	300	13.74	1190	90.32		

Analysis - Under

Malvern Instruments

Malvern

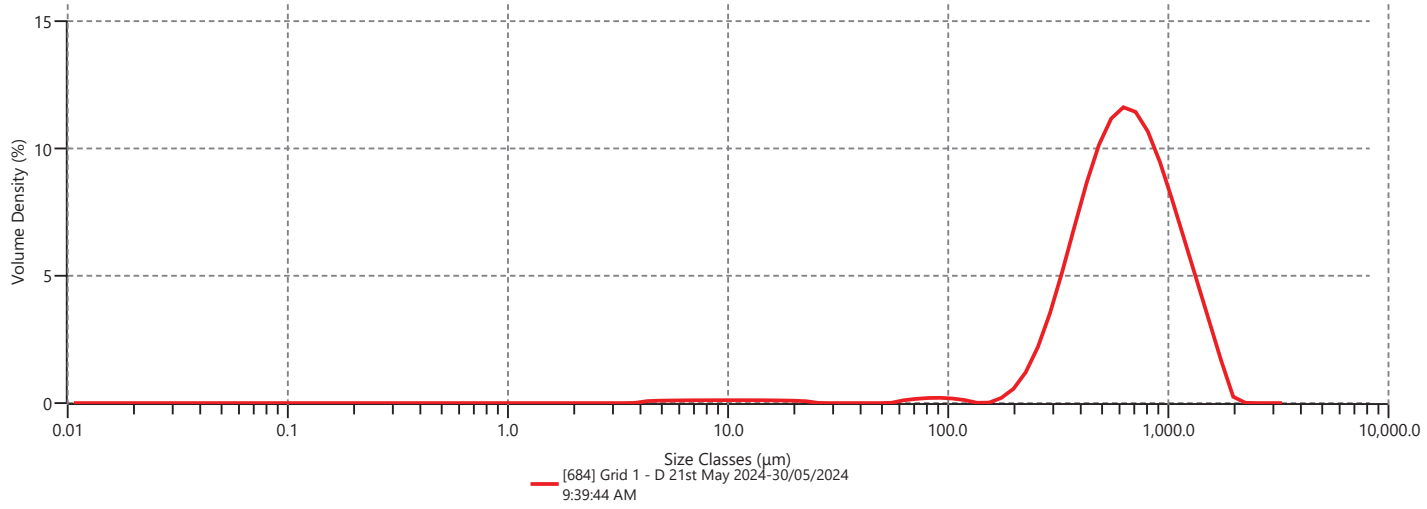
Measurement Details	
Sample Name	Grid 1 - D 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/4
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 9:39:44 AM
Measurement Date Time	30/05/2024 9:39:44 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.62 %
Laser Obscuration	12.63 %

Result	
Concentration	0.5375 %
Span	1.388
Uniformity	0.427
Specific Surface Area	7.342 m²/kg
D [3,2]	314 µm
D [4,3]	705 µm
Dv (10)	325 µm
Dv (50)	638 µm
Dv (90)	1210 µm
Dv (95)	1400 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.25 %
Volume Below (20) µm	1.10 %
Volume Below (31) µm	1.21 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.43	88.0	1.64	350	12.54	1410	95.27
0.0600	0.00	15.6	0.94	105	1.87	420	21.32	1680	98.84
0.120	0.00	31.0	1.21	125	2.03	500	32.15	2000	99.96
0.240	0.00	37.0	1.21	149	2.05	590	44.09	2380	100.00
0.490	0.00	44.0	1.21	177	2.15	710	58.13	2830	100.00
0.980	0.00	53.0	1.21	210	2.64	840	70.21	3360	100.00
2.00	0.00	63.0	1.26	250	4.23	1000	80.96		
3.90	0.00	74.0	1.42	300	7.68	1190	89.31		

Analysis - Under

Malvern Instruments

Malvern

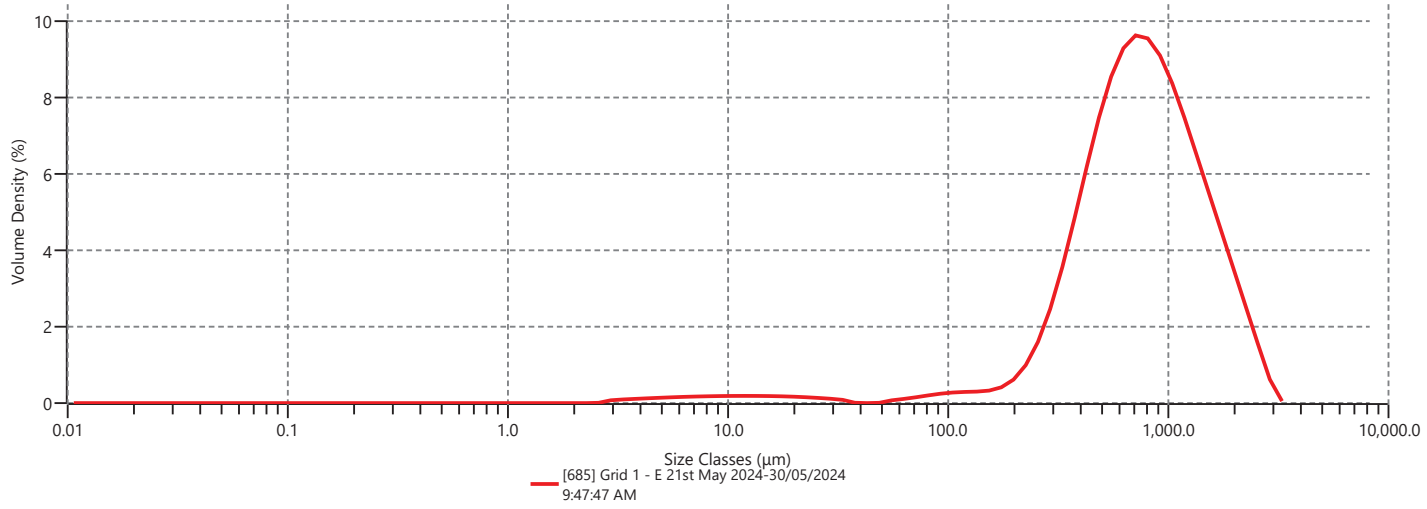
Measurement Details	
Sample Name	Grid 1 - E 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/5
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 9:47:47 AM
Measurement Date Time	30/05/2024 9:47:47 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.50 %
Laser Obscuration	16.08 %

Result	
Concentration	0.4795 %
Span	1.789
Uniformity	0.551
Specific Surface Area	10.61 m^2/kg
D [3,2]	218 µm
D [4,3]	879 µm
Dv (10)	321 µm
Dv (50)	750 µm
Dv (90)	1660 µm
Dv (95)	2010 µm
Volume Below (3) µm	0.05 %
Volume Below (6) µm	0.60 %
Volume Below (20) µm	2.01 %
Volume Below (31) µm	2.41 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.89	88.0	2.97	350	11.98	1410	84.09
0.0600	0.00	15.6	1.73	105	3.27	420	18.14	1680	90.29
0.120	0.00	31.0	2.41	125	3.60	500	26.01	2000	94.94
0.240	0.00	37.0	2.49	149	3.94	590	35.10	2380	98.15
0.490	0.00	44.0	2.49	177	4.35	710	46.51	2830	99.67
0.980	0.00	53.0	2.50	210	4.96	840	57.07	3360	100.00
2.00	0.00	63.0	2.60	250	6.22	1000	67.41		
3.90	0.21	74.0	2.74	300	8.64	1190	76.52		

Analysis - Under

Malvern Instruments

Malvern

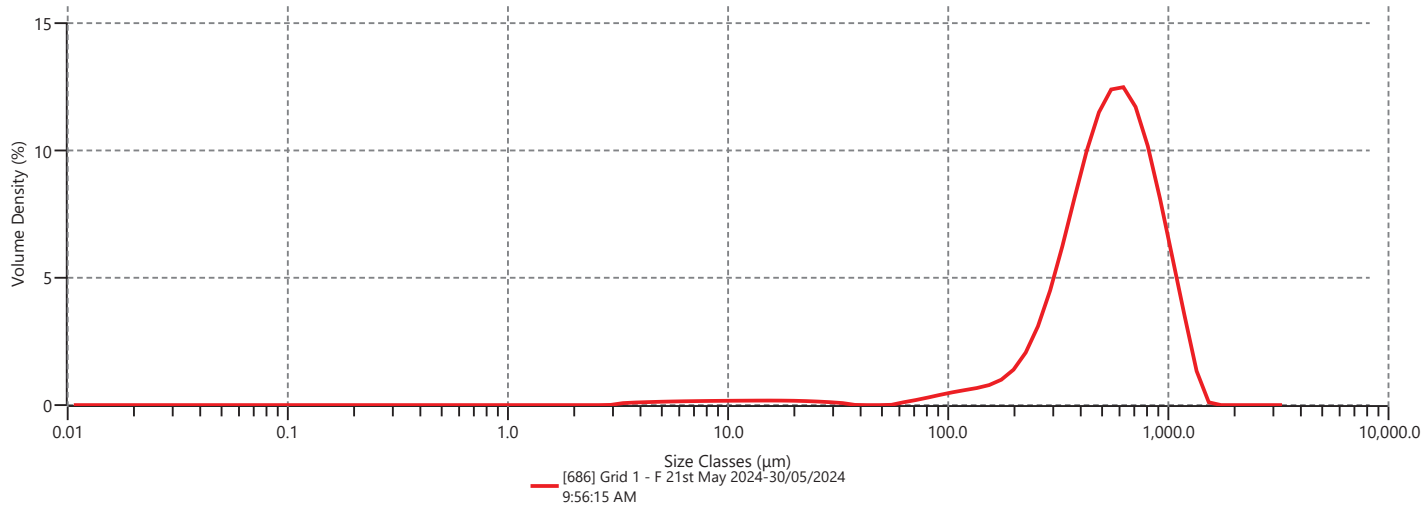
Measurement Details	
Sample Name	Grid 1 - F 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/6
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 9:56:15 AM
Measurement Date Time	30/05/2024 9:56:15 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.48 %
Laser Obscuration	16.12 %

Result	
Concentration	0.4692 %
Span	1.284
Uniformity	0.395
Specific Surface Area	10.93 m²/kg
D [3,2]	211 µm
D [4,3]	576 µm
Dv (10)	253 µm
Dv (50)	547 µm
Dv (90)	956 µm
Dv (95)	1080 µm
Volume Below (3) µm	0.0007 %
Volume Below (6) µm	0.49 %
Volume Below (20) µm	1.82 %
Volume Below (31) µm	2.22 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.76	88.0	2.85	350	20.19	1410	99.87
0.0600	0.00	15.6	1.53	105	3.36	420	30.44	1680	100.00
0.120	0.00	31.0	2.22	125	4.00	500	42.81	2000	100.00
0.240	0.00	37.0	2.29	149	4.79	590	56.11	2380	100.00
0.490	0.00	44.0	2.29	177	5.77	710	70.96	2830	100.00
0.980	0.00	53.0	2.29	210	7.17	840	82.83	3360	100.00
2.00	0.00	63.0	2.35	250	9.75	1000	92.04		
3.90	0.13	74.0	2.52	300	14.28	1190	97.62		

Analysis - Under

Malvern Instruments

Malvern

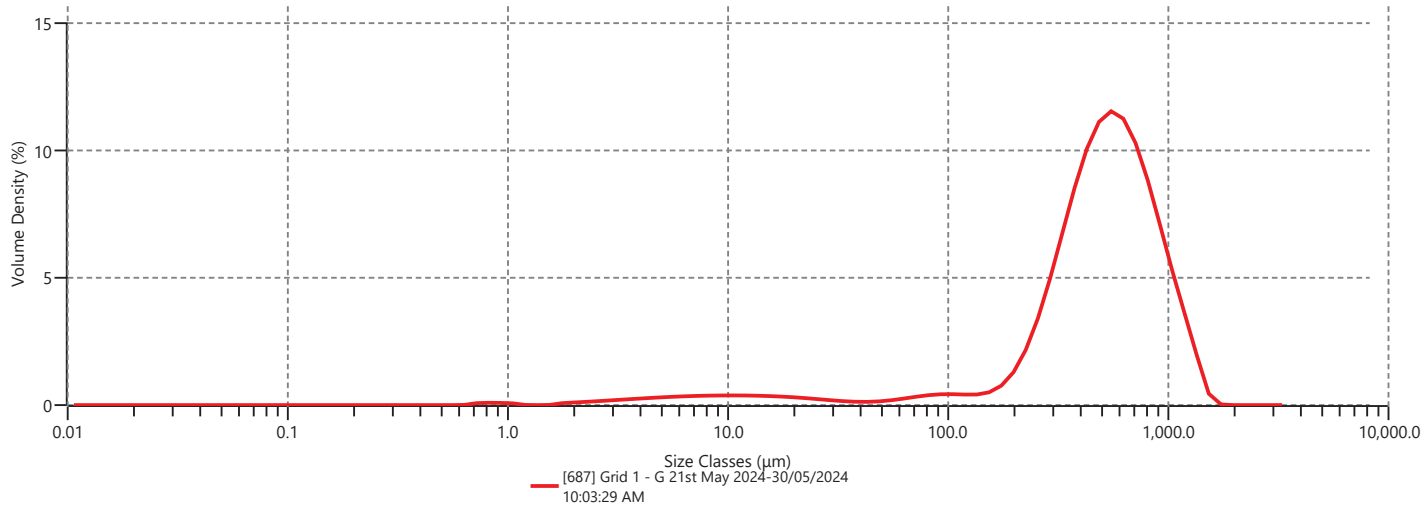
Measurement Details	
Sample Name	Grid 1 - G 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/7
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 10:03:29 AM
Measurement Date Time	30/05/2024 10:03:29 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.49 %
Laser Obscuration	19.30 %

Result	
Concentration	0.2074 %
Span	1.472
Uniformity	0.453
Specific Surface Area	31.26 m^2/kg
D [3,2]	73.8 µm
D [4,3]	551 µm
Dv (10)	200 µm
Dv (50)	518 µm
Dv (90)	963 µm
Dv (95)	1110 µm
Volume Below (3) µm	0.77 %
Volume Below (6) µm	1.99 %
Volume Below (20) µm	4.82 %
Volume Below (31) µm	5.52 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	2.60	88.0	7.00	350	24.58	1410	99.52
0.0600	0.00	15.6	4.29	105	7.50	420	35.21	1680	100.00
0.120	0.00	31.0	5.52	125	7.97	500	47.39	2000	100.00
0.240	0.00	37.0	5.69	149	8.46	590	59.83	2380	100.00
0.490	0.00	44.0	5.83	177	9.14	710	73.09	2830	100.00
0.980	0.21	53.0	6.01	210	10.39	840	83.42	3360	100.00
2.00	0.39	63.0	6.25	250	13.13	1000	91.47		
3.90	1.15	74.0	6.57	300	18.15	1190	96.70		

Analysis - Under

Malvern Instruments

Malvern

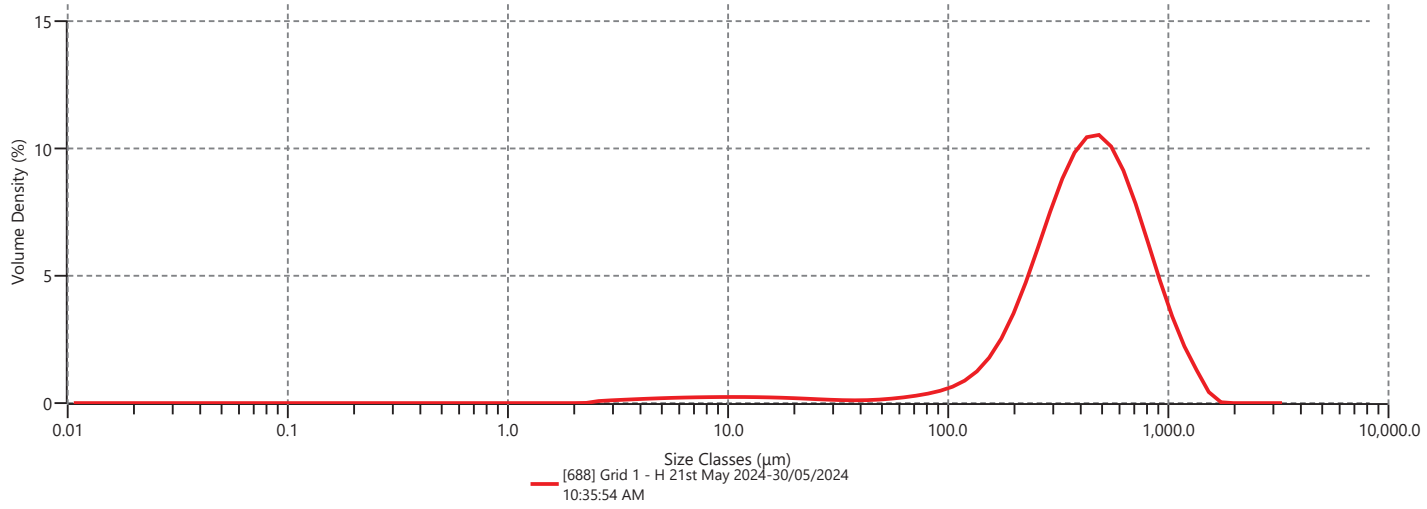
Measurement Details	
Sample Name	Grid 1 - H 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/8
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 10:35:54 AM
Measurement Date Time	30/05/2024 10:35:54 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.41 %
Laser Obscuration	17.01 %

Result	
Concentration	0.3385 %
Span	1.576
Uniformity	0.490
Specific Surface Area	16.02 m²/kg
D [3,2]	144 µm
D [4,3]	482 µm
Dv (10)	179 µm
Dv (50)	433 µm
Dv (90)	861 µm
Dv (95)	1020 µm
Volume Below (3) µm	0.13 %
Volume Below (6) µm	0.89 %
Volume Below (20) µm	2.68 %
Volume Below (31) µm	3.13 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.27	88.0	4.46	350	35.96	1410	99.54
0.0600	0.00	15.6	2.34	105	5.09	420	47.88	1680	100.00
0.120	0.00	31.0	3.13	125	5.99	500	59.88	2000	100.00
0.240	0.00	37.0	3.26	149	7.49	590	70.87	2380	100.00
0.490	0.00	44.0	3.38	177	9.86	710	81.40	2830	100.00
0.980	0.00	53.0	3.55	210	13.46	840	88.98	3360	100.00
2.00	0.00	63.0	3.77	250	19.17	1000	94.46		
3.90	0.36	74.0	4.04	300	27.33	1190	97.76		

Analysis - Under

Malvern Instruments

Malvern

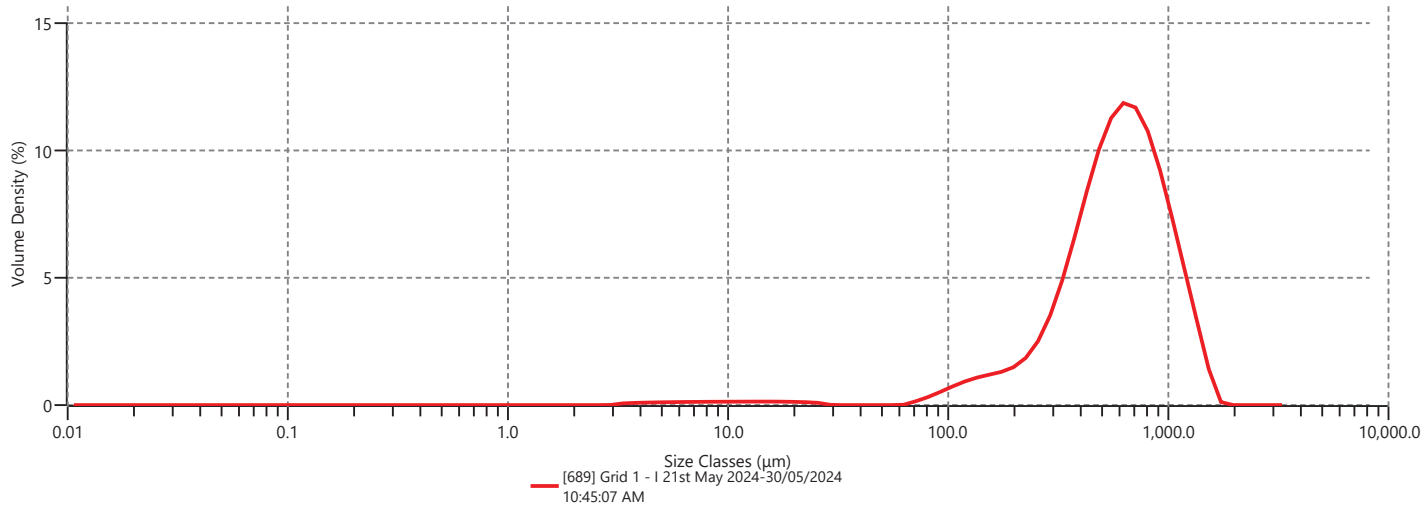
Measurement Details	
Sample Name	Grid 1 - I 21st May 2024
SOP File Name	Sediment.msop
Lab Number	2024137/9
Operator Name	instrument

Measurement Details	
Analysis Date Time	30/05/2024 10:45:07 AM
Measurement Date Time	30/05/2024 10:45:07 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.63 %
Laser Obscuration	20.99 %

Result	
Concentration	0.7161 %
Span	1.394
Uniformity	0.424
Specific Surface Area	9.610 m²/kg
D [3,2]	240 µm
D [4,3]	630 µm
Dv (10)	246 µm
Dv (50)	594 µm
Dv (90)	1070 µm
Dv (95)	1220 µm
Volume Below (3) µm	0.0006 %
Volume Below (6) µm	0.42 %
Volume Below (20) µm	1.45 %
Volume Below (31) µm	1.68 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.63	88.0	2.13	350	18.51	1410	98.52
0.0600	0.00	15.6	1.24	105	2.82	420	26.89	1680	100.00
0.120	0.00	31.0	1.68	125	3.80	500	37.51	2000	100.00
0.240	0.00	37.0	1.68	149	5.06	590	49.53	2380	100.00
0.490	0.00	44.0	1.68	177	6.46	710	63.88	2830	100.00
0.980	0.00	53.0	1.68	210	8.05	840	76.14	3360	100.00
2.00	0.00	63.0	1.68	250	10.29	1000	86.62		
3.90	0.12	74.0	1.78	300	13.88	1190	94.05		

Analysis - Under

Malvern Instruments

Malvern

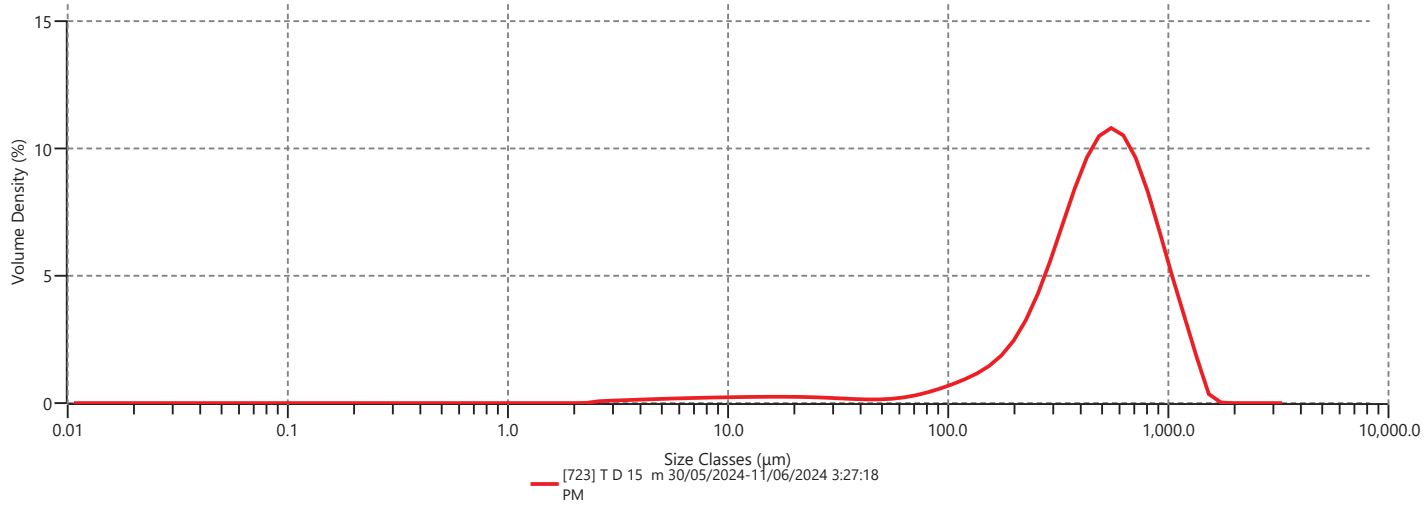
Measurement Details	
Sample Name	T D 15 m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/34
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 3:27:18 PM
Measurement Date Time	11/06/2024 3:27:18 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.41 %
Laser Obscuration	15.31 %

Result	
Concentration	0.3234 %
Span	1.548
Uniformity	0.472
Specific Surface Area	14.94 m²/kg
D [3,2]	154 µm
D [4,3]	533 µm
Dv (10)	182 µm
Dv (50)	495 µm
Dv (90)	948 µm
Dv (95)	1090 µm
Volume Below (3) µm	0.12 %
Volume Below (6) µm	0.77 %
Volume Below (20) µm	2.56 %
Volume Below (31) µm	3.21 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.11	88.0	4.73	350	28.78	1410	99.61
0.0600	0.00	15.6	2.16	105	5.46	420	39.17	1680	100.00
0.120	0.00	31.0	3.21	125	6.45	500	50.72	2000	100.00
0.240	0.00	37.0	3.41	149	7.82	590	62.38	2380	100.00
0.490	0.00	44.0	3.58	177	9.66	710	74.78	2830	100.00
0.980	0.00	53.0	3.75	210	12.19	840	84.48	3360	100.00
2.00	0.00	63.0	3.96	250	16.13	1000	92.07		
3.90	0.32	74.0	4.25	300	22.03	1190	97.01		

Analysis - Under

Malvern Instruments

Malvern

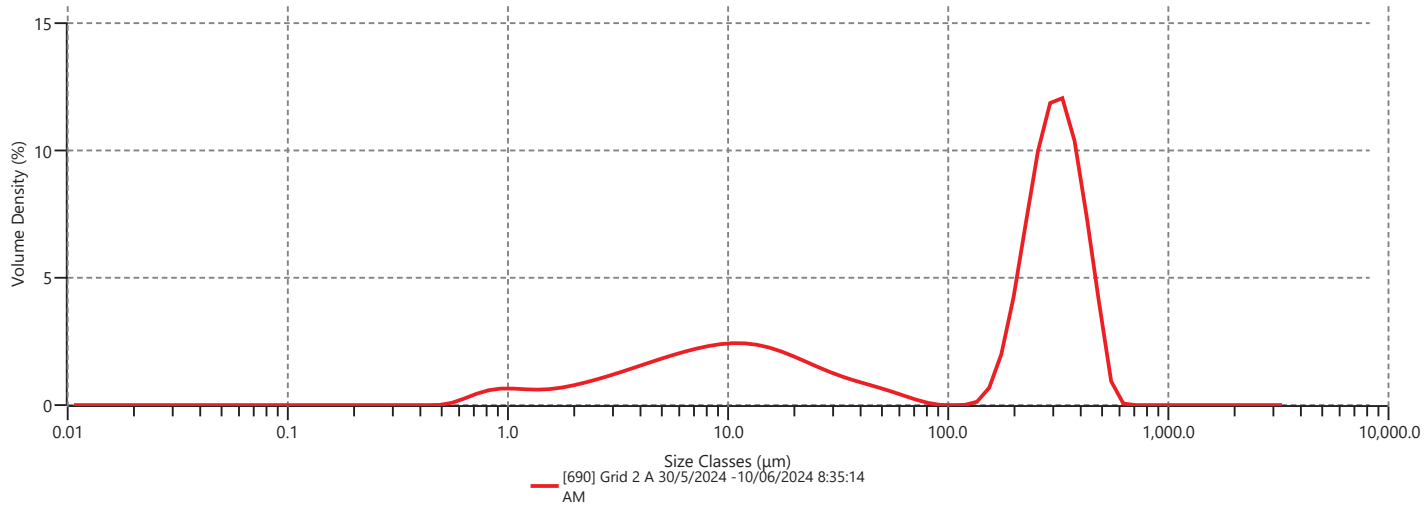
Measurement Details	
Sample Name	Grid 2 A 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/1
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 8:35:14 AM
Measurement Date Time	10/06/2024 8:35:14 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.83 %
Laser Obscuration	5.54 %

Result	
Concentration	0.0082 %
Span	1.747
Uniformity	0.638
Specific Surface Area	214.3 m²/kg
D [3,2]	10.8 µm
D [4,3]	192 µm
Dv (10)	4.06 µm
Dv (50)	227 µm
Dv (90)	401 µm
Dv (95)	444 µm
Volume Below (3) µm	7.27 %
Volume Below (6) µm	14.62 %
Volume Below (20) µm	32.48 %
Volume Below (31) µm	36.92 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	18.34	88.0	40.93	350	80.73	1410	100.00
0.0600	0.00	15.6	29.11	105	40.93	420	92.26	1680	100.00
0.120	0.00	31.0	36.92	125	40.93	500	98.58	2000	100.00
0.240	0.00	37.0	38.16	149	41.15	590	100.00	2380	100.00
0.490	0.00	44.0	39.17	177	42.51	710	100.00	2830	100.00
0.980	1.65	53.0	40.01	210	46.46	840	100.00	3360	100.00
2.00	4.68	63.0	40.54	250	55.27	1000	100.00		
3.90	9.60	74.0	40.82	300	68.47	1190	100.00		

Analysis - Under

Malvern Instruments

Malvern

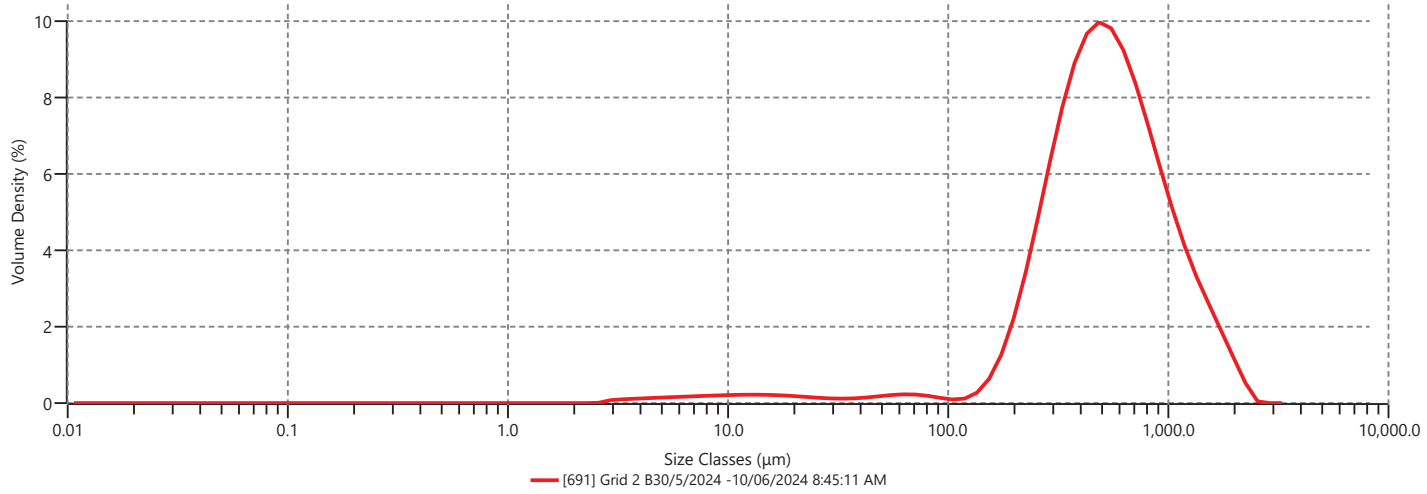
Measurement Details	
Sample Name	Grid 2 B30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/2
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 8:45:11 AM
Measurement Date Time	10/06/2024 8:45:11 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.44 %
Laser Obscuration	16.86 %

Result	
Concentration	0.4257 %
Span	1.815
Uniformity	0.563
Specific Surface Area	12.62 m^2/kg
D [3,2]	183 µm
D [4,3]	615 µm
Dv (10)	234 µm
Dv (50)	514 µm
Dv (90)	1170 µm
Dv (95)	1450 µm
Volume Below (3) µm	0.05 %
Volume Below (6) µm	0.62 %
Volume Below (20) µm	2.20 %
Volume Below (31) µm	2.62 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.92	88.0	3.83	350	26.09	1410	94.48
0.0600	0.00	15.6	1.88	105	3.96	420	36.95	1680	97.37
0.120	0.00	31.0	2.62	125	4.08	500	48.20	2000	99.18
0.240	0.00	37.0	2.76	149	4.44	590	58.85	2380	99.99
0.490	0.00	44.0	2.91	177	5.46	710	69.68	2830	100.00
0.980	0.00	53.0	3.13	210	7.60	840	78.15	3360	100.00
2.00	0.00	63.0	3.37	250	11.83	1000	85.18		
3.90	0.22	74.0	3.61	300	18.55	1190	90.52		

Analysis - Under

Malvern Instruments

Malvern

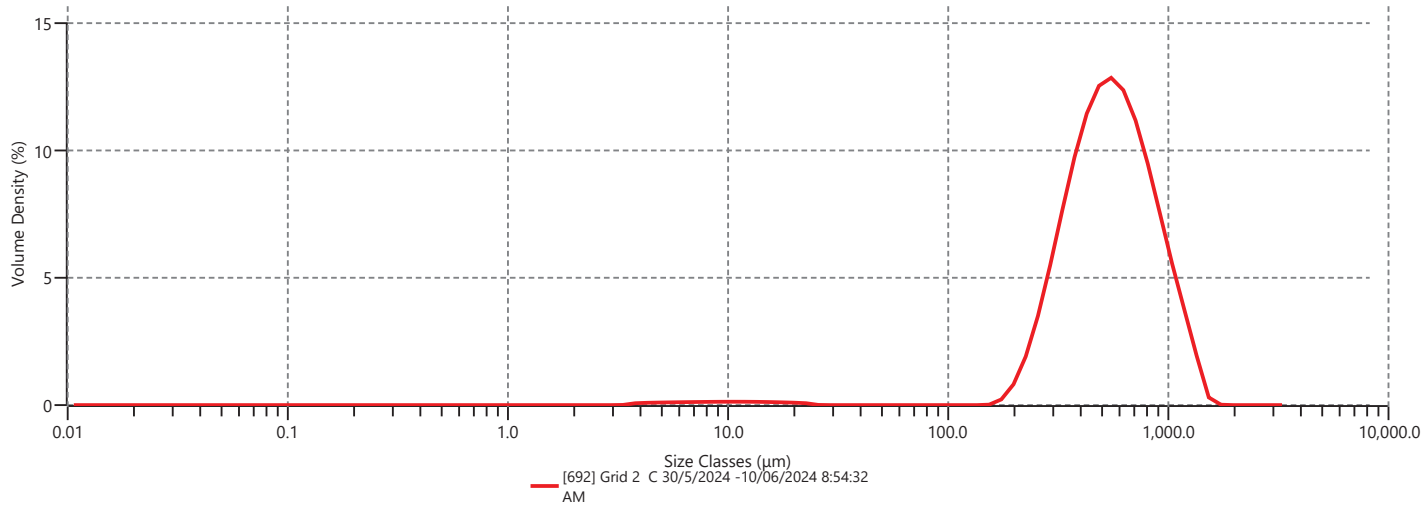
Measurement Details	
Sample Name	Grid 2 C 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/3
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 8:54:32 AM
Measurement Date Time	10/06/2024 8:54:32 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.57 %
Laser Obscuration	14.51 %

Result	
Concentration	0.5414 %
Span	1.231
Uniformity	0.380
Specific Surface Area	8.463 m²/kg
D [3,2]	273 µm
D [4,3]	589 µm
Dv (10)	299 µm
Dv (50)	542 µm
Dv (90)	966 µm
Dv (95)	1110 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.33 %
Volume Below (20) µm	1.29 %
Volume Below (31) µm	1.39 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.53	88.0	1.39	350	17.36	1410	99.66
0.0600	0.00	15.6	1.11	105	1.39	420	29.49	1680	100.00
0.120	0.00	31.0	1.39	125	1.39	500	43.28	2000	100.00
0.240	0.00	37.0	1.39	149	1.39	590	57.16	2380	100.00
0.490	0.00	44.0	1.39	177	1.49	710	71.68	2830	100.00
0.980	0.00	53.0	1.39	210	2.17	840	82.83	3360	100.00
2.00	0.00	63.0	1.39	250	4.70	1000	91.37		
3.90	0.05	74.0	1.39	300	10.09	1190	96.84		

Analysis - Under

Malvern Instruments

Malvern

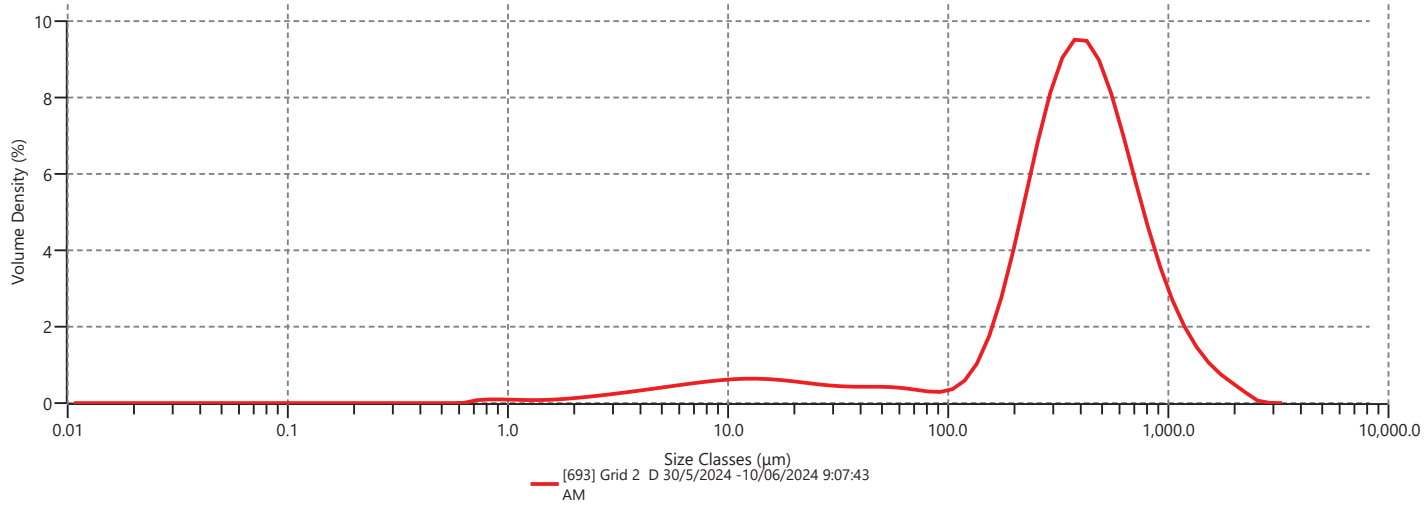
Measurement Details	
Sample Name	Grid 2 D 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/4
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 9:07:43 AM
Measurement Date Time	10/06/2024 9:07:43 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.30 %
Laser Obscuration	26.62 %

Result	
Concentration	0.2078 %
Span	2.159
Uniformity	0.631
Specific Surface Area	44.62 m^2/kg
D [3,2]	51.7 µm
D [4,3]	451 µm
Dv (10)	47.3 µm
Dv (50)	381 µm
Dv (90)	870 µm
Dv (95)	1120 µm
Volume Below (3) µm	1.13 %
Volume Below (6) µm	2.72 %
Volume Below (20) µm	7.37 %
Volume Below (31) µm	8.81 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	3.60	88.0	11.51	350	44.72	1410	97.66
0.0600	0.00	15.6	6.40	105	11.87	420	56.07	1680	98.84
0.120	0.00	31.0	8.81	125	12.43	500	66.60	2000	99.56
0.240	0.00	37.0	9.31	149	13.72	590	75.51	2380	99.95
0.490	0.00	44.0	9.80	177	16.19	710	83.47	2830	100.00
0.980	0.22	53.0	10.32	210	20.26	840	89.02	3360	100.00
2.00	0.65	63.0	10.78	250	26.79	1000	93.11		
3.90	1.61	74.0	11.16	300	35.77	1190	95.85		

Analysis - Under

Malvern Instruments

Malvern

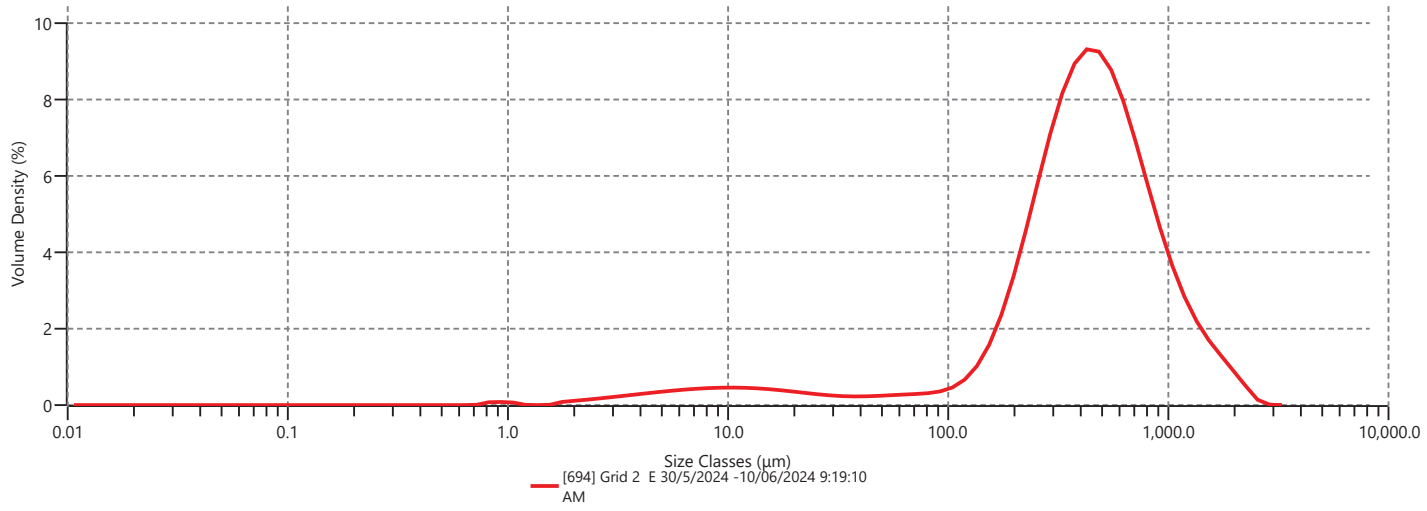
Measurement Details	
Sample Name	Grid 2 E 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/5
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 9:19:10 AM
Measurement Date Time	10/06/2024 9:19:10 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.36 %
Laser Obscuration	16.34 %

Result	
Concentration	0.1630 %
Span	2.022
Uniformity	0.631
Specific Surface Area	32.36 m²/kg
D [3,2]	71.3 µm
D [4,3]	522 µm
Dv (10)	141 µm
Dv (50)	433 µm
Dv (90)	1020 µm
Dv (95)	1310 µm
Volume Below (3) µm	0.74 %
Volume Below (6) µm	2.13 %
Volume Below (20) µm	5.49 %
Volume Below (31) µm	6.33 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	2.84	88.0	8.10	350	37.33	1410	96.01
0.0600	0.00	15.6	4.87	105	8.55	420	48.12	1680	97.92
0.120	0.00	31.0	6.33	125	9.22	500	58.73	2000	99.19
0.240	0.00	37.0	6.59	149	10.47	590	68.30	2380	99.89
0.490	0.00	44.0	6.85	177	12.62	710	77.50	2830	100.00
0.980	0.13	53.0	7.15	210	16.05	840	84.30	3360	100.00
2.00	0.32	63.0	7.44	250	21.55	1000	89.59		
3.90	1.17	74.0	7.74	300	29.30	1190	93.35		

Analysis - Under

Malvern Instruments

Malvern

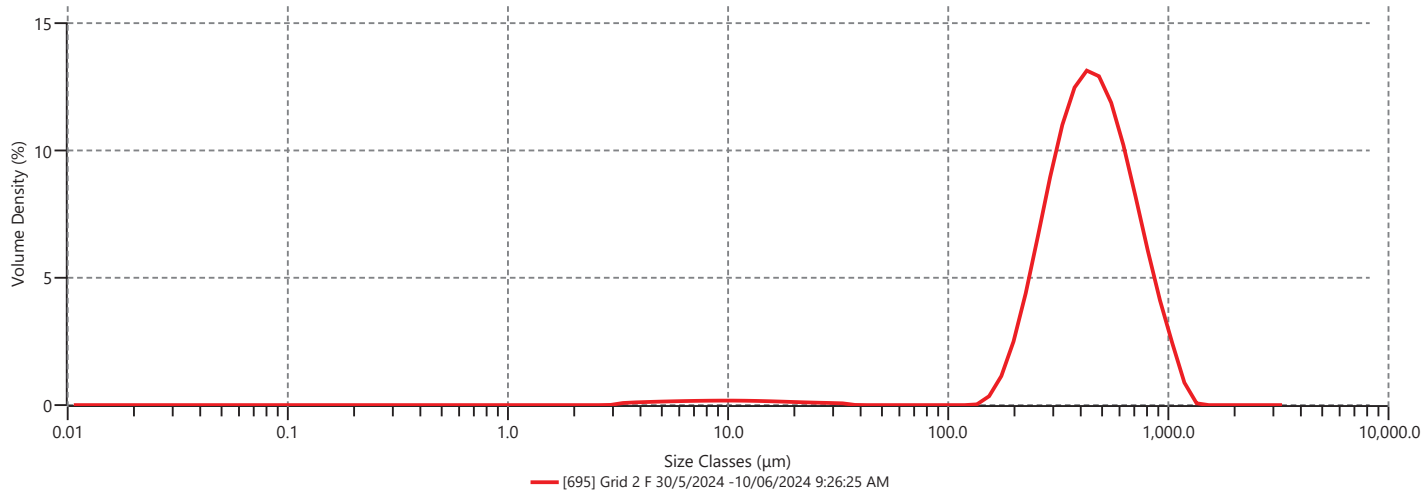
Measurement Details	
Sample Name	Grid 2 F 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/6
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 9:26:25 AM
Measurement Date Time	10/06/2024 9:26:25 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.40 %
Laser Obscuration	24.49 %

Result	
Concentration	0.7184 %
Span	1.213
Uniformity	0.379
Specific Surface Area	11.41 m²/kg
D [3,2]	202 µm
D [4,3]	477 µm
Dv (10)	245 µm
Dv (50)	440 µm
Dv (90)	779 µm
Dv (95)	896 µm
Volume Below (3) µm	0.0007 %
Volume Below (6) µm	0.52 %
Volume Below (20) µm	1.79 %
Volume Below (31) µm	2.06 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.80	88.0	2.13	350	30.87	1410	100.00
0.0600	0.00	15.6	1.57	105	2.13	420	45.97	1680	100.00
0.120	0.00	31.0	2.06	125	2.13	500	60.87	2000	100.00
0.240	0.00	37.0	2.13	149	2.20	590	73.91	2380	100.00
0.490	0.00	44.0	2.13	177	2.96	710	85.43	2830	100.00
0.980	0.00	53.0	2.13	210	5.27	840	92.97	3360	100.00
2.00	0.00	63.0	2.13	250	10.79	1000	97.66		
3.90	0.14	74.0	2.13	300	20.16	1190	99.69		

Analysis - Under

Malvern Instruments

Malvern

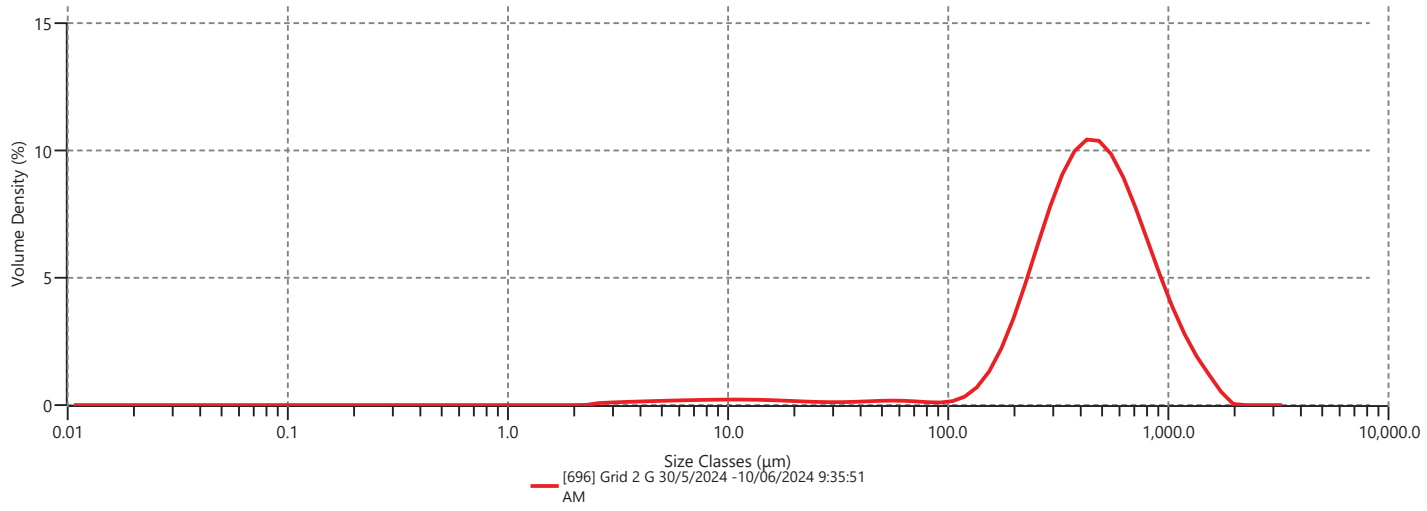
Measurement Details	
Sample Name	Grid 2 G 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/7
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 9:35:51 AM
Measurement Date Time	10/06/2024 9:35:51 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.40 %
Laser Obscuration	19.31 %

Result	
Concentration	0.4286 %
Span	1.628
Uniformity	0.510
Specific Surface Area	14.56 m^2/kg
D [3,2]	158 µm
D [4,3]	515 µm
Dv (10)	206 µm
Dv (50)	448 µm
Dv (90)	935 µm
Dv (95)	1130 µm
Volume Below (3) µm	0.13 %
Volume Below (6) µm	0.80 %
Volume Below (20) µm	2.37 %
Volume Below (31) µm	2.75 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.13	88.0	3.73	350	33.59	1410	98.37
0.0600	0.00	15.6	2.09	105	3.86	420	45.63	1680	99.68
0.120	0.00	31.0	2.75	125	4.16	500	57.52	2000	100.00
0.240	0.00	37.0	2.88	149	5.04	590	68.28	2380	100.00
0.490	0.00	44.0	3.04	177	6.97	710	78.61	2830	100.00
0.980	0.00	53.0	3.24	210	10.38	840	86.22	3360	100.00
2.00	0.00	63.0	3.44	250	16.22	1000	92.04		
3.90	0.34	74.0	3.60	300	24.69	1190	95.93		

Analysis - Under

Malvern Instruments

Malvern

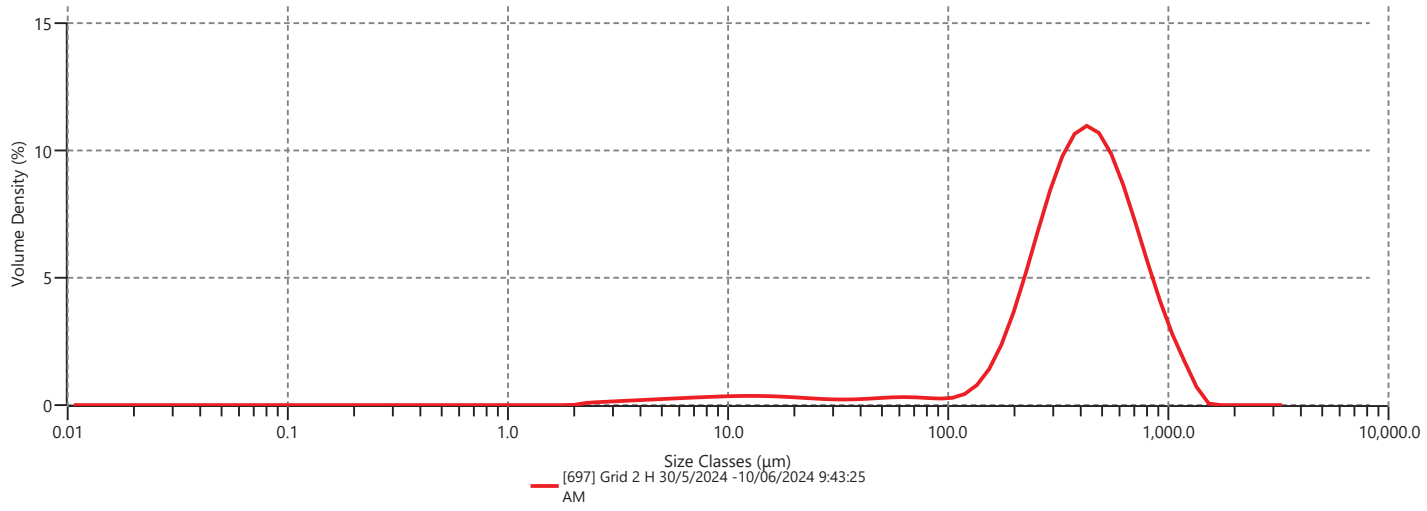
Measurement Details	
Sample Name	Grid 2 H 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/8
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 9:43:25 AM
Measurement Date Time	10/06/2024 9:43:25 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.34 %
Laser Obscuration	15.48 %

Result	
Concentration	0.2402 %
Span	1.540
Uniformity	0.480
Specific Surface Area	20.30 m²/kg
D [3,2]	114 µm
D [4,3]	452 µm
Dv (10)	175 µm
Dv (50)	410 µm
Dv (90)	807 µm
Dv (95)	952 µm
Volume Below (3) µm	0.26 %
Volume Below (6) µm	1.19 %
Volume Below (20) µm	3.80 %
Volume Below (31) µm	4.54 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.69	88.0	6.38	350	38.84	1410	99.93
0.0600	0.00	15.6	3.27	105	6.68	420	51.65	1680	100.00
0.120	0.00	31.0	4.54	125	7.10	500	64.02	2000	100.00
0.240	0.00	37.0	4.79	149	8.09	590	74.84	2380	100.00
0.490	0.00	44.0	5.06	177	10.14	710	84.67	2830	100.00
0.980	0.00	53.0	5.39	210	13.78	840	91.44	3360	100.00
2.00	0.00	63.0	5.74	250	20.07	1000	96.11		
3.90	0.54	74.0	6.07	300	29.24	1190	98.78		

Analysis - Under

Malvern Instruments

Malvern

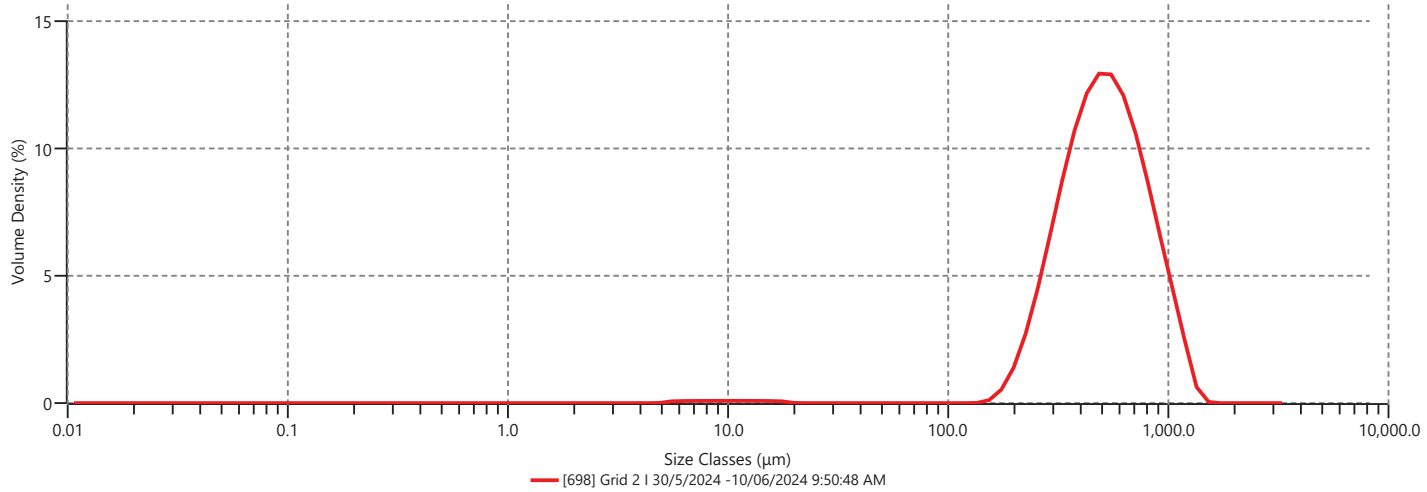
Measurement Details	
Sample Name	Grid 2 I 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/9
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 9:50:48 AM
Measurement Date Time	10/06/2024 9:50:48 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.47 %
Laser Obscuration	22.00 %

Result	
Concentration	1.0932 %
Span	1.204
Uniformity	0.370
Specific Surface Area	6.689 m²/kg
D [3,2]	345 µm
D [4,3]	552 µm
Dv (10)	283 µm
Dv (50)	509 µm
Dv (90)	896 µm
Dv (95)	1020 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.07 %
Volume Below (20) µm	0.70 %
Volume Below (31) µm	0.71 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.22	88.0	0.71	350	20.88	1410	99.95
0.0600	0.00	15.6	0.61	105	0.71	420	34.10	1680	100.00
0.120	0.00	31.0	0.71	125	0.71	500	48.51	2000	100.00
0.240	0.00	37.0	0.71	149	0.73	590	62.51	2380	100.00
0.490	0.00	44.0	0.71	177	1.04	710	76.56	2830	100.00
0.980	0.00	53.0	0.71	210	2.27	840	86.91	3360	100.00
2.00	0.00	63.0	0.71	250	5.79	1000	94.40		
3.90	0.00	74.0	0.71	300	12.48	1190	98.63		

Analysis - Under

Malvern Instruments

Malvern

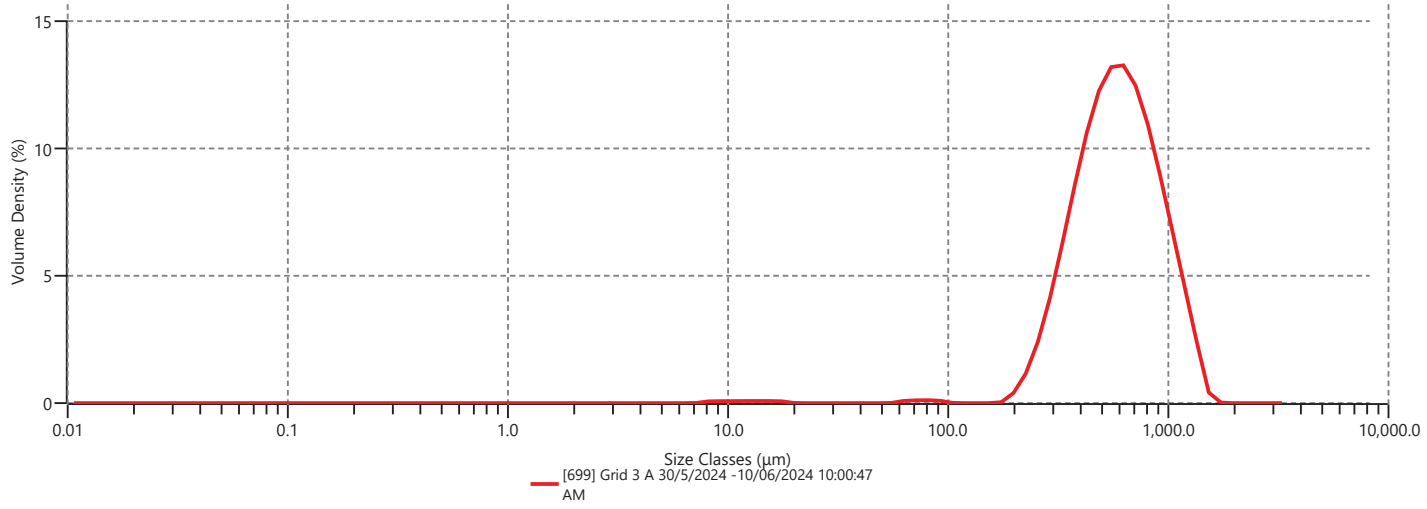
Measurement Details	
Sample Name	Grid 3 A 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/10
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 10:00:47 AM
Measurement Date Time	10/06/2024 10:00:47 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.68 %
Laser Obscuration	14.79 %

Result	
Concentration	0.8919 %
Span	1.172
Uniformity	0.360
Specific Surface Area	5.291 m²/kg
D [3,2]	436 µm
D [4,3]	631 µm
Dv (10)	329 µm
Dv (50)	586 µm
Dv (90)	1020 µm
Dv (95)	1150 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.00 %
Volume Below (20) µm	0.46 %
Volume Below (31) µm	0.46 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.01	88.0	0.74	350	12.50	1410	99.54
0.0600	0.00	15.6	0.37	105	0.81	420	23.29	1680	100.00
0.120	0.00	31.0	0.46	125	0.81	500	36.48	2000	100.00
0.240	0.00	37.0	0.46	149	0.81	590	50.63	2380	100.00
0.490	0.00	44.0	0.46	177	0.82	710	66.42	2830	100.00
0.980	0.00	53.0	0.46	210	1.11	840	79.13	3360	100.00
2.00	0.00	63.0	0.51	250	2.70	1000	89.31		
3.90	0.00	74.0	0.62	300	6.63	1190	96.03		

Analysis - Under

Malvern Instruments

Malvern

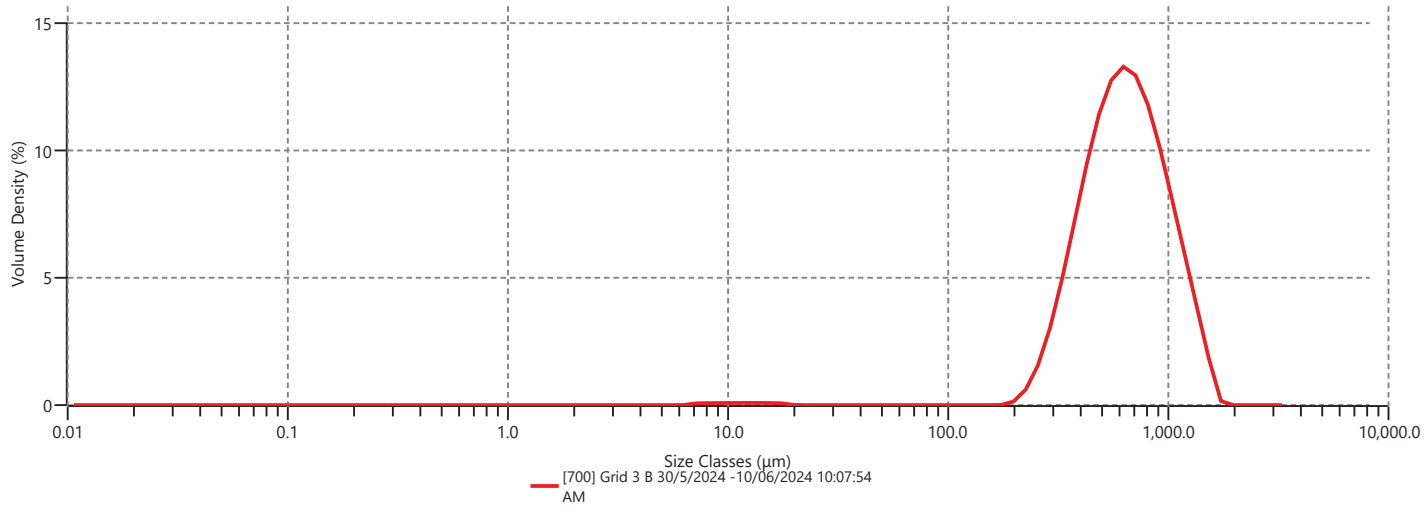
Measurement Details	
Sample Name	Grid 3 B 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/11
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 10:07:54 AM
Measurement Date Time	10/06/2024 10:07:54 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.76 %
Laser Obscuration	13.78 %

Result	
Concentration	0.8538 %
Span	1.177
Uniformity	0.361
Specific Surface Area	5.111 m²/kg
D [3,2]	452 µm
D [4,3]	686 µm
Dv (10)	359 µm
Dv (50)	633 µm
Dv (90)	1100 µm
Dv (95)	1250 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.0001 %
Volume Below (20) µm	0.54 %
Volume Below (31) µm	0.54 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.07	88.0	0.54	350	8.88	1410	98.09
0.0600	0.00	15.6	0.45	105	0.54	420	18.15	1680	99.99
0.120	0.00	31.0	0.54	125	0.54	500	30.21	2000	100.00
0.240	0.00	37.0	0.54	149	0.54	590	43.81	2380	100.00
0.490	0.00	44.0	0.54	177	0.54	710	59.83	2830	100.00
0.980	0.00	53.0	0.54	210	0.63	840	73.33	3360	100.00
2.00	0.00	63.0	0.54	250	1.52	1000	84.79		
3.90	0.00	74.0	0.54	300	4.27	1190	92.99		

Analysis - Under

Malvern Instruments

Malvern

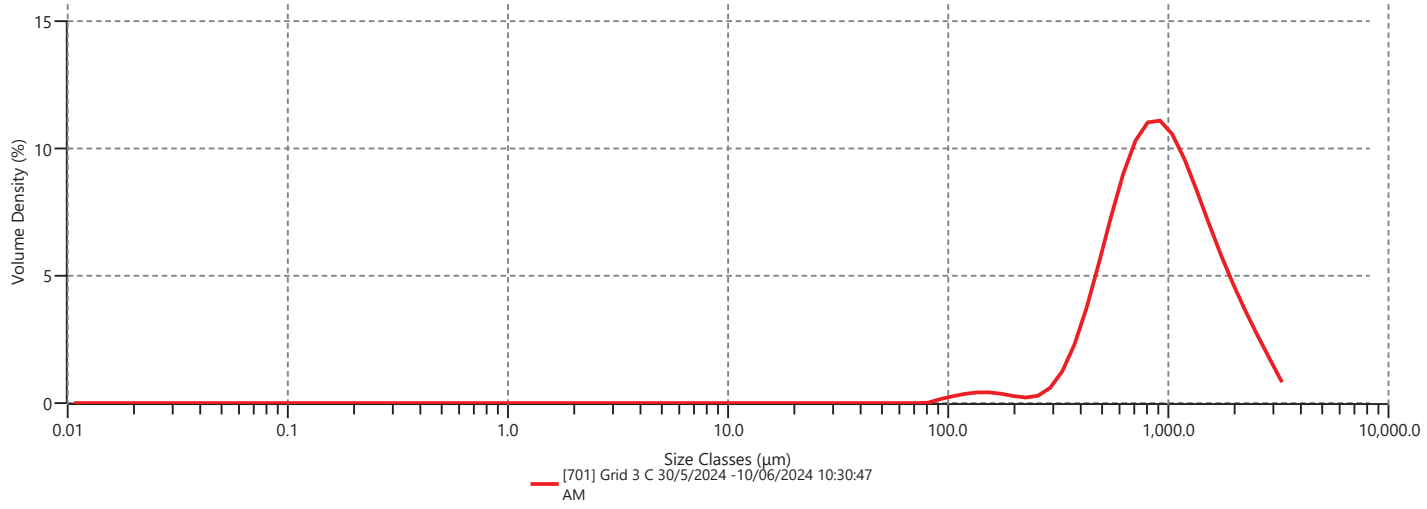
Measurement Details	
Sample Name	Grid 3 C 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/12
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 10:30:47 AM
Measurement Date Time	10/06/2024 10:30:47 AM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	1.24 %
Laser Obscuration	12.44 %

Result	
Concentration	1.2999 %
Span	1.579
Uniformity	0.481
Specific Surface Area	3.028 m^2/kg
D [3,2]	762 µm
D [4,3]	1070 µm
Dv (10)	469 µm
Dv (50)	921 µm
Dv (90)	1920 µm
Dv (95)	2320 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.00 %
Volume Below (20) µm	0.00 %
Volume Below (31) µm	0.00 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.00	88.0	0.02	350	3.76	1410	77.21
0.0600	0.00	15.6	0.00	105	0.26	420	6.91	1680	85.15
0.120	0.00	31.0	0.00	125	0.63	500	12.28	2000	91.17
0.240	0.00	37.0	0.00	149	1.11	590	19.93	2380	95.62
0.490	0.00	44.0	0.00	177	1.56	710	31.42	2830	98.37
0.980	0.00	53.0	0.00	210	1.90	840	43.29	3360	99.78
2.00	0.00	63.0	0.00	250	2.15	1000	55.88		
3.90	0.00	74.0	0.00	300	2.66	1190	67.47		

Analysis - Under

Malvern Instruments

Malvern

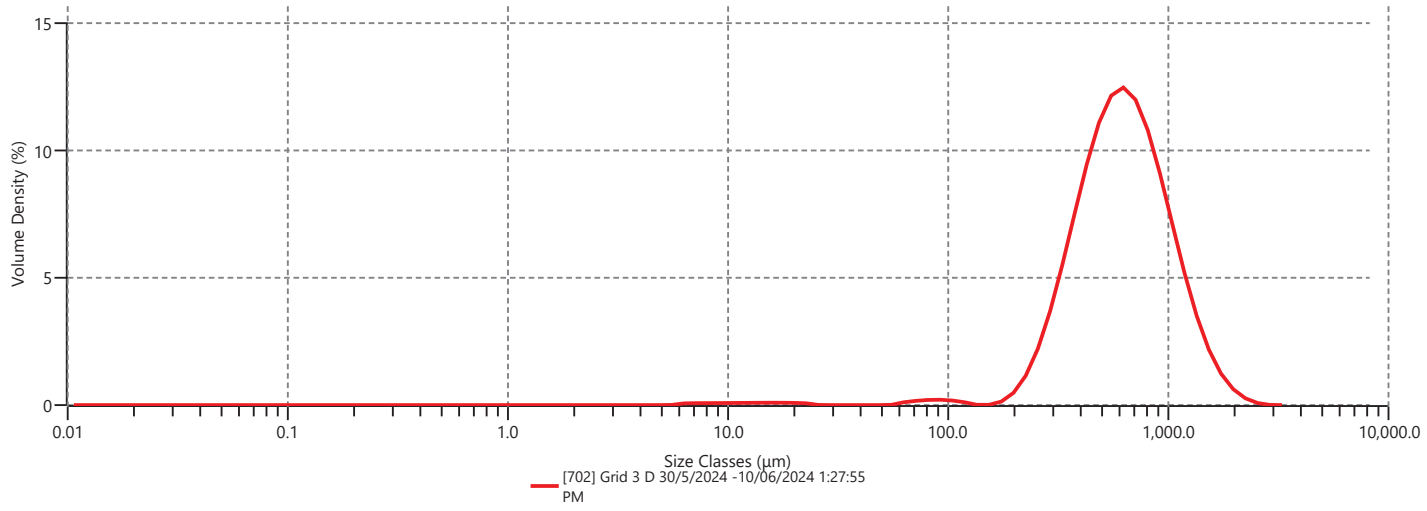
Measurement Details	
Sample Name	Grid 3 D 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/13
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 1:27:55 PM
Measurement Date Time	10/06/2024 1:27:55 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.90 %
Laser Obscuration	12.40 %

Result	
Concentration	0.6658 %
Span	1.315
Uniformity	0.413
Specific Surface Area	5.844 m²/kg
D [3,2]	395 µm
D [4,3]	683 µm
Dv (10)	328 µm
Dv (50)	615 µm
Dv (90)	1140 µm
Dv (95)	1350 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.008 %
Volume Below (20) µm	0.67 %
Volume Below (31) µm	0.77 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.14	88.0	1.20	350	12.31	1410	96.07
0.0600	0.00	15.6	0.52	105	1.44	420	21.83	1680	98.47
0.120	0.00	31.0	0.77	125	1.59	500	33.67	2000	99.53
0.240	0.00	37.0	0.77	149	1.60	590	46.67	2380	99.93
0.490	0.00	44.0	0.77	177	1.67	710	61.62	2830	100.00
0.980	0.00	53.0	0.77	210	2.07	840	74.03	3360	100.00
2.00	0.00	63.0	0.82	250	3.61	1000	84.35		
3.90	0.00	74.0	0.98	300	7.15	1190	91.57		

Analysis - Under

Malvern Instruments

Malvern

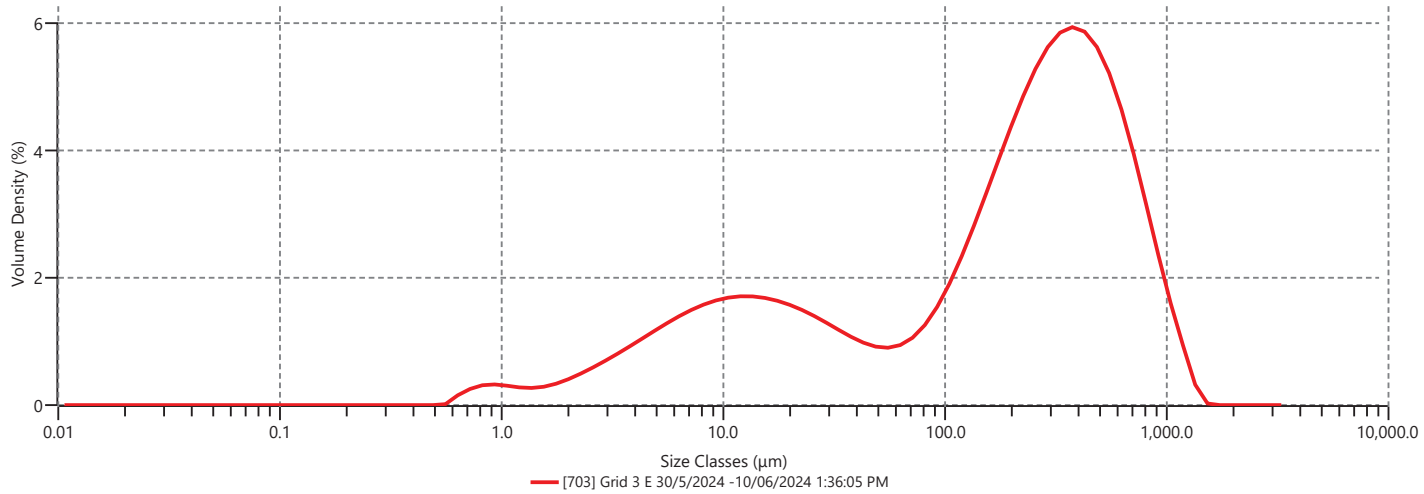
Measurement Details	
Sample Name	Grid 3 E 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/14
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 1:36:05 PM
Measurement Date Time	10/06/2024 1:36:05 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.29 %
Laser Obscuration	16.50 %

Result	
Concentration	0.0428 %
Span	3.045
Uniformity	0.974
Specific Surface Area	128.2 m^2/kg
D [3,2]	18.0 µm
D [4,3]	281 µm
Dv (10)	7.11 µm
Dv (50)	218 µm
Dv (90)	672 µm
Dv (95)	831 µm
Volume Below (3) µm	3.74 %
Volume Below (6) µm	8.41 %
Volume Below (20) µm	21.13 %
Volume Below (31) µm	25.20 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	10.91	88.0	32.31	350	66.77	1410	99.97
0.0600	0.00	15.6	18.48	105	34.24	420	73.83	1680	100.00
0.120	0.00	31.0	25.20	125	36.73	500	80.38	2000	100.00
0.240	0.00	37.0	26.53	149	40.04	590	86.08	2380	100.00
0.490	0.00	44.0	27.69	177	44.05	710	91.41	2830	100.00
0.980	0.86	53.0	28.81	210	48.77	840	95.21	3360	100.00
2.00	2.28	63.0	29.84	250	54.40	1000	97.89		
3.90	5.17	74.0	30.90	300	60.92	1190	99.40		

Analysis - Under

Malvern Instruments

Malvern

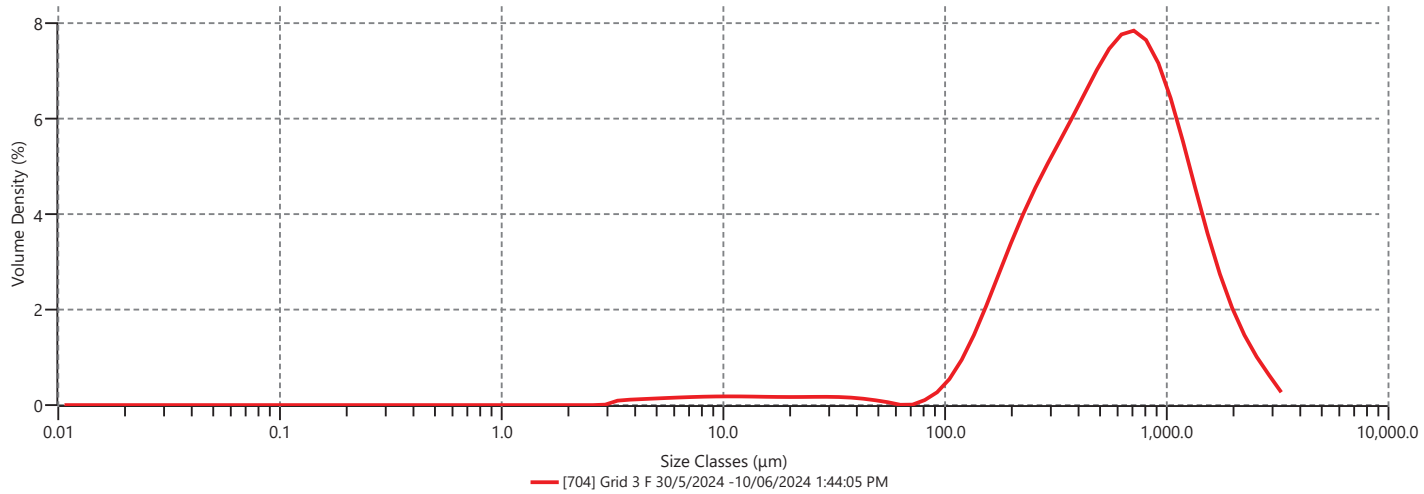
Measurement Details	
Sample Name	Grid 3 F 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/15
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 1:44:05 PM
Measurement Date Time	10/06/2024 1:44:05 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.44 %
Laser Obscuration	12.88 %

Result	
Concentration	0.3425 %
Span	2.148
Uniformity	0.681
Specific Surface Area	11.75 m^2/kg
D [3,2]	196 µm
D [4,3]	710 µm
Dv (10)	188 µm
Dv (50)	574 µm
Dv (90)	1420 µm
Dv (95)	1800 µm
Volume Below (3) µm	0.0009 %
Volume Below (6) µm	0.54 %
Volume Below (20) µm	1.91 %
Volume Below (31) µm	2.40 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.82	88.0	3.04	350	28.32	1410	89.78
0.0600	0.00	15.6	1.63	105	3.46	420	35.64	1680	93.81
0.120	0.00	31.0	2.40	125	4.37	500	43.39	2000	96.56
0.240	0.00	37.0	2.59	149	6.14	590	51.39	2380	98.40
0.490	0.00	44.0	2.75	177	8.82	710	60.83	2830	99.43
0.980	0.00	53.0	2.88	210	12.40	840	69.34	3360	99.93
2.00	0.00	63.0	2.92	250	17.09	1000	77.47		
3.90	0.15	74.0	2.92	300	22.84	1190	84.38		

Analysis - Under

Malvern Instruments

Malvern

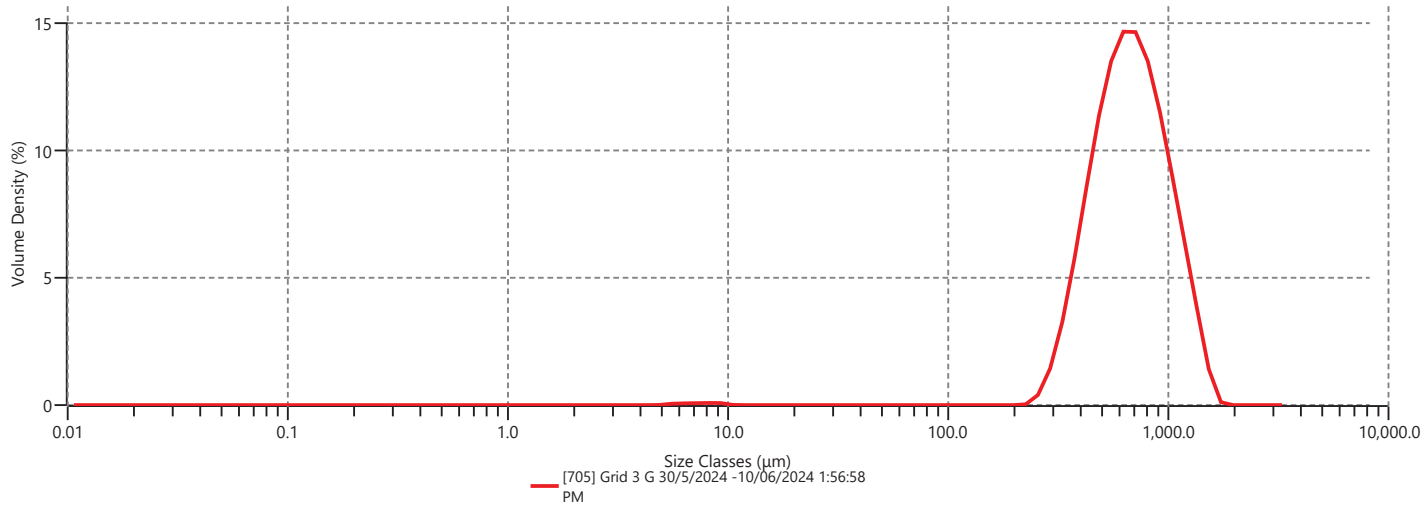
Measurement Details	
Sample Name	Grid 3 G 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/16
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 1:56:58 PM
Measurement Date Time	10/06/2024 1:56:58 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.80 %
Laser Obscuration	12.49 %

Result	
Concentration	0.8371 %
Span	1.044
Uniformity	0.323
Specific Surface Area	4.689 m^2/kg
D [3,2]	492 µm
D [4,3]	715 µm
Dv (10)	405 µm
Dv (50)	669 µm
Dv (90)	1100 µm
Dv (95)	1240 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.06 %
Volume Below (20) µm	0.32 %
Volume Below (31) µm	0.32 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.18	88.0	0.32	350	4.32	1410	98.51
0.0600	0.00	15.6	0.32	105	0.32	420	12.02	1680	100.00
0.120	0.00	31.0	0.32	125	0.32	500	23.60	2000	100.00
0.240	0.00	37.0	0.32	149	0.32	590	37.90	2380	100.00
0.490	0.00	44.0	0.32	177	0.32	710	55.75	2830	100.00
0.980	0.00	53.0	0.32	210	0.32	840	71.14	3360	100.00
2.00	0.00	63.0	0.32	250	0.41	1000	84.19		
3.90	0.00	74.0	0.32	300	1.47	1190	93.26		

Analysis - Under

Malvern Instruments

Malvern

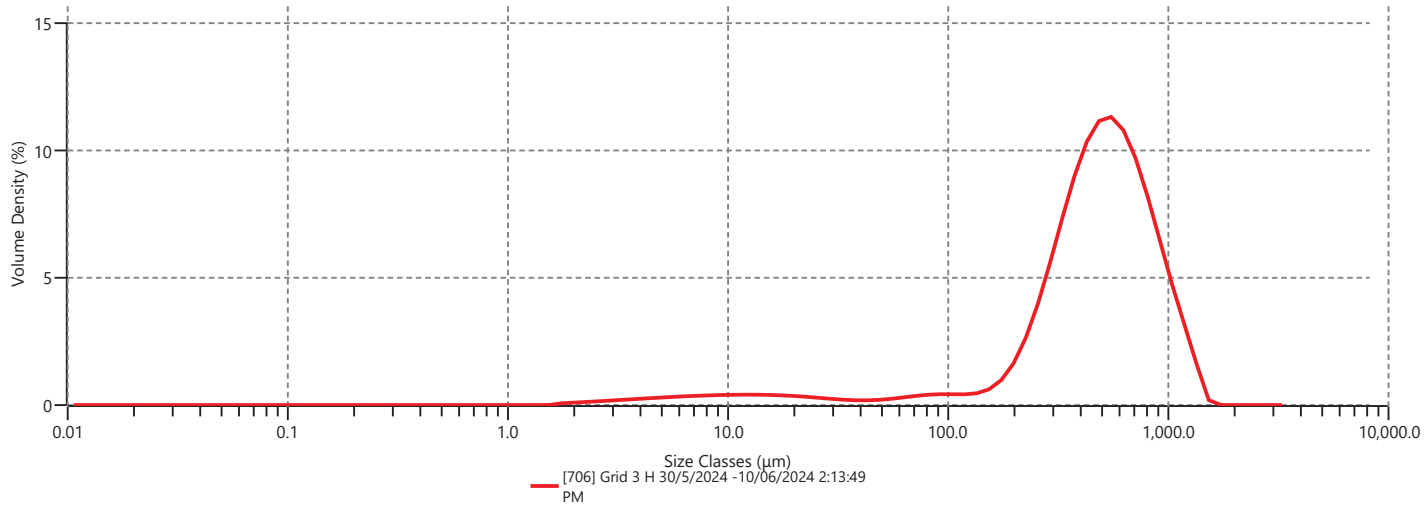
Measurement Details	
Sample Name	Grid 3 H 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/17
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 2:13:49 PM
Measurement Date Time	10/06/2024 2:13:49 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.46 %
Laser Obscuration	14.60 %

Result	
Concentration	0.1882 %
Span	1.511
Uniformity	0.461
Specific Surface Area	24.21 m^2/kg
D [3,2]	95.3 µm
D [4,3]	527 µm
Dv (10)	184 µm
Dv (50)	494 µm
Dv (90)	930 µm
Dv (95)	1080 µm
Volume Below (3) µm	0.48 %
Volume Below (6) µm	1.66 %
Volume Below (20) µm	4.69 %
Volume Below (31) µm	5.54 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	2.27	88.0	7.36	350	27.43	1410	99.78
0.0600	0.00	15.6	4.08	105	7.85	420	38.57	1680	100.00
0.120	0.00	31.0	5.54	125	8.33	500	50.92	2000	100.00
0.240	0.00	37.0	5.78	149	8.88	590	63.16	2380	100.00
0.490	0.00	44.0	5.99	177	9.75	710	75.81	2830	100.00
0.980	0.00	53.0	6.24	210	11.34	840	85.44	3360	100.00
2.00	0.11	63.0	6.55	250	14.64	1000	92.77		
3.90	0.84	74.0	6.90	300	20.38	1190	97.41		

Analysis - Under

Malvern Instruments

Malvern

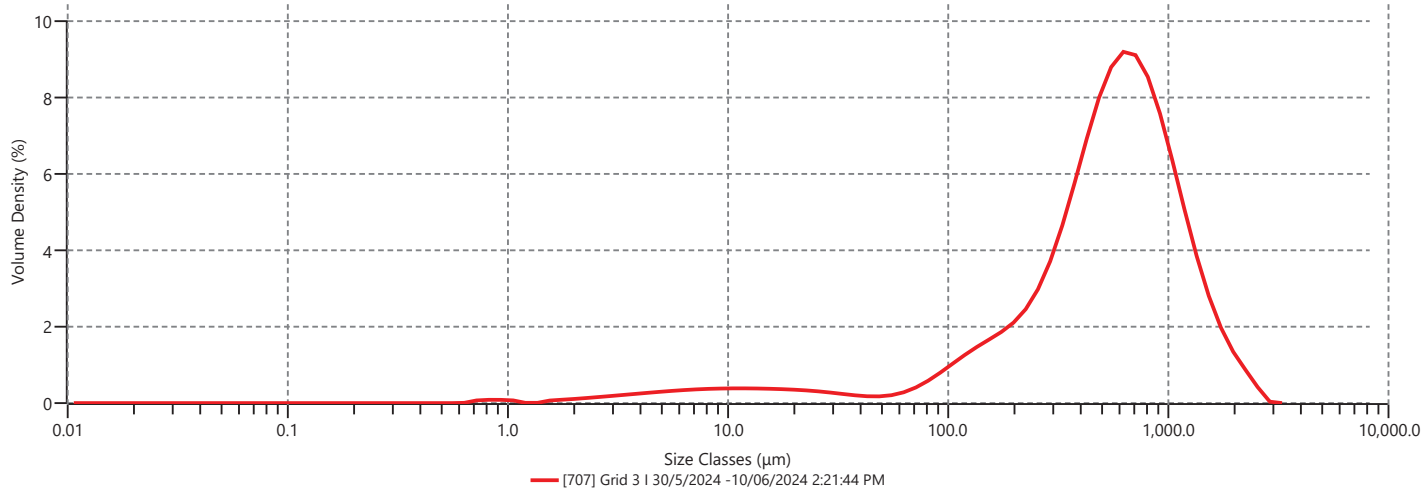
Measurement Details	
Sample Name	Grid 3 I 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/18
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 2:21:44 PM
Measurement Date Time	10/06/2024 2:21:44 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.37 %
Laser Obscuration	13.06 %

Result	
Concentration	0.1292 %
Span	1.978
Uniformity	0.605
Specific Surface Area	32.62 m²/kg
D [3,2]	70.7 µm
D [4,3]	640 µm
Dv (10)	122 µm
Dv (50)	563 µm
Dv (90)	1240 µm
Dv (95)	1520 µm
Volume Below (3) µm	0.84 %
Volume Below (6) µm	2.04 %
Volume Below (20) µm	4.95 %
Volume Below (31) µm	5.85 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	2.64	88.0	7.84	350	27.53	1410	93.47
0.0600	0.00	15.6	4.36	105	8.86	420	34.73	1680	96.59
0.120	0.00	31.0	5.85	125	10.20	500	43.31	2000	98.50
0.240	0.00	37.0	6.11	149	11.92	590	52.71	2380	99.64
0.490	0.00	44.0	6.33	177	13.89	710	63.84	2830	100.00
0.980	0.20	53.0	6.54	210	16.16	840	73.49	3360	100.00
2.00	0.45	63.0	6.81	250	19.07	1000	82.11		
3.90	1.22	74.0	7.18	300	23.06	1190	88.75		

Analysis - Under

Malvern Instruments

Malvern

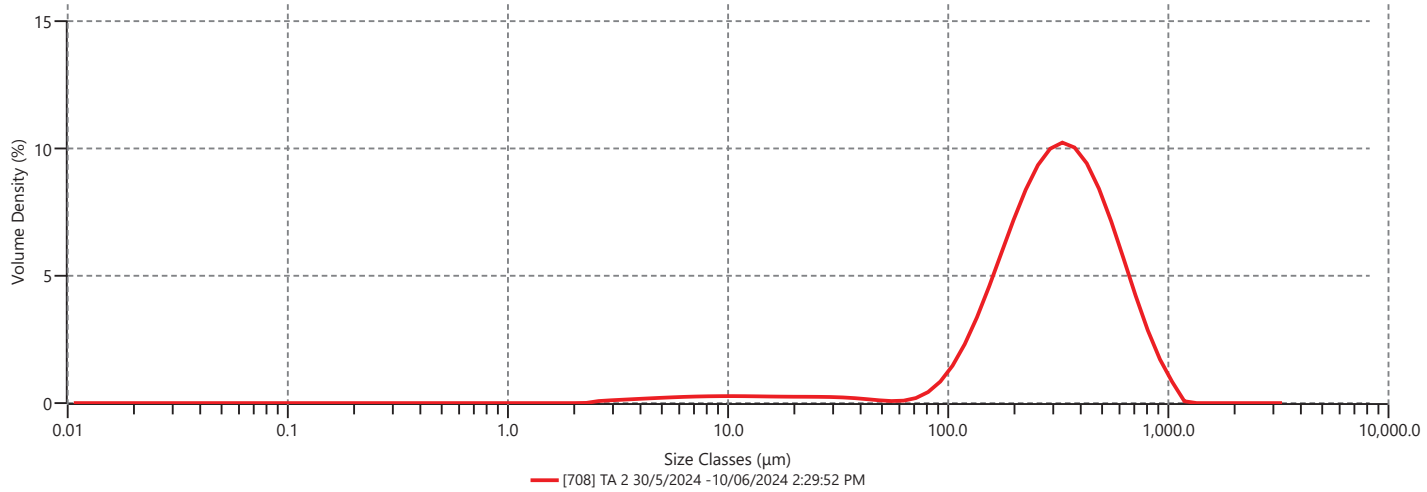
Measurement Details	
Sample Name	TA 2 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/19
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 2:29:52 PM
Measurement Date Time	10/06/2024 2:29:52 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.20 %
Laser Obscuration	12.46 %

Result	
Concentration	0.2034 %
Span	1.590
Uniformity	0.497
Specific Surface Area	19.08 m^2/kg
D [3,2]	121 µm
D [4,3]	349 µm
Dv (10)	134 µm
Dv (50)	312 µm
Dv (90)	631 µm
Dv (95)	742 µm
Volume Below (3) µm	0.13 %
Volume Below (6) µm	0.94 %
Volume Below (20) µm	3.00 %
Volume Below (31) µm	3.71 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.37	88.0	5.02	350	57.66	1410	100.00
0.0600	0.00	15.6	2.59	105	6.25	420	69.45	1680	100.00
0.120	0.00	31.0	3.71	125	8.53	500	79.58	2000	100.00
0.240	0.00	37.0	3.96	149	12.56	590	87.51	2380	100.00
0.490	0.00	44.0	4.15	177	18.39	710	93.78	2830	100.00
0.980	0.00	53.0	4.29	210	26.01	840	97.47	3360	100.00
2.00	0.00	63.0	4.38	250	35.80	1000	99.43		
3.90	0.37	74.0	4.54	300	47.37	1190	100.00		

Analysis - Under

Malvern Instruments

Malvern

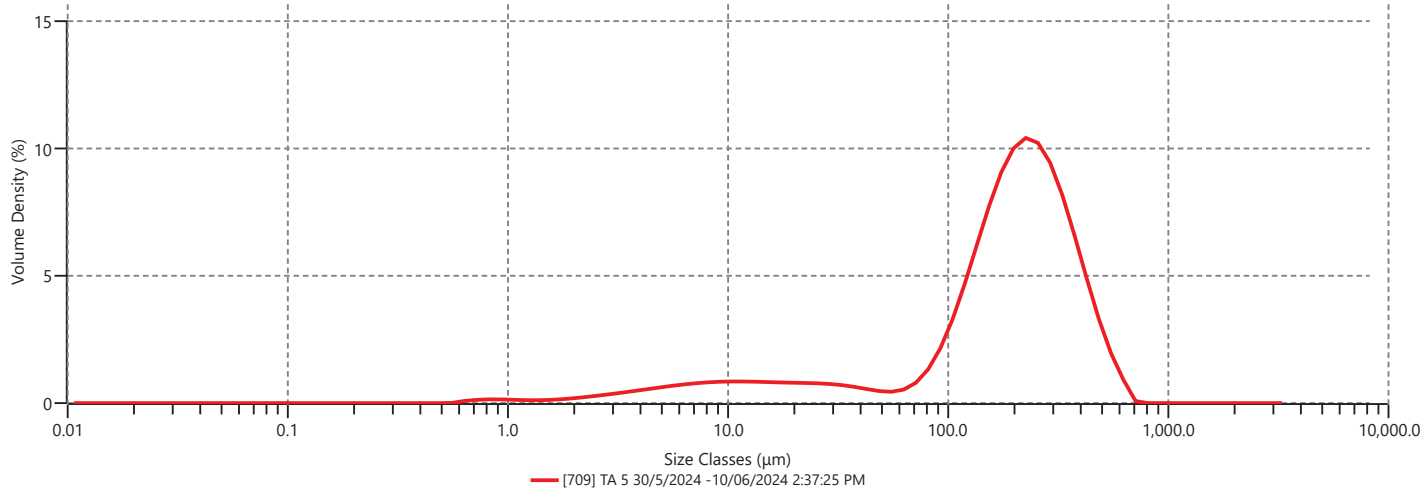
Measurement Details	
Sample Name	TA 5 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/20
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 2:37:25 PM
Measurement Date Time	10/06/2024 2:37:25 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.25 %
Laser Obscuration	15.61 %

Result	
Concentration	0.0738 %
Span	1.864
Uniformity	0.524
Specific Surface Area	69.74 m^2/kg
D [3,2]	33.1 µm
D [4,3]	212 µm
Dv (10)	17.8 µm
Dv (50)	201 µm
Dv (90)	392 µm
Dv (95)	456 µm
Volume Below (3) µm	1.76 %
Volume Below (6) µm	4.20 %
Volume Below (20) µm	10.61 %
Volume Below (31) µm	12.83 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	5.50	88.0	17.59	350	85.10	1410	100.00
0.0600	0.00	15.6	9.29	105	20.55	420	92.44	1680	100.00
0.120	0.00	31.0	12.83	125	25.31	500	96.98	2000	100.00
0.240	0.00	37.0	13.62	149	32.66	590	99.28	2380	100.00
0.490	0.00	44.0	14.29	177	42.09	710	100.00	2830	100.00
0.980	0.41	53.0	14.87	210	53.01	840	100.00	3360	100.00
2.00	1.03	63.0	15.40	250	64.86	1000	100.00		
3.90	2.49	74.0	16.11	300	76.59	1190	100.00		

Analysis - Under

Malvern Instruments

Malvern

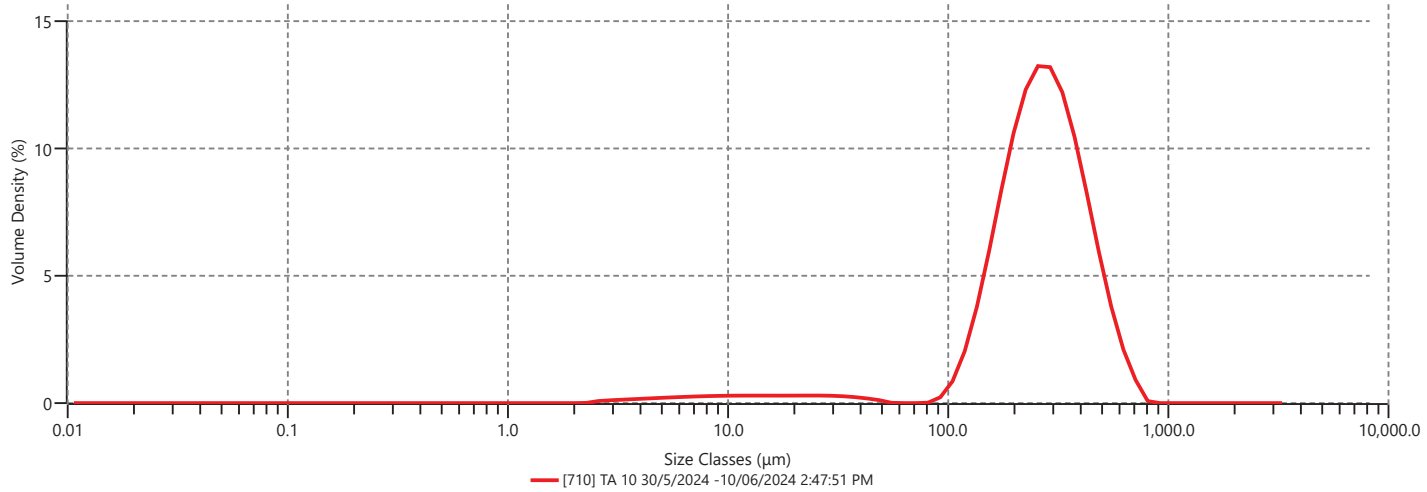
Measurement Details	
Sample Name	TA 10 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/21
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 2:47:51 PM
Measurement Date Time	10/06/2024 2:47:51 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.32 %
Laser Obscuration	14.44 %

Result	
Concentration	0.2245 %
Span	1.202
Uniformity	0.385
Specific Surface Area	20.28 m²/kg
D [3,2]	114 µm
D [4,3]	282 µm
Dv (10)	142 µm
Dv (50)	265 µm
Dv (90)	460 µm
Dv (95)	528 µm
Volume Below (3) µm	0.14 %
Volume Below (6) µm	0.94 %
Volume Below (20) µm	3.16 %
Volume Below (31) µm	4.00 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.37	88.0	4.71	350	73.47	1410	100.00
0.0600	0.00	15.6	2.68	105	5.20	420	85.29	1680	100.00
0.120	0.00	31.0	4.00	125	7.01	500	93.20	2000	100.00
0.240	0.00	37.0	4.30	149	11.66	590	97.63	2380	100.00
0.490	0.00	44.0	4.54	177	19.62	710	99.63	2830	100.00
0.980	0.00	53.0	4.68	210	30.78	840	100.00	3360	100.00
2.00	0.00	63.0	4.68	250	45.08	1000	100.00		
3.90	0.38	74.0	4.68	300	60.91	1190	100.00		

Analysis - Under

Malvern Instruments

Malvern

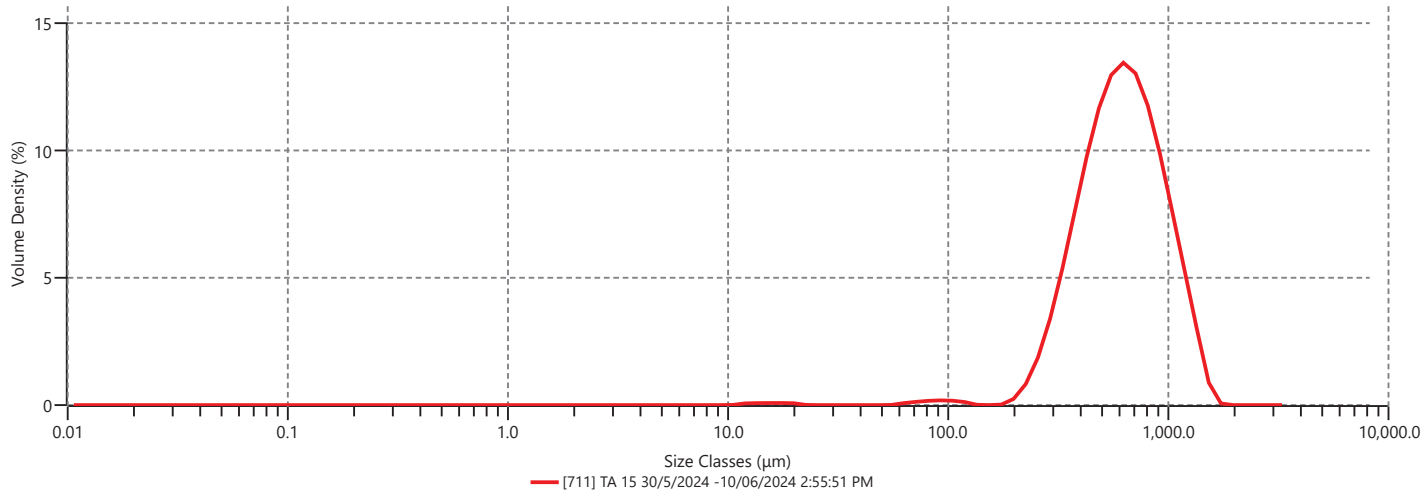
Measurement Details	
Sample Name	TA 15 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/22
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 2:55:51 PM
Measurement Date Time	10/06/2024 2:55:51 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.64 %
Laser Obscuration	14.12 %

Result	
Concentration	0.9489 %
Span	1.158
Uniformity	0.355
Specific Surface Area	4.746 m^2/kg
D [3,2]	486 µm
D [4,3]	660 µm
Dv (10)	345 µm
Dv (50)	615 µm
Dv (90)	1060 µm
Dv (95)	1200 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.00 %
Volume Below (20) µm	0.30 %
Volume Below (31) µm	0.33 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.00	88.0	0.67	350	10.49	1410	99.06
0.0600	0.00	15.6	0.17	105	0.88	420	20.16	1680	100.00
0.120	0.00	31.0	0.33	125	1.04	500	32.52	2000	100.00
0.240	0.00	37.0	0.33	149	1.05	590	46.36	2380	100.00
0.490	0.00	44.0	0.33	177	1.06	710	62.53	2830	100.00
0.980	0.00	53.0	0.33	210	1.23	840	76.04	3360	100.00
2.00	0.00	63.0	0.37	250	2.38	1000	87.24		
3.90	0.00	74.0	0.48	300	5.53	1190	94.84		

Analysis - Under

Malvern Instruments

Malvern

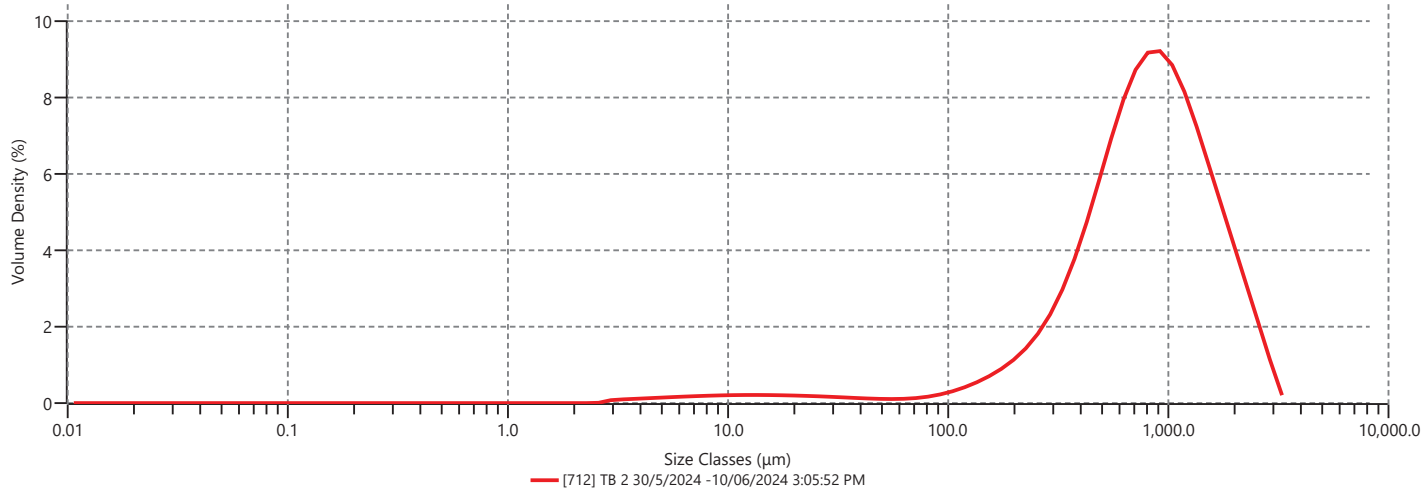
Measurement Details	
Sample Name	TB 2 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/23
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 3:05:52 PM
Measurement Date Time	10/06/2024 3:05:52 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.61 %
Laser Obscuration	8.00 %

Result	
Concentration	0.2148 %
Span	1.873
Uniformity	0.567
Specific Surface Area	11.27 m^2/kg
D [3,2]	205 µm
D [4,3]	935 µm
Dv (10)	277 µm
Dv (50)	811 µm
Dv (90)	1800 µm
Dv (95)	2150 µm
Volume Below (3) µm	0.05 %
Volume Below (6) µm	0.61 %
Volume Below (20) µm	2.18 %
Volume Below (31) µm	2.70 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.92	88.0	3.59	350	14.06	1410	80.71
0.0600	0.00	15.6	1.85	105	3.88	420	18.83	1680	87.73
0.120	0.00	31.0	2.70	125	4.31	500	24.91	2000	93.14
0.240	0.00	37.0	2.87	149	4.96	590	32.22	2380	97.08
0.490	0.00	44.0	3.01	177	5.85	710	42.17	2830	99.26
0.980	0.00	53.0	3.15	210	7.03	840	52.10	3360	99.96
2.00	0.00	63.0	3.27	250	8.75	1000	62.57		
3.90	0.22	74.0	3.40	300	11.22	1190	72.33		

Analysis - Under

Malvern Instruments

Malvern

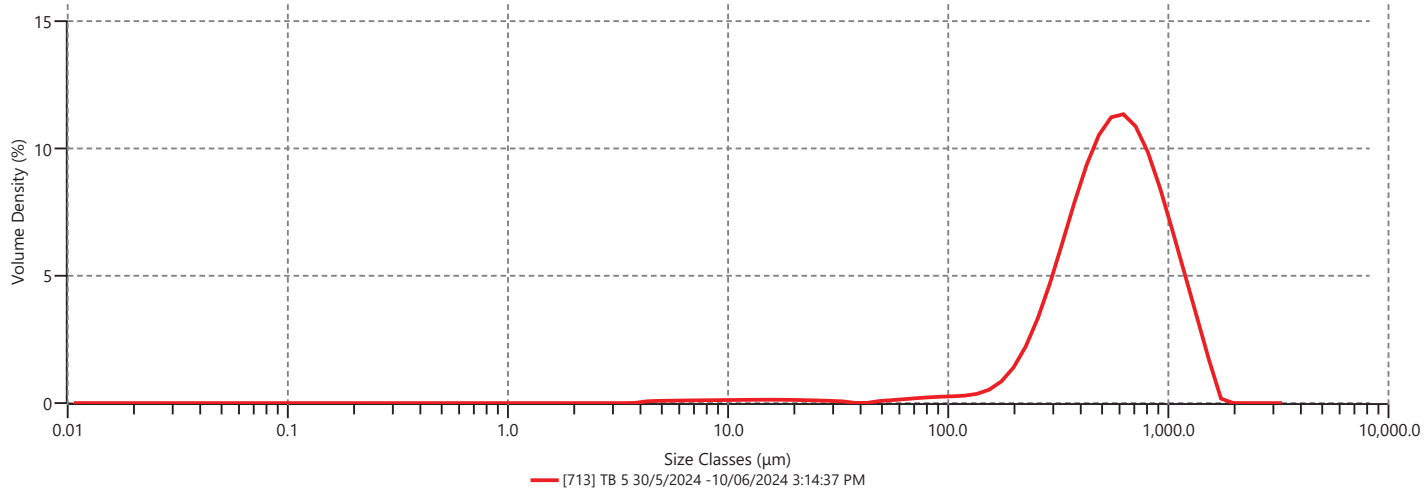
Measurement Details	
Sample Name	TB 5 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/24
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 3:14:37 PM
Measurement Date Time	10/06/2024 3:14:37 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.40 %
Laser Obscuration	8.68 %

Result	
Concentration	0.3214 %
Span	1.404
Uniformity	0.434
Specific Surface Area	8.274 m^2/kg
D [3,2]	279 µm
D [4,3]	624 µm
Dv (10)	272 µm
Dv (50)	572 µm
Dv (90)	1070 µm
Dv (95)	1240 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.23 %
Volume Below (20) µm	1.18 %
Volume Below (31) µm	1.48 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.41	88.0	2.21	350	18.99	1410	98.19
0.0600	0.00	15.6	0.97	105	2.50	420	28.84	1680	99.98
0.120	0.00	31.0	1.48	125	2.82	500	40.28	2000	100.00
0.240	0.00	37.0	1.54	149	3.26	590	52.32	2380	100.00
0.490	0.00	44.0	1.54	177	4.00	710	65.90	2830	100.00
0.980	0.00	53.0	1.63	210	5.37	840	77.19	3360	100.00
2.00	0.00	63.0	1.77	250	8.15	1000	86.79		
3.90	0.00	74.0	1.96	300	12.98	1190	93.76		

Analysis - Under

Malvern Instruments

Malvern

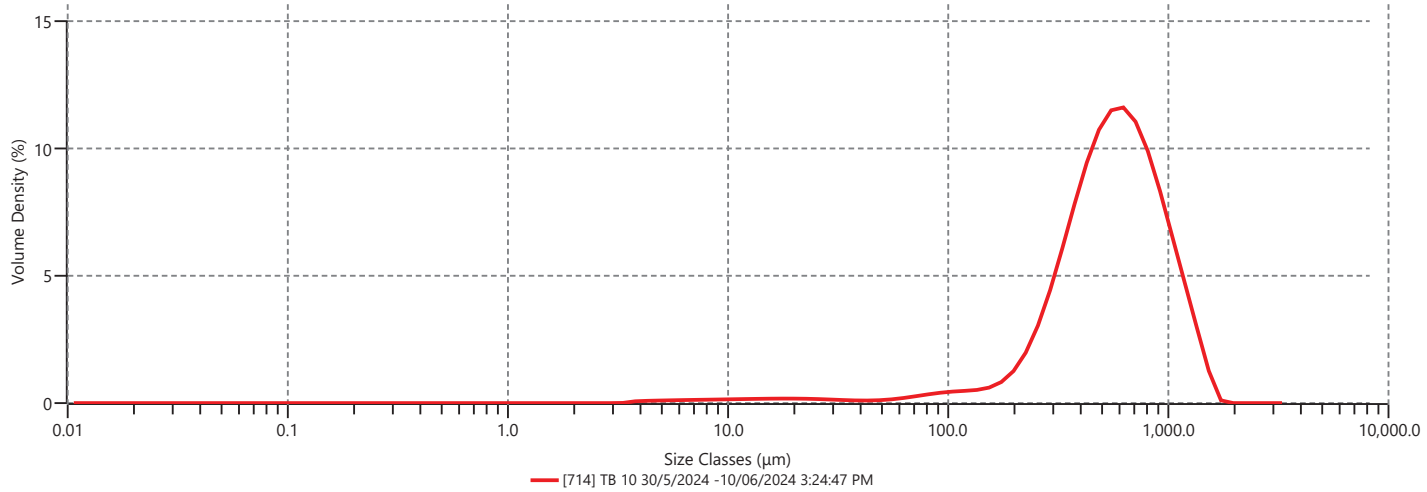
Measurement Details	
Sample Name	TB 10 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/25
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 3:24:47 PM
Measurement Date Time	10/06/2024 3:24:47 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.37 %
Laser Obscuration	14.22 %

Result	
Concentration	0.4618 %
Span	1.396
Uniformity	0.431
Specific Surface Area	9.709 m^2/kg
D [3,2]	238 µm
D [4,3]	609 µm
Dv (10)	259 µm
Dv (50)	565 µm
Dv (90)	1050 µm
Dv (95)	1200 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.33 %
Volume Below (20) µm	1.52 %
Volume Below (31) µm	1.97 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.54	88.0	3.19	350	19.58	1410	98.67
0.0600	0.00	15.6	1.23	105	3.68	420	29.38	1680	100.00
0.120	0.00	31.0	1.97	125	4.21	500	40.99	2000	100.00
0.240	0.00	37.0	2.11	149	4.82	590	53.32	2380	100.00
0.490	0.00	44.0	2.22	177	5.60	710	67.19	2830	100.00
0.980	0.00	53.0	2.36	210	6.84	840	78.59	3360	100.00
2.00	0.00	63.0	2.55	250	9.33	1000	88.05		
3.90	0.05	74.0	2.80	300	13.80	1190	94.68		

Analysis - Under

Malvern Instruments

Malvern

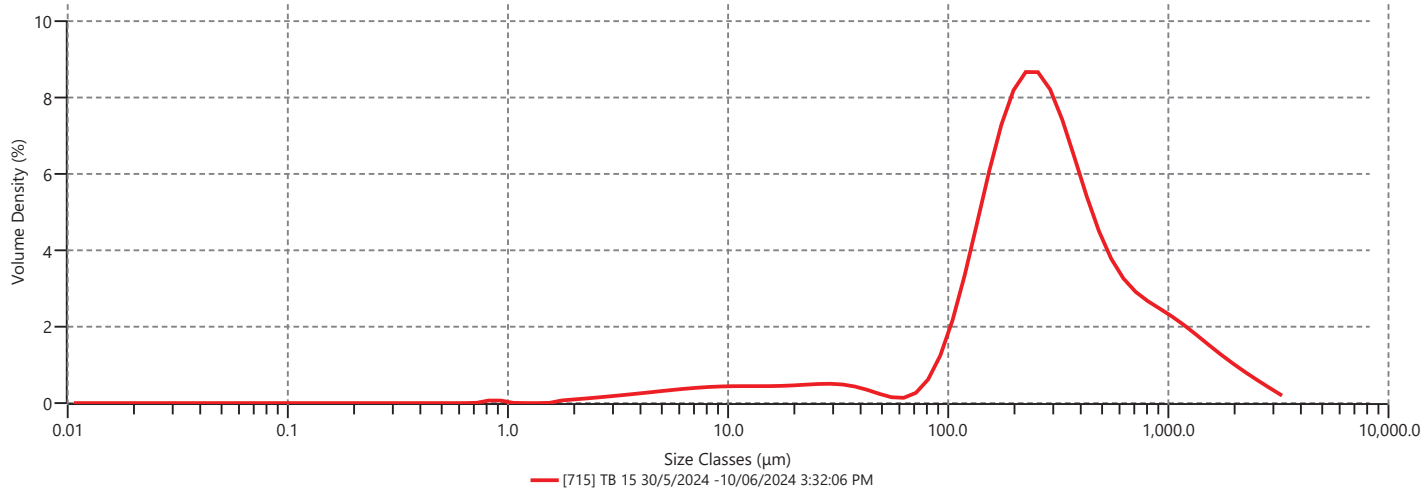
Measurement Details	
Sample Name	TB 15 30/5/2024
SOP File Name	Sediment.msop
Lab Number	2024155/26
Operator Name	instrument

Measurement Details	
Analysis Date Time	10/06/2024 3:32:06 PM
Measurement Date Time	10/06/2024 3:32:06 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.28 %
Laser Obscuration	13.52 %

Result	
Concentration	0.1328 %
Span	3.252
Uniformity	0.996
Specific Surface Area	32.28 m^2/kg
D [3,2]	71.5 µm
D [4,3]	423 µm
Dv (10)	99.2 µm
Dv (50)	268 µm
Dv (90)	972 µm
Dv (95)	1410 µm
Volume Below (3) µm	0.59 %
Volume Below (6) µm	1.82 %
Volume Below (20) µm	5.21 %
Volume Below (31) µm	6.62 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	2.49	88.0	8.98	350	63.70	1410	94.97
0.0600	0.00	15.6	4.48	105	10.80	420	71.05	1680	96.69
0.120	0.00	31.0	6.62	125	14.13	500	76.62	2000	98.01
0.240	0.00	37.0	7.17	149	19.71	590	80.81	2380	99.00
0.490	0.00	44.0	7.62	177	27.19	710	84.60	2830	99.62
0.980	0.12	53.0	7.92	210	36.09	840	87.62	3360	99.95
2.00	0.23	63.0	8.08	250	45.98	1000	90.43		
3.90	0.96	74.0	8.29	300	56.05	1190	92.90		

Analysis - Under

Malvern Instruments

Malvern

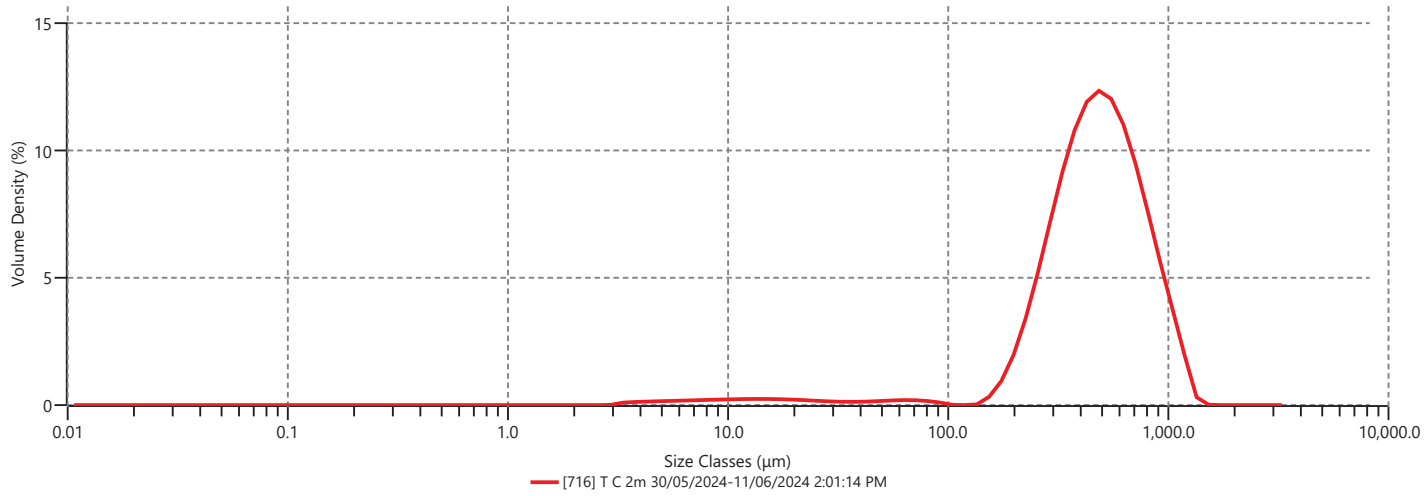
Measurement Details	
Sample Name	T C 2m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/27
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 2:01:14 PM
Measurement Date Time	11/06/2024 2:01:14 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.49 %
Laser Obscuration	16.20 %

Result	
Concentration	0.4010 %
Span	1.285
Uniformity	0.404
Specific Surface Area	12.84 m^2/kg
D [3,2]	180 µm
D [4,3]	511 µm
Dv (10)	244 µm
Dv (50)	475 µm
Dv (90)	854 µm
Dv (95)	976 µm
Volume Below (3) µm	0.0009 %
Volume Below (6) µm	0.59 %
Volume Below (20) µm	2.31 %
Volume Below (31) µm	2.80 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.91	88.0	3.89	350	27.11	1410	99.98
0.0600	0.00	15.6	1.94	105	3.96	420	40.33	1680	100.00
0.120	0.00	31.0	2.80	125	3.96	500	54.24	2000	100.00
0.240	0.00	37.0	2.95	149	4.03	590	67.32	2380	100.00
0.490	0.00	44.0	3.10	177	4.69	710	80.04	2830	100.00
0.980	0.00	53.0	3.29	210	6.52	840	89.18	3360	100.00
2.00	0.00	63.0	3.50	250	10.83	1000	95.62		
3.90	0.16	74.0	3.71	300	18.28	1190	99.11		

Analysis - Under

Malvern Instruments

Malvern

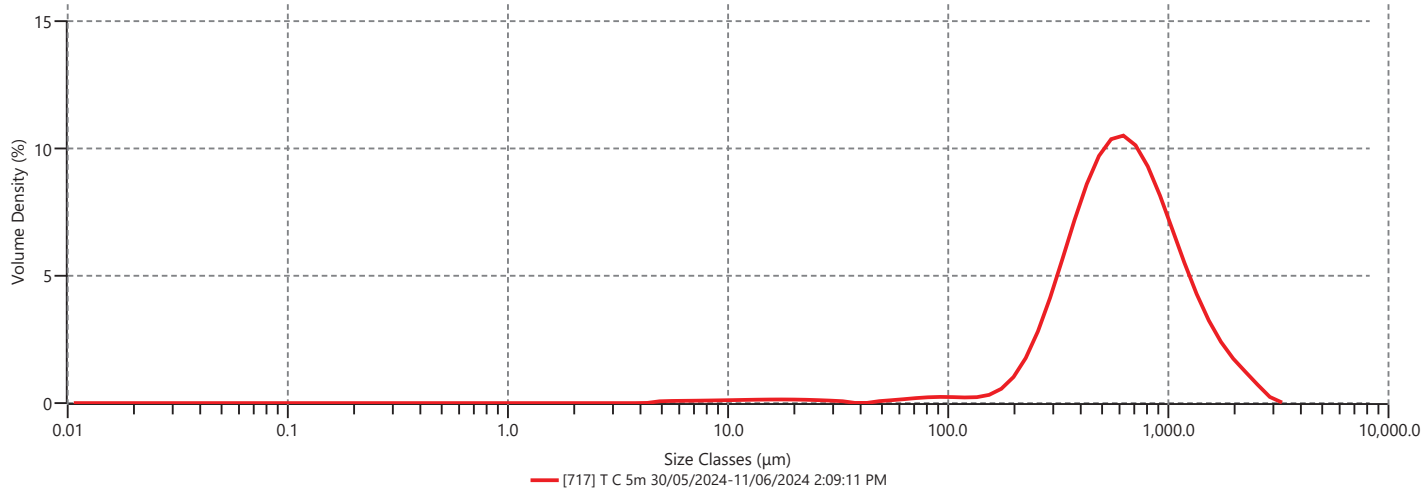
Measurement Details	
Sample Name	T C 5m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/27
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 2:09:11 PM
Measurement Date Time	11/06/2024 2:09:11 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.49 %
Laser Obscuration	10.83 %

Result	
Concentration	0.4540 %
Span	1.682
Uniformity	0.526
Specific Surface Area	7.399 m^2/kg
D [3,2]	312 µm
D [4,3]	728 µm
Dv (10)	291 µm
Dv (50)	618 µm
Dv (90)	1330 µm
Dv (95)	1650 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.14 %
Volume Below (20) µm	1.07 %
Volume Below (31) µm	1.41 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.30	88.0	2.15	350	16.19	1410	91.63
0.0600	0.00	15.6	0.85	105	2.43	420	25.18	1680	95.25
0.120	0.00	31.0	1.41	125	2.69	500	35.71	2000	97.63
0.240	0.00	37.0	1.48	149	2.97	590	46.84	2380	99.19
0.490	0.00	44.0	1.48	177	3.44	710	59.43	2830	99.88
0.980	0.00	53.0	1.56	210	4.41	840	70.01	3360	100.00
2.00	0.00	63.0	1.71	250	6.66	1000	79.28		
3.90	0.00	74.0	1.90	300	10.82	1190	86.43		

Analysis - Under

Malvern Instruments

Malvern

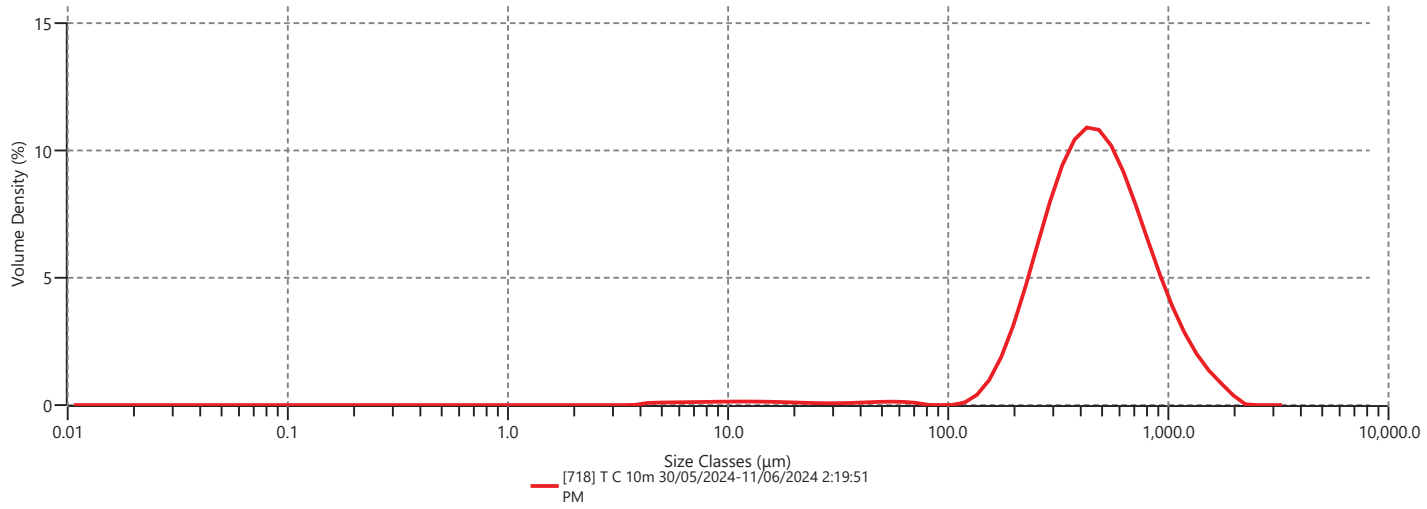
Measurement Details	
Sample Name	T C 10m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/29
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 2:19:51 PM
Measurement Date Time	11/06/2024 2:19:51 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.28 %
Laser Obscuration	12.34 %

Result	
Concentration	0.4115 %
Span	1.589
Uniformity	0.500
Specific Surface Area	9.381 m^2/kg
D [3,2]	246 µm
D [4,3]	537 µm
Dv (10)	229 µm
Dv (50)	460 µm
Dv (90)	960 µm
Dv (95)	1180 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.26 %
Volume Below (20) µm	1.26 %
Volume Below (31) µm	1.49 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.46	88.0	2.13	350	30.97	1410	97.64
0.0600	0.00	15.6	1.07	105	2.13	420	43.56	1680	99.15
0.120	0.00	31.0	1.49	125	2.20	500	55.97	2000	99.88
0.240	0.00	37.0	1.59	149	2.74	590	67.10	2380	100.00
0.490	0.00	44.0	1.70	177	4.28	710	77.66	2830	100.00
0.980	0.00	53.0	1.85	210	7.38	840	85.36	3360	100.00
2.00	0.00	63.0	2.00	250	13.11	1000	91.19		
3.90	0.00	74.0	2.11	300	21.74	1190	95.11		

Analysis - Under

Malvern Instruments

Malvern

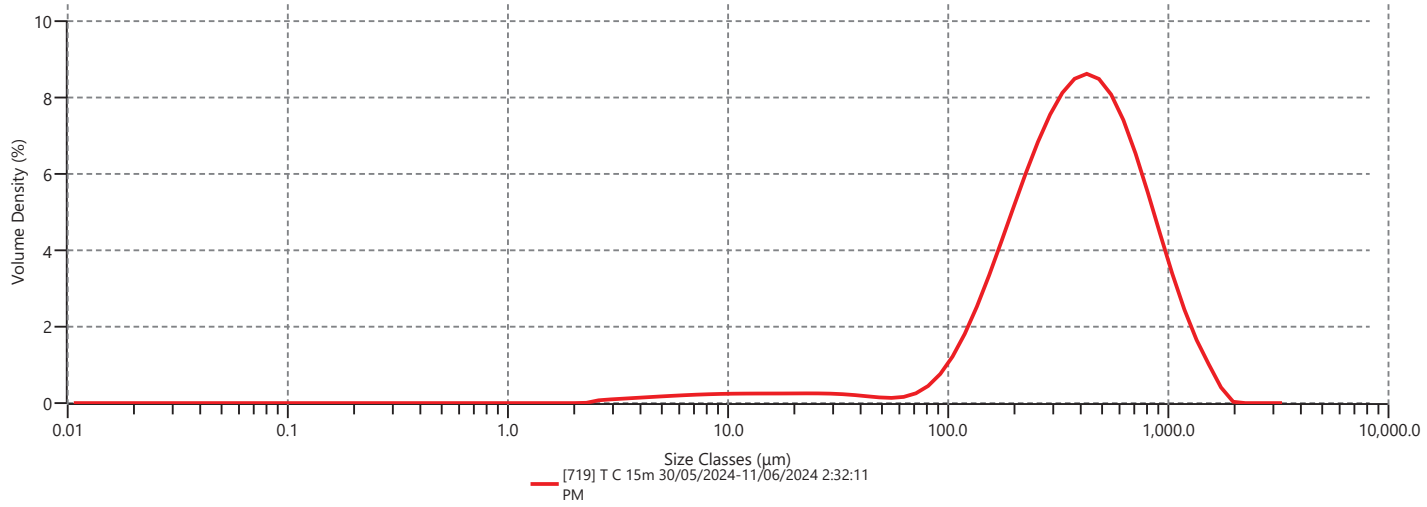
Measurement Details	
Sample Name	T C 15m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/30
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 2:32:11 PM
Measurement Date Time	11/06/2024 2:32:11 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.31 %
Laser Obscuration	11.78 %

Result	
Concentration	0.2178 %
Span	1.931
Uniformity	0.602
Specific Surface Area	16.77 m^2/kg
D [3,2]	138 µm
D [4,3]	460 µm
Dv (10)	143 µm
Dv (50)	388 µm
Dv (90)	892 µm
Dv (95)	1090 µm
Volume Below (3) µm	0.12 %
Volume Below (6) µm	0.81 %
Volume Below (20) µm	2.69 %
Volume Below (31) µm	3.41 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.17	88.0	4.96	350	44.26	1410	98.66
0.0600	0.00	15.6	2.28	105	6.03	420	54.42	1680	99.75
0.120	0.00	31.0	3.41	125	7.85	500	64.18	2000	100.00
0.240	0.00	37.0	3.67	149	10.86	590	72.99	2380	100.00
0.490	0.00	44.0	3.89	177	15.08	710	81.60	2830	100.00
0.980	0.00	53.0	4.08	210	20.52	840	88.08	3360	100.00
2.00	0.00	63.0	4.24	250	27.57	1000	93.13		
3.90	0.33	74.0	4.46	300	36.18	1190	96.55		

Analysis - Under

Malvern Instruments

Malvern

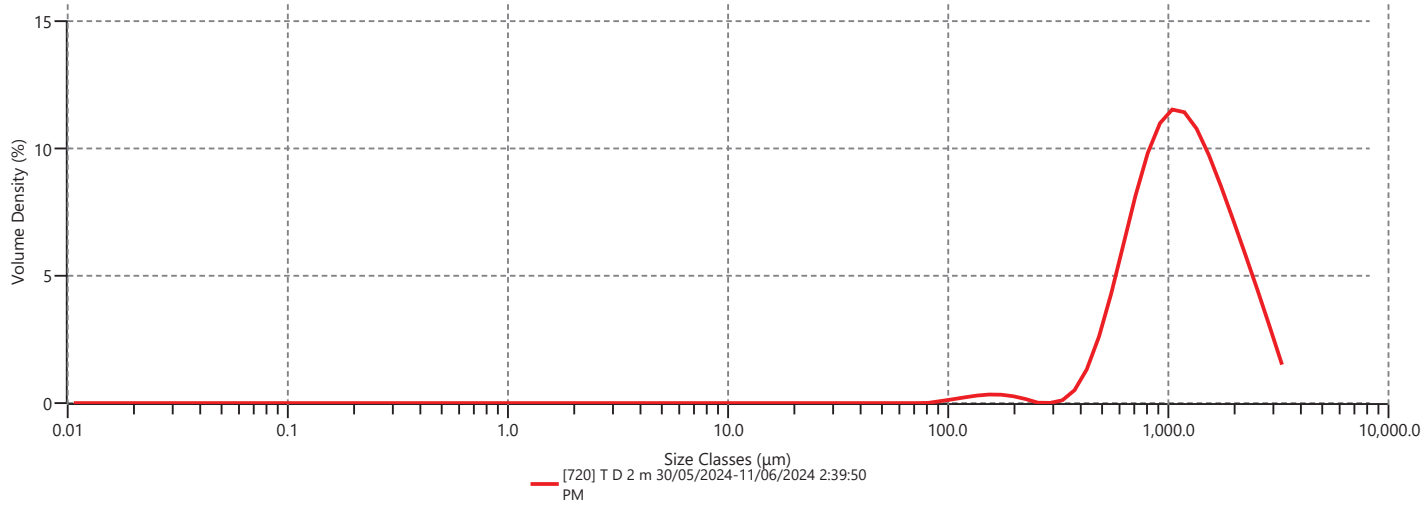
Measurement Details	
Sample Name	T D 2 m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/31
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 2:39:50 PM
Measurement Date Time	11/06/2024 2:39:50 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	1.45 %
Laser Obscuration	7.34 %

Result	
Concentration	0.9331 %
Span	1.426
Uniformity	0.435
Specific Surface Area	2.418 m^2/kg
D [3,2]	955 µm
D [4,3]	1290 µm
Dv (10)	604 µm
Dv (50)	1140 µm
Dv (90)	2230 µm
Dv (95)	2600 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.00 %
Volume Below (20) µm	0.00 %
Volume Below (31) µm	0.00 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.00	88.0	0.01	350	1.62	1410	65.36
0.0600	0.00	15.6	0.00	105	0.13	420	2.43	1680	76.38
0.120	0.00	31.0	0.00	125	0.36	500	4.71	2000	85.40
0.240	0.00	37.0	0.00	149	0.70	590	9.06	2380	92.45
0.490	0.00	44.0	0.00	177	1.08	710	17.41	2830	97.08
0.980	0.00	53.0	0.00	210	1.40	840	27.55	3360	99.60
2.00	0.00	63.0	0.00	250	1.55	1000	40.03		
3.90	0.00	74.0	0.00	300	1.55	1190	53.14		

Analysis - Under

Malvern Instruments

Malvern

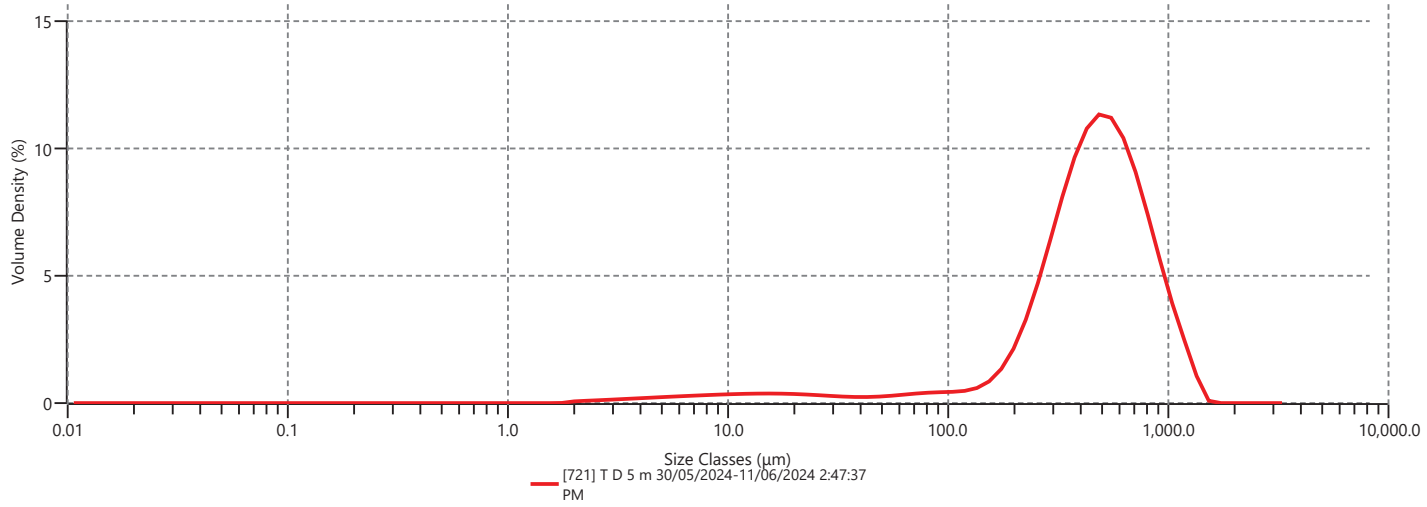
Measurement Details	
Sample Name	T D 5 m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/32
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 2:47:37 PM
Measurement Date Time	11/06/2024 2:47:37 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.42 %
Laser Obscuration	14.00 %

Result	
Concentration	0.2127 %
Span	1.493
Uniformity	0.460
Specific Surface Area	20.53 m²/kg
D [3,2]	112 µm
D [4,3]	501 µm
Dv (10)	181 µm
Dv (50)	468 µm
Dv (90)	880 µm
Dv (95)	1020 µm
Volume Below (3) µm	0.31 %
Volume Below (6) µm	1.23 %
Volume Below (20) µm	3.91 %
Volume Below (31) µm	4.82 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	1.72	88.0	6.87	350	30.43	1410	99.89
0.0600	0.00	15.6	3.32	105	7.37	420	42.29	1680	100.00
0.120	0.00	31.0	4.82	125	7.90	500	54.97	2000	100.00
0.240	0.00	37.0	5.11	149	8.61	590	67.14	2380	100.00
0.490	0.00	44.0	5.38	177	9.80	710	79.21	2830	100.00
0.980	0.00	53.0	5.69	210	11.90	840	88.05	3360	100.00
2.00	0.03	63.0	6.03	250	15.95	1000	94.43		
3.90	0.59	74.0	6.41	300	22.61	1190	98.21		

Analysis - Under

Malvern Instruments

Malvern

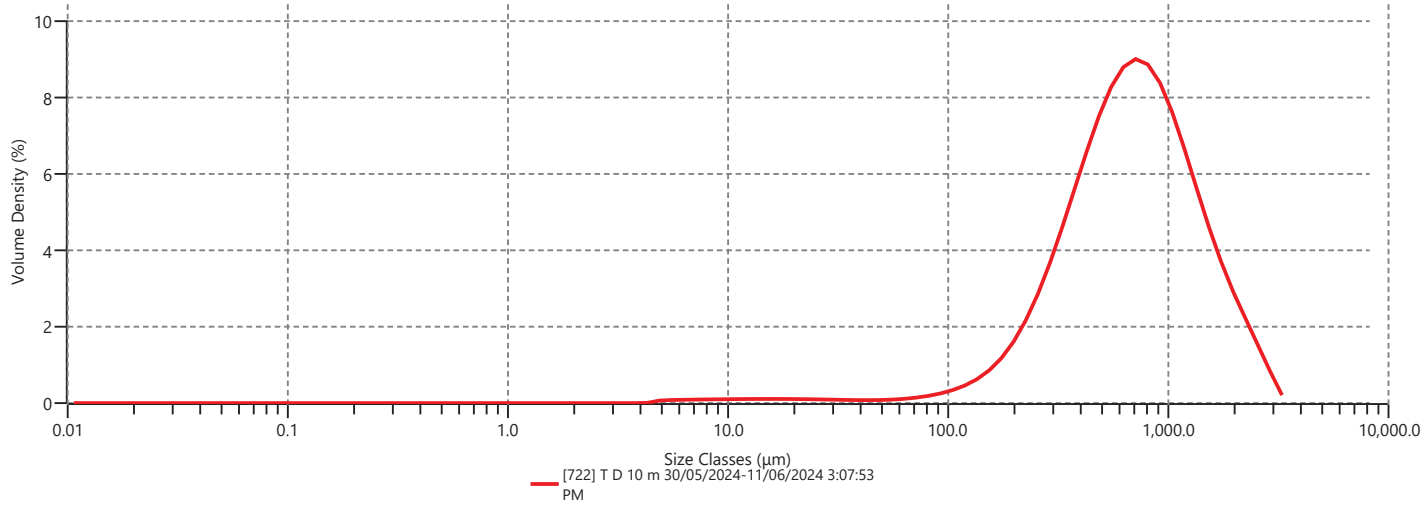
Measurement Details	
Sample Name	T D 10 m 30/05/2024
SOP File Name	Sediment.msop
Lab Number	2024155/33
Operator Name	instrument

Measurement Details	
Analysis Date Time	11/06/2024 3:07:53 PM
Measurement Date Time	11/06/2024 3:07:53 PM
Result Source	Measurement

Analysis	
Particle Name	Sediment
Particle Refractive Index	1.500
Particle Absorption Index	0.200
Dispersant Name	Water
Dispersant Refractive Index	1.330
Scattering Model	Mie
Analysis Model	General Purpose
Weighted Residual	0.52 %
Laser Obscuration	27.08 %

Result	
Concentration	1.3114 %
Span	1.940
Uniformity	0.597
Specific Surface Area	7.063 m²/kg
D [3,2]	327 µm
D [4,3]	826 µm
Dv (10)	265 µm
Dv (50)	687 µm
Dv (90)	1600 µm
Dv (95)	1990 µm
Volume Below (3) µm	0.00 %
Volume Below (6) µm	0.14 %
Volume Below (20) µm	0.93 %
Volume Below (31) µm	1.22 %

Frequency (compatible)



Result

Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0500	0.00	7.80	0.29	88.0	1.95	350	17.25	1410	86.11
0.0600	0.00	15.6	0.76	105	2.28	420	24.21	1680	91.30
0.120	0.00	31.0	1.22	125	2.75	500	32.31	2000	95.10
0.240	0.00	37.0	1.31	149	3.50	590	41.15	2380	97.84
0.490	0.00	44.0	1.40	177	4.62	710	51.91	2830	99.39
0.980	0.00	53.0	1.50	210	6.26	840	61.73	3360	99.96
2.00	0.00	63.0	1.61	250	8.89	1000	71.26		
3.90	0.00	74.0	1.74	300	12.80	1190	79.49		

Appendix 3: Contaminant Analyses

R J Hill Laboratories Limited
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Private Bag 3205
Hamilton 3240 New Zealand

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www.**hill-labs**.co.nz

Certificate of Analysis

Client:	Boffa Miskell Limited	**Lab No:**	3590317 SPv1
Contact:	S De Luca	**Date Received:**	24-May-2024
	C/- Boffa Miskell Limited	**Date Reported:**	07-Jun-2024
	PO Box 13373	**Quote No:**	126033
	Tauranga 3141	**Order No:**	BM220589C
		Client Reference:	BM220589C
		Submitted By:	Tyla Kettle

Sample Type: Sediment

		Sample Name:	1 A-B-C	1 D-E-F	1 G-H-I
		Lab Number:	3590317.1	3590317.2	3590317.3
Individual Tests					
Dry Matter	g/100g as rcvd		82	80	77
Total Organic Carbon*	g/100g dry wt		< 0.13	0.14	0.21
Heavy metals, trace As,Cd,Cr,Cu,Ni,Pb,Zn,Hg					
Total Recoverable Arsenic	mg/kg dry wt		6.3	5.4	7.1
Total Recoverable Cadmium	mg/kg dry wt		< 0.010	< 0.010	< 0.010
Total Recoverable Chromium	mg/kg dry wt		2.7	2.2	2.9
Total Recoverable Copper	mg/kg dry wt		0.2	0.3	0.5
Total Recoverable Lead	mg/kg dry wt		1.48	1.10	1.59
Total Recoverable Mercury	mg/kg dry wt		< 0.02	< 0.02	< 0.02
Total Recoverable Nickel	mg/kg dry wt		0.8	0.8	1.0
Total Recoverable Zinc	mg/kg dry wt		7.9	6.9	9.5
Polycyclic Aromatic Hydrocarbons Trace in Soil*					
Total of Reported PAHs in Soil	mg/kg dry wt		< 0.05	< 0.05	< 0.05
1-Methylnaphthalene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
2-Methylnaphthalene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Acenaphthene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Acenaphthylene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Anthracene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Benzo[a]anthracene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Benzo[a]pyrene (BAP)	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Benzo[e]pyrene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Benzo[g,h,i]perylene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Benzo[k]fluoranthene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Chrysene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Dibenzo[a,h]anthracene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Fluoranthene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Fluorene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Naphthalene	mg/kg dry wt		< 0.010	< 0.010	< 0.010
Perylene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Phenanthrene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Pyrene	mg/kg dry wt		< 0.002	< 0.002	< 0.002
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES*	mg/kg dry wt		< 0.0049	< 0.0049	< 0.0049
Benzo[a]pyrene Toxic Equivalence (TEF)*	mg/kg dry wt		< 0.0049	< 0.0049	< 0.0049

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Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Sediment

Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Drying*	Air dried at 35°C Used for sample preparation. May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-3
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation May contain a residual moisture content of 2-5%. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed).	-	1-3
Heavy metals, trace As,Cd,Cr,Cu,Ni,Pb,Zn,Hg	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, trace level.	0.010 - 0.8 mg/kg dry wt	1-3
Polycyclic Aromatic Hydrocarbons Trace in Soil*	Sonication extraction, GC-MS/MS analysis. Tested on as received sample. In-house based on US EPA 8270.	0.002 - 0.03 mg/kg dry wt	1-3
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-3
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-3
Total Organic Carbon*	Acid pretreatment to remove carbonates present followed by Catalytic Combustion (O2), separation, Thermal Conductivity Detector [Elementar Analyser].	0.05 g/100g dry wt	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 24-May-2024 and 07-Jun-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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Ara Heron BSc (Tech)
Client Services Manager - Environmental

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+64 7 858 2000
mail@hill-labs.co.nz
www.**hill-labs**.co.nz

Certificate of Analysis

Client:	Boffa Miskell Limited	**Lab No:**	3590665 SPv1
Contact:	S De Luca	**Date Received:**	24-May-2024
	C/- Boffa Miskell Limited	**Date Reported:**	10-Jun-2024
	PO Box 13373	**Quote No:**	126033
	Tauranga 3141	**Order No:**	BM220589C
		Client Reference:	BM230431
		Submitted By:	Tyla Kettle

Sample Type: Shellfish

	Sample Name:	Grid 1 - Shellfish
	Lab Number:	3590665.1
Arsenic	mg/kg as rcvd	1.43
Cadmium	mg/kg as rcvd	0.066
Chromium	mg/kg as rcvd	< 0.2
Copper	mg/kg as rcvd	0.68
Lead	mg/kg as rcvd	< 0.02
Mercury	mg/kg as rcvd	< 0.010
Nickel	mg/kg as rcvd	< 0.10
Zinc	mg/kg as rcvd	9.4

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request.
Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Shellfish

Test	Method Description	Default Detection Limit	Sample No
Shucking of Shellfish*	Removal of tissue from shell.	-	1
Homogenise*	Mincing, chopping, or blending of sample to form homogenous sample fraction.	-	1
Biological Materials Digestion	Nitric and hydrochloric acid micro digestion, filtration. In-house based on APHA 3030.	-	1
Arsenic	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.02 mg/kg as rcvd	1
Cadmium	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.0008 mg/kg as rcvd	1
Chromium	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.04 mg/kg as rcvd	1
Copper	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.010 mg/kg as rcvd	1
Lead	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.004 mg/kg as rcvd	1
Mercury	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.002 mg/kg as rcvd	1
Nickel	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.02 mg/kg as rcvd	1
Zinc	Biological materials digestion. Analysis by ICP-MS. In-house based on APHA 3125.	0.2 mg/kg as rcvd	1

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These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 24-May-2024 and 07-Jun-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

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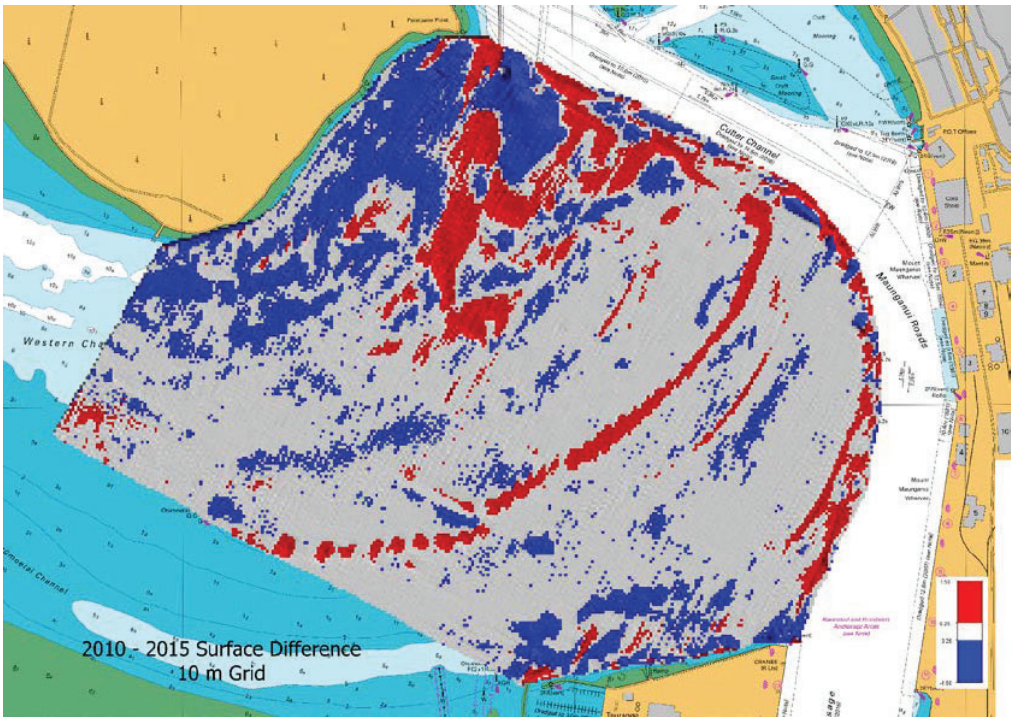
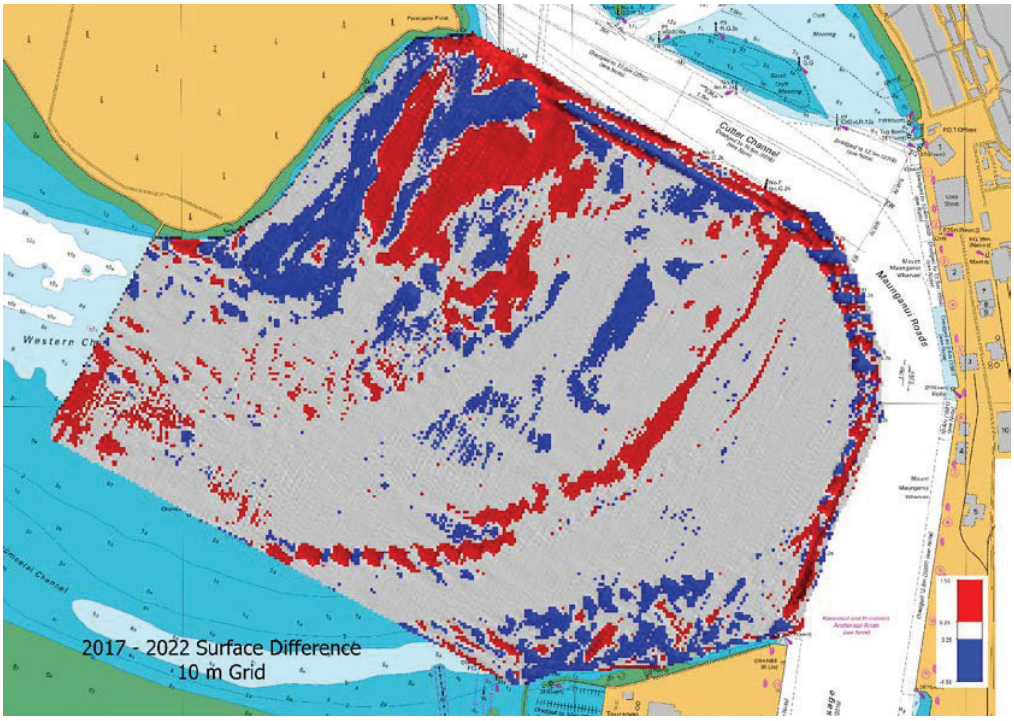
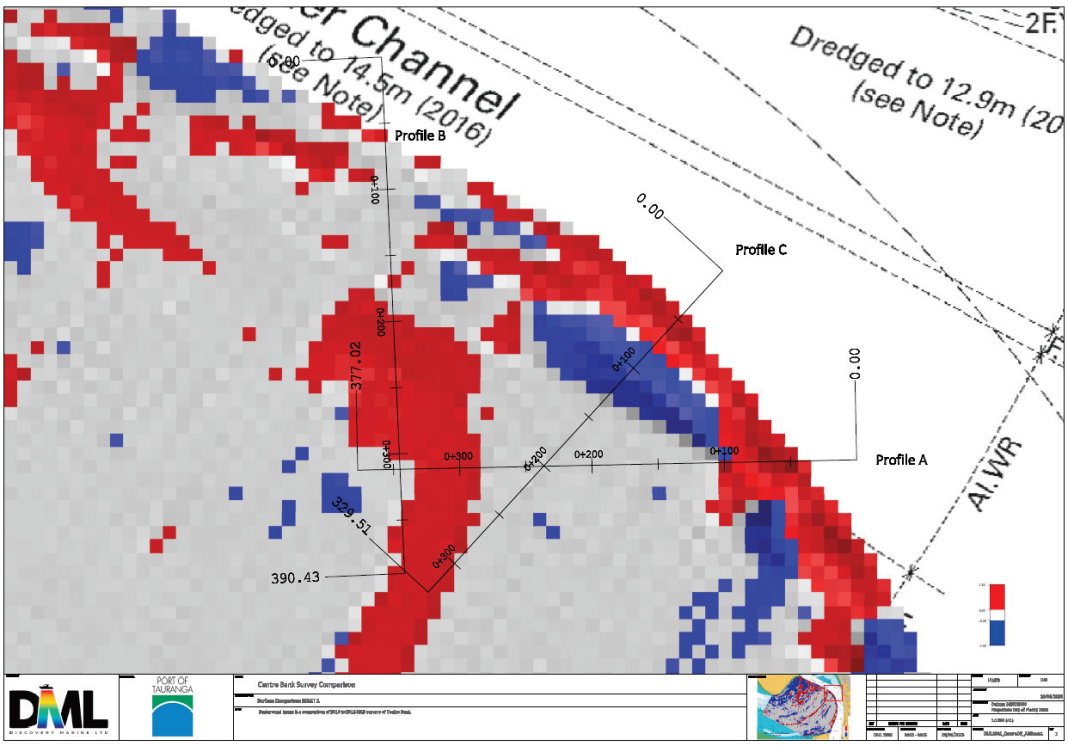
Giselle Jeannes
GLP Study Director - Food & Bioanalytical

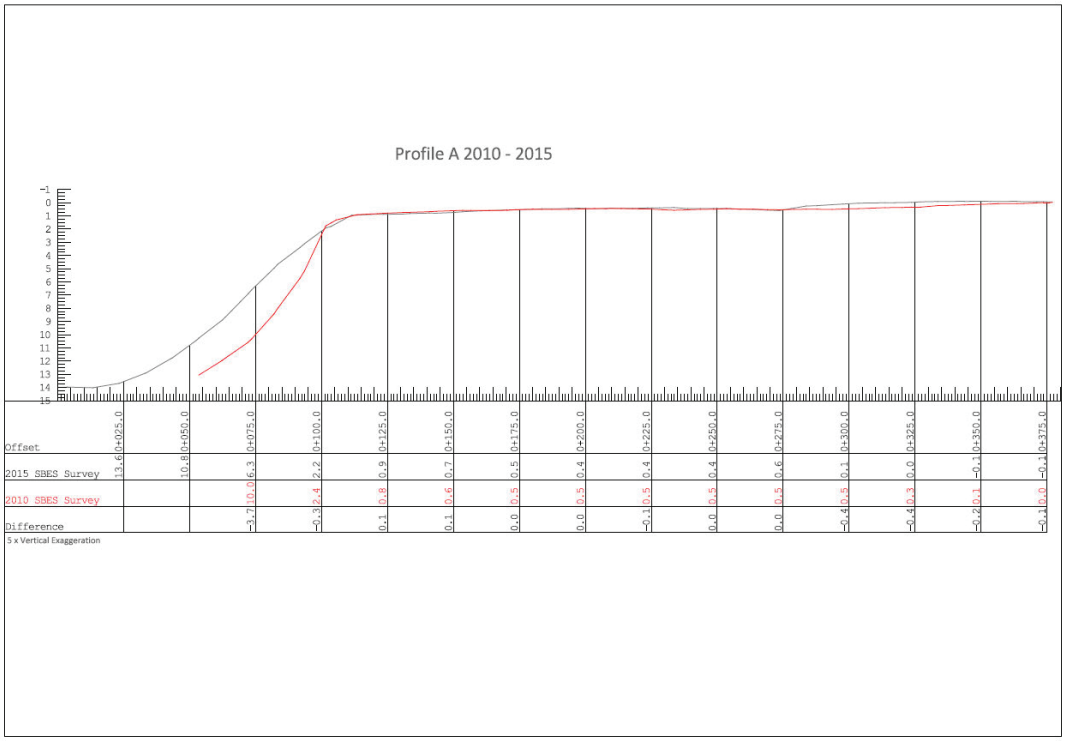
Appendix 4: Bathymetry





Appendix 5: Subtidal Slope Profiles

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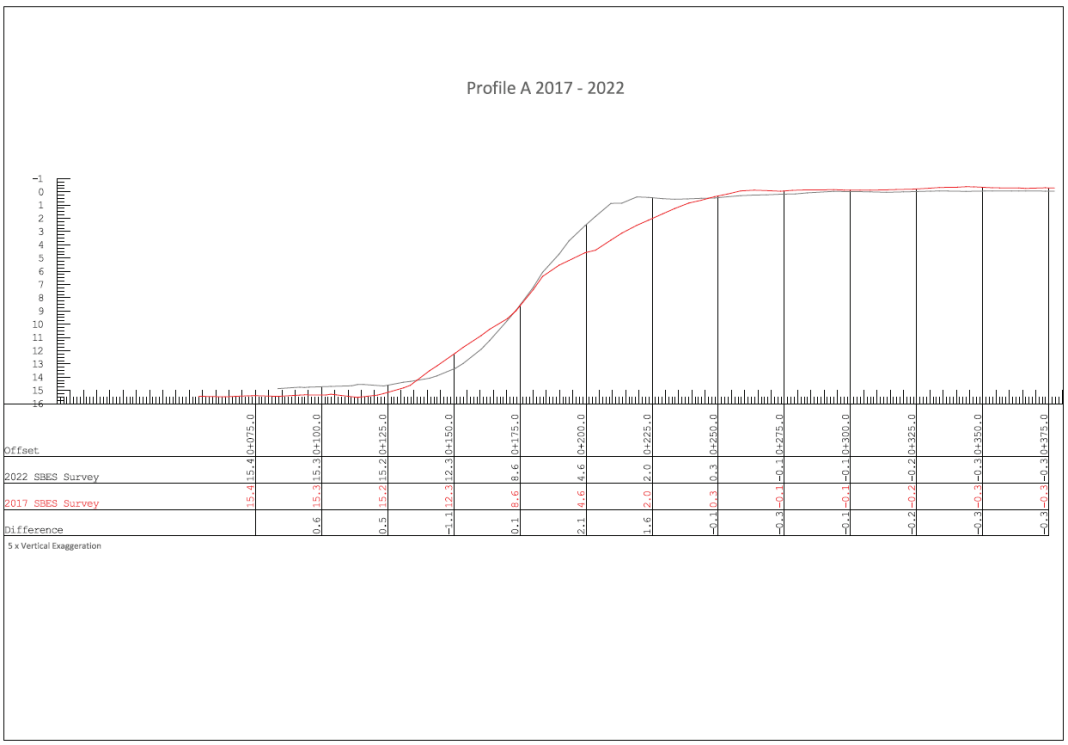
2010 SBES Survey
Difference
5 x Vertical Exaggeration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2017 SBES Survey
Difference
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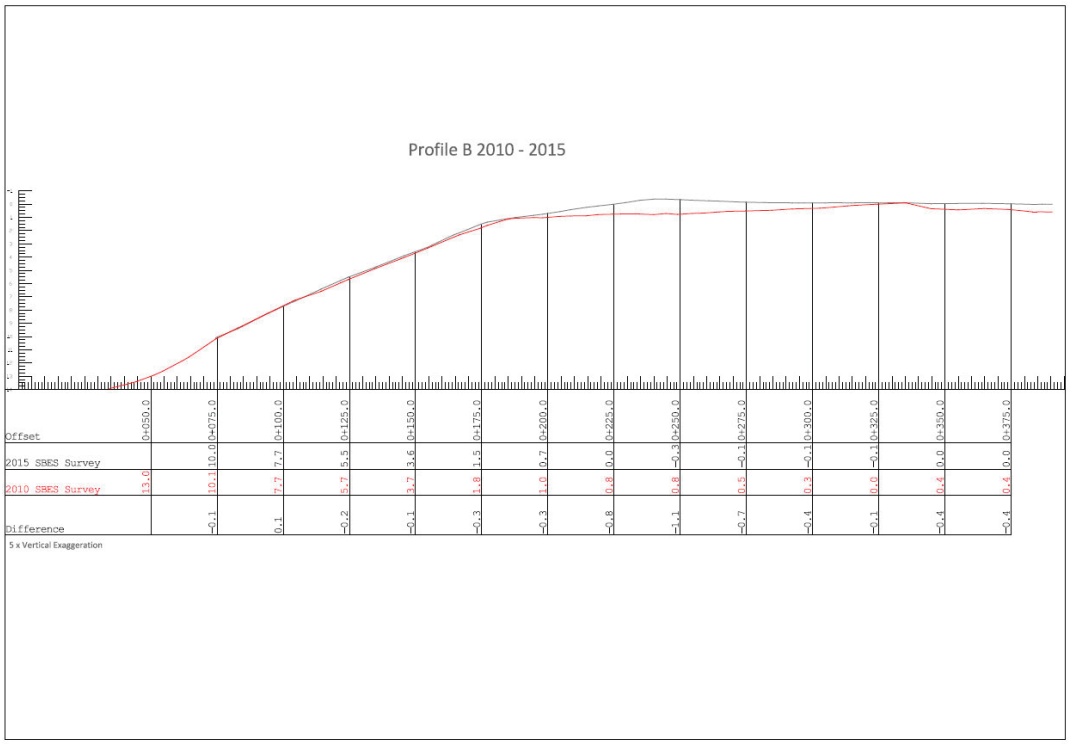
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2010 SBES Survey
Difference
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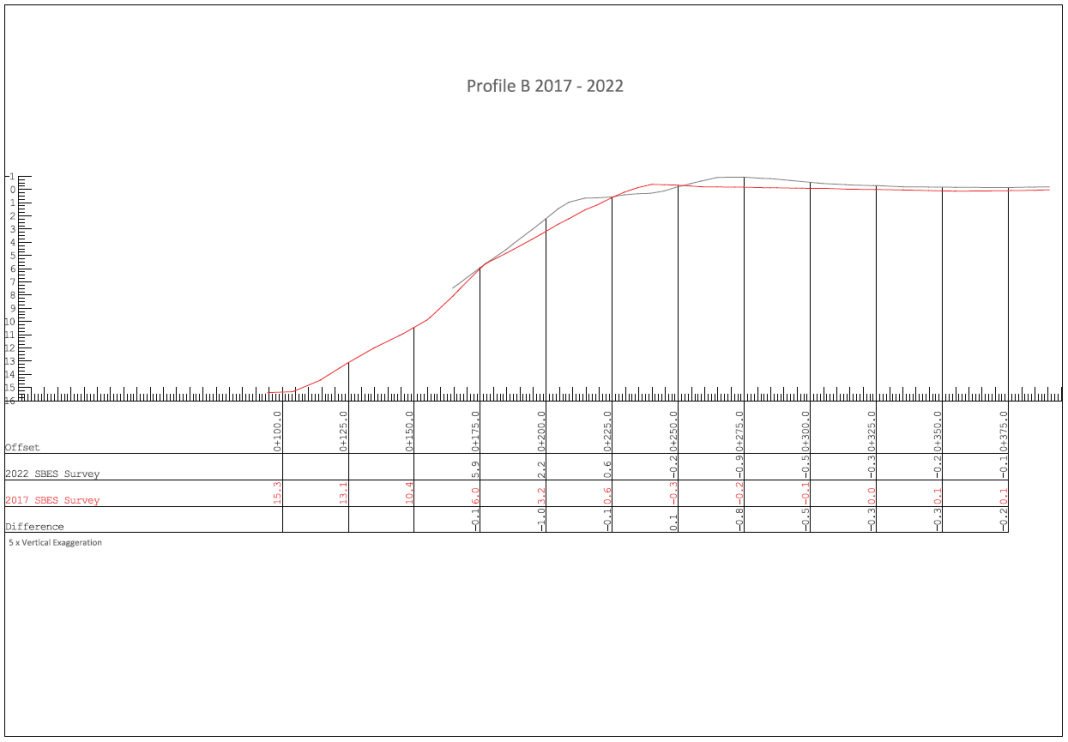
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Difference
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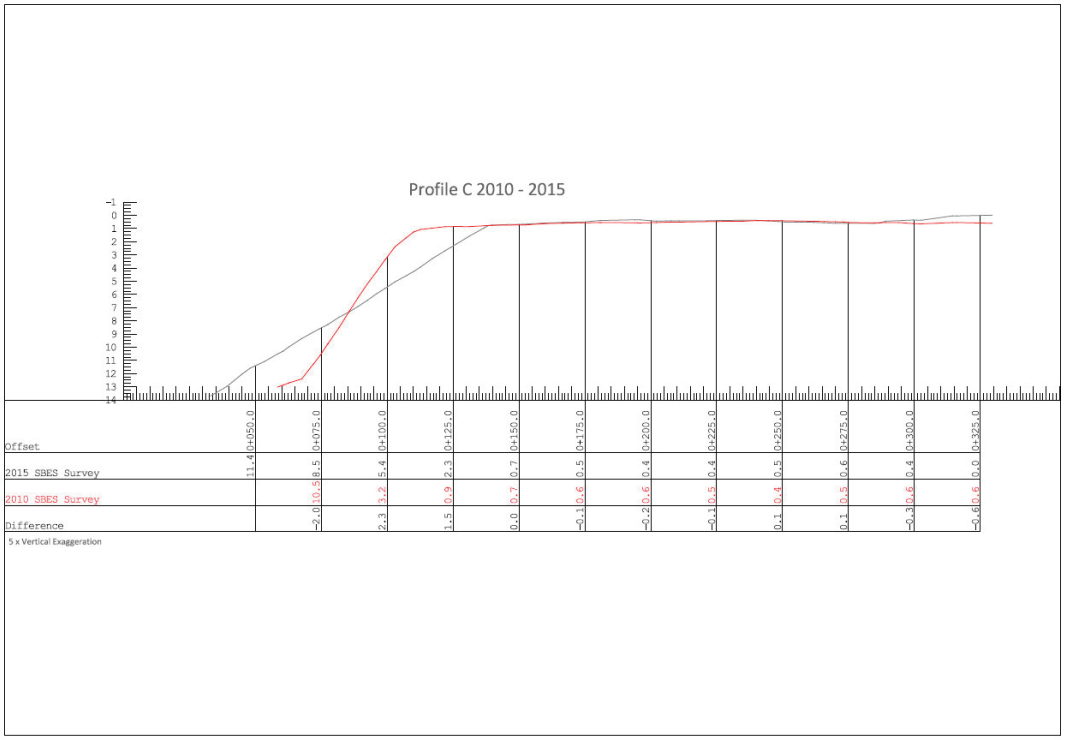
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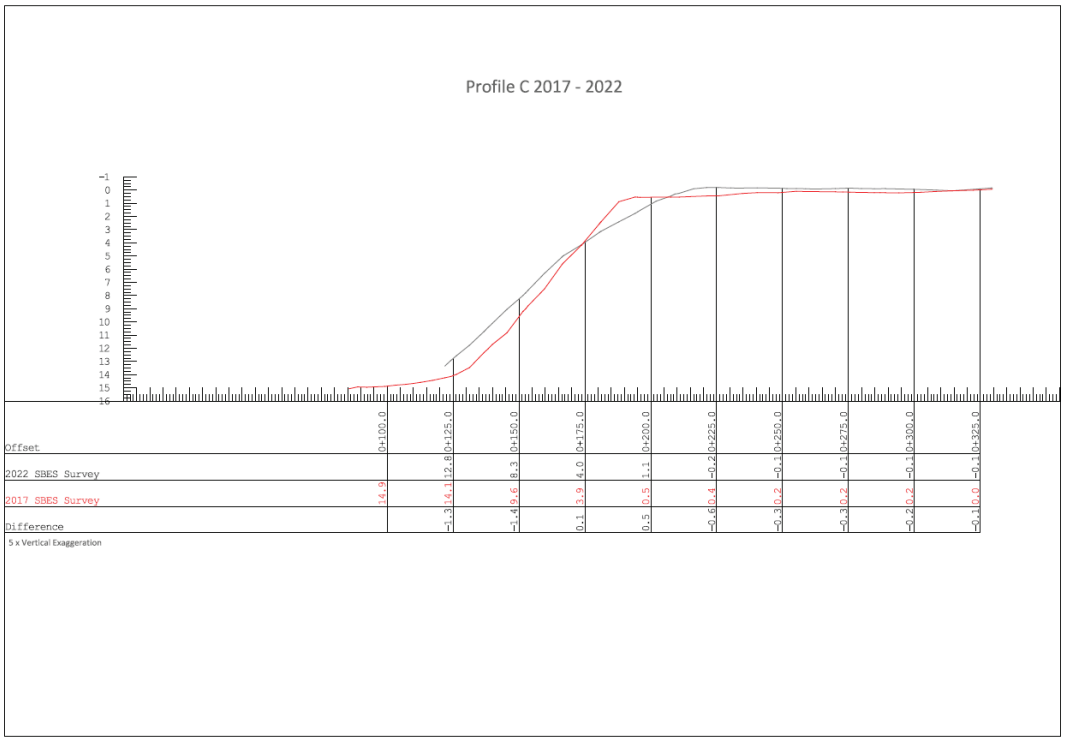
Difference
5 x Vertical Exaggeration


Profile C 2017 - 2022
Offset
2022 SBES Survey
2017 SBES Survey
Difference
5 x Vertical Exaggeration

Appendix 6: Mussel Bed Observations

Figure 20: Mussel bed images in proximity to May 2024 B7 subgrid.

About Boffa Miskell

Boffa Miskell is a leading New Zealand professional services consultancy with offices in Whangarei, Auckland, Hamilton, Tauranga, Wellington, Christchurch, Dunedin, and Queenstown. We work with a wide range of local and international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, cultural heritage, graphics and mapping. Over the past four decades we have built a reputation for professionalism, innovation and excellence. During this time we have been associated with a significant number of projects that have shaped New Zealand's environment.

Boffa Miskell

Tauranga Harbour Marine Monitoring Methodologies

Prepared for The Port of Tauranga

27 September 2024

Boffa Miskell is proudly a
Toitū net carbonzero certified consultancy

Document Quality Assurance

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Prepared by:	Tyla Kettle Ecologist Boffa Miskell Limited	
Reviewed by:	Dr Sharon De Luca	
Status: FINAL	Revision / version:1	Issue date: 27 September 2024

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1.0 Introduction

Boffa Miskell Limited (BML) has been engaged by The Port of Tauranga (POTL) to collate recent surveying methods that have been applied across the Tauranga Harbour Monitoring in response to the Stella Passage decision. This report outlines the objectives and methods implemented across the following assessments:

1. 2022 Te Paritaha Pipi Monitoring,
2. 2023 Te Paritaha Pipi Monitoring,
3. 2024 Winter (June) Te Paritaha Pipi and Mussel Monitoring,
4. 2024 Summer Te Paritaha Pipi and Mussel Monitoring (to be completed in November 2024),
5. 2023 Panepane Point Rapid Ecological Assessment,
6. 2023 Relocated Boulders Flora and Fauna Monitoring,
7. 2023 Monitoring of Kaimoana in the Tauranga Moana Mātaitai Reserve, and
8. 2024 Monitoring of Kaimoana in the Tauranga Moana Mātaitai Reserve.

The objectives and methods set out in this report that have been implemented across the assessments listed above will also be implemented for future Te Paritaha and kaimoana monitoring undertaken by POTL within Tauranga Harbour, to give effect to both existing consent conditions and the directions of the Court in its Interim Decision in relation to the Stella Passage development.

2.0 Methods

2.1 2022 Te Paritaha Pipi Monitoring

The Port of Tauranga engaged BML to carry out surveys of pipi *(Paphies Australis)* across Te Paritaha required under resource consent for Coastal Permit Number 65807 (Condition 12). Surveys were carried out in October 2022 based on the methods of Fairlie et al., (2017).

Surveys consisted of three components:

1. Site selection,
2. Pipi and macroinvertebrate surveys, and
3. Sediment grain size surveys.

Site selection
A pre-survey site examination was conducted by BML staff and Kia Māia Ellis (Tauranga Moana Iwi Customary Fisheries Trust) on Tuesday 25 October 2022 to partition the shallow subtidal area into multiple sub grids. Kia Māia Ellis identified areas of interest regarded as mahinga kai based on local and historic knowledge that has been handed down through generations. The

location of these areas was recorded using handheld Garmin GPS and fundamentally informed the overall 2022 pipi monitoring.

The sampling grid which covered an area of approximately 81,500m^2 was divided into nine sub grids (A – I). Within each sub grid a sampling site was randomly selected covering ~750m^2. Ten random sampling points were then sampled in each of these sub grids, totalling 90 sampling points across the study area (Figure 1).

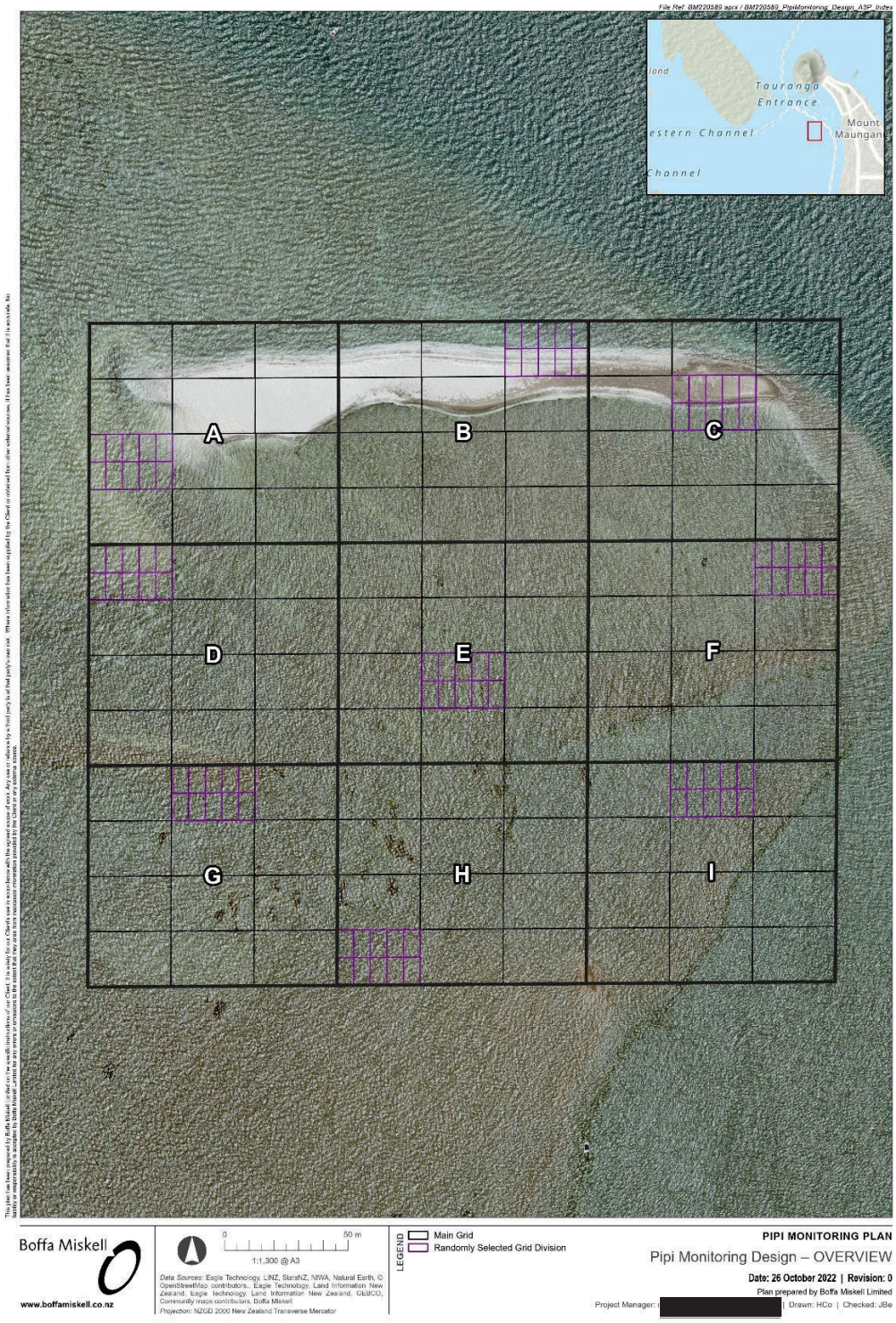

Figure 1: 2022 sampling grid across Te Paritaha.

Pipi and macroinvertebrate surveys
At each sampling point (10 per site), a 15cm deep x 10cm diameter benthic core was excavated and sieved through 0.5mm mesh. Pipi retained in the sieve were counted and measured to the nearest millimetre. Pipi were measured along the longest axis of the shell using vernier callipers.

Samples of benthic macrofauna living within the sediment (including, for example, marine worms and shellfish) were collected through core sampling from two of the ten sampling points at each site (adjacent to the pipi cores but not overlapping), sieved through a 0.5mm mesh and preserved in 70% ethanol before being processed in the taxonomy laboratory.

Sediment grain size surveys
Surface sediment samples (top 2-5cm) were collected from two of the ten sampling points at each site (adjacent to the pipi cores but not overlapping). Sediment samples were stored chilled prior to analysis by the University of Waikato. The proportion of different various grain size fractions (an indicator of habitat quality for infaunal macroinvertebrates) was assessed using a Malvern Mastersizer 3000 (by University of Waikato). The average grain sizes of the two samples per site were calculated.

Subtidal surveys
Subtidal surveys were carried out in December 2022 and were based on the methods of Ross & Culliford, (2018). The distribution and size of pipi was quantified along three transects established on the north-east edge of Te Paritaha (the three transects extended from the upper intertidal slope to the bottom of the main harbour channel, at a depth of approximately 15 m (Figure 2). The length of the three transects varied between 100 m and 170 m depending on the profile of the channel edge, with pipi monitoring stations established at four depths (2 m, 5 m, 10 m and 15 m) along each transect (Figure 2). Sampling was undertaken by divers using SCUBA. At each depth, ten sediment core samples (10 cm core diameter) were collected. Sediment cores were placed in mesh sieve bags that captured all pipi greater than 10 mm in length. Pipi from each core were then counted and measured to the nearest millimetre.

Figure 2: Layout of the three subtidal transects (A, B, C) extending to 15m depth on the north-east edge of Te Paritaha.

Data analysis
Data on intertidal pipi density and size (shell length), macroinvertebrate abundance and sediment grain size composition were graphed separately for each site. The relationship between the abundance and length of pipi, and the proportion of the dominant grain size fraction (medium/coarse sand material) was explored with linear regression analyses. Data on subtidal pipi density and size were graphed separately for each transect and depth.

2.2 2023 Te Paritaha Pipi Monitoring

In 2022, BML was engaged by The Port of Tauranga to prepare the Te Paritaha Monitoring Plan (TPMP) to guide the future collection and information on temporal trends in the size and abundance of Kaimoana (pipi) at Te Paritaha (Centre Bank).

The original version of the TPMP (Boffa Miskell Ltd, 2022) informed intertidal and subtidal surveys carried out at Te Paritaha in October (Boffa Miskell Ltd, 2023). The 2022 surveys showed significant changes in the abundance and population structure of pipi at Te Paritaha in relation to previous surveys between 2013 and 2017 (Fairlie et al., 2016; Ross & Culliford, 2018). The changes observed in 2022 included high abundances of intertidal juvenile pipi combined with a large decline in the abundance of adult pipi in comparison to both pre- and post-dredging levels (Fairlie et al., 2016; Ross & Culliford, 2018).

The TPMP was revised in 2023 to expand the spatial coverage of the surveys (Boffa Miskell Limited, 2023). The aim of the revised TPMP was to allow the collection of additional information, to better understand the mechanisms underlying the 2022 results and to provide a more robust assessment of future changes in the abundance and size of pipi at Te Paritaha.

Key changes between the original version of the TPMP and the revised version include:

- Pipi sampling methods aligned with those of Berkenbusch et al., (2022), where 10 benthic sediment cores are split into five pairs, with the sediment cores within each pair collected adjacent to one another.
- Addition of one subtidal transect (named Transect D) located beside Transects A, B and C, which were originally established by Ross & Culliford, (2018) on the north-east edge of Te Paritaha.
- Addition of two shallow subtidal grids (named Grid 2 and Grid 3) located to the south and to the west of the original sampling grid (Grid 1) established as part of the 2022 surveys in the northern portion of Te Paritaha.
- Inclusion of sediment and pipi flesh contaminant sampling across all grids and transects.

Intertidal surveys
The intertidal surveys in March 2023 were repeated across the grid established as part of the original TPMP and used for the 2022 surveys (Site 1, Figure 3). This grid was selected based on input from Tauranga Moana Iwi Customary Fisheries Trust and following a pre-survey site examination by BML ecologists in 2022.

Grid 1 covers approximately 81,000 m^2 and is divided into 9 sub grids (A – I; Figure 3). Each of the nine sub grids are further divided into 12 areas (A1 – A12; Figure 4).

Intertidal pipi sampling consisted of the collection of ten 10 cm diameter x 15 cm deep sediment cores from each of the nine sub grids within Grid 1. Sediment cores were collected in pairs

(adjacent to one another[1]) from five randomly selected areas within each sub grid (Figure 4). This sampling protocol slightly differs from 2022, where the 10 sampling points were adjacent to each other within a single area within each sub grid, as opposed to 5 pairs spaced across each area. The change in protocol allows for better spatial coverage throughout the grid, whilst collecting the same quantity of sediment (sampling effort remains the same across years).

The excavated sediment was sieved (0.5mm mesh) on site and any pipi retained were counted and measured to the nearest mm along the longest axis of the shell before being returned to the seabed.

Pipi larger than 50 mm were kept on ice and combined into one composite pipi flesh sample[2] used for laboratory analyses of tissue concentrations of heavy metals and polycyclic aromatic hydrocarbons (PAHs).

Two sets of composite surface sediment samples (top 2-3 cm) were collected from each of three sets of adjacent sub grids (A-B-C, D-E-H and G-H-I). One of the samples from each sub grid was used for laboratory analysis of sediment grain size and the other for analyses of sediment contamination by heavy metals and polycyclic aromatic hydrocarbons (PAHs).

Subtidal surveys

Subtidal surveys were repeated along the same three transects established by Ross & Culliford (2018) on the north-east edge of Te Paritaha. The three transects extend from the upper intertidal slope to the bottom of Cutter Channel at a depth of approximately 15 m. Along each transect there are four sampling stations at 2 m, 5 m, 10 m and 15 m depth.

To extend the spatial coverage of the subtidal survey along the northern edge of Te Paritaha, a fourth transect (D) with the same number of monitoring stations and sampling points was added to the west of transect B (Figure 3).

Along all subtidal transects:

- Ten 10 cm diameter x 15 cm deep sediment cores were collected at each station. The excavated sediment was sieved on site. Pipi retained in the sieve were counted and measured to the nearest millimetre along the longest axis of the shell before being returned to the seabed.
- Two surface sediment samples (top 2-3 cm) were collected for laboratory analysis of sediment grain size composition. Samples from two sets of contiguous stations (2m-5m and 10m-15m) were combined into a single composite sample.
- One composite surface sediment sample (top 2-3 cm) was collected combining sediment from all stations and used for laboratory analyses of sediment contamination by heavy metals and polycyclic aromatic hydrocarbons (PAHs).
- One composite pipi flesh sample[3] was collected combining animals from all stations (if large pipi, > 50 mm, were present) and used for laboratory analyses of tissue concentrations of heavy metals and polycyclic aromatic hydrocarbons (PAHs).

Two additional subtidal sampling grids were established in the southern half of Te Paritaha (Site 2; Figure 3) and in the channel located to the west of the bank (Grid 3, Figure 3), where large aggregations of adult pipi have previously been identified (Gouk, 2001; Hull, 1996). Each of the nine sub grids were further divided into 12 areas (A1 – A12; Figure 4).

[1] Berkenbusch et al. (2022)

[2] 30 g of pipi flesh per sample

[3] 30 g of pipi flesh per sample

Both at Grid 2 and 3:

- Ten 10 cm diameter x 15 cm deep sediment cores were collected from each of the 9 sub grids (A – I), with the cores divided into five pairs[4] and allocated to five areas randomly selected within each sub grid (Figure 2). The excavated sediment was sieved on site. Pipi retained in the sieve were counted and measured to the nearest millimetre along the longest axis of the shell before being returned to the seabed.
- Two sets of composite surface sediment samples (top 2-3 cm) were collected from each of three sets of adjacent sub grids (A-B-C, D-E-H and G-H-I) for laboratory analysis of sediment grain size and contamination by heavy metals and polycyclic aromatic hydrocarbons (PAHs).
- Composite pipi flesh samples[3] were collected for laboratory analyses of tissue concentrations of heavy metals and polycyclic aromatic hydrocarbons (PAHs). The number of pipi flesh samples varied depending on the availability of large pipi (> 50 mm).

Table 1 below provides a summary of the measures collected across all sites for 2023.

Table 1 Measures collected during the 2023 surveys.

	Pipi abundance and size (cores)	Sediment grain size samples	Sediment contaminant samples	Pipi flesh contaminant samples
Grid 1 (intertidal)	90	3	2	1
Grid 2	90	3	2	1
Grid 3	90	3	2	3
Transect A	40	2	1	None
Transect B	40	2	1	1
Transect C	40	2	1	None
Transect D	40	2	1	1

[4] Berkenbusch et al. (2022)

Figure 3: Layout of the survey design, comprising three grids and four transects. Grids 2 and 3 and transect D were sampled for the first time in 2023.

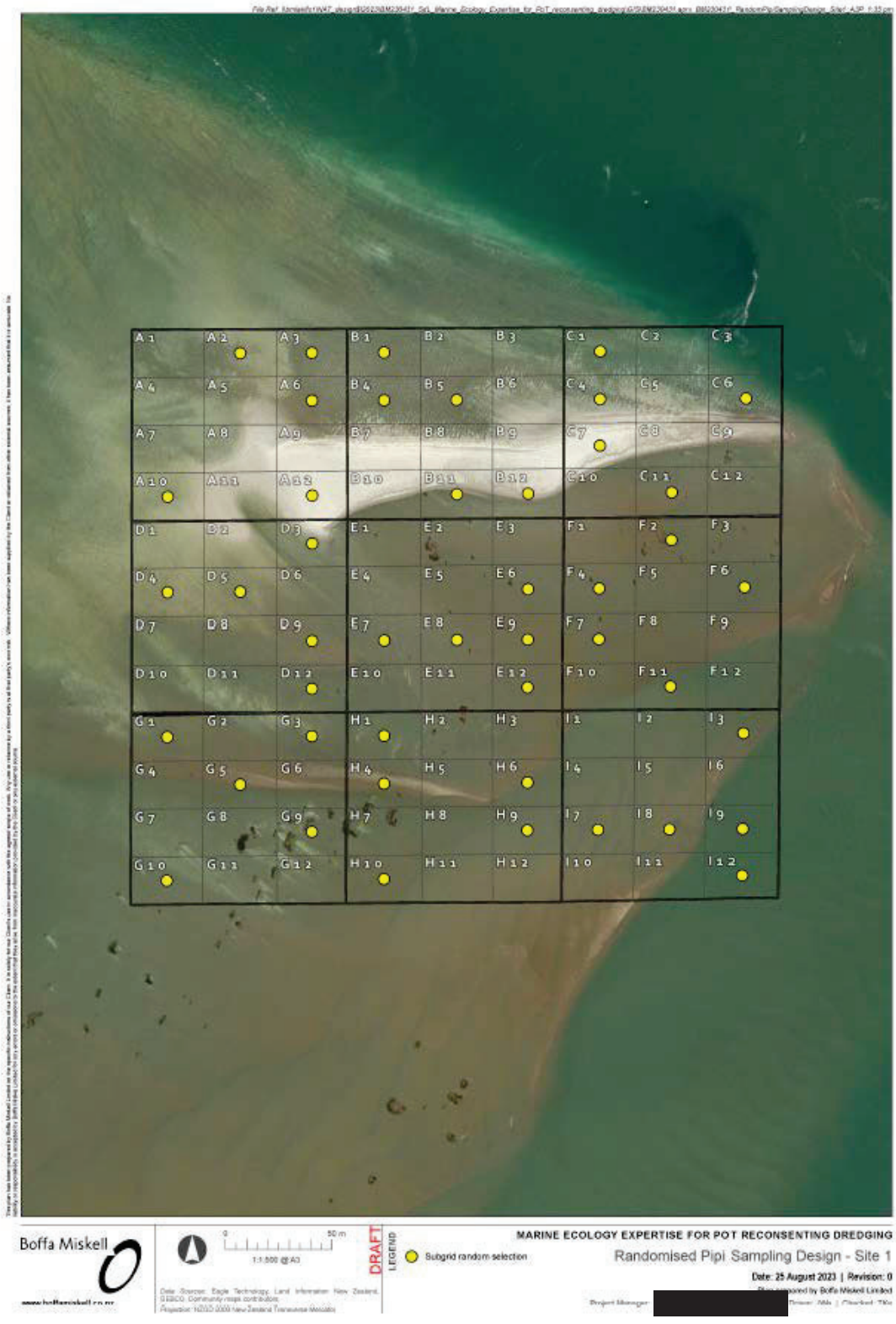

Figure 4: Example of grid partition in the 9 sub grids. Each containing 12 areas with sediment cores collected in pairs from five randomly allocated areas in each sub grid.

2.3 2024 Te Paritaha Pipi and Mussel Monitoring

In 2022, BML was engaged by The Port of Tauranga to prepare a TPMP to guide future collection and information on temporal trends in size and abundance of pipi across Te Paritaha. Surveying by BML commenced in 2022 and followed up in 2023. After directions of the Court in its Interim Decision in relation to the Stella Passage development, additional monitoring under the TPMP was requested.

BML was engaged to carry out two additional surveys for 2024 (winter and summer) following the methods outlined in the TPMP (described above). In addition to pipi monitoring, 2024 sampling included the identification and delineation of subtidal mussel beds (and any other kaimoana) on the soft sediment benthos within Te Paritaha which were noted by Toi Ohomai subtidal divers during 2023. Divers were tasked to carry out a rapid habitat assessment of any mussel beds present across/adjacent to Te Paritaha. In addition to this they clearly identify and delineate each mussel bed. Detailed mapping using the information provided by the divers will then inform future mussel surveys.

Winter monitoring was carried out in June 2024 and summer monitoring is scheduled for November 2024.

Mussel surveys
The outside perimeters of each of the subgrids within Grids 2 and 3 were expanded by an extra grid in all directions to provide a larger sampling frame for carrying out mussel bed surveys after the presence of mussels was opportunistically recorded during the 2023 pipi surveys (Figure 5). A total of 50 grid sites (c. 81,000 m^2 for the original grid area, plus 144,000 m^2 for the expanded grid area per expanded grid of 225,000 m^2) were surveyed to assess the presence of mussel beds. Where mussel beds greater than 2 m x 2 m were found, a modified rapid assessment of approximate mussel bed size, mussel density and length were carried out using a method developed for use in low to moderate subtidal currents.

To determine mussel bed size, at each mussel bed a transect line was deployed along the main axis (Y) between the up-current edge and the downstream end of the bed. At random distances along the Y axis, a series of X axis measurements were taken perpendicular to the Y axis and averaged to calculate the width of the bed. X and Y were then multiplied to provide an estimate of the size of the bed.

To determine mussel density, three 25 cm x 25 cm quadrats were randomly placed within each mussel bed. Mussel density was estimated by counting all mussels in each quadrat, averaging the measures from the three quadrats, and multiplying by 16 to obtain a per m^2 estimate.

In each of the quadrats sampled within each mussel bed, five mussels were randomly selected and measured along the longest axis of the shell.

Figure 5: Layout of the survey design for mussel bed surveys, comprising two expanded subtidal grids (yellow). Red grids are the original pipi surveying areas. Grid 1 was excluded from the mussel bed surveys due to being intertidal.

2.4 2023 Panepane Point Rapid Ecological Assessment

BML were engaged by The Port of Tauranga to carry out a baseline subtidal marine ecological assessment of Panepane Point located at the southern end of Matakana Island, Tauranga Harbour. This report was prepared in addition to the Kaimoana Restoration Programme which is aimed at providing information on customary taonga species at identified sites of significance in the Tauranga Mataitai Reserve.

Taonga species of significance for the population surveys include kina (*Evechinus chloroticus*, sea urchin), kūtai (*Perna canaliculus*, green lipped mussel); pūpū (*Turbo smargdus*, cats eye); pāua (*Haliotis iris*, abalone), and koura *(Jasus edwardsii),* red crayfish)[5]. For the 2023 Panepane Point report we have also included pipi *(Paphies australis)* as a key taonga species based on historical records of pipi adjacent to Panepane Point (Hull, 1996).

Methods

Tauranga Harbour is one of the largest estuaries in New Zealand (Tay et al., 2013). Classified as a barrier-enclosed mesotidal estuarine lagoon, they are generally shallow with circular to slightly elongated basins, extensive intertidal areas, narrow entrance with ebb and flood tidal deltas, as well as ocean forced circulation, strong flushing and wind mixing (Hume et al., 2007). However, a combination of natural accretion and dredging throughout the main channel entrance which now drops to below 30 meters deep has resulted in the area being dominated by tidal currents and wind generated waves (Davies-Colley & Healy, 1978).

Panepane Point, a sand spit located at the southernmost point of Matakana Island has experienced significant accretion as a result of dredging and natural evolutionary changes (de Lange et al., 2015). The study site for this report being Panepane Point presents extremely challenging variables to consider for subtidal surveys i.e., high tidal velocities, sudden changes in depth, and altered tide times. Therefore, drop camera surveys have been considered the safest approach to surveying. In addition to this, the risks associated with this region of the harbour present potentially problematic harvesting risks.

Drop camera surveys

To rapidly assess subtidal habitats at Panepane Point, drop camera surveys were carried out by Toi Ohomai contractors on 29 August 2023. A weighted camera with underwater lighting was deployed three times at four depth bands, giving a total of 12 images. Depth bands included 8m, 12m, 16m, and 20m. Each depth band was located using sonar at slack low tide to enable the camera to drop with the least tidal flow influence.

Each drop site was recorded via GPS. Images were labelled with a depth number and replicate number for reference (each drop also has a boat code (BC) which is it's GPS position on the survey vessel WEKA) (Figure 6).

Images were sorted to gain the best frame grab which provided the most detail of the benthic habitat (bottom) and where possible the site label on weight system. Photographs were then analysed to identify species and qualitative abundance. The online data base "New Zealand Mollusca[6]" was used to verify species, authorities, distribution, and depths.

[5] Kiamaia Ellis notes that these were the taonga species that were identified for population surveys. It does not mean that they are the only taonga species. This survey focuses on a range of taonga species that can be considered indicator species for potential changes in the surrounding environment.

[6] https://www.mollusca.co.nz/

Video transects

Additionally, two suspended video transects were conducted along the depth contours parallel to Panepane Point. Two video transects were performed. The first video started at 2m depth (ST1-ST2) and the second video at 4m depth (MT1-MT-3), both covering a distance approximately 130m in length parallel to Panepane Point.

Video footage was analysed, paying particular attention to key taonga species and any suitable substrate/habitat that could be inhabited by these species.

Figure 6: Panepane Point subtidal sampling locations.

2.5 2023 Relocated Boulders Flora and Fauna Monitoring

BML were engaged by POTL to report on the flora and fauna across relocated boulder rock from Tanea shelf to the southern side of Mauao near Pilot Bay.

Manaaki Te Awanui, (2016) carried out baseline monitoring of subtidal marine flora and fauna present on the relocated boulder. This report replicated methods applied by Manaaki Te Awanui, (2016), and draws upon the results as a comparison to current flora and fauna.

Methods
The initial baseline report by Manaaki Te Awanui, (2016) provides in depth detail around site selection for boulder rock monitoring. Below is a brief description of the site and grid created for subtidal surveying.

A survey grid was established on the southern side of Mauao encompassing the relocated boulder rock. Area of the grid measures approximately 250m length x 50m wide. To streamline surveying, reference points were plotted ~20m apart at the shallowest width of the survey area and again at the deepest width. This created a cross reference for transect surveys to be carried out in the field i.e. 50m from point A to A1 (Figure 7).

Subtidal monitoring
Transect surveys were used to record the growth of flora and fauna on the relocated boulder rock. Transects were laid by deploying a drop weight tethered to a dive float at each of the GPS locations along the deepest width of the survey area (i.e., points A1 – K1[7]). Divers[8] began transect surveys at the deployed dive float.

To identify substrate, flora, and fauna, a series of 0.25m^2 photo quadrats were taken along the transects at 2m intervals. Photo quadrats began at 0m and finished at 50m, totalling 26 photo quadrats per transect. Divers identified and recorded all flora and fauna species observed within each of the quadrats.

Data analysis
For each 50m transect, 26 photo quadrats are quantified using the software programme Coral Point Count"[9] following methodology of Manaaki Te Awanui, (2016). Ten randomly allocated points are distributed across each photo to determine percentage of substrate type and coverage and flora type (including algae and sponges), coverage, and fauna (as benthic epi-fauna).

[7] Based on the recommendations of Manaaki Te Awanui, (2016), transect A and B are considered control sites, and transect L – Q are excluded from this survey.

[8] Subcontractor Toi Ohomai dive team included Dr Daniel Sharp, Paul Warren, David Culliford, David Guccione, Dean Tully & Gloria Barugel.

[9] Kohler, K.E. and S.M. Gill, 2006. Coral Point Count with Excel extensions (CPCe): A Visual Basic program for the determination of coral and substrate coverage using random point count methodology. Computers and Geosciences, Vol. 32, No. 9, pp. 1259-1269, DOI:10.1016/j.cageo.2005.11.009.

Figure 7: Relocated boulder rock survey grid near Pilot Bay, Tauranga Harbour.

2.6 2023 Kaimoana surveys in Tauranga Moana Mātaitai Reserve

Background
BML were engaged by POTL to report on the 2023 findings for the Kaimoana Restoration Programme, specifically customary taonga species at identified sites of cultural significance[10] in the Tauranga Moana Mātaitai Reserve. Customary taonga species include kina *(Evechinus chloroticus, Sea Urchin),* kūtai *(Perna canaliculus,* green lipped mussel*);* pūpū *(Turbo smaragdus,* Cats Eye*);* pāua *(Haliotis iris,* Abalone*),* and kōura *(Edwardsii jasus,* Red Crayfish*).* The Tauranga Moana Iwi Customary Fisheries Trust revisited which taonga species would be monitored moving forward and identified kina, kūtai, pāua, and kōura as key species to survey, therefore, pūpū were not included in the 2023 report. This report was the third addition to the long-term monitoring programme submitted to satisfy consent condition 7 and 7.14 of the Coastal Permit (application number 65806).

The initial baseline report was conducted by Paul-Burke et al., (2013) in association with the restoration programme, providing further insight into the original consent conditions and the purpose of the Kaimoana Restoration Programme. Paul-Burke & Burke, (2015) also carried out the 2015 monitoring. Manaaki Te Awanui carried out the 2016 monitoring (Fairlie et al., 2016).

Raw data and GPS locations from the 2013 and 2015 reports was made available by Burke et al., however the 2016 raw data from Manaaki Te Awanui (Fairlie et al., 2016) was not forthcoming. Further to this, site names (without GPS coordinates) have varied across years, therefore, high-level comparisons and comments on obvious trends across the four years of monitoring were made in the 2023 report.

Methods
BML were engaged to collate data that was collected during the 2023 surveying period and produce the annual report. Below is an outline of what has been recorded previously and assumed was replicated for 2023.

Baseline surveys, and therefore the entirety of the Kaimoana Restoration Programme is fundamentally informed by mātauranga Māori whereby semi structured interviews with Tauranga Moana, participating iwi representatives including kaumātua were carried out in 2013 to identify cultural sites of significance in the Tauranga Moana Mātaitai Reserve. Intergenerational mātauranga Māori identified traditional distribution, abundance and sizing of taonga species; kina, kūtai, kōura, pāua and pūpū across all identified sites.

Site selection
Survey locations have been identified across three main areas including Mauao (A), Moturiki (B), and Motuōtau (C) (Figure 8). Species specific boundaries are further refined within each of these areas (Figure 9). Dive sites for this research have been determined by customary and traditional observations, experimental learnings, and mātauranga Māori of participating iwi representatives.

[10] We have adopted the term “sites of cultural significance” based on areas identified by iwi / hapū during baseline surveys. Significance refers to sites that are of cultural importance to mana whenua.

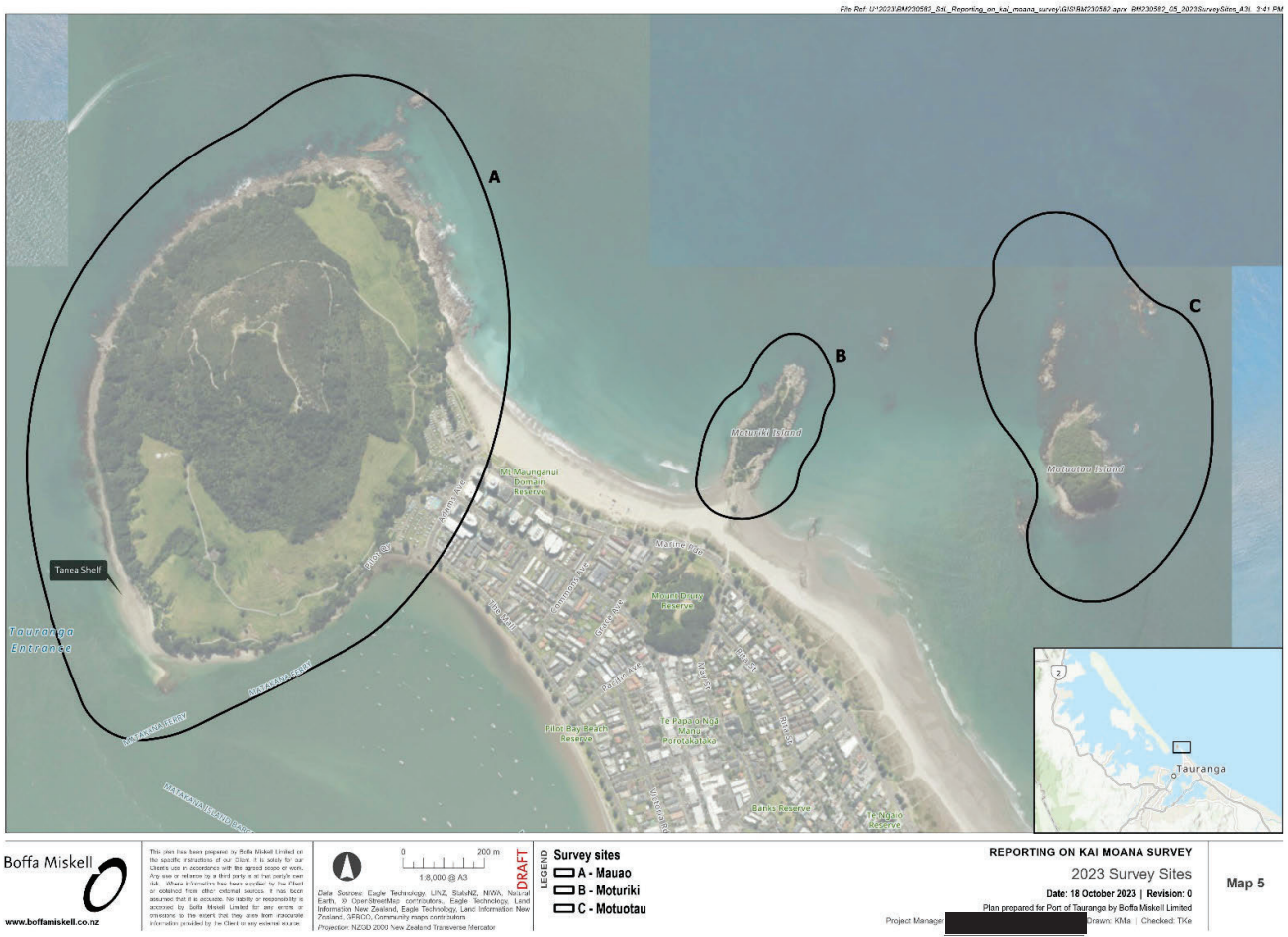

Figure 8: Sites of cultural significance identified within the Kaimoana Restoration Programme.

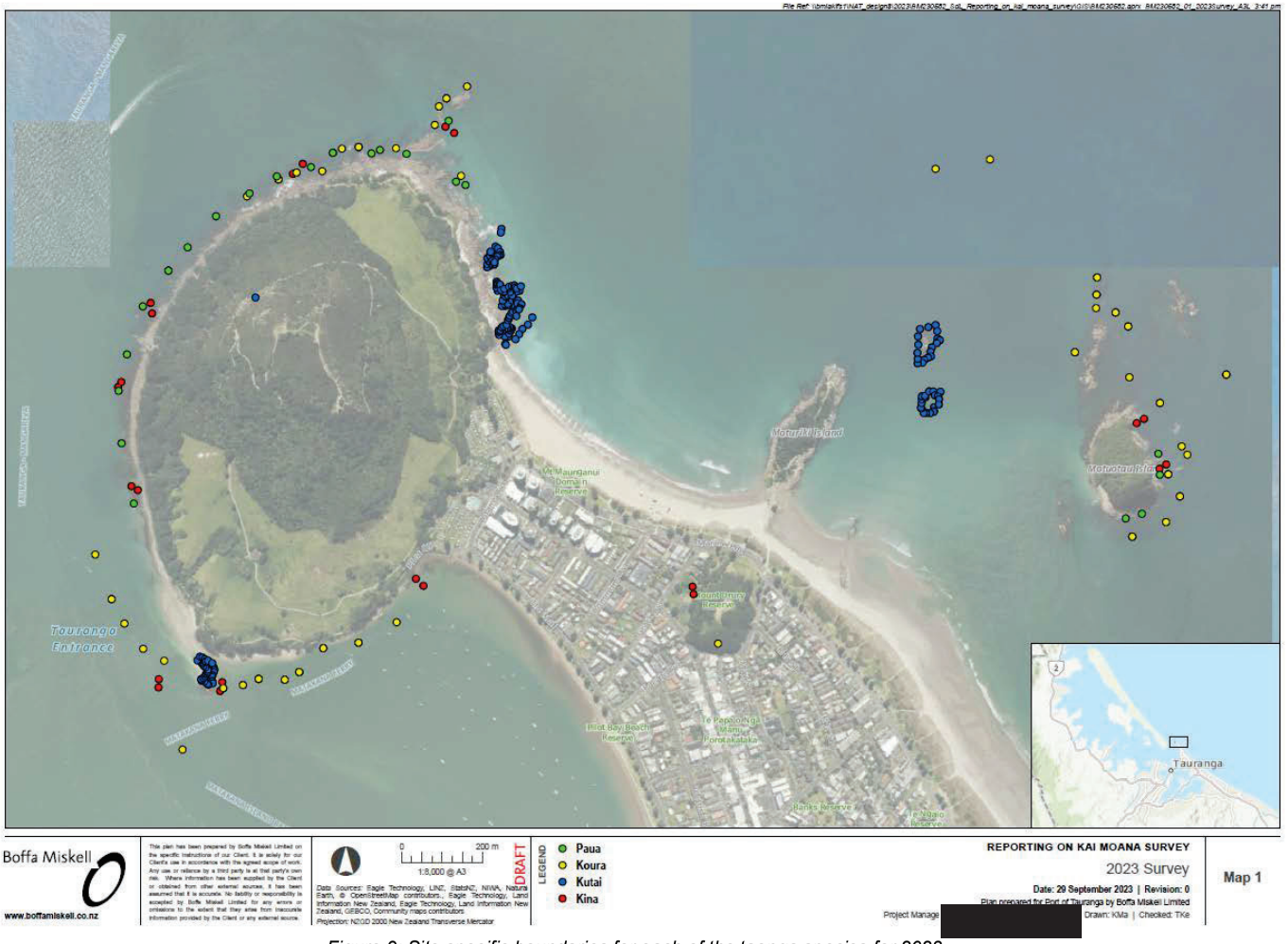

Figure 9: Site specific boundaries for each of the taonga species for 2023.

Kina surveys
Monitoring of kina densities replicate those previously implemented by Paul-Burke & Burke, (2015). Surveying begun with navigating to already identified GPS locations / sites of cultural significance. At each site a 25m transect was laid at a referenced bearing. Along the transect at two-meter intervals, the bottom right-hand corner of a $1m^2$ quadrat was placed down, starting at 25 meters, and ending at one meter. Any kina present within the quadrat was counted and measured along the greatest shell width (mm) using electronic callipers. Depth and substrate were also noted.

Single factor ANOVA is used to statistically analyse differences between population abundances across each survey site for 2013, 2015, and 2023. Where appropriate, a two-tailed t-test is used to compare abundances across years.

Kūtai surveys
Monitoring of kūtai follows a haphazard sampling technique whereby $1m^2$ quadrats are randomly placed within known mussel bed populations. GPS locations for these mussel beds were determined during baseline surveys.

Surveying began by navigating to each mussel bed and mapping the outer extent / boundary. Ten $0.25m^2$ quadrats were then randomly placed within the identified site, counting, and measuring any kūtai present within the quadrat. Seven size classes including 0-10mm, 11-20mm, 21-30mm, 31-40mm, 41-50mm, 51-60mm, and 61-70mm were also determined. For the 2023 surveys, it is important to note kūtai were measured across the widest part of the shell (not shell length) to avoid dislodging and / or disturbing the shellfish.

Recording methods appear to differ between 2013/2015 and 2023, whereby previous recording reached a maximum count of 5 per quadrat, whereas 2023 maximum abundance by far exceed this.

Single factor ANOVA is used to statistically analyse the difference between population abundances across each survey site for 2013, 2015 and 2023 kūtai. Where appropriate, a two-tailed t-test is used to compare abundances across years.

Pāua and kōura surveys
Pāua and kōura surveys were commenced on GPS boundary marks previously identified by iwi representatives. Pāua GPS points were located during 2013 baseline surveys, and kōura GPS points during 2015 surveys. All pāua and kōura counts were undertaken utilising a ten-minute timed count method. The count started when the first pāua / kōura was located. If it took one minute or more to locate the first specimen the time was recorded and then the ten-minute time count commenced. If no pāua / kōura were found within the ten-minute timeframe a nil count was recorded.

No pāua were dislodged, removed, or disturbed from their natural habitat. An estimate of pāua shell length along the longest axis was made using pre-determined size classes of; <25mm, 25-44mm, 45-64mm, 65-84mm, 85-104mm, 105-124mm, 125-144mm and >145mm.

Kōura were measured along the carapace length (body cavity) using flexi rulers[11]. If kōura were unable to be caught, an estimate of carapace length was recorded using pre-determined size classes of; <50mm, 51-70mm, 71-90mm, 91-110mm, 111-130mm, and 131-150mm.

Single factor ANOVA is used to statistically analyse difference between population abundances across each survey site for 2013 (excluding pāua), 2015, and 2023. Where appropriate, a two-tailed t-test is used to compare abundances across years.

[11] Measurements of kōura were only taken if the crayfish was able to be caught without damaging the individual.

2.7 2024 Kaimoana surveys in Tauranga Moana Mātaitai Reserve

- The 2024 kaimoana monitoring in Tauranga Moana Mātaitai Reserve is a collaboration between Toi Ohomai (surveying) and BML (reporting). The methods implemented for 2023 were replicated where possible, however, some changes were made to ensure consistency and robust surveying for future monitoring. Key differences are described below:
- Species specific survey sites were determined based on historical data and GPS coordinates externally provided. Where inconsistencies between site names and locations fell, new sites and GPS points were marked and clearly mapped.
- The 2023 kina surveys were replicated in 2024, apart from sites K19-K20 which were moved to and area of more appropriate kina habitat.
- The 2024 kūtai surveys replicated those implemented in 2013 (baseline surveys). A haphazard sampling technique whereby ten $1m^2$ quadrats were randomly placed within the identified site/mussel bed. A percentage cover assessment was made, and substrate was noted. The size of kūtai were recorded for 20 representative mussels within each $1m^2$ quadrat. Mussels were categorised into five pre-determined size classes including 0-20mm (size class 1), 21-40mm (size class 2), 41-60mm (size class 3), 61-80mm (size class 4), and <81mm (size class 5).
- Pāua and kōura surveys replicated those methodology implemented in 2023.
- A key difference between 2023 and 2024 is all surveys were carried out on SCUBA, whereas it is assumed 2023 surveys were done using the breath-hold/free dive method.
- Flesh samples of all species were collected for analysis of contaminants including trace metals and Polycyclic Aromatic Hydrocarbons (PAHs) and compared against Food Standards Australia and New Zealand Guidelines (schedule 19).

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Port of Tauranga, Summary of Scientific Environmental Data, 2024

Prepared for Port of Tauranga Ltd
Prepared by Beca Limited

11 July 2024

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Summary of Scientific Environmental Data – Port of Tauranga

Port of Tauranga ('the port'), New Zealand's busiest port, handling 42% of all of New Zealand's containers and 50% of New Zealand's exports by value, is in the Bay of Plenty on the east coast of the North Island. The port handles a diverse range of cargo. Forestry, kiwifruit and dairy exports account for almost 75% of exports. Imports are also an important and expanding sector of the Port's business. These include petroleum, fertiliser, coal, dry and liquid bulk, protein feeds and a range of other products. Port of Tauranga is owned and operated by Port of Tauranga Limited (POTL).

The port is located on the southern edge of Tauranga Harbour and has developed on both sides of the harbour (Sulphur Point and Mount Maunganui) over time. The port is located within a port zone, as defined by BOPRC Regional Coastal Plan (Bay of Plenty Regional Council, 2019).

The purpose of this report is to present a summary of existing scientific environmental data from monitoring previously undertaken in and around the port zone, as applicable to each technical area, based on the data and information collected over a number of years. This is the result of an Environment Court direction relating to the POTL Stella Passage resource consent application. The report is intended to provide a snapshot of the existing scientific information at the time of this reports preparation (June 2024).

The scope of the report covers scientific data on the following topics: air quality, water quality, marine ecology and sediment, marine mammals, and avifauna. It is acknowledged that this data does not encompass Mātauranga Māori or the Māori world view. It is also acknowledged that the view of tangata whenua is that in order to achieve a complete snapshot and a holistic understanding of the state of the environment, it is essential to incorporate Mātauranga Māori. It is understood that tangata whenua's preference is for a State of the Environment report to be prepared in the future using a framework that incorporates Te Ao Māori.

The **Summary Figure** below provide the snapshot of the key existing scientific environmental information included within this report.

Sensitivity: General

1 Introduction

1.1 Background

Port of Tauranga ('the port'), New Zealand's busiest port, handling 42% of all of New Zealand's containers and 50% of New Zealand's exports by value largest port by export volume, is in the Bay of Plenty on the east coast of the North Island. The port handles a diverse range of cargo. Forestry, kiwifruit and dairy exports account for almost 75% of exports. Imports are also an important and expanding sector of the Port's business. These include petroleum, fertiliser, coal, dry and liquid bulk, protein feeds and a range of other products., including containers, bulk liquids, forestry products, and vehicles. Port of Tauranga is owned and operated by Port of Tauranga Limited (POTL).

As part of its long-term strategy to meet the growing demand for port services, Port of Tauranga has applied for resource consent to extend the existing wharves and undertake associated dredging in Stella Passage. The proposed project will increase the port's capacity and provide resilience for New Zealand exporters and importers.

As part of the consenting process, main issues raised by the submitters included the potential environmental impacts of the dredging and disposal activities, such as effects on water quality, sediment quality, marine ecology, and cultural values.

In December 2023, the Environment Court (under a direct referral of the consent application) issued an interim decision[1] and associated directions in regard to the project. Among other matters, the directions required POTL to ***(6) Undertake a comprehensive state of the environment report of the areas affected by Port operations within six months of the date of this decision, as described at [437] and [569].*** Where 437 and 569 state the following:

[437] A comprehensive state of the environment report identifying current baseline is required before we make our final decision, taking into account the survey and the views of TW (tangata whenua) prior to and after the survey of kaimoana at Te Paritaha is undertaken. The report needs to include all effects of Port operations on Te Awanui and extent to all areas affected by Port operations.

[569] POTL must prepare a comprehensive SOE (State of Environment) report that addresses all effects of Port operations on the marine environment within six months of this decision. It appears to us that currently available information can form the basis of the report.

1.2 Purpose

The purpose of this report is to:

- Satisfy the court direction (6) specifically requiring the 'SOE' to be prepared.
- Collate existing scientific environmental information relating to those environmental areas identified in proposed condition 18 (see **Scope** below) to create a snapshot in time regarding the available existing scientific data.

This report is not intended to provide an effects assessment relating to POTL activities and the receiving environment as this has been covered through the court proceedings and we do not interpret that to be the intent of the court directions. However, the scope has been prepared in the context to the extent of areas potentially affected by Port operations.

[1] Decision [2023] NZEnvC 270, dated 13 December 2023

The report is intended to inform future consent decision-making processes and to provide a scientific baseline for future environmental management and reporting. This may involve this report being referenced to in the Southern Te Awanui Harbour Health Plan that was also required by the Environment Court Directions issued 13 December 2023.

1.3 Scope

The scope of the report covers scientific data only and it is acknowledged that this data does not encompass Mātauranga Māori or the Māori world view. It is also acknowledged that the view of tangata whenua is that in order to achieve a complete snapshot and a holistic understanding of the state of the environment, it is essential to incorporate Mātauranga Māori. It is understood that tangata whenua's preference is for a State of the Environment report to be prepared in the future using a framework that incorporates Te Ao Māori.

The scope of this report has been based on the proposed consent condition put forward as part of the hearing process:

*18. **Port 'State of the Environment' Report***

18.1 Within one year of the commencement of this consent, the Consent Holder shall prepare a 'Port of Tauranga State of the Environment' Report. The purpose of the report is to compile all of the existing information on the environment within the Port Zone (as defined by the Regional Coastal Environment Plan) held by the Consent Holder to form a comprehensive 'environmental snapshot'. This may be information collected as part of other resource consents, through past monitoring, commissioned studies or information provided to the Consent Holder by other parties. The report will collate available information on the following as it relates to the Port Zone (Regional Coastal Environment Plan):

(a) Sediment characteristics.

(b) Sediment quality (e.g. presence of contaminants).

(c) Marine ecology.

(d) Harbour water quality.

(e) Stormwater quality.

(f) Air quality.

POTL commissioned subject matter experts (SMEs) to create this report based on scientific monitoring data in the fields of:

- Water quality (Beca Ltd).
- Marine ecology and sediment quality (Boffa Miskell).
- Air quality (Tonkin and Taylor).

Through consultation with parties to the resource consent application, avian and marine mammal information has also been collated based on the technical reports that were submitted with the consent application. Beca provided support to POTL throughout the preparation of this report and were commissioned to collate the final findings.

1.4 Geographic Extent

Proposed Condition 18 refers to the Port Zone, but the court directions refer to *'the areas affected by Port operations*'. As a major national port the extent of the area where 'port operations' may have effects, both positive and adverse, could be very broad. Indeed, the view of many iwi and hapu groups to the resource consent application is that the port and associated operations has considerable spatial and temporal effects.

While the proposed consent condition indicated this report would be for the 'Port Zone' in order to be clear on the extent of the area to be covered by the report, each SME has interpreted the area which is to be covered by this report independently to provide the most appropriate snapshot of scientific information relating to the environment and the area potentially affected by POTL activities as directed by the court. It is noted that each domain has limitations with respect to the degree in which POTL activities and their influence on the environment can be inferred, given there are a number of other activities occurring in the area that will all contribute to the overall state of the environment.

The geographic extent of the scientific information collated is contained at the start of each sub-section in this report.

1.5 Engagement on the State of the Environment

In line with the court directions (reference [437]), consultation has been undertaken with parties to the resource consent application and an initial version of this report was shared with tangata whenua to obtain their views both before and after receipt of the kaimoana surveys.

It has been advised by all parties that any state of environment reporting should should incorporate foundational cultural aspects in accordance with mātauranga Māori and te ao Māori perspectives. While the inclusion of these elements within the report is recognized as important, the necessary information is currently unavailable. Additional work is essential to fully comprehend the overall state of the environment from these cultural viewpoints.

2 General Description of the Environment

2.1 Te Awanui (Tauranga Harbour) and Catchment Area

Te Awanui (Tauranga Harbour) is situated on the East Coast of the North Island in the Bay of Plenty. The harbour has an area of 210km^2 and consists mainly of tidal flats (77%) with large intertidal flats dividing its north and south regions. Mount Maunganui and Tauranga City are located on the southeastern edge of the harbour. The harbour facilitates large cargo ships at its deeper eastern entrance near Tauranga, while the shallower western entrance near Otāwhiwhi is frequented by recreational boaters (Bay of Plenty Regional Council, 2023). The BOPRC Regional Coastal Environment Plan (Bay of Plenty Regional Council, 2019) identified Tauranga harbour as an outstanding natural feature and landscape and an area of significant conservation value (excluding the port area).

Tauranga catchment area land use consists largely of urban, agricultural, and horticultural. Tauranga harbour is fed by 27 rivers and 46 streams. Matakana Island is situated along the harbour. The main inflow into the southern harbour is the Wairoa River, Tauranga Harbour is one of New Zealand's largest tidal harbours, the main freshwater inflow into Tauranga Harbour is from the Wairoa River (Zygadlo, 2020), which is located near the 'Tauranga Harbour at Tilby Point' monitoring location (as shown in Figure 2). In addition to Wairoa River, other freshwater sources include the Kopurererua Stream, and Waimapu Stream (as shown in Figure 1).

Estuaries serve as transitional regions between land and sea, where they facilitate the transportation and retention of nutrients, sediment, contaminants, and pollutants originating from terrestrial sources. Because the marine environment is essentially the 'end of the chain', contaminants from land and freshwater systems tend to be magnified in the marine environment (Beca Ltd, 2017).

The primary land use within the Tauranga Harbour catchment is agricultural, horticultural and urban residential areas, with the Tauranga area being one of the fastest growing residential areas in New Zealand (Bay of Plenty Regional Council, 2023). The land uses located upstream from Tauranga Harbour have the potential to significantly impact the state of soils, watercourses, and estuaries downstream. This impact is primarily due to the increase supply of nutrients to rivers and streams that ultimately flow into Tauranga Harbour. The main issues effecting New Zealand estuaries include sedimentation, eutrophication, microbiological risks, and habitat loss. Therefore, it is important to acknowledge the freshwater influence on Tauranga Harbour water quality.

Additionally, BOPRC 2020 NERM Estuary Water Quality Report stated the following regarding nutrient loading to Tauranga Harbour:

'Groundwater inputs have recently been identified to be a large source of nutrient loading to the harbour, often greater than that of surrounding rivers (Stewart et al., 2018). The groundwater can have long lag times from initial nutrient deposition onto land, to appearance in the harbour. Thus, there may be the potential for nutrient rich groundwater to be an ongoing source of nutrients to the harbour, even if the water quality in the rivers improve (Crawshaw, 2021b).'

2.2 Port Zone and Context of the Port in the Wider Environment

The port zone, as defined by BOPRC Regional Coastal Plan (Bay of Plenty Regional Council, 2019), is located on the southern edge of Tauranga Harbour and is shown in Figure 1 below. The port zone is wholly within the coastal marine area. However, adjacent port land is identified as port industry zoning in the Tauranga City Plan (Figure 1).

According to history provided by Port of Tauranga, the first wharf was constructed in the 1860s, before which shipping operations took place from the beach. In September 1873 the Port of Tauranga was officially established. In 1927 the Railway Wharf was completed, and the construction of the Mount Maunganui wharf

started in 1953. Over time the port has developed on both sides of the harbour, with a maximum berth depth of 15m. POTL handle a significant portion of New Zealand's maritime activities, the port manages a third of the nation's cargo, close to 40% of its exports, and nearly half of all shipping containers (Port of Tauranga Limited, 2020) The port has various associated activities such as stevedoring (the process of loading vessels and stowing cargo), log debarking (process of removing bark from wood), and general maintenance activities.

Figure 1: Map of the Port Zone as Defined by the Regional Coastal Environment Plan and Surrounding Areas

3 Water Quality

In this desktop review, the existing harbour water quality and stormwater quality data from the Port Zone and wider receiving environment have been provided. It is important to note that the stormwater monitoring locations are not situated in the receiving environment (Tauranga Harbour). Consequently, stormwater quality samples likely display higher concentrations of pollutants compared to water quality samples obtained from the receiving environment.

This section is set out in the following sub-sections:

- A description of available guidelines, standards, and consent conditions;
- A description of existing information and methodology;
- A review of existing harbour water quality data provided by TCC and POTL;
- A summary of existing Harbour water quality and stormwater consent compliance.

3.1 Scope of Existing Information

BOPRC and POTL monitor nine locations in the Tauranga Harbour within the Port Zone, while BOPRC monitoring extends to three sites near to, but outside of, the port zone. The additional monitoring locations beyond the port zone have been discussed within this report due to the port zone's location within the harbour and the short residency time of Tauranga Harbour. This inclusion aims to provide a more comprehensive representation of water quality within the port zone and water quality in surrounding areas.

Stormwater quality is monitored by TCC and POTL at 17 locations within the vicinity of the Port of Tauranga. Five of the stormwater monitoring sites are placed within the Port Zone (with one of the monitoring locations located upstream of the port). The other 12 monitoring locations are monitored by TCC and assess the stormwater quality outside of the port from other industrial areas.

It is noted that there are other stormwater discharges to the harbour in the vicinity of the Port that will contribute to overall water quality such as the Mount Industrial Area. For example, Ballance Agri-Nutrients information has been included within this report but not included in the analysis and final summary of data presented.

3.2 Guidelines and Standards

3.2.1 Estuary Trophic Index and Estuary Classification

The New Zealand Estuary Trophic Index (ETI) toolbox was created to address the lack of guidance for assessing eutrophication in New Zealand estuaries. The main objective of the ETI toolbox is to provide a consistent method for assessing estuarine eutrophication, including establishing nutrient load thresholds. Its purpose is to help Regional Councils gauge an estuary's susceptibility to eutrophication, evaluate its current trophic state, and understand how adjusting nutrient load limits could impact its condition. The ETI toolkit has provided a useful approach to explore the potential effects of freshwater nutrient load limits on the eutrophication status of estuaries in the Bay of Plenty, including Tauranga Harbour (Zygadlo, 2020). For a comprehensive description of the ETI tool and how it has been applied to Tauranga Harbour refer to Lawton (2017). In order to apply the ETI toolkit estuaries must be classified depending on their susceptibility to eutrophication (ETI classifications for Tauranga Harbour are presented in **Appendix A**).

Chlorophyll-a (CHLa) can be an indicator of algae concentration and therefore the level of eutrophication in a waterbody. Presently, there are no established guideline values for CHLa in New Zealand marine waters, therefore, the interim rating thresholds for phytoplankton chlorophyll-a concentrations in NZ estuaries will be used (B. M. Robertson, *et al.,* 2016) The interim rating threshold for euhaline estuaries will be used as

Tauranga Harbour is a saline dominated harbour with a salinity concentration of >30.0 ppt (Zygadlo, 2020). However, it is important to note that the preferred primary indicator in estuaries with short residence times (including Tauranga Harbour) is macroalgae.

The interim rating thresholds for phytoplankton chlorophyll-a concentrations in NZ estuaries are provided in **Appendix A.**

3.2.2 Available Marine Water Quality Guidelines and Standards

The water quality of the Port Zone will be compared against relevant guidelines. Available guidelines include the toxicant guideline value for ammoniacal nitrogen (NH_4-N) published in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)[2]. However, as ANZG (2018) does not provide chemical and physical guideline values for marine water, chemical and physical water quality parameters will be compared against Australian and New Zealand Guidelines for Fresh and Marine Water Quality ANZECC (2000)[3].

The ANZECC (2000) does not include guidelines specifically for New Zealand marine water, however, until New Zealand guideline are established the guideline values for estuaries in south-east Australia will be applied. However, as stated in BOPRC 2020 NERMN Estuary Water Quality Report:

'These trigger values may not represent a reliable or realistic measure of protection for Bay of Plenty waters as these values have been developed in different catchments with differing ecosystems. It is suggested that water quality managers develop their own physico-chemical indicators better suited to their respective regions. '

ANZG (2018) present a preferred hierarchy of types of guideline values for water quality indicators. This hierarchy prioritises site-specific and/or local guidelines over regional and national guidelines. Trigger values indicate that there is a 'potential risk' of adverse effects at a site.

The Ministry for the Environment (MfE) has also published a guideline document, Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (MfE/MoH, 2003)[4], which is designed to be used by Council's to inform the public of human health risks related to areas used for swimming and recreational use. The MfE guideline for Enterococci with be used as Enterococci is the preferred microbiological indicator in marine water.

Available Marine Water Quality Guidelines and Standards are presented in **Appendix A.**

3.3 Existing Scientific Information/Data Sources

3.3.1 Harbour Water Quality Monitoring

The Natural Environmental Regional Harbour Monitoring

The Natural Environmental Regional Monitoring Network (NERMN) was established in 1991 to collect data on the state and trends of estuary water quality by BOPRC. The monitoring programme was reviewed and subsequently updated in July 2015 to include additional monitoring sites and to change the sampling timing from high tide to mid-ebb tide to capture a greater freshwater influence and therefore better represent terrestrial inputs.

[2] See: https://www.waterquality.gov.au/anz-guidelines/your-location/new-zealand.

[3] See: https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000

[4] See: https://environment.govt.nz/publications/microbiological-water-quality-guidelines-for-marine-and-freshwater-recreational-area

The Regional Council collect water quality samples monthly which are monitored for 17 parameters, including chlorophyll (CHLa), dissolved oxygen concentration (DO (mg/L)), dissolved oxygen saturation (DO (%)), dissolved reactive phosphorous (DRP), *Escherichia coli* (*E. coli*), Enterococci (Ent), faecal coliform (FC), total ammoniacal nitrogen (NH_4-N), nitrite nitrate nitrogen (NNN), pH, salinity, conductivity (SpC), total nitrogen (TN), total phosphorous (TP), total suspended solids (TSS), turbidity, and water temperature. The NERMN water quality monitoring locations included in the below data analysis include two locations in the port zone and three monitoring locations in close proximity to the Port Zone (see Figure 2).

The Port of Tauranga Mount Maunganui Wharves Monitoring

The Port of Tauranga incorporates three monitoring locations for the receiving environment in their Mount Maunganui Wharves monitoring, which are monitored at the same time as their stormwater monitoring locations (see Section 3.2.2). Two samples are collected per sampling location, at depths of 0 to 200mm and 1m below the water surface. Samples are collected by boat or drone and are analysed for the following parameters total metals (Cu, Pb, Zn, Ni, Hg, Cd, and Cr), Chloride (Cl), TSS, TPH, and pH. The following parameters were also analysed in the samples collected on 05/09/2022, dissolved metals (Cu, Pb, Zn, Ni, Hg, Cd, and Cr), TN, TON, TP, turbidity, NH_4-N, DRP, total Kjeldahl nitrogen (TKN), enterococci, FC, and secchi depth. However, as this is a single sample these parameters have not been included in the data analysis.

The Port of Tauranga Te Awanui Harbour Monitoring

POTL monitor four locations within the Port Zone as part of their Te Awanui Harbour monitoring program, the monitoring locations are situated upstream and downstream of the Port of Tauranga. Initially POTL collected water quality samples at different tide times to assess if there was any obvious variability in the monitoring data. However, it was determined that samples should be collected monthly and at ebbtide to align with BOPRC NERMIN harbour water quality methodology. A GPS locator is used to locate the sampling locations to ensure that samples are taken in as close to the same location during each sampling occasion. Water quality samples are analysed for NH_4-N, DRP, dissolved UV absorption, NO_2-N, NO_3-N, pH, TKN, total organic nitrogen (TON), total oxidized nitrogen, TP, TSS, turbidity, VSS, enterococci, FC, total and dissolved carbon, As, Cd, Cr, Cu, Pb, Ni, Zn, and TPH.

Bay of Plenty Regional Council High-Frequency Monitoring

BOPRC conduct continuous monitoring at Tauranga Harbour Toll Bridge Marina, in a similar location to NERMN monitoring location at Tauranga Harbour at Toll Bridge Marina (see Figure 2). Data is collected at 5-minute intervals and includes the following parameters, CHLa, conductivity, DO (concentration and Saturation), pH, phycoerythrin, salinity, turbidity, and temperature.

In their 2023 report (4Sight Consulting, 2023) 4 Sight Consulting make the following conclusions:

- *'The ability to detect rapid change in concentration is the primary benefit of high-frequency measurements that would otherwise be missed with only discrete, monthly sampling. This may be particularly beneficial to monitoring events but less important for long term state of the environment monitoring.*
- *Typically, there was a stronger correlation between monthly and high-frequency data when the high-frequency data was averaged by day than when using raw data. This was most notable for chlorophyll-a and water temperature was an exception to this.*
- *There was a weaker correlation for parameters that rapidly change (e.g., chlorophyll-a, conductivity).*
- *A critical downside is that the technology is not there yet to be able to measure some of the most essential water quality parameters using a high-frequency instrument in estuarine conditions, notably nutrients and E. coli and enterococci'.*

Therefore, to maintain consistency in data analysis, the BOPRC high-frequency data has been omitted from the following analysis due to the differences in monitoring methodology.

Ballance Agri-Nutrients Mount Maunganui

Ballance Agri-Nutrients conducted shellfish, intertidal and subtidal sediment, and water quality sampling on the 8 and 9 of September 2022, in accordance with consent 60987, to assess the effects of the discharges from Ballance Agri-Nutrients at Mount Maunganui to Tauranga Harbour. Four sampling locations were sampled for water quality and analysed for salinity, temperature, DO (concentration), pH, TSS, F, and TP.

In their 2022 report (Bioresearches, 2022) make the following conclusions in regard to water quality:

- *The ANZECC trigger level guideline concentration for total phosphorus in south-east Australian estuarine waters is 0.030 mg/L. All samples from the receiving waters, including the background water quality sample from the main harbour channel, showed total phosphorus concentrations below this value.*
- *The receiving environment samples taken showed no discernible differences from the background water quality for pH or total phosphorus, marginally higher concentrations of fluoride and lower concentrations of suspended solids then those recorded at the channel station'.*

However, to maintain consistency in data analysis, the Ballance Agri-Nutrients water quality data has been omitted from the below data analysis due to limited data (only one sampling round was undertaken on 9 September 2022).

The monitoring locations and the monitoring periods are listed in Table 1 and are shown in Figure 2.

Table 1: Harbour Water Quality Monitoring Locations and Monitoring Periods

Monitoring Location	Monitoring Period
NERMN Harbour Water Quality Monitoring Sites	
Tauranga Harbour at Waikareao (1)	7/01/2015 to 13/02/2024
Tauranga Harbour at Tilby Point (2)	19/03/1998 to 13/02/2024
Tauranga Harbour at Mount Maunganui (3)	18/06/2015 to 14/02/2024
Tauranga Harbour at Toll Bridge Marina (4)	11/09/1990 to 13/02/2024
Tauranga Harbour at Maungatapu Bridge (5)	1/10/1991 to 13/02/2024
Port of Tauranga Te Awanui Harbour Monitoring (Upstream and Downstream of the Port of Tauranga)	
Te Awanui Harbour at North of Bridge Marina (6)	28/06/2023 to 28/03/2024
Te Awanui Harbour at Middle of channel (7)	28/06/2023 to 28/03/2024
Te Awanui Harbour at Te Paritaha (8)	28/06/2023 to 28/03/2024
Te Awanui Harbour at No. 6 marker (9)	28/06/2023 to 28/03/2024
Port of Tauranga Stormwater Monitoring Plan - Mount Maunganui Wharves	
70 m from discharge (Compliance site) (10)	19/08/2020 to 5/09/2022
Otumoetai Channel (Control site) (11)	19/08/2020 to 5/09/2022
North of Bridge Marina (Control site) (12)	19/08/2020 to 5/09/2022
Ballance Agri-Nutrients Monitoring	
The Outfall (13)	09/09/2022
100 Meters North of the Outfall (14)	09/09/2022
400 Meters North of the Outfall (15)	09/09/2022
The Channel South of the Outfall (16)	09/09/2022

Figure 2: Harbour Water Quality Monitoring Locations in Relation to the Port Zone

3.3.2 Harbour Water Quality Analysis Methodology

10-years' worth of data (2014 to 2024) was provided by BOPRC for five monitoring locations within Tauranga Harbour. However, as stated in Section 3.3.1, due to the sampling time change which came into effect in July 2015 only data from this point onwards has been included in the data analysis.

A 5 and 8-year analysis of the datasets was undertaken for the BOPRC monitoring locations. The 5-year minimum, maximum, median, and 95th percentile values for each parameter at each monitoring location were compared against ANZG (2018) and ANZECC (2000) guideline values, where applicable. A summary of the data analysis is presented in Table 4. This analysis was undertaken to provide an indication of the current state of each of the water quality attributes assessed and it is considered a 5-year period is appropriate for this analysis.

To determine any trends in water quality attributes, the longer 8-year data period was statistically analysed using the Mann-Kendall test. The Mann-Kendall test is used to evaluate whether a given dataset exhibits a significant increasing or decreasing trend over time. It is specifically designed to determine the presence of a statistically significant trend, without providing information about the magnitude of change. The trend analysis output was classified into three3 categories: 'Increasing', 'Decreasing', and 'Indeterminate'. A trend was classified as 'Indeterminate' when there was insufficient statistical evidence of a significant trend at the specified level of significance (using a p-value of 0.05). In the context of the final reporting, the terms 'Increasing', 'Decreasing', and 'Indeterminate' were interpreted and expressed as 'Improving', 'Worsening', or 'Uncertain', depending on their respective implications for environmental conditions. For example, an increasing trend in a parameter such as Total Nitrogen (TN) is considered a degradation, while an increasing trend in clarity is regarded as an improvement. Table 4 shows the results of the Mann-Kendall statistical analysis.

Box and whisker plots were used to summarise 8-year water quality data at each site, the use of box plots allows a visual representation of data distribution across multiple monitoring locations. The boxes show the range between the 25th and 75th percentiles, and the horizontal line inside represents the median concentration. The whiskers indicate the range from the 5th to the 95th percentile value.

POTL provided two years of water quality data for monitoring locations 6 to 9 (Te Awanui Harbour at North Bridge Marina to Te Awanui Harbour at No. 6 marker). Due the limited number of samples collected during this period (9 samples), it is more appropriate to compare the minimum, maximum, and average concentrations against ANZECC (2000) standards. Moreover, due to the small dataset, no statistical analysis will be performed for these monitoring sites.

Although monitoring locations 10 to 12 (70m from discharge to North of Bridge Marina) are sampled in the receiving environment due to the differences in sampling methodology and a limited dataset concentrations of individual water quality samples collected at these sites will be assessed against ANZECC (2000) as specified in the consent.

3.3.3 Stormwater Quality Monitoring

Stormwater monitoring is undertaken by TCC and POTL in accordance with relevant consent conditions.

A summary of TCC and POTL consent conditions and monitoring protocols are provided in **Appendix B.**

Table 2: Stormwater Monitoring Locations and Monitoring Periods

Stormwater Monitoring Location	Monitoring Period
Tauranga City Council Monitoring Locations	
Totara Street (TCC1)	12/09/2013 to 20/09/2023
Existing northern (TCC2)	10/06/2013 to 19/12/2023
Portside/Te Maire new southern (TCC3)	08/07/2015 to 14/12/2023
Mid southern (TCC4)	08/07/2015 to 16/01/2024
True southern (TCC5)	23/06/2016 to 05/09/2023
Hewletts Road North (TCC6)	14/07/2016 to 15/012024
Hewletts Road South (TCC7)	07/08/2020 to 15/01/2024
Den Place (TCC8)	25/09/2013 to 06/11/2023
Cross Road East (TCC9)	14/08/2018 to 6/11/2023
Cross Road West (TCC10)	14/08/2018 to 06/11/2023
Reid Place (TCC11)	14/08/2018 to 06/11/2023
Port of Tauranga Sulphur Point Monitoring Locations	
East Road Outlet (PTL12)	16/03/2018 to 3/03/2024
Pond Site (PTL13)	16/03/2018 to 3/03/2024
Port of Tauranga Stormwater Mount Maunganui Wharves Monitoring Locations	
P9-B (PTL14)	1/06/2020 to 15/01/2024
PC10-A (PTL15)	18/06/2020 to 15/01/2024
PC10-B (PTL16)	18/06/2020 to 15/01/2024

The stormwater monitoring locations are shown in Figure 3.

Figure 3: Stormwater Quality Monitoring Locations in Relation to the Port Zone

3.3.4 Stormwater Quality Analysis Methodology

Stormwater data from 17 monitoring locations was supplied by TCC and POTL, monitoring location names and monitoring periods are provided in Table 2. Both TCC and POT compare their stormwater monitoring findings against relevant consent conditions (refer to Section 3.2.2), highlighting any samples exceeding their respective trigger values after each sampling event. It is important to note that stormwater monitoring locations TCC1 to TCC11 are not located in the port and therefore capture stormwater quality prior to port influence. Additionally, monitoring location PTL15 is an upstream monitoring location and does not receive stormwater from the port. An assessment of total number of trigger values exceedances for each monitoring year (from 2018 to 2024) where applicable, was undertaken and is provided in **Appendix C.**

It is important to note that the stormwater monitoring locations are not situated in the receiving environment (Tauranga Harbour). As a result, it is expected that these locations may exhibit higher concentrations of pollutants compared to the standards outlined in ANZECC (2000) and the concentrations recorded at the receiving environment monitoring locations (listed in Section 3.2.1). Therefore, making direct comparisons between the harbour water quality monitoring results and ANZECC (2000) would not be appropriate in this context and concentrations will only be compared against relevant consent conditions.

3.4 Water Quality State – Based on Scientific Information

3.4.1 Stormwater Quality

Stormwater data from 17 monitoring locations was supplied by TCC and POT. An assessment of total number of exceedances for each monitoring year (from 2018 to 2024) where applicable, was undertaken and is provided in **Appendix C.**

- The stormwater data analysis showed the following: As, Cd, Cr, Ni, PAH, pH, Hg, concentrations remained below their relative consent trigger values during all sampling rounds, excluding one occasion for pH (at monitoring location TCC8 in 2023) and two occasions for COD (at monitoring location TCC5 in 2018 and 2019).
- NH_4-N concentration did not exceed the relative consent conditions at monitoring locations TCC1 and TCC6 to TCC11. However, there were multiple exceedances at monitoring locations TCC2 and TCC4. Additionally, monitoring locations TCC3 and TCC5 exceeded the relative consent trigger value on one occasion each during 2019 and 2023, respectively. There are no applicable consent trigger values for monitoring locations PTL12 to PTL16.
- Cu concentrations exceeded their relative consent conditions at monitoring locations TCC1 to TCC11. However, there were no exceedances at monitoring locations PTL14 to SW16.
- *E. coli* concentration frequently exceeded relative guidelines at monitoring locations TCC1 to TCC5 and TCC10. However, there were no recorded exceedances at monitoring locations TCC6 to TCC11.
- Pb concentrations had multiple exceedances from 2018 to 2021; however, the frequency of exceedances decreased between 2022 and 2024. Furthermore, there were no recorded exceedances at monitoring locations PTL14 to PTL16.
- TSS concentration exceeded the relevant consent trigger values on a few sampling occasions at monitoring locations TCC1, TCC2, TCC5, TCC6, and TCC9.
- Zn concentration at most monitoring locations exceeded their relative consent trigger values frequently, excluding monitoring locations PTL14 and PTL15. It is understood that the exceedances at PTL16 were investigated, and it was considered that there was uncertainty about if the exceedances were from an upstream network of the Port catchment.

- Water quality results from samples collected in the receiving environment concurrently with stormwater monitoring showed that all applicable parameters remained below the ANZECC (2000) guideline values as specified by the consent.

3.4.2 Harbour Water Quality

A summary of 5-year (2018 to 2023 for monitoring locations 1 to 5) and 2-year (2022 to 2023 for monitoring locations 6 to 9) water quality results are presented in Table 3. The sampling results are compared against the ANZG (2018) and MfE and MoH (2003) to provide typical scientific baseline water quality. Additionally, results of the Mann-Kendall test for monitoring locations 1 to 5 are shown in Table 4. However, there is insufficient data to conduct a statistical analysis for monitoring locations 6 to 9. Graphs of the last 8-years of data (2015-2023) for monitoring locations 1 to 5 are shown in Figure 3 to Figure 18 below.

Additionally, a summary of the water quality results for heavy metal concentrations is provided in **Appendix D**. However, concentrations of all parameters at each monitoring location were well below the ANZECC (2000) and relative consent limit, where applicable. This was also found in BOPRC 2019 Tauranga Moana State of The Environment Report, which found that heavy metal concentrations are generally low in Tauranga Harbour.

Table 3: Water Quality Monitoring Results

Monitoring Location		CHLa (mg/L)	DO (mg/L)	DO (%)	DRP (mg/L)	Ent (cfu/ 100mL)	*E. coli* (cfu/ 100mL)	FC (cfu/ 100mL)	NH_4-N (mg/L)	NNN (mg/L)	NO_3-N (mg/L)	NO_2-N (mg/L)	TKN (mg/L)	Salinity (ppt)	Cond (uS/cm)	TN (mg/L)	TP (mg/L)	TSS (mg/L)	Turbidity (NTU)
Tauranga Harbour at Waikareao (1)	Min	0.2	6.24	81.10	0.0001	0	0	0	0.006	0.001	-	-	-	14.35	25213.5	0.14	0.005	3.11	0.61
	Max	1.4	10.04	118.2	0.013	2000	300	420	0.091	0.221	-	-	-	33.57	53610.9	0.50	0.028	24.20	8.90
	Median	0.6	7.93	98.00	0.004	3	3	5	0.030	0.048	-	-	-	29.13	47097.1	0.27	0.016	8.88	1.96
	95%tile	1.1	9.05	111.88	0.008	292	69	166	0.055	0.16	-	-	-	32.81	51203.2	0.41	0.022	19.76	5.16
Tauranga Harbour at Tilby Point (2)	Min	0.4	6.85	91.00	0.005	0	0	0	0.001	0.001	-	-	-	14.72	24400.0	0.17	0.004	2.90	0.82
	Max	34.3	12.03	131.5	0.008	3640	220	2870	0.060	0.199	-	-	-	32.85	51684.4	1.72	0.29	498.00	169.0
	Median	1.45	8.82	104.95	0.0017	12	13	25	0.017	0.027	-	-	-	28.06	45406.6	0.29	0.019	10.55	2.29
	95%tile	7.13	10.45	123.17	0.006	190	167	310	0.047	0.18	-	-	-	31.82	50710.9	0.55	0.060	106.12	25.40
Tauranga Harbour at Mount Maunganui (3)	Min	0.3	6.28	74.80	0.003	0	0	0	0.005	0.002	-	-	-	25.75	42700.0	0.12	0.004	2.00	0.40
	Max	3.6	10.30	129.1	0.016	170	620	1300	0.050	0.11	-	-	-	35.90	57377.2	0.37	0.043	32.10	6.15
	Median	1.2	7.99	100.4	0.003	3	2	5	0.013	0.013	-	-	-	32.25	51635.0	0.21	0.016	9.30	1.70
	95%tile	3.08	9.58	116.01	0.01	44	52	61	0.031	0.069	-	-	-	34.72	54811.7	0.32	0.025	25.61	4.80
Tauranga Harbour at	Min	0.3	6.50	83.90	0.001	0	0	0	0.002	0.003	-	-	-	25.09	41758.5	0.15	0.006	3.20	0.86
	Max	2.5	9.16	111.0	0.01	80	69	69	0.042	0.091	-	-	-	34.28	54189.9	0.30	0.049	27.30	4.43
	Median	0.9	7.81	98.25	0.004	1	1	4	0.018	0.017	-	-	-	31.62	50550.0	0.22	0.016	8.39	2.01

Monitoring Location		CHLa (mg/L)	DO (mg/L)	DO (%)	DRP (mg/L)	Ent (cfu/ 100mL)	*E. coli* (cfu/ 100mL)	FC (cfu/ 100mL)	NH_4-N (mg/L)	NNN (mg/L)	NO_3-N (mg/L)	NO_2-N (mg/L)	TKN (mg/L)	Salinity (ppt)	Cond (uS/cm)	TN (mg/L)	TP (mg/L)	TSS (mg/L)	Turbidity (NTU)
Toll Bridge Marina (4)	95%tile	2.08	8.77	106.96	0.008	32	26	28	0.031	0.067	-	-	-	33.82	53521.6	0.30	0.025	15.61	3.43
Tauranga Harbour at Maungatapu Bridge (5)	Min	0.4	4.40	51.00	0.0001	0	0	0	0.004	0.001	-	-	-	17.15	29652.0	0.16	0.007	4.00	1.18
	Max	3.4	9.90	112.0	0.013	450	260	280	0.076	0.26	-	-	-	33.70	53531.2	0.53	0.041	63.00	9.33
	Median	1	7.72	95.55	0.004	6	4	6	0.022	0.027	-	-	-	30.11	48334.2	0.25	0.018	9.74	2.91
	95%tile	2.1	8.82	104.33	0.009	71	41	52	0.044	0.13	-	-	-	33.08	51392.2	0.36	0.025	22.69	7.26
Te Awanui Harbour at North of Bridge Marina (6)	Min	-	-	-	0.005	1	-	1	0.003	-	0.001	0.001	0.017	-	-	0.057	0.008	3.4	1.5
	Max	-	-	-	0.011	2	-	70	0.024	-	0.110	0.006	0.140	-	-	0.260	0.013	12.4	3.1
	Average	-	-	-	0.008	1	-	9	0.008	-	0.038	0.002	0.082	-	-	0.123	0.010	7.1	1.9
Te Awanui Harbour at Middle of channel (7)	Min	-	-	-	0.004	1	-	1	0.0025	-	0.001	0.001	0.06	-	-	0.06	0.01	3.80	1.00
	Max	-	-	-	0.012	2	-	78	0.018	-	0.093	0.009	0.11	-	-	0.20	0.02	19.0	2.90
	Average	-	-	-	0.008	1	-	10	0.0074	-	0.033	0.002	0.09	-	-	0.12	0.01	8.49	1.82
Te Awanui Harbour at Te Paritaha (8)	Min	-	-	-	0.004	1	-	1	0.003	-	0.001	0.001	0.005	-	-	0.07	0.006	4.6	0.60
	Max	-	-	-	0.012	78	-	80	0.010	-	0.075	0.012	0.11	-	-	0.18	0.011	11.4	2.60
	Average	-	-	-	0.007	9	-	10	0.004	-	0.036	0.002	0.067	-	-	0.10	0.009	6.8	1.53
Te Awanui Harbour at No. 6 marker (9)	Min	-	-	-	0.004	1	-	1	0.003	-	0.00	0.001	0.03	-	-	0.07	0.005	3.20	0.85
	Max	-	-	-	0.014	8	-	64	0.02	-	0.08	0.011	0.12	-	-	0.19	0.014	11.80	2.80
	Average	-	-	-	0.008	3	-	9	0.01	-	0.03	0.002	0.08	-	-	0.11	0.009	6.44	1.68

Note: Red indicates that the ANZG (2018) is exceeded, and Yellow indicates the MfE and MoH (2003) is exceeded

Table 4: Mann-Kendall Statistical Analysis Results (8-year period (2015 - 2023))

Parameters	Tauranga Harbour at Waikareao (1)	Tauranga Harbour at Tilby Point (2)	Tauranga Harbour at Mount Maunganui (3)	Tauranga Harbour at Toll Bridge Marina (4)	Tauranga Harbour at Maungatapu Bridge (5)
CHLa (mg/L)	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Indeterminate
DO (mg/L)	Indeterminate	Decreasing	Indeterminate	Indeterminate	Decreasing
DO (%)	Indeterminate	Decreasing	Indeterminate	Indeterminate	Decreasing
DRP (mg/L)	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing
Ent (cfu/100m)	Indeterminate	Indeterminate	Inderterminate	Decreasing	Indeterminate
E. coli (cfu/ 100m)	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Indeterminate
FC (cfu/ 100ml)	Indeterminate	Increasing	Indeterminate	Indeterminate	Indeterminate
NH_4-N (mg/L)	Indeterminate	Indeterminate	Decreasing	Decreasing	Decreasing
NNN (mg/L)	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Indeterminate
Salinity (ppt)*	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing
SpC (uS/cm)	Decreasing	Indeterminate	Indeterminate	Indeterminate	Indeterminate
TN (mg/L)	Indeterminate	Indeterminate	Decreasing	Indeterminate	Decreasing
TP (mg/L)	Decreasing	Indeterminate	Decreasing	Decreasing	Decreasing
TSS (mg/L)	Indeterminate	Indeterminate	Decreasing	Decreasing	Decreasing
Turbidity (NTU)	Increasing	Indeterminate	Indeterminate	Indeterminate	Indeterminate

Note: Green indicates an 'Improving' trend, Red indicates 'Worsening' trend, and Grey indicated an 'Uncertain' trend.

*This is potentially related to more wet weather and greater freshwater inputs, and therefore a trend has not been allocated to this parameter.

3.4.2.1 Chlorophyll-a

CHLa median concentrations had a range of 0.6mg/L at location 1 (Tauranga Harbour at Waikareao) to 1.45mg/L at location 2 (Tauranga Harbour at Tilby Point) (as shown in Table 3). The statistical analysis (shown in Table 4) determined that there was insufficient statistical evidence to support the presence of a significant trend. The 8-year data analysis shows that Tauranga Harbour at Tilby Point had consistently

higher CHLa concentrations when compared to the other monitoring locations with a median concentration of 1.90mg/L, whereas the median values for the other four locations ranged between 0.6mg/L to 1.2mg/L (refer to Figure 4).

Additionally, BOPRC 2020 NERMN Estuary Water Quality Report found that CHLa concentrations in Tauranga Harbour are shown in Figure 4. The assessment found that Tauranga Harbour at Tilby Point had the overall highest CHLa concentration when compared to all other monitoring locations. However, Tauranga Harbour at Tilby Point is within the 'A' band (excluding the 95th percentile value) and is therefore considered to be in a healthy and resilient ecological state. However, as previously stated, CHLa is not a reliable indicator for algae growth in harbours with short residency time (see Section 4.2.3.1 for the marine macroalgae and seaweed assessment).

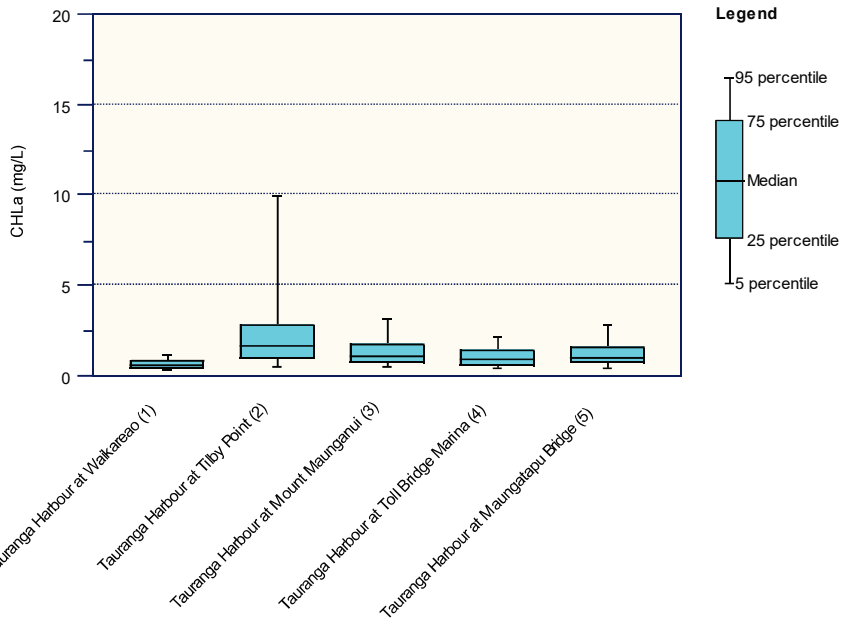

Figure 3: Distribution of Concentrations of CHLa for Each Monitoring Location Over an 8-year Period (2015 - 2023)

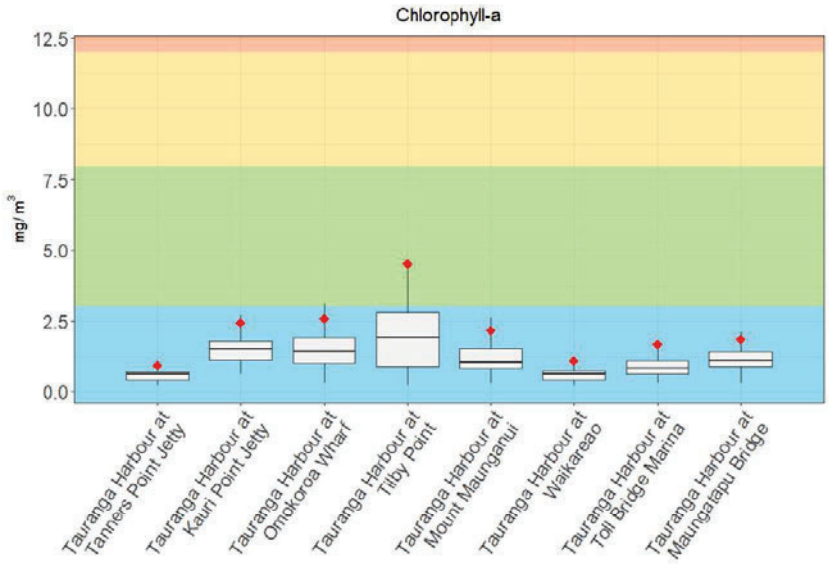

Figure 4: Distribution of Concentrations of CHLa for NERMN Monitoring Locations in Tauranga Harbour over a 5-year Period (2015 - 2020) (Source: NERM Estuary Water Quality Report, BOPRC, 2020)

In BOPRC 2022 Tauranga Harbour Sensitivity to Freshwater Inflows and Ecological State Assessment, Tauranga Harbour was assigned an overall B grade (ETI toolbox 2), indicating a moderate susceptibility to eutrophication. Additionally, southern sub-estuaries Waikareao (located near monitoring location 1) and Waimapu (located near monitoring location 5) were assigned a D grade (ETI toolbox 2), indicating a high risk of eutrophication. However, the assessment found that all the sub-estuaries that received a D grade (ETI toolbox 2), had low to medium abundance of macroalgae, and therefore received an A or B grade (ETI toolbox 1). These findings indicate that the southern sub-estuaries susceptibility to eutrophication may be lower than the assigned D grade (Crawshaw et al., 2022).

3.4.2.2 Conductivity

The statistical analysis showed a declining ‘Improving’ trend in conductivity at location 1 (Tauranga Harbour at Waikareao), while insufficient evidence was found to support a statistical trend at locations 2 to 5 (as shown in Table 4).

The 8-year data analysis showed that locations 3,4, and 5 (Tauranga Harbour at Mount Maunganui to Tauranga Harbour at Maungatapu Bridge) had slightly higher conductivity levels when compared to comparison to locations 1 and 2 (as shown in Figure 5).

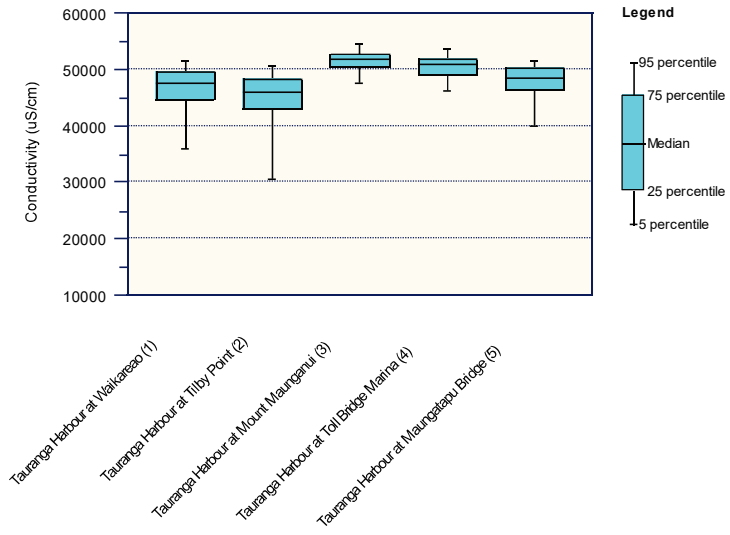

Figure 5: Distribution of Conductivity Levels for Each Monitoring Location Over an 8-year Period (2015 - 2023)

3.4.2.3 Dissolved Oxygen Concentration

The 5-year data analysis shows that median DO concentration at each monitoring location varied between 7.72mg/L (at location 5) to 8.82mg/L (at location 2). Moreover, statistical analysis showed a declining trend in DO concentration at locations 2 and 5, while insufficient evidence was found to support a statistical trend at locations 1, 3, and 4 (as shown in Table 4).

The 8-year data analysis showed that location 2 (Tauranga Harbour at Tilby Point) had slightly higher concentrations of DO in comparison to locations 1, 3, 4, and 5 (as shown in Figure 6).

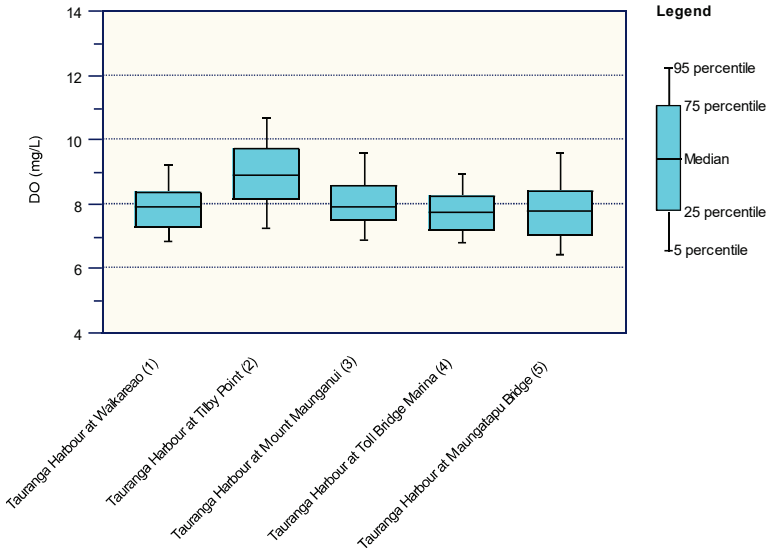

Figure 6: Distribution of Concentrations of DO for Each Monitoring Location Over an 8-year Period (2015 - 2023)

3.4.2.4 Dissolved Oxygen Saturation

The 5-year data analysis showed that DO median saturation had a range of 95.5% at location 5 (Tauranga Harbour at Maungatapu Bridge) to 104.9% at location 2 (Tauranga Harbour at Tilby Point).The statistical

analysis showed a declining trend in DO saturation at locations 2 and 5, while no statistically significant trend was found at locations 1, 3, and 4 (as shown in Table 4).

The 8-year analysis showed that location 2 had higher DO saturation levels compared to locations 1, 3, 4, and 5 with a median of 108.0%, which remained within the bounds of the ANZECC (2000) maximum and minimum guideline values. Furthermore, the DO saturation median values across all locations were > 90% (as shown in Figure 7).

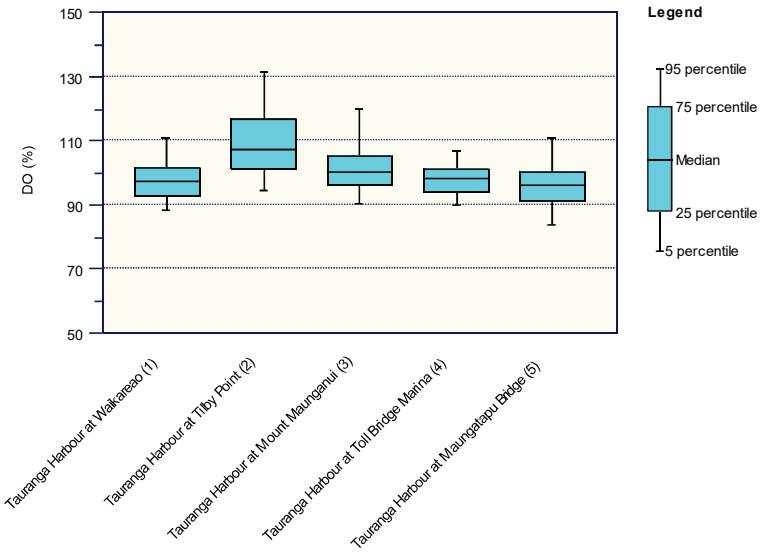

Figure 7: Distribution of DO Saturations for Each Monitoring Location Over a 9-year Period (2015 - 2024)

3.4.2.5 Dissolved Reactive Phosphorus

DRP median concentration had a range of 0.0017mg/L (at location 2) to 0.004mg/L (at locations 1, 4, and 5) (as shown in Table 6). Additionally, DRP average concentration had no notable difference between monitoring locations 6 to 9 (Te Awanui Harbour at North of Bridge Marina to Te Awanui Harbour at No.6 marker). The statistical analysis showed a decreasing ('Improving') trend in DRP concentrations at all applicable monitoring locations (1, 2, 3, 4, and 5). Additionally, the 8-year analysis showed that location 2 had the overall lowest DRP concentration when compared to all other monitoring locations. However, no notable difference in DRP concentration was observed between locations 1, 3, 4, and 5 (as shown in Figure 8).

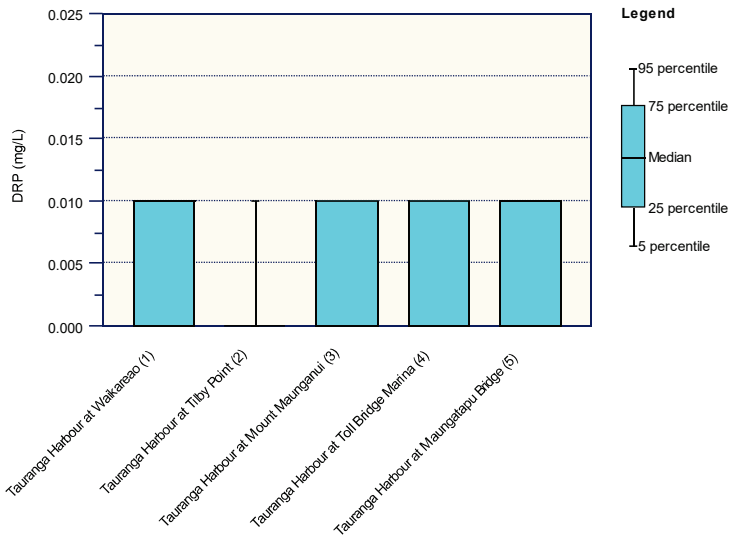

Figure 8: Distribution of Concentrations of DRP for Monitoring Locations 1 to 5 Over an 8-year Period (2015 - 2023)

3.4.2.6 Escherichia coli

Presently, there is no established guideline value for E. coli in New Zealand marine water. The 5-year data analysis showed that E. coli median concentrations across all locations ranged from 1 cfu/100mL at location 4 (Tauranga harbour at Toll Bridge Marina) to 13 cfu/100mL at location 2 (Tauranga Harbour at Tilby Point).

The statistical analysis showed that there was no statistically significant trend in E. coli concentration at any applicable monitoring location. Furthermore, analysis of an 8-year dataset showed elevated E. coli concentrations at location 2 in comparison to locations 1, 3, 4, and 5 (as shown in Figure 9).

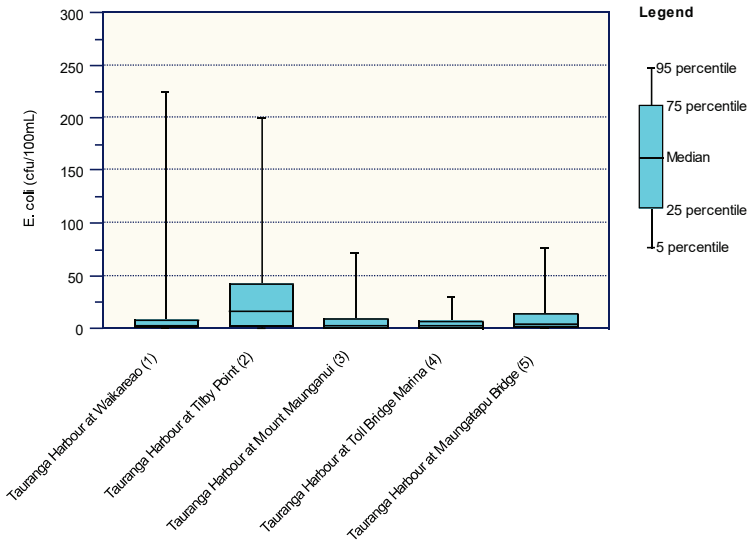

Figure 9: Distribution of Concentrations of E. coli for Each Monitoring Location Over an 8-year Period (2015 - 2023)

3.4.2.7 Enterococci

Enterococci concentration was compared against the MfE and MoH (2003) guideline value. The 5-year data analysis showed that the maximum and 95th percentile values exceeded the MfE and MoH (2000) at

locations 1 and 2. Additionally, Enterococci maximum concentration at locations 3 and 5 exceeded the MfE and MoH (2003).

The statistical analysis showed a declining trend in Enterococci concentration at location 4. However, there was no evidence of statistically significant trend at locations 1, 2, 3, and 5 (as shown in Table 4).

The 8-year analysis showed that location 2 had an overall higher Enterococci concentration compared to locations 1, 2, 3, 4, and 5.

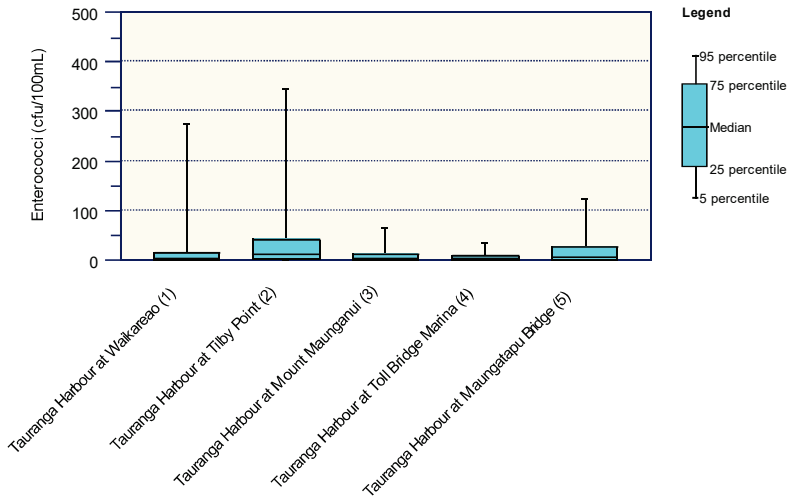

Figure 10: Distribution of Concentrations of Enterococci for Each Monitoring Location Over an 8-year Period (2015-2023)

3.4.2.8 Faecal Coliforms

Analysis of 5-year data showed a range of FC median concentrations, from 4 cfu/100ml at location 1 (Tauranga Harbour at Waikareao) to 25 cfu/100ml at location 2 (Tauranga Harbour at Tilby Point).

The 2-year data analysis (for monitoring locations 6 to location 9) showed that FC average concentration ranged from 9 cfu/100mL (at locations 6 and 9) to 10 cfu/100mL (at locations 7 and 8).

The statistical analysis (including locations 1 to 5) indicated no statistically significant trend in FC concentration at locations 1, 3, 4, and 5. However, an increasing trend (classified as 'Worsening') was observed at location 1. Additionally, further analysis of the 8-year dataset showed elevated FC concentrations at location 2 in comparison to locations 1, 3, 4, and 5 (as shown in Figure 11).

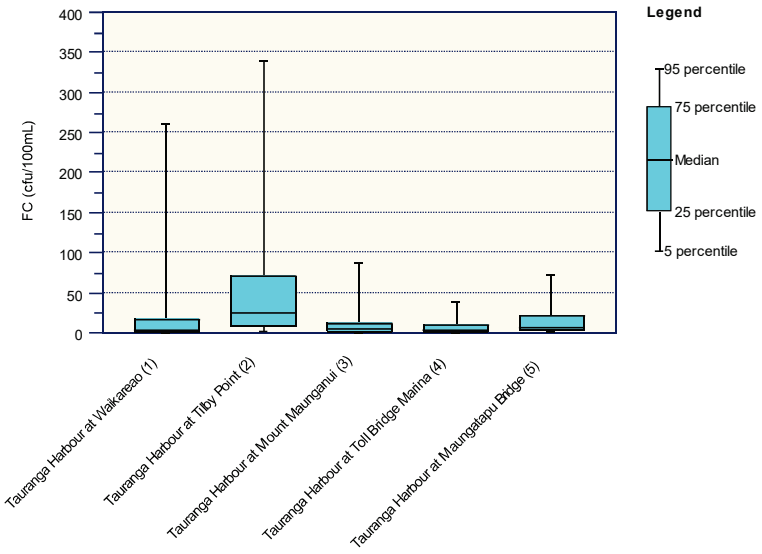

Figure 11: Distribution of Concentrations of FC for Monitoring Location 1 to 5 Over an 8-year Period (2015 - 2023)

3.4.2.9 Nitrite, Nitrate, Nitrogen

The 5-year data analysis (for locations 1 to 5) showed that location 1 (Tauranga Harbour at Waikareao) had the highest median concentration of 0.048mg/L when compared to locations 2 to 5, which had a maximum median concentration of 0.027mg/L at locations 2 and 5 (Tauranga Harbour at Tilby Point and Tauranga Harbour at Maungatapu Bridge).

The statistical analysis showed insufficient evidence of a statistical trend at any of the monitoring locations (1 to 5). Further analysis of the 8-year data showed that location 1 had the highest NNN concentration, with a median value of 0.05 compared to locations 2, 3, 4, and 5 which had a max median concentration of 0.4mg/L at location 2 (as shown in Figure 12).

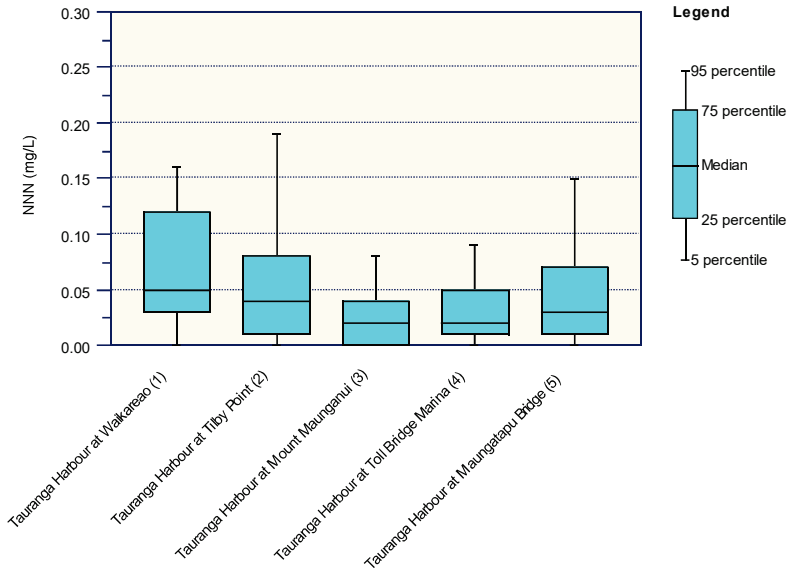

Figure 12: Distribution of Concentrations of NNN for Monitoring Location 1 to 5 Over a 8-year Period (2015 - 2023)

3.4.2.10 Nitrate, Nitrite, and Total Kjeldahl Nitrogen (TKN)

The analysis of the 2-year data for monitoring locations 6 to 9 showed the following:

- NO_3-N concentration range from 0.03mg/L at location 9 to 0.038mg/L at location 6.
- All monitoring locations had an average NO_2-N concentrations of 0.002mg/L.
- TKN concentration had a range of 0.067mg/L at location 8 to 0.09 mg/L at location 7.

3.4.2.11 Salinity

The analysis of the 5-year data showed that location 3 had the highest salinity concentration of 32.25 ppt. The statistical analysis showed that there was a statistically significant decreasing trend at each monitoring location (as shown in Table 4). Further analysis of the 8-year data showed that locations 3 and 4 had higher median concentrations, measuring 34.0 ppt and 32.1 ppt, respectively, in comparison to locations 1, 2, and 5. Notably, location 2 exhibited the lowest salinity concentration at 28.0 ppt (as shown in Figure 13).However, a decreasing salinity trend may be attributed to rainfall events and greater freshwater influence, therefore, the decreasing trend is not categorised as 'Improving' or 'Worsening'.

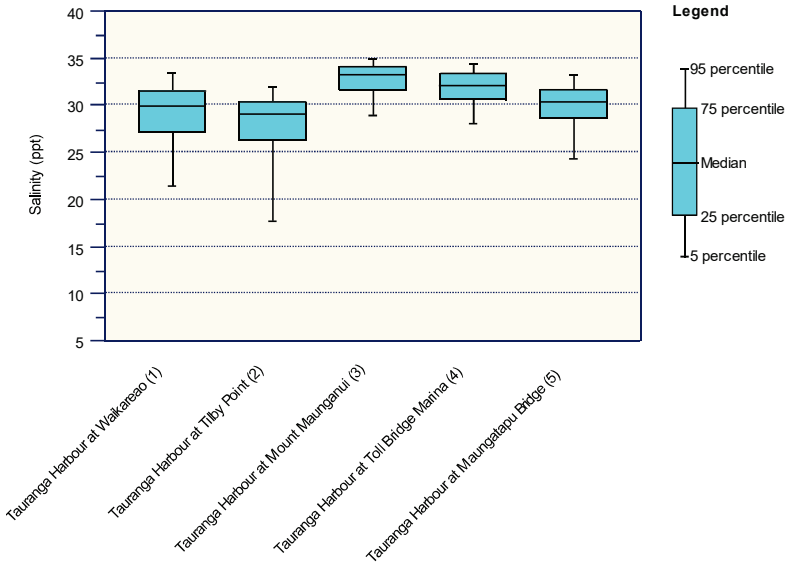

Figure 13: Distribution of Concentrations of Salinity for Each Monitoring Location Over an 8-year Period (2015 - 2023)

3.4.2.12 Total Ammoniacal Nitrogen

NH_4-N concentrations were compared against the ANZG (2018) toxicant guideline value. The 5-year data analysis showed that the minimum, maximum, median, and 95th percentile concentration across all monitoring locations did not exceed the ANZG (2018) toxicant guideline value of 0.9mg/L. The highest NH_4-N median concentration was recorded at location 1 (with a concentration of 0.030mg/L), whereas median values at locations 2, 3, 4, and 5 ranged from 0.013mg/L (at location 3) to 0.022mg/L (at location 5). Additionally, the minimum, maximum, and average concentrations at monitoring location 6 to 9 were well below the ANZG (2018) toxicant guideline value. Moreover, the 2-year data analysis (locations 6 to 9) showed that location 9 had the highest average concentration of 0.01mg/L when compared to locations 6 to 8, which had a max average concentration of 0.008mg/L at location 6.

The statistical analysis showed a decreasing ('Improving') trend in NH_4-N concentrations at locations 3, 4, and 5. However, there was insufficient evidence to support a statistically significant trend at locations 1 and 2.

Overall, the 8-year data analysis (locations 1 to 5) showed that locations 2 and 3 had the lowest NH_4-N concentrations compared to locations 1, 4, and 5 (as shown in Figure 14).

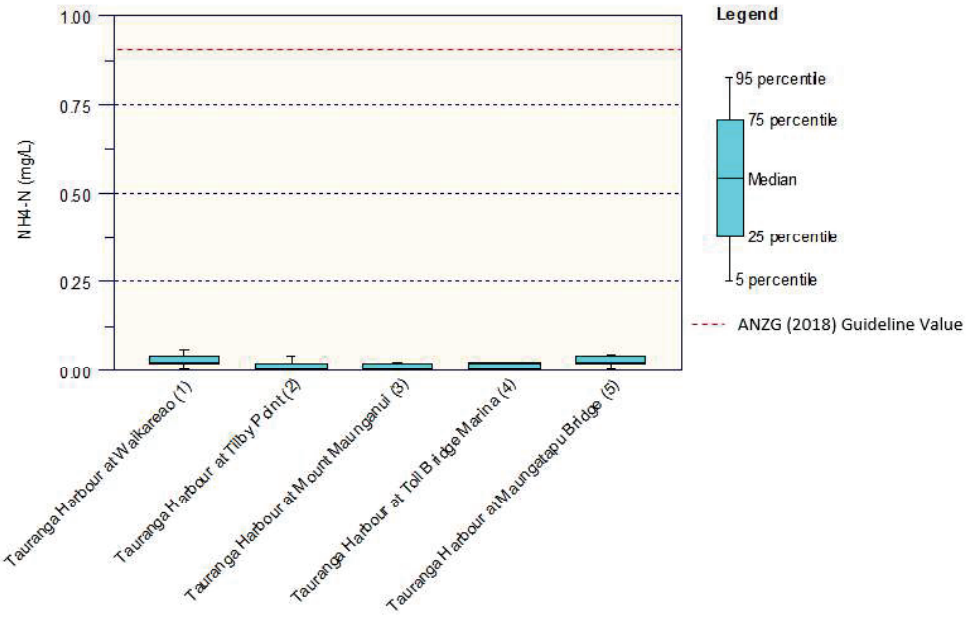

Figure 14: Distribution of Concentrations of NH4-N for Monitoring Locations 1 to 5 Over an 8-year Period (2015 - 2023)

3.4.2.13 Total Nitrogen

Similar to BOPRC 2020 NERM Estuary Water Quality Report, the 5-year data analysis showed that at location 2 (Tauranga Harbour at Tilby Point) had the highest median TN concentration of 0.29mg/L when compared to locations 1, 3, 4, and 5, which had a max median concentration of 0.27mg/L at location 1 (Tauranga Harbour at Waikareao)

The statistical analysis showed a statistically significant decreasing trend ('Improving') at locations 3 and 5, while no evidence of a statistical trend was observed at locations 1, 2, and 3 (as shown in Table 4

).

Parameters	Tauranga Harbour at Waikareao (1)	Tauranga Harbour at Tilby Point (2)	Tauranga Harbour at Mount Maunganui (3)	Tauranga Harbour at Toll Bridge Marina (4)	Tauranga Harbour at Maungatapu Bridge (5)
CHLa (mg/L)	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Indeterminate
DO (mg/L)	Indeterminate	Decreasing	Indeterminate	Indeterminate	Decreasing
DO (%)	Indeterminate	Decreasing	Indeterminate	Indeterminate	Decreasing
DRP (mg/L)	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing
Ent (cfu/100m)	Indeterminate	Indeterminate	Inderterminate	Decreasing	Indeterminate
E. coli (cfu/ 100m)	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Indeterminate
FC (cfu/ 100ml)	Indeterminate	Increasing	Indeterminate	Indeterminate	Indeterminate
NH_4-N (mg/L)	Indeterminate	Indeterminate	Decreasing	Decreasing	Decreasing
NNN (mg/L)	Indeterminate	Indeterminate	Indeterminate	Indeterminate	Indeterminate
Salinity (ppt)*	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing
SpC (uS/cm)	Decreasing	Indeterminate	Indeterminate	Indeterminate	Indeterminate
TN (mg/L)	Indeterminate	Indeterminate	Decreasing	Indeterminate	Decreasing
TP (mg/L)	Decreasing	Indeterminate	Decreasing	Decreasing	Decreasing
TSS (mg/L)	Indeterminate	Indeterminate	Decreasing	Decreasing	Decreasing
Turbidity (NTU)	Increasing	Indeterminate	Indeterminate	Indeterminate	Indeterminate

Note: Green indicates an 'Improving' trend, Red indicates 'Worsening' trend, and Grey indicated an 'Uncertain' trend.

*This is potentially related to more wet weather and greater freshwater inputs, and therefore a trend has not been allocated to this parameter.

Further analysis of the 8-year data showed slightly higher concentrations of TN at monitoring locations 1 and 2, with median concentrations of 0.27mg/L and 0.29mg/L, respectively, when compared to locations 3, 4, and 5.

The 2-year data analysis (locations 6 to 9) showed locations 6 and 7 had slightly higher average concentration of 0.12mg/L when compared to locations 8 and 9 which had a max average concentration of 0.11mg/L.

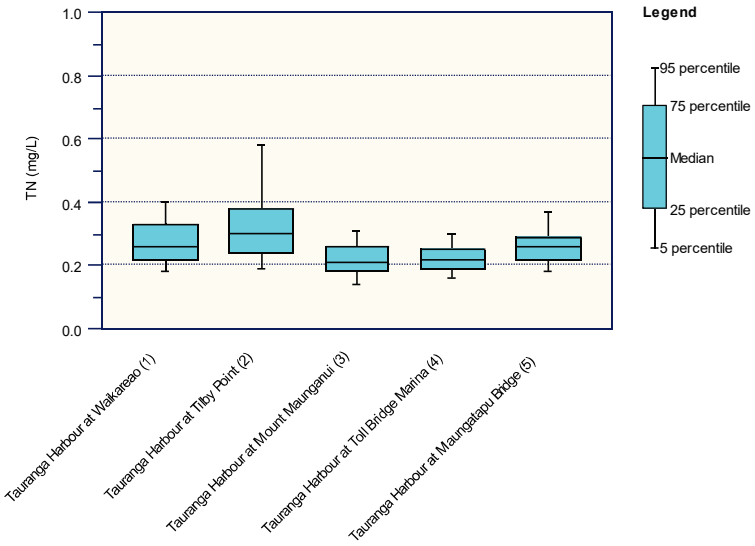

Figure 15: Distribution of Concentrations of TN for Each Monitoring Location Over an 8-year Period (2015 - 2023)

3.4.2.14 Total Phosphorus

Similar to BOPRC 2020 NERM Estuary Water Quality Report, the 5-year data analysis showed that at location 2 (Tauranga Harbour at Tilby Point) had the highest median concentration of 0.019mg/L when compared to locations 1, 3, 4, and 5, which had a max concentration of 0.018mg/L at location 5 (Tauranga Harbour at Maungatapu Bridge).

The statistical analysis showed a decreasing ('Improving') trend at all monitoring locations, excluding location 2, where no statistically significant trend was observed.

The 8-year analysis showed overall higher concentrations of TP at location 2, which had a slightly elevated median concentration of 0.019mg/L compared to the other monitoring locations, which exhibited a median value range of 0.016 to 0.018mg/L (as shown in Figure 16).

The 2-year data analysis showed that locations 6 and 7 had the highest average concentration of 0.010mg/L when compared to locations 8, and 9 both of which had a max average concentration of 0.009mg/L.

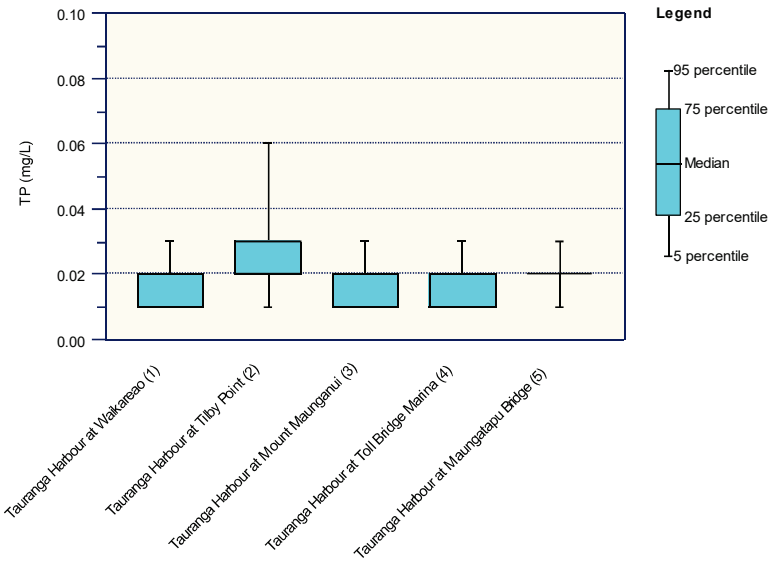

Figure 16: Distribution of Concentrations of TP for Each Monitoring Location Over an 8-year Period (2015 - 2023)

3.4.2.15 Total Suspended Solids

The 5-year data analysis showed that the median TSS concentration at each location ranged from a minimum concentration of 8.88mg/L at location 1 (Tauranga Harbour at Waikareao) to a maximum concentration of 10.55mg/L at location 2 (Tauranga Harbour at Tilby Point). Additionally, the minimum, maximum, and average TSS concentrations at monitoring locations 6 to 9 had a max average concentration of 8.49 mg/L at location 7 and a minimum concentration of 6.44mg/L at location 9.

The statistical analysis showed a decreasing (‘Improving’) trend at locations 3, 4, and 5. However, there was insufficient evidence to support a statistical trend at locations 1 and 2 (as shown in Table 4).

Further analysis of the 8-year data showed that location 2 had the highest overall TSS concentration. However, there was no notable difference in TSS concentration observed between locations 1, 2, 3, 4, and 5 overall (as shown in Figure 17).

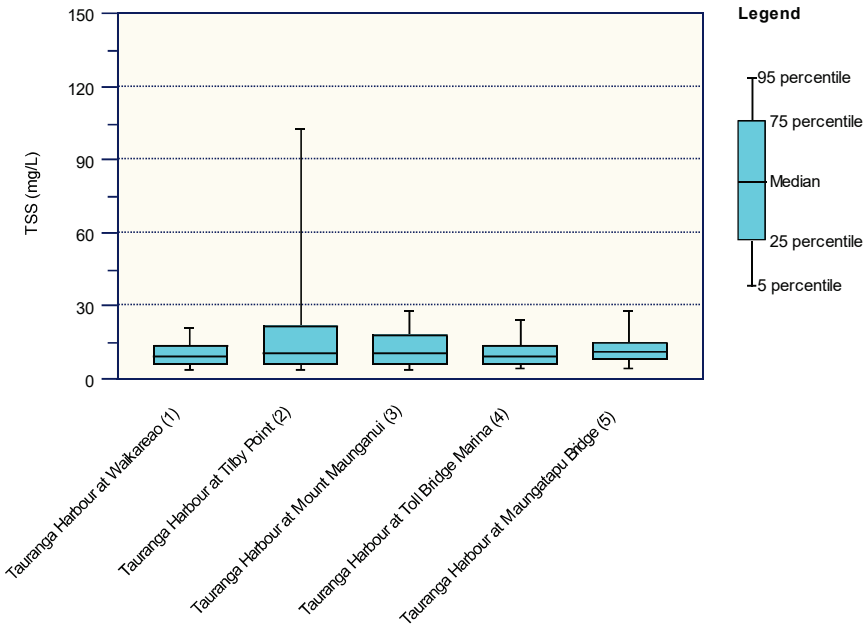

Figure 17: Distribution of Concentrations of TSS for Each Monitoring Location Over an 8-year Period (2015 - 2023)

3.4.2.16 Turbidity

The 5-year data analysis showed that location 5 (Tauranga Harbour at Maungatapu Bridge) had the highest turbidity median concentration of 2.91 NTU, when compared to locations 1, 3, 4, and 5, which had a maximum median concentration of 2.29 NTU at location 2 (Tauranga Harbour at Tilby Point).

The statistical analysis showed an increasing ('Worsening') trend at location 1. However, insufficient evidence of a statistically significant trend was observed at locations 2, 3, 4, and 5 (as shown in Table 4). Further examination of 8-year data showed that location 2 had the highest overall turbidity concentration. However, no notable difference in turbidity median concentration was observed between locations 1 to 5 with median concentrations ranging from 1.70mg/L (at location 3) to 2.91mg/L (at location 5) (as shown in Figure 18).

Additionally, the 2-year data analysis showed that location 6 (Te Awanui Harbour at North Bridge Marina) had the highest average concentration of 1.9 NTU, when compared to locations 7 to 9, which had a max concentration of 1.82 NTU at location 7 (Te Awanui Harbour at middle of channel).

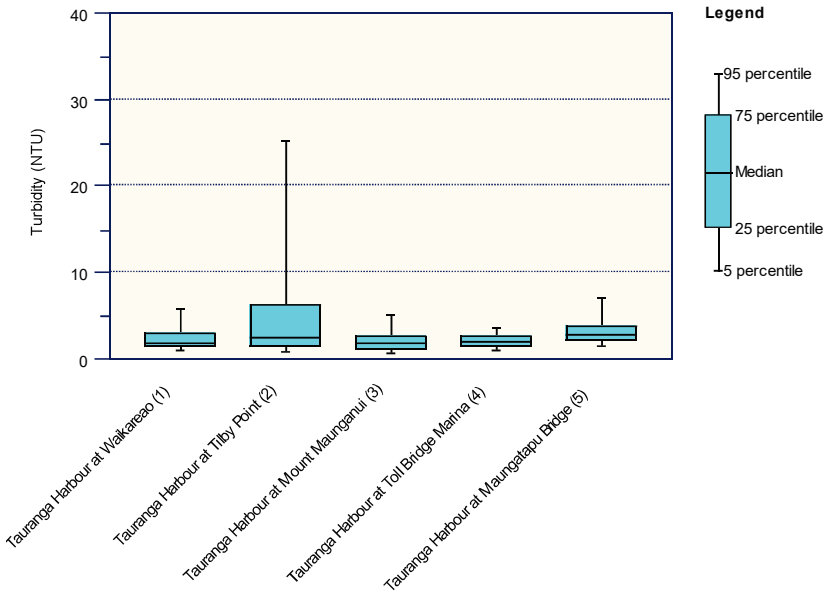

Figure 18: Distribution of Concentrations of Turbidity for Each Monitoring Location Over an 8-year Period (2015 - 2023)

4 Marine Ecology and Sediment Quality

The marine ecology and sediment quality section covers scientific data in the parts of Te Awanui that could be affected by the activities of the Port of Tauranga, in relation to intertidal and subtidal soft sediment and rocky shore/hardshore ecology (invertebrates, kaimoana species, invasive species, fish and marine vegetation) and sediment.

Specifically, data for hardshores at Mauao (including Tanea Reef and the Relocated Boulder Reef), Motutoau and Moturiki Islands and wharf structures is presented. scientific monitoring data for soft sediment habitats, the Western Channel, Harbour Entrance, Panepane Point, Stella Passage, Te Paritaha (Centre Bank), dredge disposal areas, and marine vegetation is presented. Pipi flesh contaminant body burden, sediment contaminants and sediment grain size scientific monitoring data are included for Te Paritaha sites where information is available.

Upper estuaries and the northern part of Te Awanui are not included in this report as we have assumed those areas are assumed to be outside of the areas influenced by POTL activities.

The areas of marine ecology covered in this section include seabed hard shore (reefs, wharves, and riprap), soft sediment (channel and adjacent to existing wharves), Te Paritaha pipi and sediment, rocky reef and soft sediment, kaimoana, relocated boulder habitat from Tanea Reef, marine vegetation, fish, invasive species and disposal field monitoring (including Motuotau subtidal reef) (Figure 19 and Figure 20).

4.1 Existing Scientific Information

There have been many marine ecology studies carried out in Te Awanui (Tauranga Harbour) related to the Port of Tauranga over the previous two decades.

This section summarises the most recent scientific data including reports/evidence from the Port of Tauranga Limited 2010 Environment Court hearing, the 2023 Stella Passage Environment Court hearing, recent marine surveys carried out by Boffa Miskell Ltd for the Port of Tauranga Limited (herein referred to as POTL), surveys carried out on behalf of Ballance Agri-nutrients, and surveys carried out by the Bay of Plenty Regional Council (BOPRC).

As background information and context for the scientific baseline marine ecology and sediment quality data presented, Tauranga Harbour is well mixed and flushed with a residence time of 1.7-3.1 days in the southern basin (Clark et al., 2018).

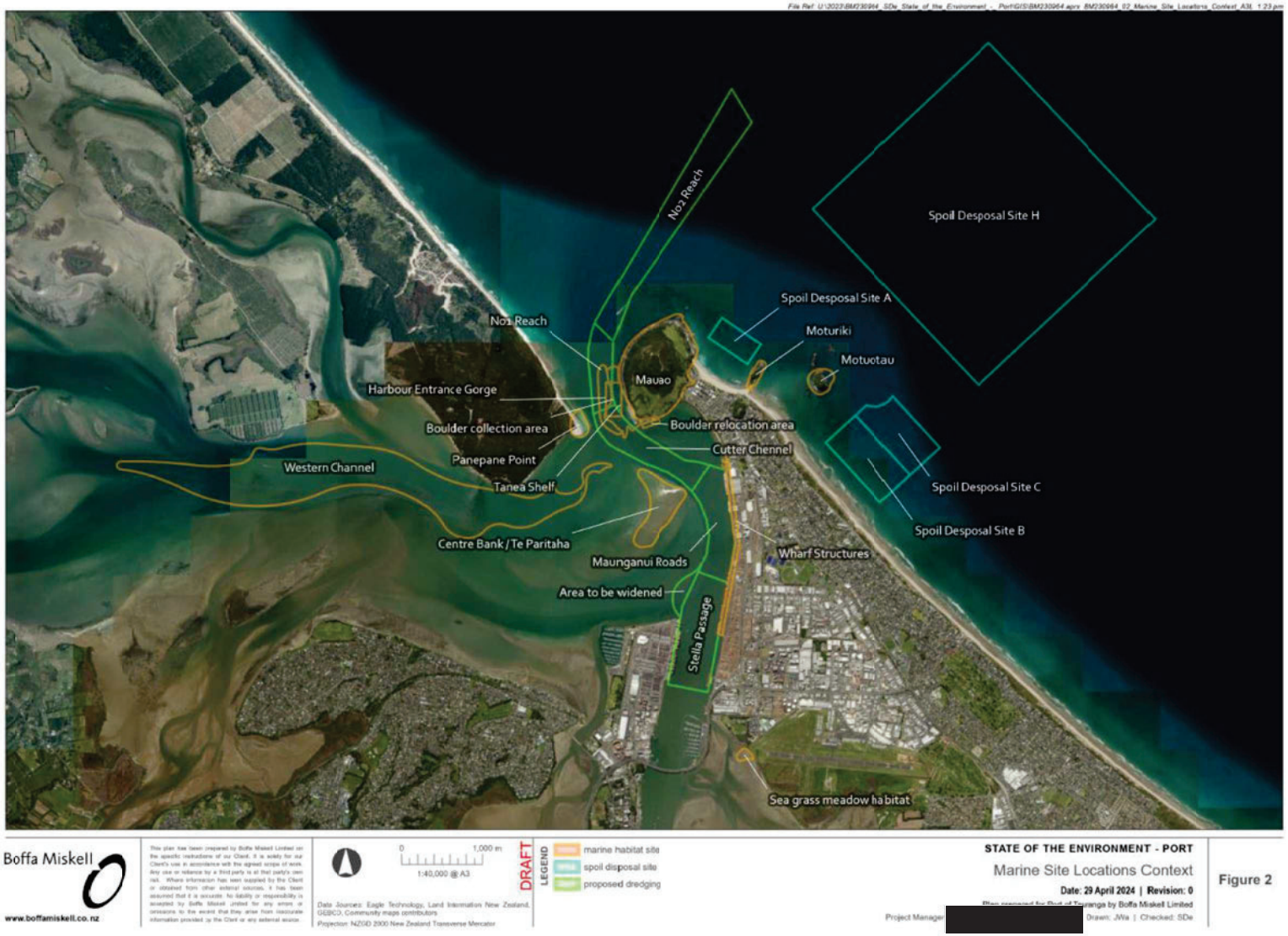

Figure 19: Map of Relevant Marine Habitats Referred to in this Assessment

4.2 Ecology

4.2.1 Hard Shores

4.2.1.1 Tanea Shelf & Relocated Boulder Reef

Tanea Shelf, located at the base of Mauao is a subtidal boulder reef that supports a diverse marine community and has a history of modification to reduce its extension into the main shipping channel for the use of larger ships by the Port. For the expansion of the Port of Tauranga shipping channel (during a previous capital dredge programme, consent 65806, in 1993/1994), 3.2ha of rock was removed from Tanea Shelf and relocated to an area on the southern side of Mauao near Pilot Bay (Figure 19 and Figure 20). The remaining subtidal rocky reef of Tanea Shelf supports a diversity of common rocky reef marine species, including kelp forest (*Ecklonia radiata*), anemones, seasquirts, seastars, crabs, kina and koura (Grace, 2010).

Monitoring of the relocated reef post relocation (1993 – 1995) documented the initial colonisation of the relocated boulder and demonstrated the increasing species diversity of the newly formed community with time (Graeme, 1995). Overall, Graeme, (1995) found boulders at the western end of the relocation site gained species diversity and coverage similar to that found on the original Tanea Shelf boulders.

After 20 months of monitoring the relocated boulders Graeme (1995) found bare rock on the boulders was colonised by barnacles, small turfing red algae, and brown large algae. Some sponge species present on the boulder's pre-relocation decreased in percent cover over time, likely either outcompeted by mussels or smothered by sediment. Ascidians were present pre-relocation and maintained coverage throughout the entirety of the surveying period (Graeme, 1995).

In summary, Graeme (1995) found the development of encrusting communities on the relocated boulders was advancing across the reef and supported a variety of motile species.

Grace's survey of the relocated boulders in 2010 concluded the marine reef life had become like that expected from a natural reef in this area. Grace noted the following on the relocated boulders and surrounding habitat; kelp forests (various species), kina (*Evechinus chloroticus*), snaketail stars (*brittle stars*) sea cucumbers (*Stichopus mollis*), nudibranchs (*order Nudibranchia*), crayfish (*Jasus edwardsii*), hydroids (Phylum Cnidaria), sponges (Phyllum Porifera), seasquirts (*ascidians*), featherduster worms (*Sabellidae, tube worm*), red moki (*Cheilodactylus spectabili*), blue cod (*Parapercis colias*), spotty (*Notolabrus celidotus*) and various red algae (Grace, 2010).

Since the dredging and relocation of part of Tanea Shelf, it has been recorded that the remaining section of Tanea Shelf is a rich and diverse habitat, long fully recovered from disturbance of boulder removal (Grace, 2010). The boulder habitat of Tanea Shelf supports kelp forests mainly in the shallower parts, with rich fauna assemblages including sea anemones, sponges, ascidians, crabs, and starfish (Grace, 2010).

Surveys of the flora and faunal communities of the relocated boulders by Manaaki Te Awanui, (2016) and Boffa Miskell Ltd, (2023) revealed that algal diversity increased between 2016 and 2023 but overall percent coverage was similar between years. Invasive species *Undaria pinnatifida* was found during both 2016 and 2023 monitoring rounds. The reduction of brown algae (*Carpophyllum spp*. and *Sargassum sinclairii*) between 1995 and 2016/2023 from the relocated boulder rock could be associated with the change in environmental factors such as water depth, temperature, and exposure to water flow. The relocated boulder rock site is located inside Tauranga Harbour (Figure 20), sheltered from the exposed coast.

Fauna observations increased from 11 species in 2016 to 36 in 2023 on the relocated boulders. All species identified during 2016 were also recorded during 2023 monitoring. Diversity and abundance of faunal species was relatively uniform across all transects; this differs to 2016 where the easternmost transect had higher diversity of species compared to the remaining transects which were relatively bare of fauna (Boffa Miskell Ltd, 2023b).

In between the boulders at Tanea Shelf the substrate is coarse shelly sand which supports the bivalve morning star shell (*Tawara spissa*) (Grace, 2010).

Figure 20: Relocated Boulder Rock from Tanea Shelf

4.2.1.2 Rocky Reef and Boulder Habitat

The rocky shores of Mauao, Moturiki and Motuotau reefs are wave-exposed and support Kaimoana such as pāua, kina, kōura *(crayfish)* and kūtai *(green lipped mussel)* (Boffa Miskell Ltd, 2023a) and typical rocky shore species found on northeastern New Zealand shores (Figure 21).

The shallow parts of Mauao, Moturiki and Motuotau reefs are dominated by kina *(Evechinus chloroticus),* which graze on marine algae**.** Kōura *(Jasus edwardsii)* and kūtai *(Perna canaliculus)* are also present. Where the reefs are deeper than approximately 15m, sponges, sea squirts (ascidians), bryozoans, anemones and red seaweed are common (Grace, 2010).

Annual monitoring of marine taonga species in rocky reef habitats within the Tauranga Moana Mātaitai Reserve is undertaken by a collaboration between Port of Tauranga and the Tauranga Moana Iwi Customary Fisheries Trust (TMICFT) (Boffa Miskell Ltd, 2023a). Table 5 below outlines the years in which monitoring has occurred. The absent years (2017 - 2022) were due to the lack of capacity of the preferred supplier to carry out the monitoring on behalf of the POTL and TMICFT.

Figure 21: The Location of the Te Maunga o Mauao Mātaitai Reserve

Sites surveyed include around Mauao (including Tanea Shelf), Moturiki Island and Motuotau Island (Boffa Miskell Ltd, 2023a; Fairlie, Lovett, Taiapa, et al., 2016; Paul-Burke et al., 2013; Paul-Burke & Burke, 2015).

Kina, pāua, kōura and kūtai were the main taonga species surveyed, informed by mātauranga Māori[5] (Table 5).

Table 5: Kaimoana Surveys 2013 - 2024

Baseline (2013) (Paul-Burke et al., 2013)	Year 1 (2015) (Paul-Burke & Burke, 2015)	Year 2 (2016) (Fairlie, Lovett, Rameka, et al., 2016)	Year 3 (2023) (Current – Paul-Burke & Burke and BML)	Year 4 (2024) (Toi Ohomai (in progress) and BML
Kina	Kina	Kina	Kina	Kina
Kūtai	Kūtai	Kūtai	Kūtai	Kūtai
Pāua	Pāua	Pāua	Pāua	Pāua
×	Kōura	×	Kōura	Kōura

Average kina abundances within the Tauranga Moana Mātaitai Reserve (2023) are above initial; results (2013), however, lower than 2015 results (Paul-Burke & Burke, 2015). The 2023 survey showed highest average kina abundance was found at Mauao with an average of 0.63 kina per quadrat (Boffa Miskell Ltd, 2023a).

Comparisons of previous kūtai abundances between 2013, 2015 and 2023 was difficult to make due to different surveying methods being used among survey rounds. Surveys conducted during 2023 revealed high variability in the average abundance of kūtai (between 11 and 111 individuals across sites). Previous surveys (2013 & 2015) implemented different survey methods to 2023, and therefore are not statistically comparable.

Average pāua abundance per 10-minute timed count varies across surveying years with an average of 25 pāua for 2023, 114 for 2015 and 35 for 2013. This indicates a decrease in average pāua abundance for 2023 in comparison to the previous sampling efforts.

Kōura was first introduced into the Tauranga Moana Mātaitai Reserve surveys in 2015 with an average abundance of 1.3 kōura per 10-minute timed count (n = 13). Sampling effort increased in 2023 (n = 165), however, the average abundance of kōura decreased to 0.4 per 10-minute timed count (Boffa Miskell Ltd, 2023a).

In summary, the data from 2023 monitoring indicates harvestable kōura and pāua abundance have declined since the baseline survey in 2013, however, the decline between 2013 and 2023 is not statistically significant[6] (Boffa Miskell Ltd, 2023a). The increase in pāua abundance between 2013 and 2015 was statistically significant, as was the decrease in pāua abundance between 2015 and 2023. On average kina abundances and size frequency has increased since baseline surveys, and kūtai size frequency has increased.

These reduction in abundance of some taonga species are likely due to a combination of harvesting pressure and natural variation.

[5] Baseline surveys, and therefore the entirety of the Kaimoana Restoration Programme is fundamentally informed by mātauranga Māori whereby semi structured interviews with Tauranga Moana, participating iwi representatives including kaumātua were carried out in 2013 to identify cultural sites of significance in the Tauranga Moana Mātaitai Reserve. Intergenerational mātauranga Māori identified traditional distribution, abundance and sizing of taonga species; kina, kūtai, kōura, pāua and pūpū across all identified sites.

[6] A Tukeys test revealed a statistically significance difference in pāua abundance between 2013 and 2015, and 2015 and 2023.

Motuotau Reef is typically monitored on a bienniel (1990 to 2022). The most recent monitoring (November 2022) indicated the reef supports a healthy assemblage of marine organisms that is comparable to other reef systems at a similar depth, aspect, and exposure along the Bay of Plenty coastline (Boffa Miskell Ltd, 2023c). The benthic communities continued to be characterised by the presence of large canopy-forming macroalgae along with a diverse understory including sponges, hydroids, mussels, anemones, and a wide range of red algae that was present in the previous surveys. Many of these reef taxa are known to be highly sensitive to sedimentation. The 2022 surveys at Motuotau Reef did not show any change in the structure and diversity of these communities which could be connected to the Port of Tauranga's dredging programme, in comparison to previous years surveys (Boffa Miskell Ltd, 2023c).

4.2.1.3 Reef and Boulder Habitat on Eastern Side of Harbour Channel Adjacent to Northern Shoreline of Mauao

Surveys of hard bottom species (primarily sponge and algal communities) were conducted at reef and boulder habitat on the eastern side of the harbour channel adjacent to the northern shoreline of Mauao, post 2015-2016 dredging by Toi Ohomai (Warren et al., 2016). Boulder and reef habitat was surveyed, as well as the interspersed with medium and coarse sand grain size sediment, with no evidence of smothering or burial of organisms.

The survey (at three depths, 15 - 20m, 15 - 10m, 10 - 5m) revealed a diversity of large sponges (characteristic of high current and limited light habitat), as well as old-growth benthic fauna that would have existed prior to the 2015 - 2016 dredging campaign. Benthic fauna included a range of hydrozoans (including white striped anemones), solitary and colonial tunicates, brittle stars, cushion sea stars and 11-armed sea stars. Algae detected included *Ecklonia radiata, Undaria pinnatifida* (invasive species)*, Ulva* sp. and small palmate red algae. No uncolonised hard surfaces were detected.

The surveyors (Warren et al., 2016) concluded that the diversity and species composition in 2016 was similar to that detected in 2015 prior to the Port of Tauranga dredging.

4.2.2 Wharf Structures

The wharf structures at Mount Maunganui and Sulphur Point have high marine biodiversity (including anemones, barnacles, sponges, seasquirts and hydroids). This biodiversity is partly due to the rapid currents (bringing nutrients) and the range of light levels on structures at various depths (Battershill, 2022). Juvenile crayfish also settle in the structures, moving to the harbour entrance and offshore reefs when adults.

Wharf pile habitats comprise a 3-dimensional community. Leonard et al., (2020), in their report for the Stella Passage port development, describe the pile communities having variable layers of dead encrusting bryozoans (*Balanus decorata, Galeolaria hystrix*) and oyster shells (*Saccostrea glomerata*), with a rich diversity of encrusting invertebrates such as sponges, hydrozoans and anthozoans overlies these organisms. Interspersed amongst these species are a large variety of encrusting and mobile worms, gastropods, polychaete worms and other invertebrates. Species composition on existing wharf piles was diverse with large sponge colonies and mature invertebrate fauna (Leonard et al., 2020). All pile communities are representative of a complex, healthy estuarine/harbour habitat. Pre-dredge and post dredge pile communities were not observed to be different (including sponges) (Leonard et al., 2020). A single specimen of a recently introduced invasive solitary, subtidal ascidian tunicate (*Styela clava*) was observed on one wharf pile in the Stella Passage assessment. Eighty-eight species have been identified from wharf pile collections indicating a highly biodiverse habitat (Leonard et al., 2020).

4.2.3 Marine Vegetation

4.2.3.1 Marine Macroalgae / Seaweed

The hard structures in the harbour, such as existing rocks and concrete wharf sides, support attached species of native seaweeds such as *Ulva lactuca*, *Ulva* spp, *Codium fragile*, *Hormosira banksii* (Neptune's necklace), *Gracilaria chilensis*, and *Gigartina* species. *Undaria pinnatifida* (an invasive species) is also present (Leonard et al., 2020). Some drifting native species such as *Carpophyllum* spp. and *Sargassum sinclarii* also contribute as potential food sources for grazers.

A study of the algae *Hormosira banksii* in Tauranga Harbour by BOPRC (Crawshaw & Shailer, 2023) revealed an increasing cover in the Tauranga Harbour and is associated with seagrass habitat (e.g see Figure 22).

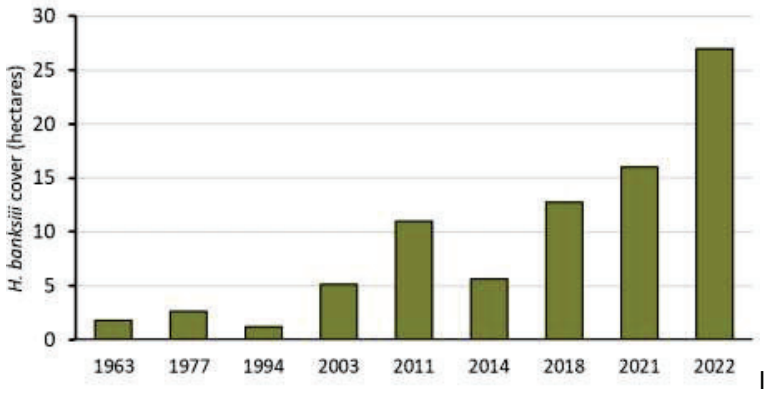

Figure 22: Estimated H. banksii Cover (ha) in Waipu Bay, Tauranga Harbour, Mapped from Aerial Imagery (Crawshaw & Shailer, 2023)

It is unlikely that *H. banksii* expansion is a sign of eutrophication or increased nutrient inputs. It is noted that in situations when *H. banksii* cover occurs over 100% of the benthos seagrass (*Zostera muelleri* - At Risk – Declining) percentage cover beneath the *H. banksii* is reduced. The extent of *H banksii* is spatially related to the presence of seagrass in Tauranga Harbour (Crawshaw & Sailer, 2023), where it is likely that the seagrass helps to trap *H. banksii* in place.

Seaweeds are not a dominant component in the Stella Passage area, which primarily consists of soft sediment benthic habitat.

4.2.4 Soft Sediment Habitats and Sediment Quality

4.2.4.1 Sediment Grain Size

(Leonard et al., 2020) notes the dominant benthic sediment grain size in Te Awanui is sand. W. de Lange (2022) notes fine sediment accumulates in harbour margins in areas of high sediment supply and low wave activity, otherwise sediments generally contain <5% silt and clay.

Sediments in the dredging channel are generally sandy with low silt content (<2.5%) (Stewart. 2024).

4.2.4.2 Sediment Quality

All metal species surveyed for the Stella Passage consent application were found in concentrations below recommended Australia and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) Default Guideline Values (ANZG DGV) as indicated by the (Leonard et al., 2020, p. 202).

Sediment from the proposed dredge sites generally have low toxicity and are consistent with the receiving environment sites. In addition, shellfish flesh toxicant concentrations are well within safe consumption limits.

Toxicants measured in sediments from the channel and Port area were generally low but increase with proximity to parts of the Port (e.g., Butters Wharf).

There is no evidence of significant metal accumulation in the harbour, and the levels observed by Leonard et al. (2020) are within the range of past recordings. Overall, the concentrations of metals, although slightly elevated in some areas, remained below the recommended ANZG DGVs. The presence of these metals in the harbour is likely due to both natural sources and human-derived inflows (Leonard et al., 2020).

PoT undertook sediment quality toxicant analyses at seven sites (Figure 23) in the channel and one at the main disposal site (December 2023 to February 2024). Toxicants were of low concentration and below ANZG DGV values:

- PCBs, TBT/TPT, PAHs, and OCPs were all below laboratory detection limits.
- Total TPH in samples was well below the ANZG DGVs.
- Arsenic, chromium, lead, nickel, and zinc were detected at most sites, but well below applicable ANZG DGVs. Antimony, cadmium, copper, mercury, and silver were below laboratory detection limits at all or most sites and well below applicable ANZG DGVs. Metal concentrations were generally higher at Site 5 (Southern Channel).
- Total organic carbon at sites 1-4 was <0.13 g/100g but was higher at site 5 (0.64 g/100g). Site 5 had a high proportion of mud (23%) relative to the other sites (1.4%-2.5%). This higher mud component at Site 5 is likely contributing to the higher toxicant concentrations at this site.

Figure 23: 2024 Sediment Survey Adjacent to the Port

Subtidal sediments in Tauranga Harbour, surveyed in 2016 for BOPRC, revealed sandy sediment (67 - 97%) with low levels of nutrients (lower than intertidal sediments) and metals concentration. The upper reaches of channels had a higher proportion of mud, organic matter and nutrient concentrations compared to sites close to the main channels (Clark et al., 2018). Metals were highest in sediment from the urbanised southern harbour catchments. Maximum metal concentrations in sediment were below ANZG DGVs.

Nutrients in sediments in Tauranga Harbour are generally low, with BOPRC stating that 85% of sites were graded as good (Lawton &Conroy, 2019). Heavy metals are measured at 69 intertidal sites by BOPRC in Tauranga Harbour annually. The majority of sites have heavy metal contaminants graded as very good (65 sites) with four sites graded as good. All sites were well below the ANZECC (ANZECC, 2000) interim sediment quality guidelines (now ANZG (ANZG, 2018) default trigger guidelines) for the protection of aquatic life (Crawshaw, 2020). (BOPRC, 2021/07).

Sedimentation is the process of sediment settlement and accumulation over time in our estuaries. The rate of sedimentation in Tauranga Harbour has increased over the years because of population growth, changing land use and soil disturbance related to development. Sediment deposition and sedimentation rates are surveyed at 65 sites across Tauranga Harbour by BOPRC. Sediment is accumulating at higher levels than background rates at 59% of the sites BOPRC monitor. At 41% of sites sedimentation rate is graded as very good, 14% as good, 36% as fair and 10% as poor (Te Puna estuary and Uretara Estuary) which is typically associated with the sheltered areas of the inner sub-estuaries of Tauranga Harbour. Less than half of the monitoring sites for mud deposition were graded as very good or good (46%). A third of all sites had a mud content that was graded as poor (33%) (Lawton & Conroy, 2019).

Sediment quality samples collected by POTL at 5 sites (see Figure 23) in February 2024 revealed polycyclic aromatic hydrocarbons were below laboratory (Watercare) detection limits <0001mg/kg), arsenic below ANZG Default Guideline Value (DGV), cadmium below laboratory detection limits (<0.09mg/kg), chromium, with copper, lead, nickel, zinc significantly below DG value (email from Joey McKenzie, POTL, dated 09/04/2024).

Ballance Agri-nutrients monitor the adjacent intertidal and subtidal sediments to their outfalls under Consent No. 60987 (Bioresearches, 2022). Results from their 2022 marine monitoring revealed elevated concentrations of fluoride, phosphorus, cadmium and zinc in Ballance Agri-Nutrient discharges. Bioresearches (2022) concluded the source of fluroride is the Ballance Agri-Nutrient discharges, whereas the remaining contaminants have other external sources. Sediment quality from intertidal stations near Ballance Agri-Nutrients site are similar to the control sites and well below ANZG DGV guidelines and therefore unlikely to be causing adverse effects on marine biota. Subtidal sediment surveys revealed that fluroride, phosphorus and cadmium were detected above ANZG DGVs. The highest concentration of fluoride, phosphorus, and cadmium and zinc were found adjacent to the Ballance wastewater outfall (Bioresearches, 2022)

Bioresearches (2022) also tested shellfish (cockle - *Austrovenus stutchburyi)* flesh for fluoride, cadmium and zinc. Analyses revealed these contaminants were below food safety standards (which comprised a combination of the revoked 1984 New Zealand Food and Drug regulations (Ministry of Health, 1984), the Australia and New Zealand Food Standards Generally Expected Levels (ANZFA) and the US Food and Drug Administration safety levels (2010).

4.2.4.3 Western Channel

The subtidal substrate comprises largely dead pipi shell and sand with large live pipi (Grace, 2010).

As part of the Te Paritaha pipi surveys, a subtidal grid in the Western Channel has been surveyed in 2023 and 2024. The total number of pipi in the 90 cores collected across this grid in 2023 was 2194, with an estimated average density of 3104 individuals per m^2 (Boffa Miskell, 2024).

Pipi average size was 29.8mm across a range between 5 to 70mm. Close to 65% of the pipi were recruits (<20 mm), 11% were juveniles (20 - 40mm), and close to 24% were adults (>40mm). The size structure of the population is bimodal, with a large cohort of recruits/juveniles and a smaller cohort of adults.

This grid will be resurveyed in May 2024.

4.2.4.4 Panepane Point

Panepane Point, an unstable sand spit located in high currents at the southernmost point of Matakana Island has experienced significant accretion as a result of dredging and natural evolutionary changes (W. de Lange et al., 2015). The mobile sand drops off sharply with depth to the pipi shell benthic habitat and large adult pipi.

The study site for Kaimoana at Panepane Point (2023) presented extremely challenging variables to consider for subtidal surveyors i.e., high tidal velocities, sudden changes in depth, and altered tide times. Drop camera surveys were therefore used as the safest approach to surveying. In addition to this, the risks associated with this region of the harbour presents potentially problematic cultural/recreational harvesting risks of any Kaimoana present (Boffa Miskell Ltd, 2023d).

The steep slope of mobile sand plunges from the end of Panepane point, to the entrance gorge, where the bottom habitat is shell armoured with large live pipi present.

Habitat and substrate identified during the 2023 Panepane Point subtidal surveys shows there does not appear to be any favourable rocky reef habitat available for taonga species that are identified in the Kaimoana Restoration Programme.

4.2.4.5 Harbour Entrance Gorge

The entrance channel to Tauranga Harbour is approximately 36m deep. The sandy subtidal habitat comprises dead pipi (*Paphies australis)* shells, live adult pipi, hermit crabs and gastropods (Grace, 2010).

Also, see subtidal survey at Panepane Point (Section 4.2.4.4).

4.2.4.6 Stella Passage

Stella Passage soft sediment habitat has previously been subject to capital dredging to accommodate ships at Sulphur Point and Stella Passage regularly receives maintenance dredging. The marine communities are in a cyclic pattern of recovery, continually resetting with maintenance dredging (Grace, 2010).

Butler (1999), detected four distinct community groups in the Stella Passage:

1. Previously dredged fine black silt habitat containing nutshell, polychaetes and crabs.
2. Mobile coarse sand near the main wharf with high currents inhabited by morning star shell (*Tawera spissa*) and hermit crabs (*Pagurus novizealandiae*).
3. Shelly sands of the undredged channel upstream and downstream of the bridge inhabited by naturally seasonally variable juvenile pipi.
4. Various patchy areas of the Stella Passage, sea lettuce (*Ulva lactuca*), turret shell (*Maoricolpus* roseus) and polychaete worms.

Horse mussel beds and associated flora and fauna are well established in Stella Passage (Battershill, 2022).

Leonard et al., (2020) states Stella Passage channel floor is in good health dominated by sand grain sizes, with only a few pockets of fine sediments with a shallow layer of oxygenated sediment above anoxic conditions are experienced in eddy areas associated with wharf.

Leonard et al., (2020) characterised the Te Awanui channel floor (relevant to the recent Stella Passage POTL project) condition as being reflective of a working port seabed, comprising an ecologically productive benthic community with naturally diverse indigenous native infaunal species. Leonard et al. (2020) stated that most benthic habitats within Ports in New Zealand are characterised by fine sediment and dominated by low native biodiversity and a high abundance of exotic species presence (such as the Mediterranean Fanworm, *Sabella spallanzanii*), whereas the Te Awanui port seabed is different to many other port seabeds being characterised by sandy (not mud dominated) sediment and predominantly native marine organisms. *Sabella*

sp. has been detected by Toi Ohomai divers in Tauranga Harbour near Pilot Bay. Bay of Plenty Regional Council currently have two approaches to dealing with marine pests. Firstly, a proactive marine pest surveillance programme which includes dive surveys and hull inspections. For high-risk areas, such as marinas, a full inspection is conducted three times each year, in addition to fortnightly inspections of vessel hulls for vessels that have recently arrived in the Bay of Plenty. Secondly, an information programme is used to inform the public on marine pests and how the spread of them can be prevented. Small scale management plans have been developed, targeting specific species such as the clubbed tunicate and Mediterranean fanworm. The small scale management plans allow for rapid biosecurity action if either of these pests are detected in the region (Lawton & Conroy, 2019).

The objectives of the programmes are to:

- Eliminate the adverse effects of the pests on economic wellbeing and the environment, and
- Eradicate the species and exclude it from further spread in the Bay of Plenty.

Leonard et al., (2020) stated that soft sediment and channel floor biodiversity surveys illustrate a total taxa diversity of 87 identified in the harbour environment across 15 survey locations (100m tow lines). The number of taxa found at each sampling station varied between 4 and 34 with an average of 17 taxa per station, with no introduced species identified. Of the 87 taxa, asteroidea (sea stars) were the dominant group with a total abundance of 376 individuals counted across all samples. In order of abundance, cirripedia (barnacles) (267), decapods (crabs) (244), polychaete worms (125), polyplacophora (chitons) (114), and gastropods (snails) (100). The remaining taxa comprised species typically associated with this type of soft sediment habitat. Leonard et al., (2020) states that their data compares well with that of Healy et al., (2009) who studied the environmental effects of previous Tauranga harbour widening and dredging where 85 taxa were recorded from the same area, and of similar species diversity.

4.2.4.7 Te Paritaha (Centre Bank)

Te Paritaha (Centre Bank) is a culturally significant gathering location for Kaimoana such as pipi *(Paphies australis).* Te Paritaha has portions that are both intertidal and subtidal, with subtidal pipi beds present along the Western channel and main entrance. Juvenile pipi settle on the intertidal sand of Te Paritaha and migrate to the deeper water (subtidal) as they grow. Monitoring of pipi at Te Paritaha has most recently been conducted by the POTL in 2016 (Fairlie et al., 2016), and Boffa Miskell as a part of the developed Te Paritaha Monitoring Plan (Boffa Miskell Limited, 2023; Boffa Miskell Ltd, 2022).

Te Paritaha and the pipi resource is a taonga to mana whenua. Various Iwi witnesses over previous POTL dredging consent hearings have raised concerns about the decline of pipi at Te Paritaha which they attribute to the POTL dredging.

Grace (2010) states that there are substantial subtidal adult pipi beds in the western harbour and the main entrance channel west of Mauao and the harbour entrance gorge.

Fairlie et al. (2016) survey detected a large recruitment of juvenile pipi into the area. Tangata whenua may be more concerned about the longevity and reproductive robustness of the pipi population which would be evidenced by the abundance of reproductively active adults (30 - 50cm) and harvestable adult pipi (50+cm). Abundance of adult pipi have been stable at between pre and post 2015 POTL dredging campaign, which supports the conclusion that these dredging campaigns did not immediately affect pipi populations at Te Paritaha (Fairlie et al., 2016).

Data presented by Ross & Culliford, (2018) of subtidal pipi abundance on the north-west edge of Te Paritaha pre and post capital dredging in October 2015 show the excised part of the north-western edge of Te Paritaha had good recovery of pipi at all depths sampled back to pre-dredge levels, although there was some spatial change in pipi location along the banks edge.

Boffa Miskell Ltd have undertaken intertidal pipi surveys at Te Paritaha in 2022, 2023 and 2024 (engaged by the POTL) and engaged divers to repeat the subtidal surveys carried out by Ross & Culliford (2018) and additional subtidal survey sites.

Initial Boffa Miskell Ltd, (2022) intertidal surveys identified abundances of pipi varied significantly among the ten sites surveyed on the northern flank of Te Paritaha. Three sites along the north-eastern portion of the study area had the highest number of pipi averaging 14 - 18 individuals per core, respectively. The lowest detections of pipi occurred in the southern extent of the study area with an average of less than one pipi per core. Many of the sites averaged 3 - 7 individuals per core. Most of the pipi were juveniles measuring less than 30mm in size (indicating a successful recruitment event), except for four adult pipi measuring between 50 - 58mm, found on the northern most point of the area surveyed.

Boffa Miskell Ltd, (2022) also carried out subtidal surveys (in conjunction with Toi Ohomai) for pipi along the north-east edge of Te Paritaha with transects extending approximately 15m down the main harbour channel. Transect locations and lengths were the same as Ross & Culliford, (2018). Subtidal pipi abundances varied between transects with the highest number of individuals totalling 274 across four cores along transect B, and the lowest number of individuals recorded at transect A (2 individuals across four benthic cores / monitoring stations). Densities of pipi varied with depth, with higher densities at shallower depths. The average size of pipi was approximately 50mm, regardless of depth. Due to the low number of pipi along two transects (A and C) and the lack of size variation with depth, a single size-frequency distribution was created for subtidal pipi, incorporating all individuals from all transects and depths. This analysis revealed that the subtidal population is dominated by adult individuals with a shell length above 30mm. Additionally, a significant proportion (72%) of the subtidal pipi fell within the 46 - 55mm size range.

In the areas of Te Paritaha that have received the most regular monitoring, it would appear pipi populations are relatively stable, although it is acknowledged that the spatial and temporal variability is naturally very large. Species such as pipi are well known for their natural spatial and temporal abundance and size class variability (Hooker, 1995). There may well be changes in the demography (the size frequency structure of pipi populations) at the north-western areas of Te Paritaha, but the variable survey approaches over the years have not allowed robust statistical comparison between surveys.

Based on the 2022 monitoring data, a revised monitoring plan was developed scope to expand the pipi monitoring (Boffa Miskell, 2022a). The aims and objectives of the revised pipi monitoring plan (Boffa Miskell, 2023e) were to allow for the collection of additional information to understand the mechanisms underlying the results of the 2022 surveys and future changes in abundance and size of pipi. Key changes to the revised monitoring include two additional shallow subtidal survey grids and a fourth subtidal transect on the north-west edge of Te Paritaha. The POTL carry out annual surveys of pipi on Te Paritaha with the most recent extensive survey completed March 2024 (Figure 24). Tangata whenua involvement and mātauranga Māori are components of the 2023 fieldwork and report (Boffa Miskell, 2024), with tangata whenua invited to participate in the fieldwork (with some attending the surveys e.g. Kia Mia Ellis).

The 2023 surveys confirmed the patterns observed in 2022, with the intertidal area of Te Paritaha dominated by recruit and juvenile pipi, while larger adult individuals were mostly confined to the subtidal areas.

In the areas sampled both in 2022 and 2023 (Grid 1 and Transects A, B, C) there was a significant increase in the abundance of recruitment and juvenile pipi, which is indicative of large recruitment events. There were high abundances of recruits and juveniles also in subtidal areas sampled for the first time in 2023, at Grid 2 and Grid 3.

Between 2022 and 2023, there was a decline in the abundance of adult individuals in the subtidal area covered by Transect A, B and C to the north-east of Te Paritaha. However, there is potential for adult stocks in this area to be replenished by the large wave of recruitment observed in 2023.

By expanding the surveys to new subtidal areas in 2023, surveys were able to better capture the patchy distribution of large subtidal pipi around Te Paritaha. Grid 3 was the subtidal area with the highest abundance of adults, with an estimated density of 528 individuals > 40mm per m^2, compared to 51 adults per m^2 at Grid 2 and 186 adults per m^2 in the area encompassed by Transect A, B, C and D.

The March and May 2024 surveys confirmed the patterns observed in 2022 and 2023, with the intertidal area of Te Paritaha dominated by recruit and juvenile pipi, while larger adult individuals were mostly confined to the subtidal sites. There was a large recruitment event between 2022 and 2023, resulting in a significant increase in the abundance of recruit and juvenile pipi. However, the abundance of adult individuals detected in late 2023/early 2024 remained lower compared to the abundance levels recorded in previous studies up to 2016/2017 (Boffa Miskell Ltd, 2024a, 2024b, Ross & Culliford, 2018; Fairlie et al., 2017)).

The May 2024 data confirm the shift to a population increasingly dominated by mid-size, juvenile individuals (20 - 40mm), which began in 2023 and was very evident in March 2024 (Table 7). A progression towards slightly larger sizes can be noticed when comparing the March and May 2024 size frequency distributions, but because of the close proximity of the two sampling events (i.e., only two months apart), there is little separation between the two distributions in size frequency plots).

The results presented in the May 2024 survey report compare the abundance and size of pipi against the patterns observed as part of the most recent surveys in 2022 - 2024 (Boffa Miskell Ltd, 2024a, 2024b) and during previous studies carried out both before and after the dredging between 2013 and 2018 (Ross & Culliford, 2018; Fairlie et al., 2017).

The comparison shows that there was a large decline in the abundance of adult pipi (>30mm shell length) between 2016 and 2022, and that adult numbers in 2023 and 2024 have not returned to the levels recorded in 2016 (Table 4). The 2015-2016 data in the study of Fairlie et al. show that the number of adult pipi remained stable during the completion of the Capital Dredging Programme. On the other hand, we have found few adult pipi from 2022 onwards. The 2024 data show abundance of adult pipi higher than in 2023 and 2022 but still well below those recorded by Fairlie et al. (Table 4).

Despite the decline in juveniles in May 2024 compared to November 2023 and March 2024, the May 2024 abundance of intertidal juvenile pipi (up to 30mm shell length) continued to be higher than those recorded in the pre-2015 capital dredging surveys (Fairlie et al., 2017) (Table 4).

In addition to pipi, mussel (Perna canaliculus) beds were also surveyed on Te Paritaha in 2024 as the scope of the TPMP was expanded to include other Kaimoana species after the presence of mussels in the study area was noticed in 2023 following the increase in the spatial coverage of the pipi surveys.

March 2024 results indicated rare mussel beds (>2m) on Te Paritaha. Results for May 2024 mussel bed surveys consisted of single occasional mussels present in subgrids A12, A2, D2, D4, D7, B7 and M10. However, at no sites did mussels constitute a mussel bed of >2 m^2, therefore, no mussel data were recorded.

Comparisons with the results of previous surveys of Te Paritaha by Fairlie et al. (2017) and Ross & Culliford (2018) show a large decline in the abundance of adult pipis between 2016 and 2022, with no sign of recovery in 2023. The studies of Fairlie et al. (2017) and Ross & Culliford (2018) showed that the abundance of large pipi in the early aftermath of the 2015 capital dredging (i.e., in 2016 and 2017) was in line with pre-dredging levels. However large declines must have occurred in the period 2016/2017 – 2022, causing a shift to a population structure dominated by recruits and juveniles.

Similar patterns of natural declining abundances of large individuals have been observed in intertidal populations of both pipi and cockles across the upper North Island (Berkenbusch et al., 2022; Berkenbusch & Hill-Moana, 2023). The reasons for the general decline of large individuals within northern pipi and cockle populations remain unknown, but are likely to include harvesting pressure, changes in the benthic environment (e.g., grain size and topography of the seabed), adverse weather conditions (particularly

unusually hot weather), poor water quality, parasites and bacteria (Berkenbusch et al., 2022; Berkenbusch & Hill-Moana, 2023).

Our results do not show significant changes in the physical structure of the benthic environment at Te Paritaha. The soft sediment habitat in 2023 was relatively uniform across the study area, with medium and coarse sand being the dominant grain size fractions. Coarse and medium sand were the dominant grain size fractions also in 2016 (Fairlie et al. 2017), suggesting that there were not large changes in the physical structure of the intertidal benthic habitat coinciding with the decline of adult pipi between 2016 and 2022.

The presence of pollutants in the seabed and in the water column is also unlikely to be the main driver of the decline of large pipi at Te Paritaha, as the 2023 surveys found low levels of contaminants both within the sediment and within the pipi as body burden.

While large pipi remain virtually absent in the intertidal area of Te Paritaha, the high recruitment rates observed across the study area in 2023 suggest that healthy aggregations of reproductive individuals are present within Tauranga Harbour.

Repeating the surveys of pipi according to the revised Te Paritaha Monitoring Plan will be key to assessing whether the large wave of recruitment detected in 2023 can translate into increasing abundances of larger individuals at Te Paritaha.

4.2.4.8 Te Paritaha Sediment Chemistry Data 2023 and 2024

Surface sediment (top 2-3 cm) was collected at the four transects and three grids in 2023 and 2024 (Figure 24). Sediment was analysed for heavy metals, polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB) and tri-butyl tin (TBT). The results indicate low concentrations of all contaminants (some heavy metals were above laboratory detection limits), with PAHs, PCBs, and TBT below laboratory detection limits (Tables 6 and 7). No heavy metal exceedances above DGV values have been detected during the Te Paritaha Pipi Monitoring.

Table 6: Concentration of Heavy Metals in Surface Sediment 2023 (also see Figure 6)

Contaminant (mg/kg dw)	Transect A	Transect B	Transect C	Transect D	Grid 1	Grid 2	Grid 3
Arsenic	6.0	5.5	5.7	8.0	6.3	5.8	6.6
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	3.5	2.0	2.1	1.9	2.3	2.3	2.0
Copper	0.4	0.2	0.2	0.2	0.23	0.17	0.2
Lead	1.62	1.06	1.14	1.17	1.19	1.16	1.1
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.9	0.6	0.7	0.6	0.6	0.6	0.7
Zinc	9.0	6.3	7.1	6.9	7.0	7.13	6.7

Table 7: Concentration of Heavy Metals in Surface Sediment 2024 (also see Figure 6)

Contaminant (mg/kg dw)	Transect A	Transect B	Transect C	Transect D	Grid 1	Grid 2	Grid 3
Arsenic	5.3	5.5	5.5	7.8	6.3	5.8	6.6
Cadmium	0.012	<0.01	0.011	<0.01	<0.01	<0.01	<0.01
Chromium	3.9	2.3	2.5	2.6	2.3	2.3	2.0
Copper	0.3	0.3	0.3	0.3	0.23	0.17	0.2
Lead	1.77	1.22	1.45	1.26	1.19	1.16	1.1

Contaminant (mg/kg dw)	Transect A	Transect B	Transect C	Transect D	Grid 1	Grid 2	Grid 3
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nickel	0.9	0.7	0.7	0.9	0.6	0.6	0.7
Zinc	9.4	7.8	7.6	7.7	7.0	7.13	6.7

Analyses of sediment contaminants showed that concentrations of copper, lead, and zinc and high molecular weight polyaromatic hydrocarbons (HMW PAHs) within surface sediment in May 2024 were below default guideline values (DGV) of the Australian and New Zealand Governments[7] at all grids and transects (Table 8).

Table 8: Concentrations of Sediment Contaminants in the 13 Composite Sediment Samples Collected Across all Grids and Transects in May 2024. Default Guideline Values (DGV) are Included in Each Panel. The Concentration of High Molecular Weight Polycyclic Aromatic Hydrocarbons (HMW PAHs) was Normalised to 1% of the Total Content of Organic Carbon

	Copper (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)	HMW PAHs (mg/kg, 1% TOC)
Grid/Transect	**DGV = 65**	**DGV = 50**	**DGV = 200**	**DGV = 10**
Grid 1 A-B-C	0.2	1.48	7.9	< 0.05
Grid 1 D-E-F	0.3	1.10	6.9	< 0.05
Grid 1 G-H-I	0.5	1.59	9.5	< 0.05
Grid 2 A-B-C	0.2	1.25	8.3	< 0.06
Grid 2 D-E-F	0.3	1.3	7.9	< 0.06
Grid 2 G-H-I	0.3	1.36	8.2	< 0.06
Grid 3 A-B-C	0.2	1.19	7.2	< 0.06
Grid 3 D-E-F	0.3	1.32	7.7	< 0.06
Grid 3 G-H-I	0.3	1.26	7.2	< 0.06
Transect A	0.4	1.59	9	< 0.06
Transect B	0.3	1.26	8.1	< 0.06
Transect C	0.2	1.38	7.8	< 0.06
Transect D	0.2	1.31	7.4	< 0.06

4.2.4.9 Pipi Chemistry

Pipi flesh collected as composite samples from grids 1, 2 and 3, and transects B and D (Figure 24) in 2023 and was analysed for heavy metals, organochlorine pesticides, polyaromatic hydrocarbons and polychlorinated biphenyls by Hill Laboratories. There was insufficient adult pipi found at Transects A and C and therefore no flesh was analysed for pipi from these transects.

All contaminants analysed were detected at either very low concentrations or below laboratory detection limits (with the exception of Cadmium described below). Some heavy metals were above laboratory detection limits, whereas no organochlorine pesticides, polyaromatic hydrocarbons or polychlorinated biphenyls were detected.

[7] https://www.waterquality.gov.au/anz-guidelines

Table 9: Heavy Metals in Pipi Flesh in 2023

Contaminant (mg/kg)	Transect B	Transect D	Grid 1	Grid 2	Grid 3	Guideline value[8]
Arsenic	2.1	1.3	0.6	1.0	0.97	1*
Cadmium	0.170	0.23	1.69	2.0	1.94	2
Chromium	<0.19	<0.19	0.101	0.147	<0.2	1
Copper	1.2	0.99	0.3	0.38	1.07	20
Lead	0.02	<0.019	<0.02	0.053	0.026	2
Mercury	0.011	<0.010	<0.010	<0.010	0.009	0.5
Nickel	0.12	<0.10	0.23	0.26	0.12	2
Zinc	13.4	11.8	9.5	12.5	11.7	70

**Inorganic arsenic is estimated to be 10% of total arsenic (USFDA 1993).*

Contaminant concentrations of pipi flesh collected across Te Paritaha (2023) were compared against guideline values outlined in the Australia and New Zealand Food Standards Code.

The concentrations of trace metals including Chromium, Copper, Lead, Mercury, Nickel, and Zinc were well below DGV's. Cadmium had a minor exceedance at Grid 2 with a reading of 2.0mg/kg, and an exceedance of Total Arsenic (see paragraph above regarding Total vs Inorganic arsenic) at Transect B, D and Grid 2. However, if we consider the 10% rule explained in paragraph above, total arsenic would be well below guideline values (Table 10).

In March 2024, the concentration of PAHs in pipi flesh was below laboratory detection limits for pipi from all grids and transects, excluding transect D which had a concentration above detection limits[10] of 0.04mg/kg and one PAH species in pipi from grid 3 A-C (Table 11).

Table 10: Concentrations of Contaminants Accumulated within the March 2024 Pipi Collected Across all Grids and Transects where it was Possible to Collect 30g of Pipi Flesh for Analyses. Australia and New Zealand Food Standards Code. Guideline Values (GV) are Included in Each Panel

	Arsenic (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Polychlorinated biphenyls (mg/kg)
Grid/Transect	**GV* = 1**	**GV* = 2**	**GV* = 2**	**GV* = 0.5**	**GV* = 0.5**
Grid 1	1.69	0.101	< 0.02	< 0.01	< 0.02
Grid 2	2	0.147	0.053	< 0.01	< 0.02
Grid 3 A-B-C	1.87	0.23	0.028	0.012	< 0.02
Grid 3 D-E-F	2.1	0.22	0.019	0.01	< 0.02
Grid 3 G-H-I	1.86	0.16	0.03	< 0.01	< 0.02
Transect B	2.1	0.17	0.02	0.011	< 0.02
Transect D	2	0.23	< 0.019	< 0.01	< 0.02

*Australia and New Zealand Food Standards Code. Guideline Values.
https://www.legislation.gov.au/F2015L00454/latest/text

Concentrations of cadmium, lead, mercury, and PCBs accumulated within pipi in May 2024 were below the DGV (Table 12). The concentration of Polycyclic Aromatic Hydrocarbons (PAHs) was above laboratory

[8] https://www.legislation.gov.au/F2015L00454/latest/text

detection limits[9] for most species of PAH (Table 11). There is no DGV in the ANZFS for polycyclic aromatic hydrocarbons in food (ANZFC), however the concentration in pipi flesh in May 2024 was below the sediment DGV and for most species of PAH was present in very low concentrations and below laboratory detection limits[10].

Table 11: Concentrations of Contaminants Accumulated within the May 2024 Pipi Collected Across all Grids and Transects where it was Possible to Collect 30g of Pipi Flesh for Analyses. Australia and New Zealand Food Standards Code. Guideline Values (GV) are Included in Each Panel

	Arsenic (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Polychlorinated biphenyls (mg/kg)	Total Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)
Grid/Transect	**GV* = 1**	**GV* = 2**	**GV* = 2**	**GV* = 0.5**	**GV* = 0.5**	**Insufficient sample**
Grid 1	1.43	0.07	<0.02	<0.01	< 0.02	0.02
Grid 2	2	0.086	0.05	0.007	< 0.02	0.02
Grid 3 A-B-C	1.68	0.101	<0.02	<0.01	< 0.02	0.01
Grid 3 D-E-F	1.9	0.113	<0.019	<0.01	< 0.02	0.02
Grid 3 G-H-I	1.98	0.12	<0.02	<0.01	< 0.02	0.01
Transect A, B and C	1.83	0.117	<0.02	<0.01	< 0.02	0.01
Transect D	2.71	0.085	< 0.02	<0.01	< 0.02	0.02
*Australia and New Zealand Food Standards Code. Guideline Values. https://www.legislation.gov.au/F2015L00454/latest/text						

The likely source of the PAHs above laboratory detection limits in pipi flesh from all grids (excluding grid 1) (Table 11) and transects is the spill of diesel and heavier oil (estimated less than 100L) on 20/05/2024[11].

In October 2023, March 2024 and May 2024, there were low levels of contaminants within the sediment and within the pipi flesh, suggesting that any pollutants in the seabed and water column are highly unlikely to be the main driver for the decline of large pipi at Te Paritaha. This supports the slight increase in pipi sizes occurring across the Te Paritaha monitoring.

[9] Where the laboratory result was below the laboratory detection limit(s), we have conservatively used half the detection limit as a positive result in our calculations.

[10] Where the PAH concentration is reported by Hills as below the laboratory detection limit, we have conservatively used half the detection limit as a positive result.

[10] PAHs that were above the laboratory detection limit included benzo[a]anthracene, benzo[a]pyrene (BAP), benzo[b]fluoranthene + benzo[j]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenzo[a,h]anthracene, fluoranthene, fluorene and pyrene.

[11] BOPRC staff undertook oil removal by bagging any noticeably impacted sand along the shoreline at Pilot Bay and conducting on-water recovery. Several potential sources were investigated, but the actual source has not been identified (source Bay of Plenty Times, 20/05/2024). The matter remains under investigation.

Figure 24: Boffa Miskell Sampling Design for 2023 and 2024

4.2.4.10 POTL Dredge Spoil Disposal Areas

Dredged sediment is currently deposited offshore in soft sediment habitats in accordance with existing resource consents (Figure 25). Since 1990, a monitoring program has been in place to assess the impacts of dredge spoil dumping on the nearest subtidal rocky reef communities (Motuotau Island) (c. 1.28km to the west of Motuotau Island is disposal site D, and 500m to the southwest are disposal sites B&C (for Marine Parade Replenishment).

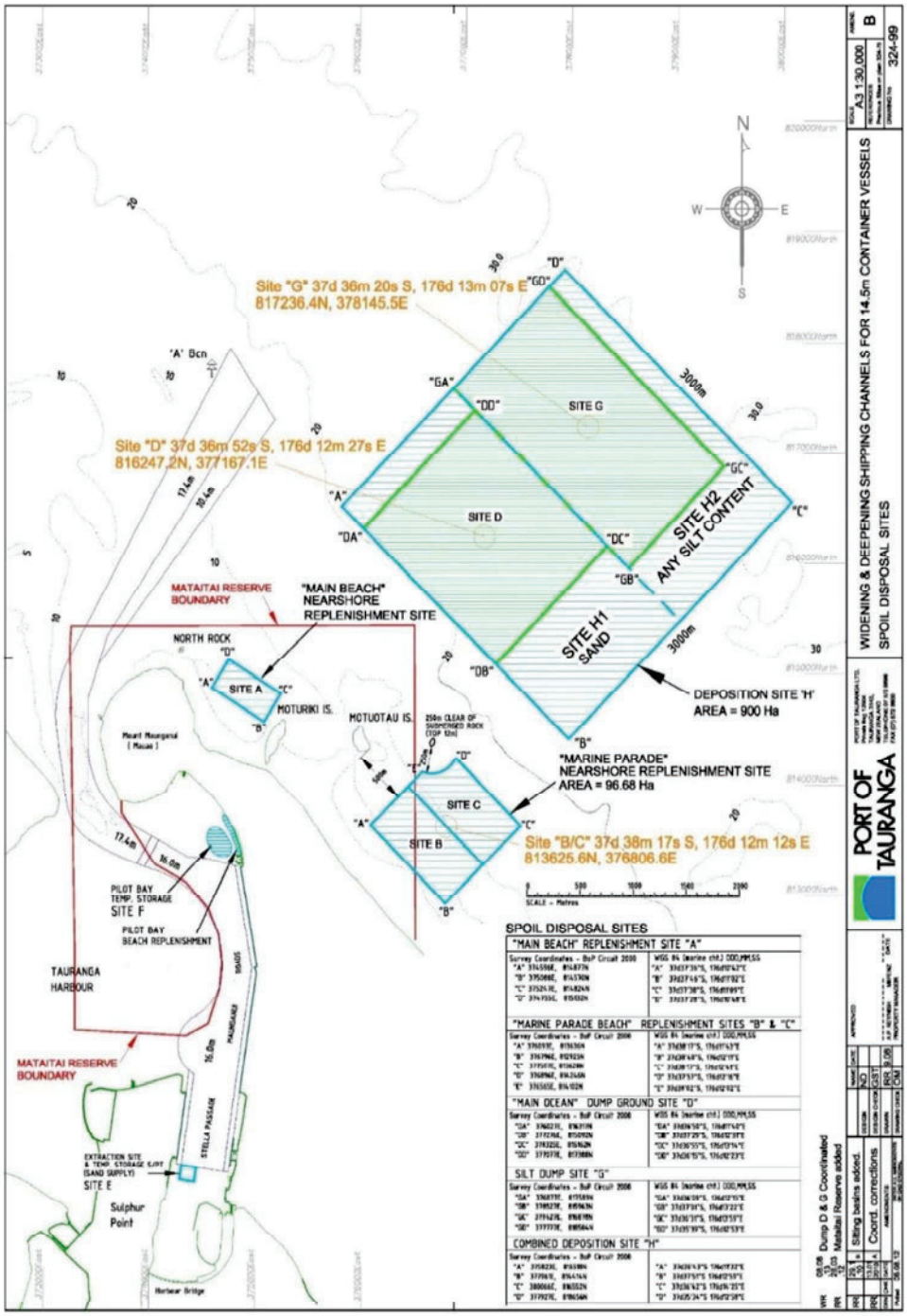

Figure 25: Port of Tauranga Limited Dredge Disposal Sites

The reef benthic communities at Motuotau Island exhibited stability, diversity, and structural complexity, comparable to other reefs in the area. The 2022 surveys did not find any changes in the community structure that could be attributed to the POTL dredging activities, nor did earlier surveys (Boffa Miskell Ltd, 2023c).

At offshore, deep-water locations where dredge spoil deposition occurs, suitable habitat does not exist for invasive (see 4.2.6) sessile organisms (i.e. no rocky reef habitat).

4.2.4.11 Seagrass

Seagrass is a flowering marine plant located in sheltered coastal and estuary ecosystems. Seagrass provides numerous ecosystem services, including habitat, food and nursery areas for a range of fish species (supporting increased biodiversity). Between 1959 and 2011 34% of seagrass beds were lost. Almost 90% of this loss occurred in the Southern Harbour. Another small loss occurred between 1996 and 2011 (6.5%). Other potential stressors to seagrass include physical disturbance, exotic species (black swan) and loss of habitat (reclamation of the sea bed) (BOPRC, 2018/2019).

Significant loss of seagrass extent has been documented across all major Bay of Plenty estuaries over the past 100 years. These previous declines have been attributed to sediment and nutrient enrichment of the estuaries caused by changes in land use and loss of fresh and saltwater wetlands. Recent assessment indicates some recovery of seagrass extent in Tauranga Harbour (including significant areas of subtidal seagrass), whilst declines continue across the smaller estuaries of the Bay of Plenty (Crawshaw et al, 2023).

Small areas of seagrass are present south of harbour bridge and offshore from Whareora Marae. Seagrass is particularly susceptible to elevated turbidity and the deposition of sediment which can reduce seabed light levels impacting primary production (Bulmer et al., 2018).

Seagrass (*Zostera muelleri* - At Risk – Declining) has been studied by Leonard et al., (2020) which indicated that the seagrass beds in Te Awanui are in a healthy condition, with variations in coverage, canopy height, shoot length, leaf count, and photosynthetic health among different locations, including these seagrass bed closest to the Port (adjacent to Whareroa marae) continues to remain in good condition.

Even with the multitude of information available on stressors to seagrass, there remains gaps in scientific knowledge to fully understand the changing dynamics of seagrass (Crawshaw et al, 2023).

4.2.5 Fish

Under water footage from beneath the POTL wharves (supplied by the POTL 2011 and 2018) revealed several mobile species (including fish) such as schools of kingfish (*Seriola lalandi lalandi*), red moki (*Cheilodactylus spectabilis*), yellow moray eel (*Gymnothorax prasinus*), spotty (*Notolabrus celidotus*), triplefin (*Forsterygion lapillum*, *Forsterygion maryannae, Grahamina capito* and *Grahamina gymnota*). Other taxa included glass shrimp (*Palaemon affinis*), sea horse (*Hippocampus abdominalis*), lemon nudibranch (*Dendrodoris citrina*), gem nudibranch (*Dendrodoris germacea*), 11 arm star fish (*Coscinasterias muricata*), cushion star (*Patirella regularis*), short tail sting ray (*Bathytoshia brevicaudata),* octopus (*Macroctopus maorum*), yellow moray eel (*Gymnothorax prasinus*), red rock crabs (*Guinusia chabrus*) and crayfish (*Jasus edwardsii*).

A fish survey using Baited Remote Underwater Video (BRUV) was conducted at 4 sites close to the dredging area but at a distance from ship operations[12] in 2018 and 2019. Fish and Ray abundance and diversity was examined amongst the four drop sites (Otumoetai Channel, Bridge Marina, Town Reach and Matapihi) (Leonard et al., 2020). The surveys conducted throughout the southern harbour showed relatively even species diversity. In 2018, three ray species and eight fish species were observed, while in 2019, there was

[12] Baited Remote Underwater Video deployments could not be safely conducted within the Port operational areas (Leonard et al., 2020).

one ray species and nine fish species. Fish counts in 2019 were higher, with the majority being juvenile snapper. The Port area consistently supported species diversity and significant populations of adult fish, particularly kahawai. Species detected in 2019 included eagle ray, snapper, trevally, kingfish, gurnard, kahawai, parore, and spotty (Leonard et al., 2020).

In summary, the observations indicate a consistent and diverse fish population in the Tauranga Harbour, with the port area supporting significant adult fish populations. Recreational fishing is popular, and shark populations suggest a stable pelagic food web (Kellett, 2021).

4.2.6 Invasive Species

Since 2002, Tauranga Harbour has been included in the government-funded National Marine High Risk Site Surveillance (NMHRSS) programme. This programme implements surveys every 6 months for a selected suite of target non-indigenous species (NIS) at high-risk sites around the country. Since the more intensive scientific baseline surveys were completed in 2002 and 2005, four secondary target species have been documented through NMHRSS surveys within Tauranga Harbour (the Asian date mussel *Arcuatula senhousia,* the asicidans *Didemnum vexillum* and *Styela clava*, and the Mediterranean fanworm *Sabella spallanzanii* (Fletcher 2023 POTL memorandum).

The NMHRSS programme is designed to detect the presence of five primary target NIS (*Asterias amurensis, Carcinus maenas, Caulerpa taxifolia, Eriocheir sinensis*, and *Potamocorbula amurensis*) and four secondary target NIS (*Arcuatula senhousia, Eudistoma elongatum, Sabella spallanzanii*, and *Styela clava*). Each High-Risk Site is surveyed bi-annually (Woods et al., 2019).

The Annual Synopsis Report details the targeted surveillance surveys at the 12 High Risk Sites during the periods June to November 2021 (the Winter 2021 surveys) and November 2021 to May 2022 (the Summer 2021–22 surveys) (Woods et al., 2019). Throughout New Zealand high-risk sites, no primary target species were detected, but all four secondary target species were detected during both rounds of surveys (Woods et al., 2019).

Woods et al., (2019) found that *Arcuatula senhousia* was present in Tauranga Harbour but also across the country including Ōpua Marina/Waikare Inlet, Waitematā Harbour and Whangārei Harbour. *Eudistoma elongatum, Styela clava and Sabella spallanzanii* was present in other harbours across New Zealand but not in the Tauranga Harbour.

A single specimen of a recently introduced invasive solitary, subtidal ascidian tunicate (*Styela clava*) was observed on one wharf pile in the Stella Passage marine assessment in 2020 (Leonard et al., 2020).

In recent years, as part of the bi-annual Tauranga Moana harbour surveillance, a large number of juvenile Mediterranean fanworm (Sabella spallanzanii) were discovered on the bottom of a boat moored in the harbour, highlighting the need to keep hulls cleaned. The boat was lifted out, scraped down, treated and returned to the water. In addition, Toi Ohomai divers observed Sabella sp. during a subtidal survey for the POTL in 2023, which BOPRC marine team have responded to finding more than 700 individuals.

Of the High-Risk sites surveyed during NMHRSS surveys, Tauranga Harbour only reported one secondary target NIS, compared to two-four NIS species in other Harbours in New Zealand. However, two of the other secondary target NIS species have been detected in Tauranga Harbour outside of the NMHRSS programme (Woods et al., 2019).

4.2.7 Significance of Marine Habitats

The seabed and shores of the western Bay of Plenty are predominantly soft sediment (sand) with rocky reef comprising approximately 5% of the coastline (Graeme, 1995).

Leonard et al., (2020) states that the marine species diversity and abundance is characteristic of New Zealand port and harbour organisms and consistent with a temperate New Zealand east coast harbour environment. The marine species assemblages are relatively stable over time despite several capital dredging campaigns in the past approximately 10 - 15 years (Leonard et al., 2020).

There are many significant marine habitats of indigenous flora and fauna according to the Bay of Plenty Regional Policy Statement (RPS) criteria.

Grace (para 167, 2010) assessed the following habitats and areas as "significant habitats of indigenous fauna" according to the criteria in the Bay of Plenty Regional Policy Statement (RPS), set 3 page 240 of the RPS (see **Appendix E**) (criteria are included in brackets for each feature):

1. Sandy offshore areas (3.1, 3.8, 3.11, 3.12, 3.17).
2. Rocky Reef of Moturiki and Motuotau (3.1, 3.11, 3.14, 3.17).
3. Margins of Mauao (3.1, 3.11, 3.14, 3.15).
4. Tanea Shelf (3.6).
5. Pilot Bay Relocated Boulder Reef (3.16, 3.17).
6. Harbour Entrance Gorge (3.5, 3.8).
7. Western Channel (3.1, 3.9, 3.10, 3.17).
8. Centre Bank (3.3, 3.5, 3.8, 3.10, 3.11, 3.3, 3.14, 3.15, 3.16, 3.17).
9. Wharf Structures (3.10 with respect to juvenile crayfish).
10. Seagrass Beds (3.1, 3.6).

No taxa (nor ecosystem) present in the southern basin of the Tauranga Harbour surveyed are recognised as Threatened or At-Risk or Naturally Uncommon (excluding occasionally present marine mammals and sharks) triggering New Zealand Coastal Policy Statement (NZCPS) policy 11 (a) or (b) apart from seagrass (*Zostera muelleri subsp. novazelandica*) which is an At-Risk (Declining) taxon (P. J. de Lange et al., 2013). Seagrass is in the CMA adjacent to the Whareroa marae, upstream of the Tauranga harbour bridge (Figure 20 and 21) and Pilot Bay and Otumoetai.

The habitats within Te Awanui are typical of a working Port in a harbour/estuarine environment and are not relevant to considerations of the NZCPS 11 (a) but are relevant to NZCPS (b) in those parts of the harbour, including the proposed dredge areas (adjacent to POTL) could constitute an ecological corridor (NZCPS11 (b vi.). As such there is evidence of effective ecological corridor functionality in terms of stable ecosystems within the sub estuary systems that feed into and are flushed through Te Awanui.

4.2.8 Summary of Scientific Information

The 2016 survey (Clark et al, 2018) was the first comprehensive quantitative survey of Tauranga Harbour's subtidal environment since 1990/91. Tauranga Harbour subtidal environment was found to be in good condition with most sediment physico-chemical parameters lower than national median values. Upper reaches of the estuarine channels tended to have higher mud, organic matter and nutrient concentrations compared to sites closer to the main channels. Metals were highest in the urbanised southern harbour in areas of high mud deposition. Compared with 1990/91 data, fewer scallops and horse mussels were observed in 2016 and the invasive Asian date mussel has become common. Overall, subtidal benthic communities appeared to be healthy with regard to mud and metal impacts (Clark et al., 2018). Most subtidal sites ranked in the lower Benthic Health Model (BHM) groups (for macroinvertebrate community), indicating Tauranga Harbour comprised fairly healthy subtidal communities with a "good" ecological ranking (Clark et al., 2018).

The ecological values of the marine environment within and adjacent to the POTL dredging and disposal areas are assessed as High (Table 8), based on:

The relevant HIGH ecological value criteria (Table 8) include:

1. Benthic soft sediment invertebrate community typically has high species richness, diversity and abundance for the habitat type.
2. Benthic hard shore invertebrate community typically has high species richness, diversity and abundance for the habitat type.
3. Benthic invertebrate community dominated by taxa sensitive taxa to organic enrichment and mud present
4. Where shellfish are present, flesh has low contaminant concentrations (below ANZFSC).
5. Marine sediments comprise low percentage silt and clay grain sizes, sediment grain size dominated by sand grain sizes.
6. Contaminant concentrations in surface sediment rarely exceed DGV concentrations.
7. Few *Threatened* ecosystems present[13].
8. Diverse and abundant fish communities present.
9. Native estuarine vegetation and macroalgae community dominated by native species and provides high quality habitat for native fauna.
10. Limited presence of non-indigenous species[14].
11. Few *Threatened* or *At Risk* marine species present.

The relevant MODERATE ecological value criteria (Table 8) include:

1. Water column contaminant values typically between ANZWQG 90% (ANZG, 2018) and 95% species protection levels and/or scored as 'Fair' on a recognised Water Quality Index.
2. Physical habitat modification limited (modification due to the area containing an operational Port and the past dredging of the approach channel and turning basin).

[13] (Holdaway et al., 2012) – estuaries classified as vulnerable A2(c) short term decline in ecological function

[14] See Fletcher (2024)

5 Avian

Scientific avian information has been sourced from Dr Della Bennet's Environment Court Statement of Evidence dated 19 April 2022. The methodology of Dr Bennet's assessment included a penguin burrow survey by Joanna Sim of DabchickNZ and a desktop review of available scientific data and information. It also included annual winter and summer count data of waders in Te Awanui (Tauranga Harbour) (OSNZ[15]/Birds New Zealand), and observations and short reports by Profession John Cockrem on birds at the Port. Dr Della Bennet also conducted a site visit in December 2021.

5.1 Sulphur Point and Panepane Point

Surveys have been undertaken in Te Awanui since 1994 by (OSNZ)/Birds New Zealand, and earlier bird counts at Sulphur Point were grouped under the site name 'Sulphur - Panepane'. It is likely that various locations were included within this site grouping, including the sand storage/management site at Sulphur Point, a large building (since removed) on the seaward end of Sulphur Point that was used as a high tide roost, and Panepane Point at the eastern end of Matakana Island. Between 2006 and 2018, Sulphur Point was clearly identified as a separate survey site, and eight wader species were recorded, including:

- Banded dotterel (*Charadrius bicinctus bicinctus*; Threatened-Nationally Vulnerable).
- Wrybill (*Anarhynchus frontalis*; Threatened-Nationally Vulnerable).
- Eastern bar-tailed godwit (*Limosa lapponica baueri*; At Risk-Declining).
- New Zealand dotterel (*Charadrius obscurus aquilonius*; At Risk-Recovering).
- Pied stilt (*Himantopus himantopus leucocephalus*; Not Threatened).
- South Island pied oystercatcher (*Haematopus finschi*; At Risk-Declining).
- Variable oystercatcher (*Haematopus unicolor*; At Risk-Recovering).
- Spur-winged plover (*Vanellus miles novaehollandiae*; Not Threatened).

Non-wader species also observed at Sulphur Point include:

- Caspian tern (*Hydroprogne caspia*; Threatened-Nationally Vulnerable).
- White-fronted tern (*Sterna striata striata*; At Risk-Declining).
- Southern black-backed gull (*Larus dominicanus*; Not Threatened).
- Red-billed gull (*Larus novaehollandiae scopulinus*; At Risk-Declining).
- Black-billed gull (*Larus bulleri*; Threatened-Nationally Critical).

White-fronted terns (67 nests in 2018), New Zealand dotterel (two nests in 2018), variable oystercatcher (one nest in 2018) and black-billed gull (2016) have been observed breeding at the Sulphur Point sand pile.

Regular monthly bird surveys at the Sulphur Point sand pile commenced in August 2021 by POTL environmental staff. Each survey was undertaken in accordance with the methodology and survey zones as set out in the monitoring of coastal birds report developed for POTL[16]. Table 12 below summarises the bird count records for the Sulphur Point sand pile between September 2021 and March 2022.

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[15] Ornithological Society of New Zealand

[16] Wildland Consultants 2020: Monitoring of coastal birds at the Port of Tauranga. *Wildland Consultants Ltd Contract Report No. 5154b* Prepared for Port of Tauranga Ltd.

Table 12: Bird Count Records for the Sulphur Point Sand Pile Between September 2021 and March 2022

Common Name	Scientific Name	Threat Classification 2021	Ave. Adult (range)	Ave. Juvenile (range)	Ave. Eggs (range)	Survey Months
Black-billed gull	*Larus bulleri*	At Risk-Declining	2	-	-	Oct 2021
Caspian tern	*Hydroprogne caspia*	Threatened-Nationally Vulnerable	1	-	-	Oct 2021
Eastern bar-tailed godwit	*Limosa lapponica baueri*	At Risk-Declining	688 (35-1200)	-	-	Oct 2021-Mar 2022
Northern New Zealand dotterel	*Charadrius obscurus aquilonius*	At Risk-Recovering	5 (1-6)	4 (1-5)	3 (2-4)	Sept 2021-Mar 2022
Red-billed gull	*Larus novaehollandiae scopulinus*	At Risk-Declining	32 (1-100)	5 (1-10)	-	Nov 2021-Mar 2022
Southern black-backed gull	*Larus dominicanus dominicanus*	Not Threatened	2 (1-5)	1	-	Sept 2021-Mar 2022
Variable oystercatcher	*Haematopus unicolor*	At Risk-Recovering	2 (1-4)	-	-	Sept 2021-Mar 2022
White-fronted tern	*Sterna striata striata*	At Risk-Declining	88 (1-400)	-	-	Aug 2021-Mar 2022

5.1.1 Sand Pile at Sulphur Point

Thirteen bird species have been recorded using the sand storage site at Sulphur Point at different times of the year. Of these species, New Zealand dotterel, variable oystercatcher, white-fronted tern, red-billed gull, and black-billed gull breed at the sand pile; and some international migratory species, including limited numbers of kuaka/bar-tailed godwit, winter-over at the site. In summary:

- Kuaka/eastern bar-tailed godwit are the most common wader at the sand pile.
- South Island pied oystercatcher (At Risk-Declining) is the second most common species using the sand pile, and low numbers of variable oystercatcher (At Risk-Recovering) are present during the breeding season (average 2, range 1-4, September 2021 to March 2022).
- New Zealand dotterels (At Risk-Recovering) have consistently low numbers at the sand pile during the breeding season, and flocks have been recorded periodically post-breeding. During September 2021 to March 2022, an average of five birds were observed during the POTL bird monitoring surveys (range 1-6).
- Banded dotterel (Threatened-Nationally Vulnerable) were only recorded in 2010 (surveys from 2007-2018), with a flock of 100.
- White-fronted tern (At Risk-Declining) established a breeding colony at the sand pile at Sulphur Point in 2018, with approximately 67 nests. During August 2021 to March 2022, an average of 88 birds were observed during the POTL bird monitoring surveys (range 1-400).
- In 2018, 1-2 Caspian terns (Threatened-Nationally Vulnerable) were observed during the breeding season and in October 2021 a single bird was sighted, although no breeding was observed.

- Black-billed gulls (Threatened-Nationally Critical) bred at the sand pile in 2016, but are highly mobile, and colonies do not necessarily establish in the same location year-to-year. Two individuals were observed in October 2021.
- Red-billed gulls (At Risk-Declining) established a breeding colony of approximately 58 nests in 2018. During November 2021 and March 2022, an average of 32 birds were observed with an average of five juveniles.
- An average of two southern black-backed gulls (Not Threatened; range 1-3) have been recorded at the sand pile between September 2021 and January 2022.
- Wrybill (Threatened-Nationally Vulnerable) is a specialist braided river bird, mostly breeding in Canterbury and with smaller populations in Otago. During the winter, they disperse to over-winter in estuaries across New Zealand. Wrybill flocks have been present at three of the 12 annual winter counts at the sand pile and, each time, numbers have been close to or above 1% of the national population (71, 52, and 48 birds).
- Pied stilt (not threatened) have only been recorded at the sand pile twice, with only two and eight birds recorded.

5.1.2 Mount Maunganui Wharf

At Mount Maunganui Wharf, during the 2016 -2018 national survey, the Mount Maunganui Wharf red-billed gull colony had approximately 471 pairs and this was approximately 1.8% of the national breeding population.

The Port commenced bird surveys within the general Port environs in January 2022 and during the survey of the rock wall the following was observed:

- An average of 47 red-billed gull adults..
- 15 juveniles

A penguin survey of the Port was undertaken in August 2019, and 16 indications of kororā (little blue penguin) presence were found within the Mount Maunganui Wharf rock wall.

Port of Tauranga key bird locations are shown in Figure 26 (figure extracted directly from Dr Della Bennet's Environment Court Statement of Evidence therefore the figure number appears out of order with other figures within this report).

Figure 26: Port of Tauranga Key Bird Locations

6 Marine Mammal Information

Marine mammal scientific information has been sourced from the Assessment of Environmental Effects on Marine Mammals, Stella Passage Development report prepared by SLR Consulting NZ Ltd, dated August 2021.

The report states the following sources were used to assess the likelihood of marine mammal species being present in the vicinity of the Stella Passage Development:

- Sightings data as recorded in the DOC Marine Mammals Sightings Database from 1968 to 2019 (DOC Sightings Database) (supplied by H. Hendriks, DOC, 09/09/2020);
- Stranding data as recorded in the DOC Marine Mammals Incident Database from 1873 to 2018 (DOC Incident Database) (supplied by H. Hendriks, 09/09/2020);
- Habitat modelling and distribution descriptions (Stephenson et al., 2020); and
- Knowledge of species distribution and habitat use obtained from published and unpublished literature. Two studies were of particular importance for this project, namely:
    - Meissner (2015), a Massey University PhD thesis that investigated marine mammal occurrence in the Bay of Plenty using both historical and contemporary sightings data with a focus on the effects of tourism on common dolphins; and
    - Gaborit-Haverkort (2012), a Massey University MSc thesis that investigated cetacean occurrence in the Bay of Plenty with a focus on the effects of tourism on common dolphins.

Figure 27 and Figure 28 below have been sourced directly from the SLR report.

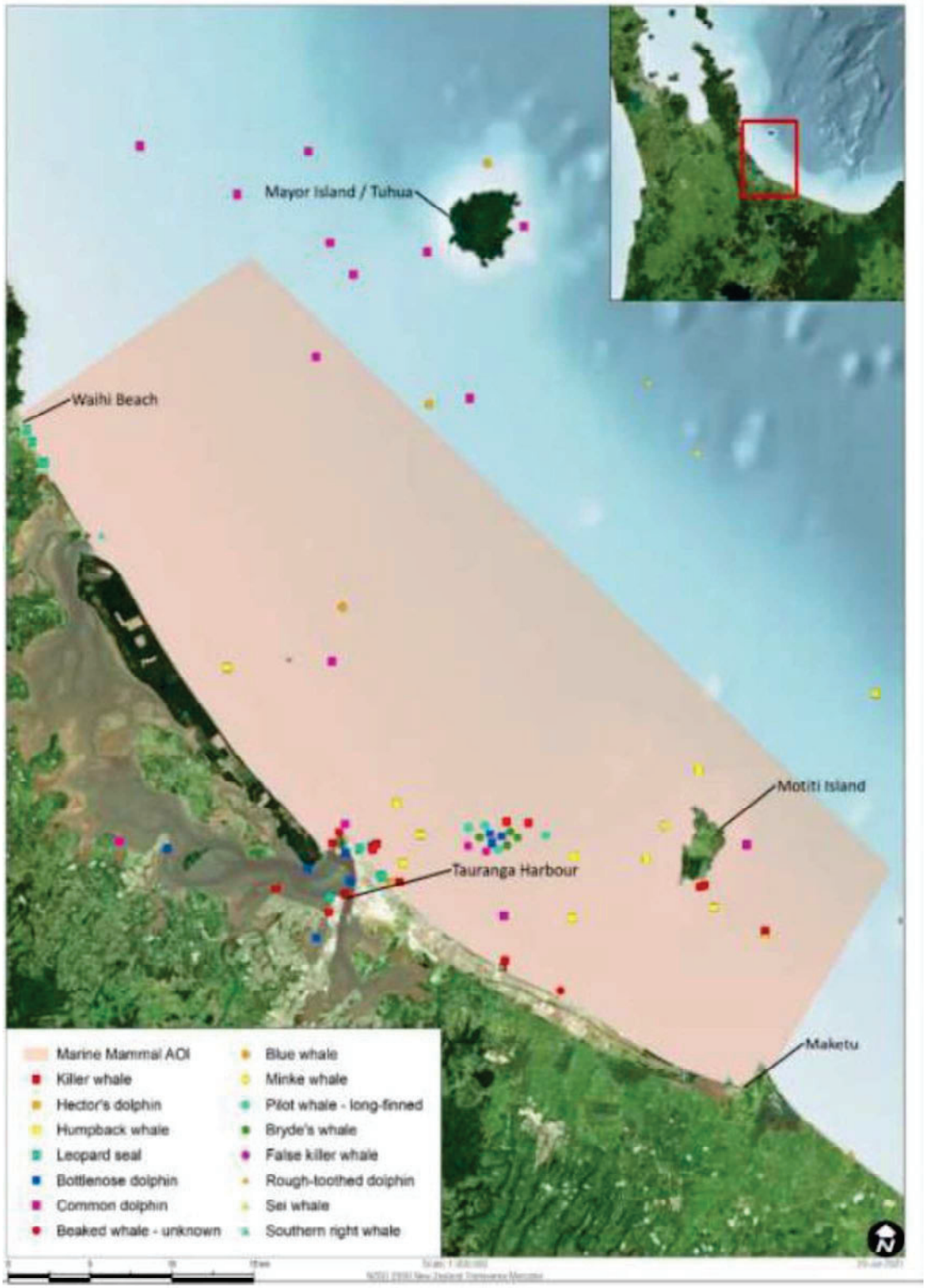

Figure 27: Marine Mammal Sightings Reported by the DOC Sightings Database

Figure 28: Marine Mammal Strandings Reported by the DOC Incident Database

For the SLR report an Area of Interest (AOI) was defined to encompass the coast from Rapatiotio Point (at the north end of Waihi Beach) to Okurei Point (east of Maketu) including a 20km buffer offshore, then the report further interrogated the data to pinpoint those sightings that were recorded within Tauranga Harbour.

Bottlenose Dolphins

SLR analysis of the DOC Sightings Database states this species is routinely sighted in the AOI (nine sightings total), including inside Tauranga Harbour (five sightings). Of the nine reported sightings from the AOI, four noted the presence of calves; hence this habitat could support some breeding behaviours.

In addition to the DOC Sightings Database records, Gaborit-Haverkort (2012) undertook 2,364 boat-based marine mammal surveys of the central Bay of Plenty (including the waters of the AOI) between March 1998 and May 2011. Throughout this study 53 sightings of bottlenose dolphins were made, including two within Tauranga Harbour. Sightings of this species were made throughout the year, but encounter rates peaked in winter. While most sightings of bottlenose dolphins from this study occurred in water depths less than 50 m, sightings were made over the depth range 4 – 109m. Group size ranged from two to 50+ individuals and calves were recorded on five occasions primarily during summer and autumn.

Meissner (2015) assessed marine mammal sightings from a range of validated sources (experts, tour operators and mariners) in the Bay of Plenty to determine historical and seasonal presence of species between 2000 and 2010. Of the 2,049 marine mammal encounters included in the analysis, 81 involved bottlenose dolphins of which five appear to have occurred inside Tauranga Harbour. Encounters occurred year-round with encounter rates highest in spring. The median water depth of bottlenose dolphin encounters was 98m.

Killer Whales

SLR analysis of the DOC Sightings Database notes that sightings in the AOI are relatively common (15 sightings in total), and sightings do occasionally occur inside Tauranga Harbour (one sighting). Of the 15 reported sightings of this species from the AOI, seven noted the presence of calves; hence this habitat could support some breeding behaviours.

During the 2,364 surveys undertaken (over three years) by Gaborit-Haverkort (2012) 45 sightings of killer whales were made, including four within Tauranga Harbour. Sightings of this species were made throughout the year, but encounter rates peaked in spring. Sightings were made over the depth range 4 – 115m (mean = 39m). Group size ranged from one to 30+ individuals and calves were recorded on 15 occasions primarily during spring and autumn.

Of the 2,049 marine mammal encounters analysed by Meissner (2015), 105 involved killer whales including some inside Tauranga Harbour. Encounters occurred year-round with encounter rates highest in winter and spring. The median water depth of killer whale encounters was 70m.

New Zealand Fur Seals

SLR states that fur seals are commonly seen in coastal Bay of Plenty waters, particularly over winter months (DOC, 2012; Bay of Plenty Times 2018). In addition, seasonal (winter) sightings of fur seals are becoming more common inside Tauranga Harbour, for example the following sighting locations were reported in the winter of 2018: Koromiko Street, Kopurererua Valley Reserve, Tauranga Marina, and Welcome Bay (Bay of Plenty Times, 2018). Both the DOC Sighting Database and the DOC Incident Database are assumed to be biased low for this species, as terrestrial haul-out behaviour and regular occurrence in coastal waters of this common and relatively frequently seen species means that most sightings go unreported.

SLR reported that based on DOC information an emerging breeding colony was establishing on Motunau Island in the Bay of Plenty. Several haul-out locations (non-breeding) occur in and around the AOI, including

Karewa Island, Motiti Island, Mayor Island and Plate Island (Meissner, 2015). Mauao also supports small numbers of fur seals ashore during winter (DOC, 2012).

Of the 2,049 marine mammal encounters analysed by Meissner (2015), 90 involved fur seals, including some that occurred inside Tauranga Harbour. Encounters occurred year-round with encounter rates highest in winter and spring. The median water depth of fur seal encounters at sea was 82m.

Meissner (2015) also conducted boat-based surveys and noted that at-sea fur seal occurrence was typically higher in deeper waters, but that the number of fur seals occurring in the Bay of Plenty is low overall compared to other regions of New Zealand, indicating early stage recolonisation following historic exploitation. Mayor Island and Plate Island supported the largest concentrations of animals ashore with up to 15 individuals present in winter; however, only three pups were encountered in the western Bay of Plenty between 2010 and 2013.

Limitations and Gaps

While the above data sources represent the best possible information, the SLR report states it is important to note that:

- Data gaps in sightings data do not necessarily indicate an absence of cetaceans, but typically reflect a lack of observation effort;
- While stranding data gives a broad indication of species occurrence, dead animals can wash ashore well away from where they died; and sick or diseased animals may be outside of their normal range prior to death;
- Each point within Figure 27 represents a sighting entry within the DOC database. Each entry can be either a single animal or a group of animals; and
- Entries in the sightings and stranding data that do not identify marine mammals to species level were excluded from the analysis.

7 Air Quality

7.1 Scope and Geographical Extent

The purpose of this report is to compile all the existing scientific monitoring information on the environment within the Port Zone (as defined by the Regional Coastal Environment Plan). However, in relation to air quality, the environment outside the Port Zone, particularly in places where members of the public are likely present and therefore may be exposed to airborne pollutants, is most relevant.

The BOPRC undertakes monitoring at a number of locations across the Mount Maunganui area. For the purposes of this report, all scientific monitoring data within the wider Mount Maunganui area has been considered, regardless of the extent to which there is likely to be any material impact from discharges to air associated with the Port of Tauranga.

One of the main sources of air quality monitoring data in the Port of Tauranga is the BOPRC air quality monitoring network. The raw data from the monitoring network is available on the BOPRC Environmental Data Portal: https://envdata.boprc.govt.nz/Data. The most recent reporting on the BOPRC air quality datasets was published in 2023 and includes data to the end of 2022 (BOPRC, 2023). That report includes interpretation of trends in the data and commentary on the setting and contributing sources at each monitoring location. This report updates the information reported by BOPRC with data from:

- The BOPRC air quality monitoring sites to the end of 2023 (where there is sufficient data); and
- One new monitoring site commissioned by the POTL[17].

7.2 Air quality Influences

There is a wide variety of natural and man-made sources of air pollutants that influence air quality in the Mount Maunganui area. The BOPRC has commissioned an emissions inventory for the Tauranga area (Wilton and Iseli, 2022), and a more localised inventory for the Mount Maunganui Airshed (MMA) (Wilton, 2023), that estimate emissions from the following anthropogenic sources:

- Industry, including small scale industrial and commercial activities
- Domestic heating
- Motor vehicles
- Outdoor burning
- Small scale domestic sources - lawn mowing, power tool use and solvent use
- Aviation
- Shipping
- Rail.

Emissions inventories are principally used as a management tool to understand the relativity of emissions from different source types. Emissions inventories do not directly relate to measured air quality as they do not account for differences in dispersion characteristics of different source types. For example, the emissions from tall buoyant stacks are better dispersed than ground level sources such as motor vehicles and therefore the relative impacts of these source types on air quality are not proportional to their relative emission rates.

POTL has commissioned a source apportionment study that will directly estimate the contribution to measured air quality from different sources based on analysis of particulate samples collected at the Mount

[17] POTL has established PM_{10} air quality monitors at two locations but, at the time of preparing this report, only one monitor had 12 months data available.

Maunganui public library and Ranch Road monitoring sites. The results of this source apportionment study will not be available until mid to late 2024.

7.3 Contaminants Monitored and Monitoring Locations

7.3.1 Sources of Air Quality Monitoring Data

Air quality monitoring data for the Mount Maunganui area is available from two main sources:

- The BOPRC operates a number of air quality monitors in the vicinity of the Port of Tauranga and the wider area.
- POTL operates air quality monitors on Tasman Quay, east of Shed 6 ("Shed 6"), and on Miro Street, south of the Mount Maunganui Library ("Library").

This monitoring is carried out for the relevant key contaminants using reference methods specified in Schedule 2 of the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (NESAQ).

The BOPRC also has a network of "low cost" sensors, which measure concentrations of several pollutants using non-reference methods. The data collected using these sensors should not be used to assess compliance with air quality standards and guidelines, but can be used to help understand temporal or spatial patterns or trends in air quality.

7.3.2 Contaminants Monitored

The key contaminants monitored in the Mount Maunganui area are summarised in Table 13.

Table 13: Key Contaminants Monitored

Contaminant	Abbreviation	Sources (Ministry for the Environment & Stats NZ, 2021)
Total suspended particulate	TSP	Particulate matter emissions typically result from combustion (such as burning petrol, diesel, wood, or coal) and abrasion processes (such as brake and tyre wear or road dust). Combustion tends to create fine particles ($PM_{2.5}$), whereas abrasion generates coarser particles (PM_{10}). Particulate matter can also be generated through the reaction of gases in the atmosphere (referred to as secondary particulate matter), and a proportion of particulate matter is naturally occurring, for example sea salt.
Particulate matter with aerodynamic diameter less than 10 micron	PM_{10}	
Particulate matter with aerodynamic diameter less than 2.5 micron	$PM_{2.5}$	
Sulphur dioxide	SO_2	SO_2 is a colourless gas with a sharp, irritating odour. It is associated with combustion of fossil fuels (such as coal, diesel, and heavy fuel oil used in maritime vessels) and industrial processes (such as the production of fertilisers and the smelting of mineral ores containing sulphur). Geothermal and volcanic gases are natural sources of sulphur dioxide in New Zealand
Nitrogen dioxide	NO_2	NO_2 is a gas primarily generated by burning fossil fuels, mainly by motor vehicles (particularly diesel vehicles) but also from industrial emissions and home heating.

Air quality monitoring at Whareroa Marae includes hydrogen fluoride (HF) and Total Reduced Sulphur (TRS)[18], which are contaminants specifically associated with discharges to air from nearby industries. HF and TRS have not been considered further in this report as they are not related to Port activities.

BOPRC also undertake monitoring for Total Volatile Organic Compounds (TVOC) as a potential indicator of methyl bromide. Other sources of TVOCs include fugitive emissions from fuel and solvent storage, and combustion sources. This monitoring is not specific to a particular organic compound and is not formally reported by the BOPRC so it has not been considered further in this report.

7.3.3 Monitoring Locations

Table 14 identifies the reference air quality monitoring locations in the Mount Maunganui area, the contaminants monitored at each location and the period over which monitoring data has been collected. The locations where air quality is monitored are shown on Figure 29. Other than the monitors at Ranch Rd (EP301713) and Mt Maunganui Library (PoT monitoring site) all the reference monitors are located within the MMA.

The locations of the BOPRC low-cost sensors for PM_{10}, $PM_{2.5}$ and NO_2 are shown in Figure 30.

[18] prior to November 2020 monitoring was for hydrogen sulphide (H_2S)

Table 14: Air Quality Monitoring Locations

Site owner	Monitoring station name	BOPRC Identifier[19]	Contaminants Monitored								
			TSP		PM_{10}		$PM_{2.5}$		SO_2		Other
			Start date	End date	Start date	End date	Start date	End date	Start date	End date	Start date
BOPRC	Rata Street	EP102897	14/12/2018	Ongoing	14/12/2018	Ongoing	-	-	1/1/2020	1/1/2024	-
BOPRC	Rail Yard South	EP106779	1/1/2019	27/1/23	28/10/2018	27/1/2023	-	-	28/10/2018	27/1/2023	-
BOPRC	Totara St Rail Crossing	EP11578	21/1/2024	Ongoing	21/1/2024	Ongoing	-	-	-	-	-
BOPRC	Totara Street	EP116688	19/8/2015	Ongoing	1/10/2018	1/8/2023	11/8/2018	1/8/2023	1/1/2016	1/1/2024	-
BOPRC	Whareroa Marae	EP079602	1/10/2015	Ongoing	12/8/2018	Ongoing	10/11/2023	Ongoing	27/9/2015	Ongoing	HF 1/2/2016 – 1/11/2021 H_2S 1/10/2015 – 01/11/2020 TRS 1/11/2020 - ongoing NO_2 18/8/23 - ongoing
BOPRC	Tauranga Bridge Marina	EP045607	4/8/2018	Ongoing	1/1/2020	1/1/2024	-	-	17/4/2016	Ongoing	-
BOPRC	Sulphur Point	DP955711	1/9/2018	1/8/2023	26/8/2018	1/8/2023	-	-	1/9/2018	1/8/2023	-
BOPRC	De Havilland Way	EP262582	1/7/2014	1/8/2023	1/1/2019	1/8/2023	-	-	-	-	-
BOPRC	Ranch Rd	EP301713	4/2/2024	Ongoing	4/2/2024	Ongoing	2/2/2024	Ongoing	-	-	-

[19] Identifiers used in BOPRC Environmental Data Portal: https://envdata.boprc.govt.nz/Data

Site owner	Monitoring station name	BOPRC Identifier[19]	Contaminants Monitored								
			TSP		PM_{10}		$PM_{2.5}$		SO_2		Other
			Start date	End date	Start date	End date	Start date	End date	Start date	End date	Start date
PoTL	Shed 6		-	-	16/3/2023	Ongoing	-	-	-	-	-
PoTL	Library		-	-	20/12/2023	Ongoing	-	-	-	-	-

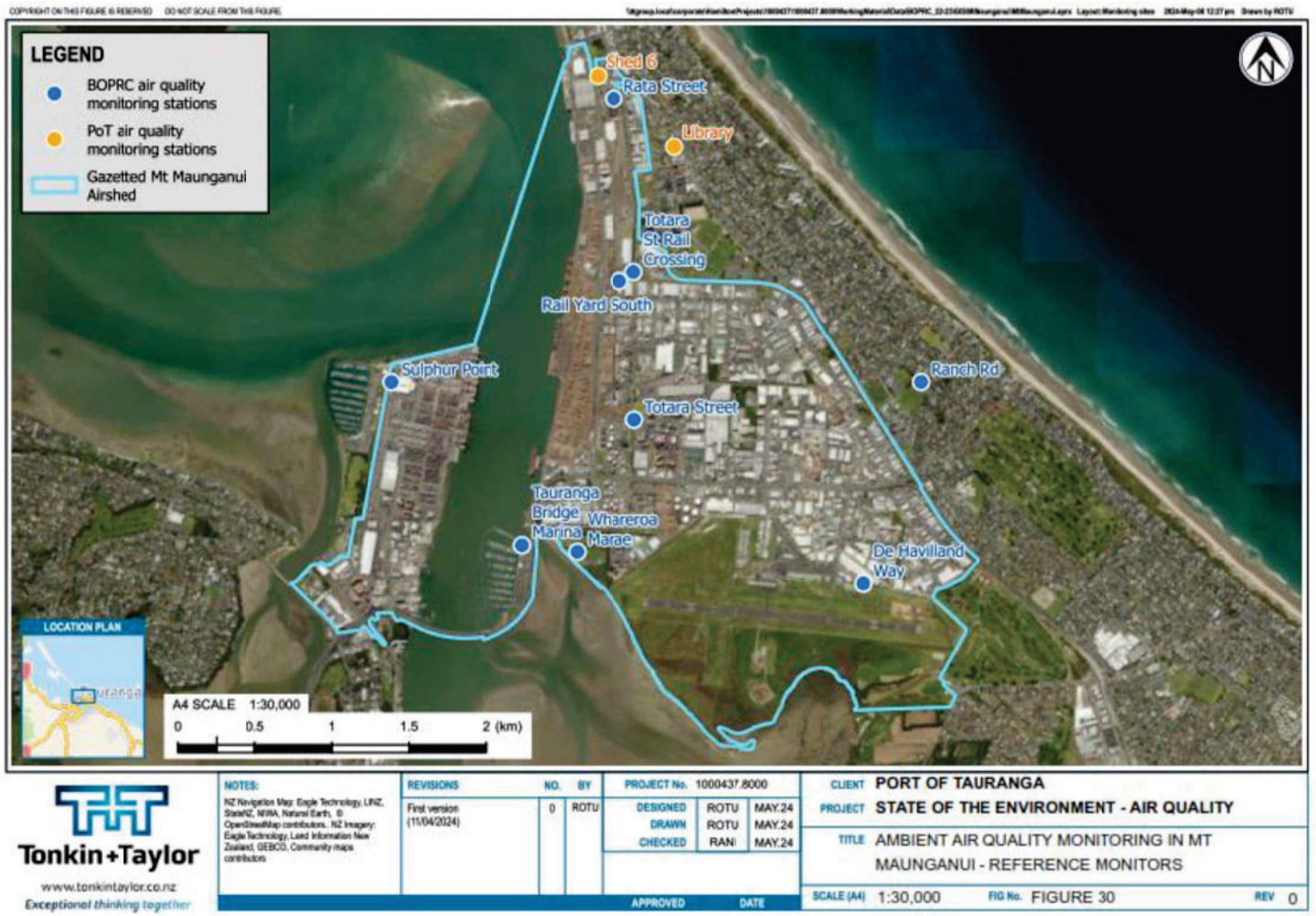

Figure 29: Location of Reference Air Quality Monitoring Sites

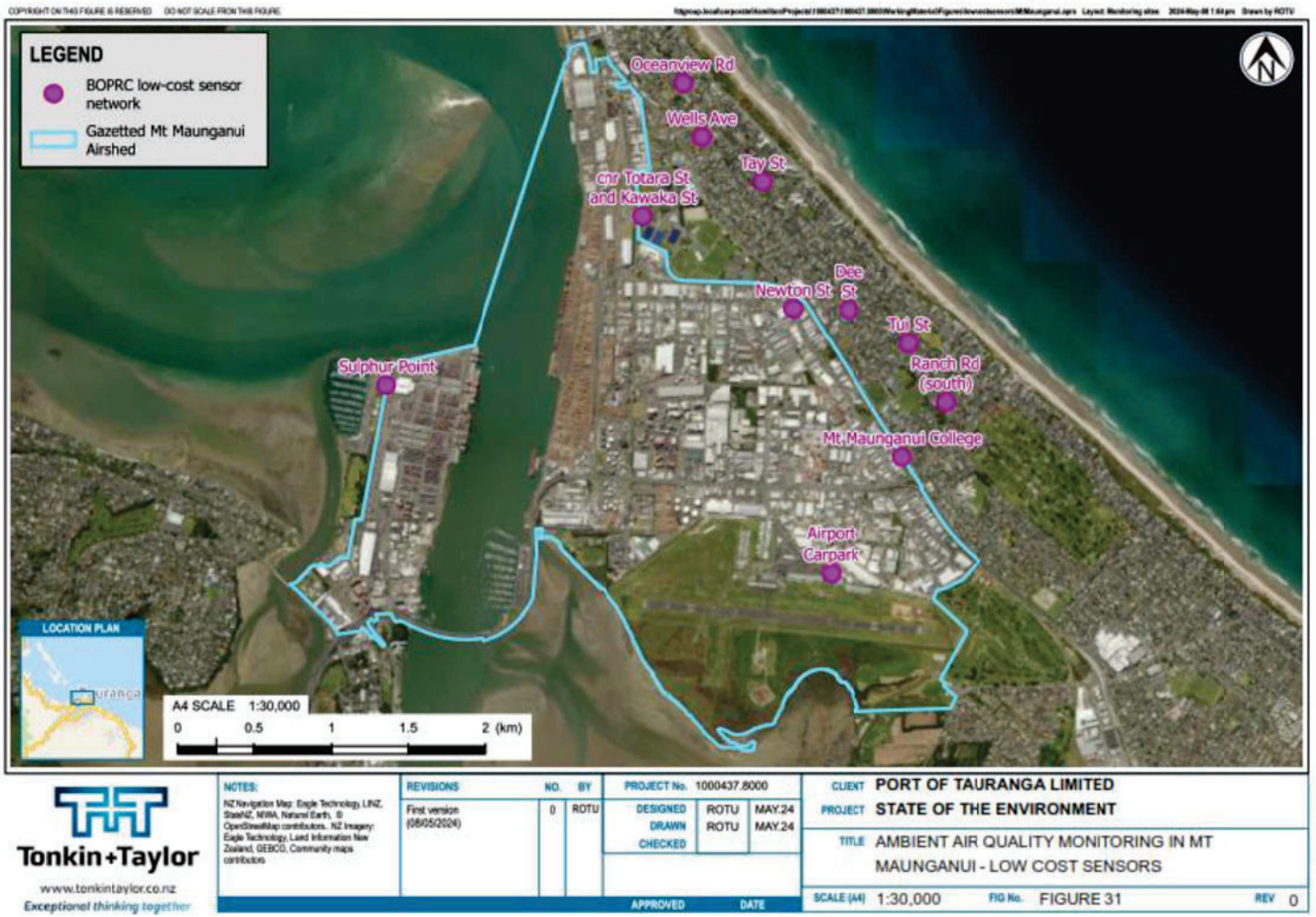

Figure 30: Location of Low Cost Sensor Air Quality Monitoring Sites

7.3.4 Classification of Monitoring Sites

The information on the classification of monitoring sites is provided in **Appendix F**.

7.4 Standards and Guidelines

The information on the available air quality standards and guidelines is provided in **Appendix G.**

7.5 Air Quality State – Based on Scientific Information

7.5.1 Introduction

The following sub-sections of this report summarise the available air quality monitoring data in comparison with air quality standards and guidelines.

7.5.2 PM_{10} Air Quality

7.5.2.1 Reference Method Monitoring

PM_{10} air quality is summarised and compared against relevant air quality standards and guidelines in Table 15 (for peak and traffic sites with no residential activities within 50m) and Table 16 (for sites with residential activity within 50m).

The data is also presented graphically in the form of polar plots in Figure 31 and Figure 32 (for mean 10-minute average PM_{10} concentration in 2022 and 2023 respectively). Polar plots present the wind direction, wind speed (wind speed increases with increasing distance from the centre) and PM_{10} concentration (shown by colour) on a single image. Polar plots can be helpful to visualise the upwind direction of sources influencing air quality at a location and, combined with wind speed, can give an indication of the nature of the source (e.g. if emissions are higher under stronger winds, such as fugitive dust).

Table 17 sets out the number of occasions where the NESAQ value of 50 µg/m^3 (24-hour average) for PM_{10} has been exceeded at any of the monitors. As noted in Section 7.3.3, all of the air quality monitors (apart from the Ranch Rd and Mt Maunganui Library sites, which have only recently commenced operation) are located within the MMA. An airshed is a polluted airshed under the NESAQ, if there is a breach of the air quality standard. For PM_{10} a breach of the standard occurs if there is more than one occasion in a 12-month period where the PM_{10} concentration exceeds the concentration set in the standard.

The MMA is defined as a polluted airshed under the NESAQ. The airshed will remain polluted until there has been 5 years of consecutive monitoring in which the standard is not breached.

Table 15: PM_{10} Air Quality – Peak and Traffic Sites (No Residential Within 50m)

Averaging period	Year	PM_{10} concentration (µg/m^3)					
		Rata Street	Rail Yard South	Sulphur Point	Totara Street	Shed 6[b]	Standard/ guideline
Annual average	2019	20.4	30.5	13.8	24.8	-	20 (AAQG) 15 (WHO 2021)
	2020	18.0	23.5	12.8	20.8	-	
	2021	19.3	24.4	13.5	21.4	-	
	2022	21.2	22.8	13.6	22.2	-	
	2023	19.7	Insufficient	Insufficient	Insufficient	15.0	
Maximum 24-hour average [a]	2019	44.2	70.2	31.3	56.6	-	50 (NESAQ)

Averaging period	Year	PM_{10} concentration (µg/m³)					
		Rata Street	Rail Yard South	Sulphur Point	Totara Street	Shed 6[b]	Standard/ guideline
	2020	86.8	114.6	28.1	46.7	-	
	2021	61.6	52.1	32.2	50.7	-	
	2022	80.5	50.5	47.8	50.4	-	
	2023	65.3	46.1[c]	37.1[c]	46.4[c]	45.3	
Fourth highest 24-hour average	2019	41.0	66.4	29.1	44.0	-	45 (WHO 2021)
	2020	47.4	53.8	25.1	39.7	-	
	2021	50.2	44.1	28.5	40.5	-	
	2022	52.8	49.2	34.2	45.9	-	
	2023	48.7	31.4[c]	34.6[c]	39.5[c]	43.1	

a. Excludes exceptional events approved by the Minister (6 Dec 2019 – all sites, 9-10 Jun 2021 Rata St, 21 April 2022 Rata St and Tauranga Bridge Marina, 18-19 August 2022 five sites: De Havilland Way, Bridge Marina, Railyard South, Rata St, Totara St, 19 April 2023 Rata St).

b. Data from 16/3/23 to 16/3/24 used as indicative of 12-month period

c. Monitoring ended 1 August 2023

Table 16: PM_{10} Air Quality – Peak Sites with Residential Within 50m

Averaging period	Year	PM_{10} concentration ($\mu g/m^3$)			
		Bridge Marina	Whareroa Marae	De Havilland Way	Standard/ guideline
Annual average	2019	16.1	17.2	19.8	20 (AAQG) 15 (WHO 2021)
	2020	14.4	14.2	18.0	
	2021	14.5	11.4	19.3	
	2022	14.9	9.8	18.4	
	2023	13.9	7.7	Insufficient	
Maximum 24-hour average [a]	2019	47.5	50.0	63.4	50 (NESAQ)
	2020	35.3	64.9	44.6	
	2021	43.1	33.8	49.0	
	2022	46.4	28.9	45.4	
	2023	43.6	25.9	51.2[b]	
Fourth highest 24-hour average	2019	32.9	46.9	51.1	45 (WHO 2021)
	2020	32.6	36.0	40.2	
	2021	39.9	25.4	49.0	
	2022	46.4	24.9	45.0	
	2023	38.6	23.3	44.6[b]	

a. Excludes exceptional events approved by the Minister (6 Dec 2019 – all sites, 9-10 Jun 2021 Rata St, 21 April 2022 Rata St and Tauranga Bridge Marina, 18-19 August 2022 five sites: De Havilland Way, Bridge Marina, Railyard South, Rata St, Totara St, 19 April 2023 Rata St).

b. Monitoring ended 1 August 2023

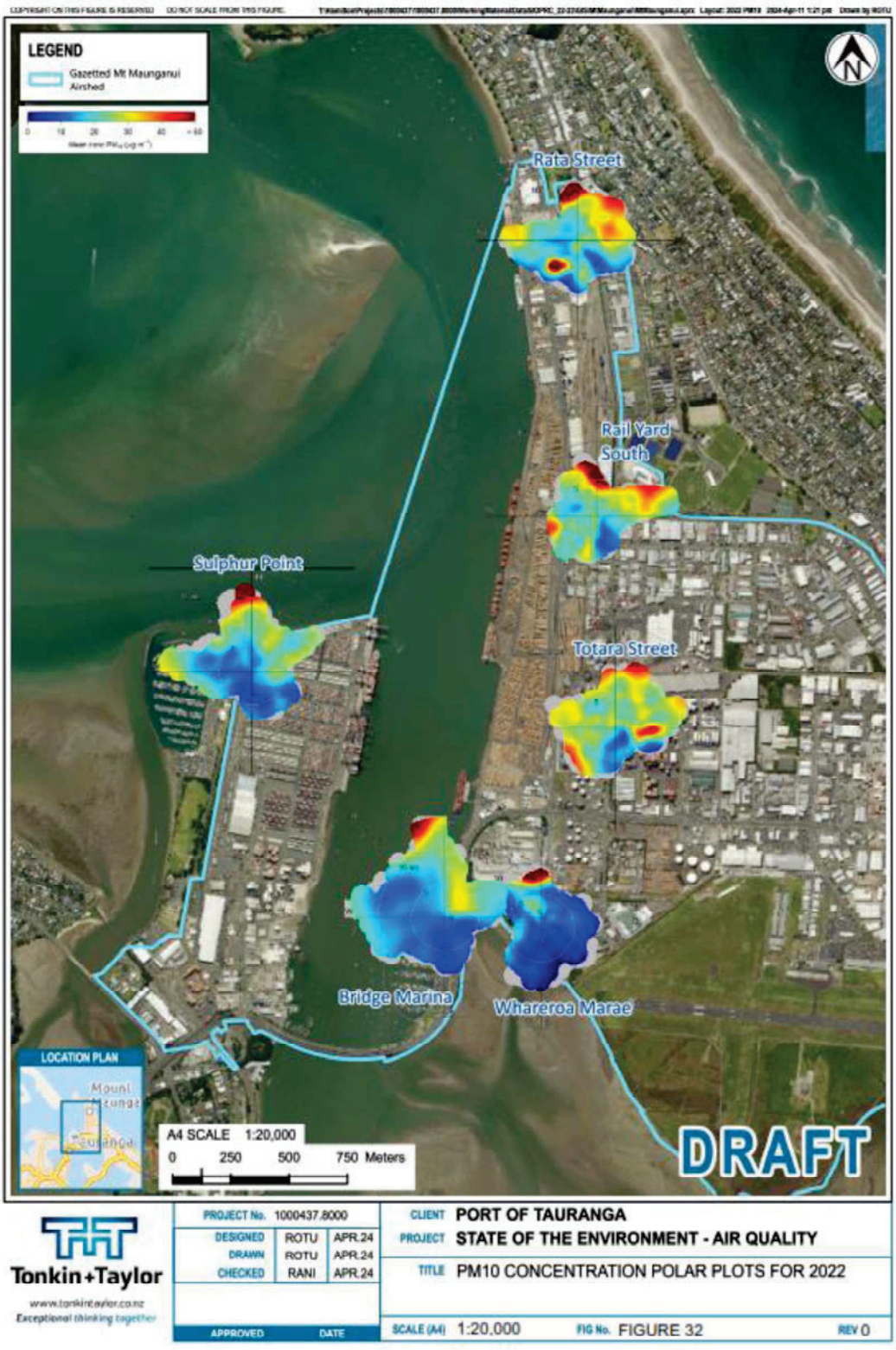

Figure 31: Polar Plots of Mean PM_{10} Air Quality from Reference Monitors for 2022

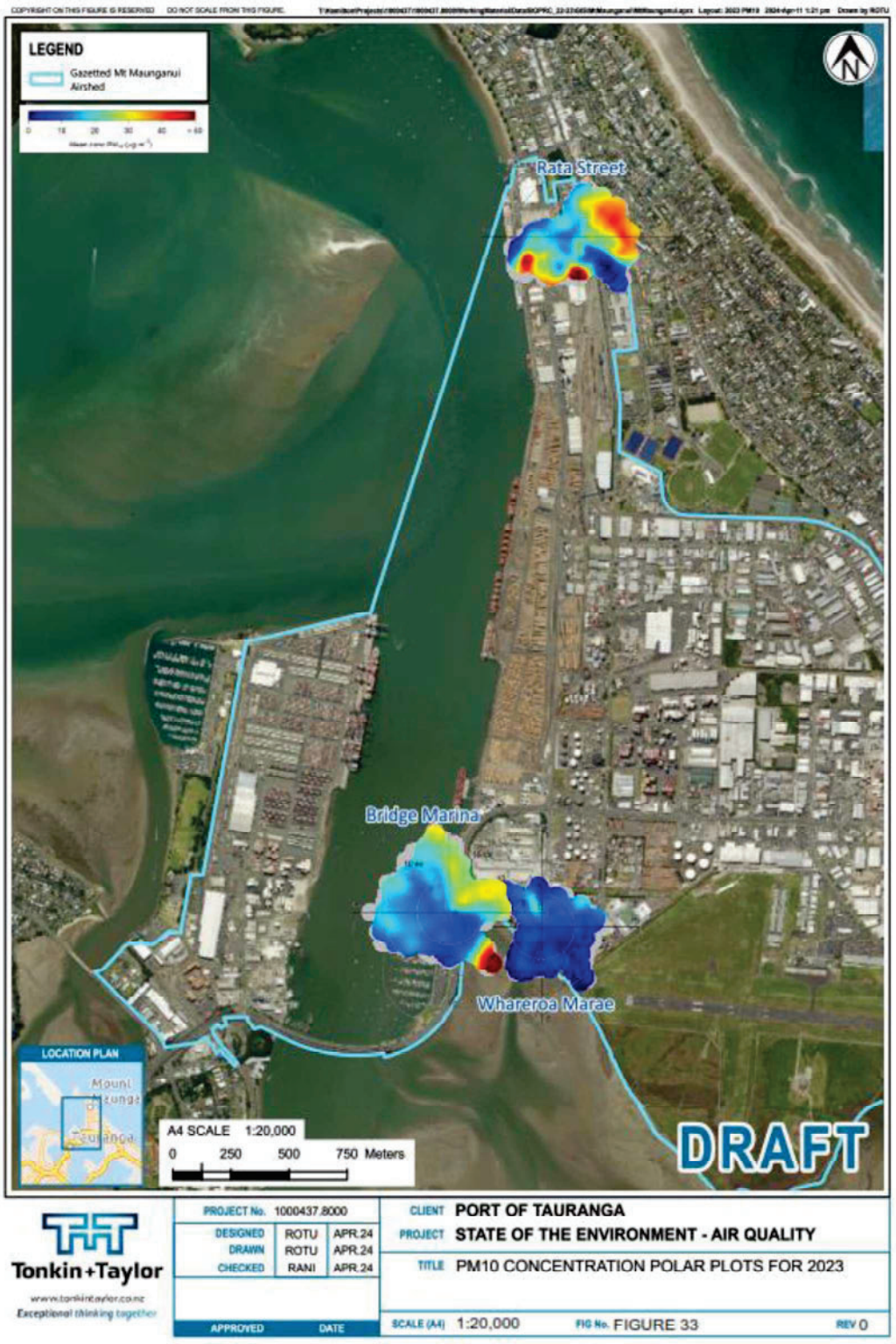

Figure 32: Polar Plots of Mean PM_{10} Air Quality from Reference Monitors for 2023

Table 17: Number of Exceedances of NESAQ PM_{10} Threshold Concentration of 50 µg/m³ (24-hour average)

Year	2019	2020	2021	2022	2023
Rata Street	0	2	1	1	1
Rail Yard South	16	5	1	0	-[c]
Sulphur Point	0	0	0	0	0[d]
Totara Street	1	0	1	1	0[d]
Bridge Marina	0	0	0	1	0
Whareroa Marae	0	1	0	0	0
De Havilland Way	3	0	0	0	1[d]
Site Exceedances	20	8	3	2	2
Total Exceedances[b]	19	7	3	1	2

a. Excludes exceptional events approved by the Minister (6 Dec 2019 – all sites, 9-10 Jun 2021 Rata St, 21 April 2022 Rata St and Tauranga Bridge Marina, 18-19 August 2022 five sites: De Havilland Way, Bridge Marina, Railyard South, Rata St, Totara St, 19 April 2023 Rata St).

b. Where an exceedance occurs at more than one site on the same day, this is recorded as a single exceedance for the purpose of the NESAQ.

c. Monitoring ended on 27 January 2023

d. Monitoring ended on 1 August 2023

7.5.2.2 Low Cost Sensor Monitoring

As discussed in Section 7.3.1, the BOPRC operates a network of "low cost" sensors, which measure concentrations of PM_{10}, $PM_{2.5}$ and NO_2 using non reference methods. This data is made available to the community in the form of an "Air Quality Index", which is reported as a unitless number. The BOPRC does not make the raw data from the low cost sensors publicly accessible as the measured concentrations of pollutants from the low cost sensors cannot be directly compared with air quality standards and guidelines.

Notwithstanding the limitations in accuracy of the low cost sensors, the data can be used to help understand temporal or spatial patterns or trends. To illustrate how the low cost sensor data could be used to help understand the nature of sources influencing air quality at the senor locations, polar plots for mean and maximum 10-minute PM_{10} are presented in Figure 33 and Figure 34. Similar plots could be prepared for $PM_{2.5}$ and NO_2.

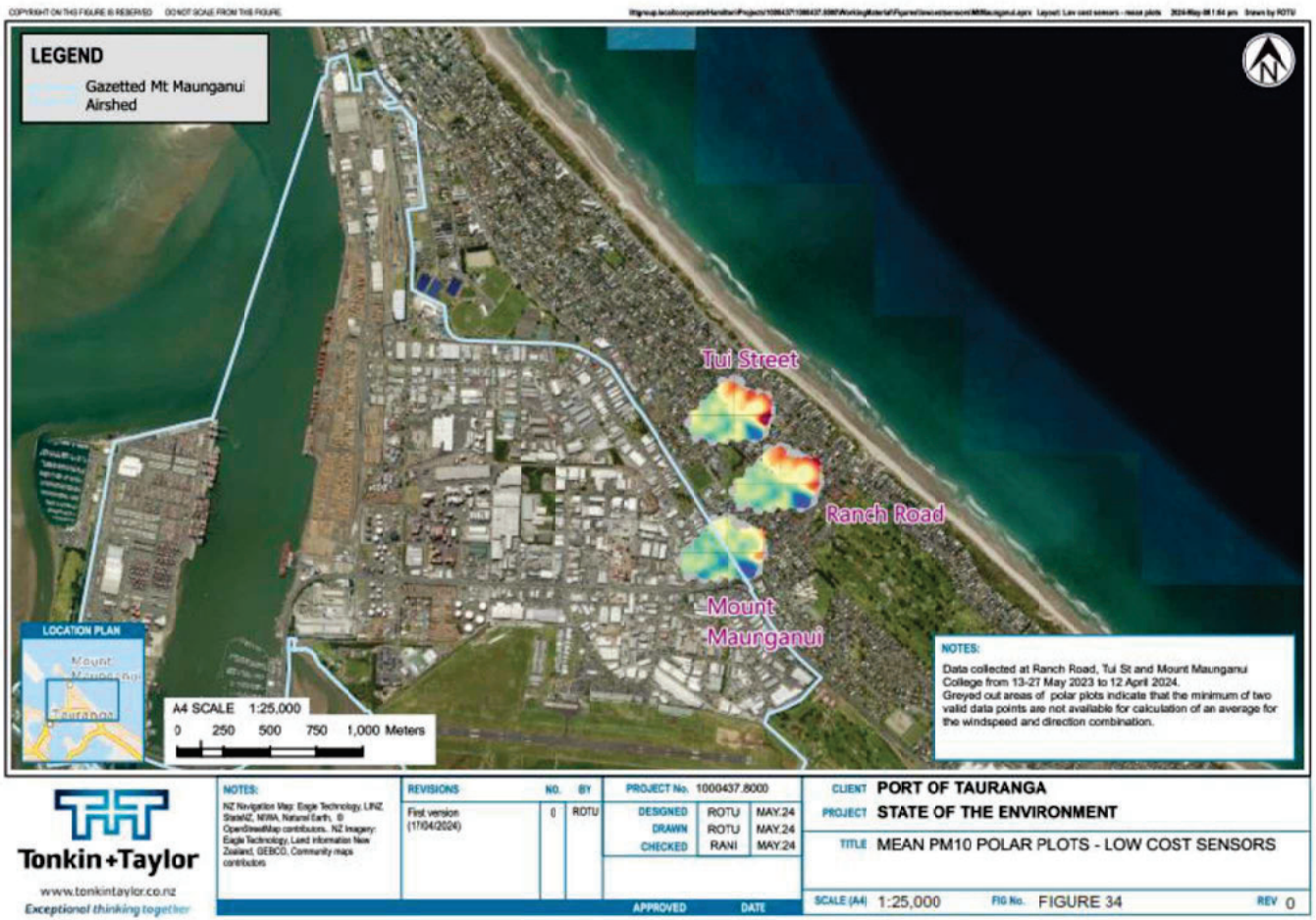

Figure 33: Polar Plots of Mean PM_{10} Air Quality from Low Cost Sensor Data

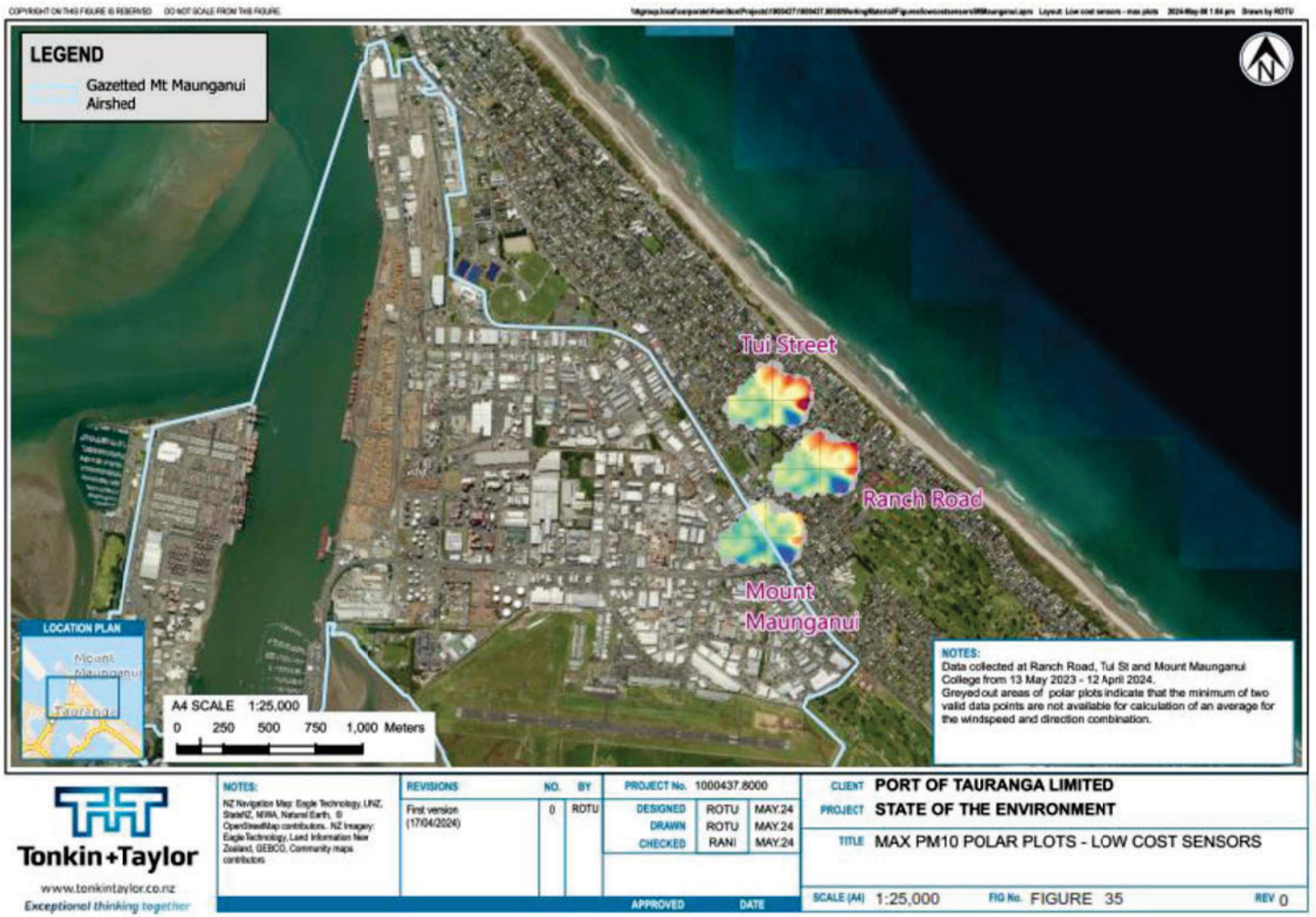

Figure 34: Polar Plots of Maximum PM_{10} Air Quality from Low Cost Sensor Data

7.5.3 $PM_{2.5}$ Air Quality

$PM_{2.5}$ air quality at Totara Street is summarised and compared against relevant air quality standards and guidelines in Table 18 and Figure 36 to Figure 37. $PM_{2.5}$ air quality monitoring has only recently started at Whareroa Marae and Ranch Rd and there is insufficient data to compare results with air quality standards or guidelines.

Table 18: $PM_{2.5}$ Air Quality at Totara Street

Averaging period	Year	$PM_{2.5}$ concentration (µg/m³)	
		Totara Street	Assessment criterion
Annual average	2019	8.0	10 (Proposed NESAQ) 5 (WHO 2021)
	2020	6.2	
	2021	6.3	
	2022	6.5	
	2023	Insufficient	
Maximum 24-hour average	2019	21.6	25 (Proposed NESAQ)
	2020	16.8	
	2021	16.1	
	2022	18.5	
	2023	10.8[a]	
Fourth highest 24-hour average	2019	15.4	15 (WHO 2021)
	2020	13.1	
	2021	11.3	
	2022	11.5	
	2023	10.0[a]	

a. Monitoring ended on 1 August 2023

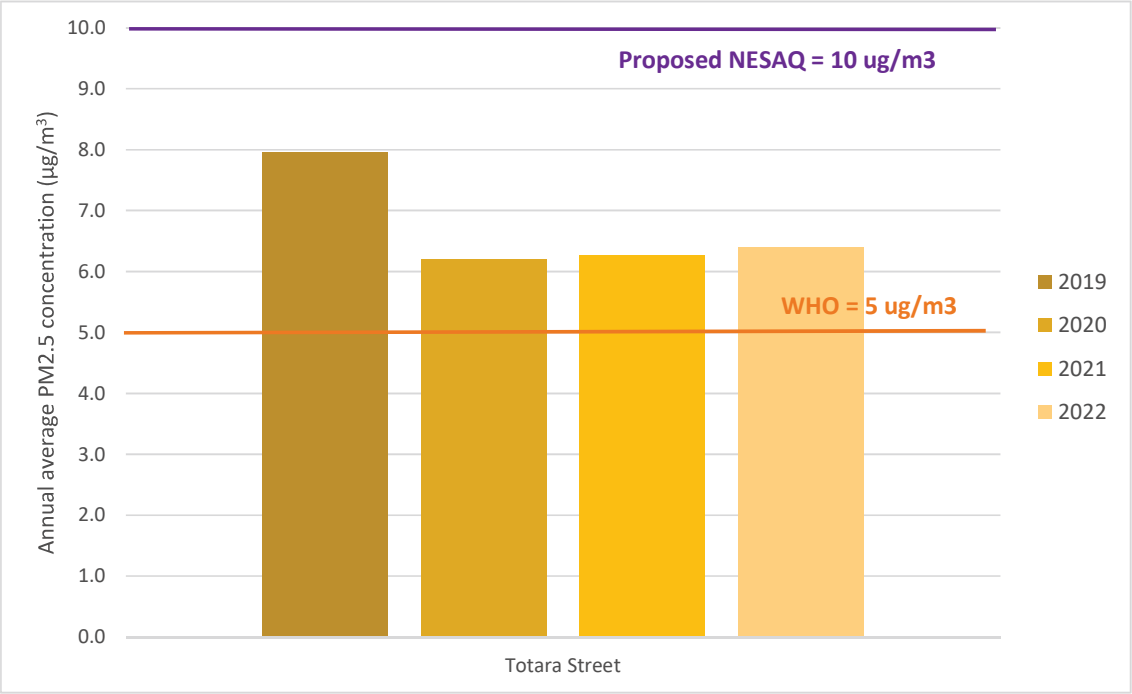

Figure 35: Annual Average $PM_{2.5}$ Air Quality

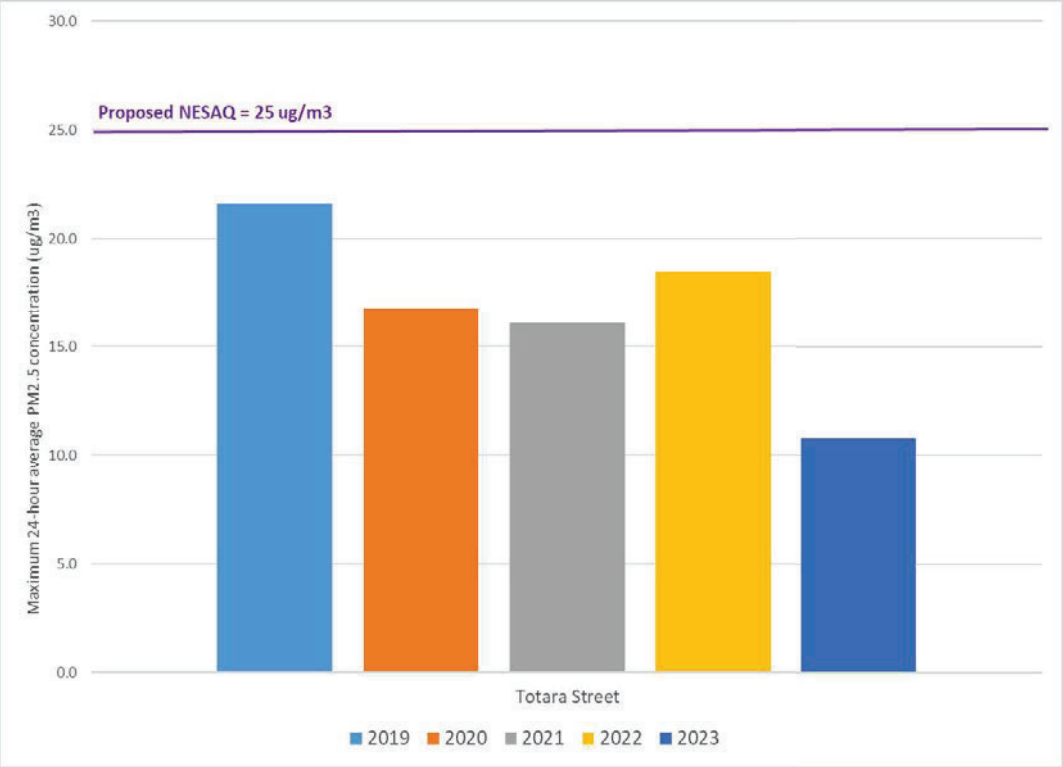

Figure 36: Maximum 24-hour Average $PM_{2.5}$ Air Quality (for Comparison with Proposed NESAQ)

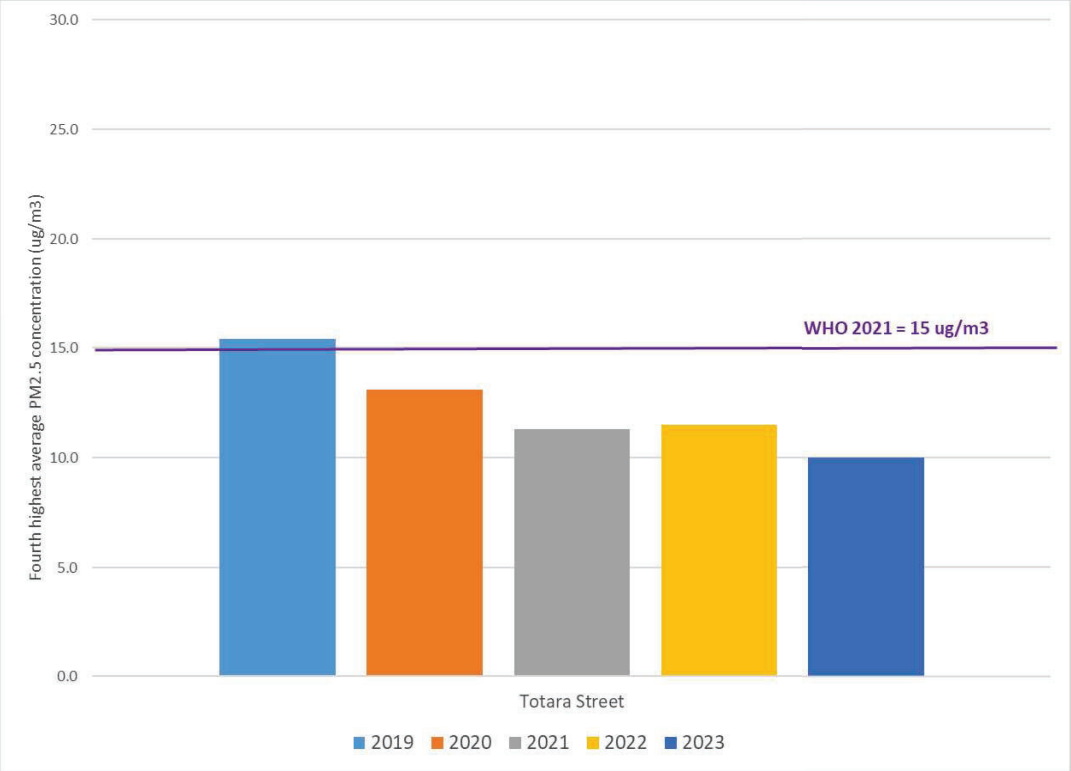

Figure 37: Fourth Highest 24-hour Average $PM_{2.5}$ Air Quality (for Comparison with WHO 2021 Air Quality Guideline)

7.5.4 SO_2 Air Quality

SO_2 air quality is summarised and compared against relevant air quality standards and guidelines for 24-hour and 1-hour average air quality inTable Table 19 and Figure 38 to Figure 40.

Table 19: SO_2 Air Quality at BOPRC Monitoring Sites

Averaging period	Year	SO_2 concentration (µg/m³)						
		Rata Street	Rail Yard South	Sulphur Point	Totara Street	Tauranga Bridge Marina	Whareroa Marae	Standard/guideline
Annual average	2016	-	-	-	11.4	-	13.0	No criterion
	2017	-	-	-	9.8	5.8	10.7	
	2018	-	-	-	13.6	7.0	10.2	
	2019	19.2	22.6	6.2	15.6	6.7	9.6	
	2020	3.5	4.1	3.0	5.0	3.8	5.5	
	2021	3.3	3.6	2.8	4.8	3.9	5.4	
	2022	4.1	3.2	3.7	5.5	3.5	4.9	
	2023	3.7	Insufficient	Insufficient	4.8	2.1	2.6	
Maximum 24-hour average	2016	-	-	-	70.6	-	74.4	120 (AAQG)
	2017	-	-	-	43.2	34.4	62.2	
	2018	-	-	-	50.6	41.5	71.3	
	2019	140.2	92.1	93.2	54.3	43.8	48.8	
	2020	15.8	17.1	23.9	19.3	53.7	53.8	
	2021	15.0	12.4	38.9	26.2	36.3	41.9	
	2022	20.4	12.8	25.6	29.2	28.2	43.1	
	2023	17.8	Insufficient	19.5[c]	18.8	21.4	16.8	
Fourth highest 24-hour average	2016	-	-	-	43.9	-	67.3	40 (WHO 2021)
	2017	-	-	-	39.0	23.0	44.0	
	2018	-	-	-	42.5	27.8	49.0	
	2019	95.8	73.3	61.4	39.5	34.6	43.1	
	2020	13.2	12.7	18.5	14.9	30.6	28.0	
	2021	13.0	10.8	19.1	13.6	24.3	24.2	
	2022	17.3	10.0	19.2	19.2	17.1	25.0	
	2023	13.5	Insufficient	14.0[c]	14.1	14.2	15.0	
Maximum hourly average	2016	-	-	-	254.6[b]	-	750.6	350 (NESAQ)
	2017	-	-	-	129.1	136.7	279.8	
	2018	-	-	-	172.8	126.6	253.8	
	2019	574.9	226.0	208.3	166.6	157.5	206.3	
	2020	57.5	68.3	100.2	63.9	161.2	250.6	
	2021	63.0	38.1	96.3	60.1	122.2[a]	118.2	
	2022	110.7	58.1	79.8	66.7	75.6	204.0	
	2023	90.1	Insufficient	44.5[c]	53.4	101.3	285.6	

Averaging period	Year	SO_2 concentration (µg/m³)						
		Rata Street	Rail Yard South	Sulphur Point	Totara Street	Tauranga Bridge Marina	Whareroa Marae	Standard/guideline

a The highest 1-hour average concentration at Tauranga Bridge Marina in 2021 was 311.7 µg/m³. This value has not been included as it is a clear outlier (more than double the second highest concentration). The second highest 1-hour average concentration is presented in this table

b Published data in BOPRC, 2023 shows a maximum hourly average concentration of 254.6 µg/m³. However, data downloaded from the BOPRC Environmental Data Portal gives a maximum hourly average concentration of 206.6 µg/m³.

c Monitoring ended on 1 August 2023.

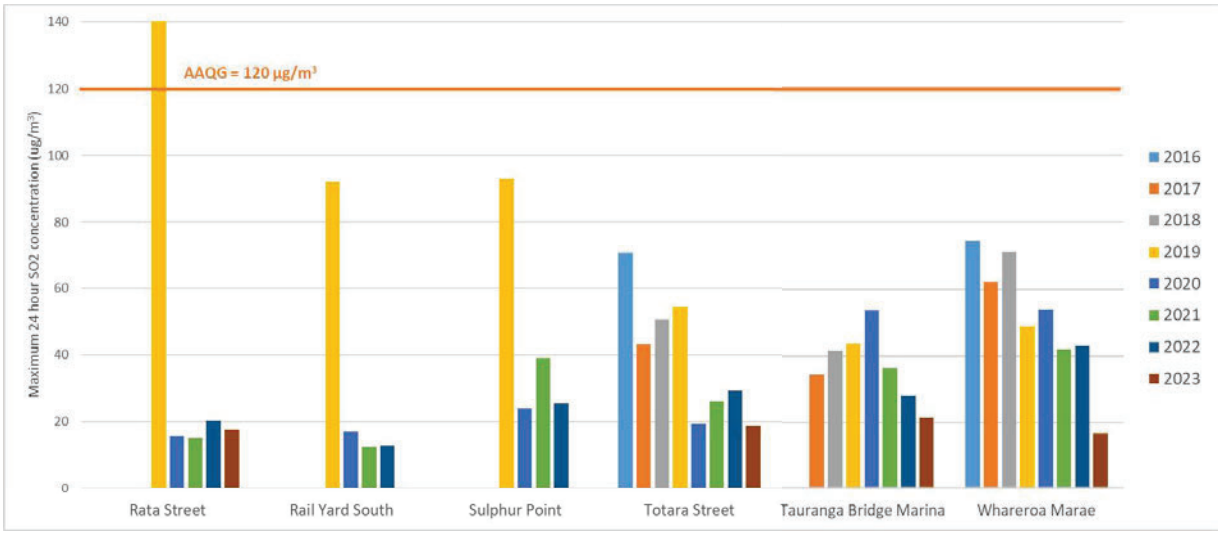

Figure 38: Maximum 24-hour Average SO_2 Air Quality (for Comparison with AAQG)

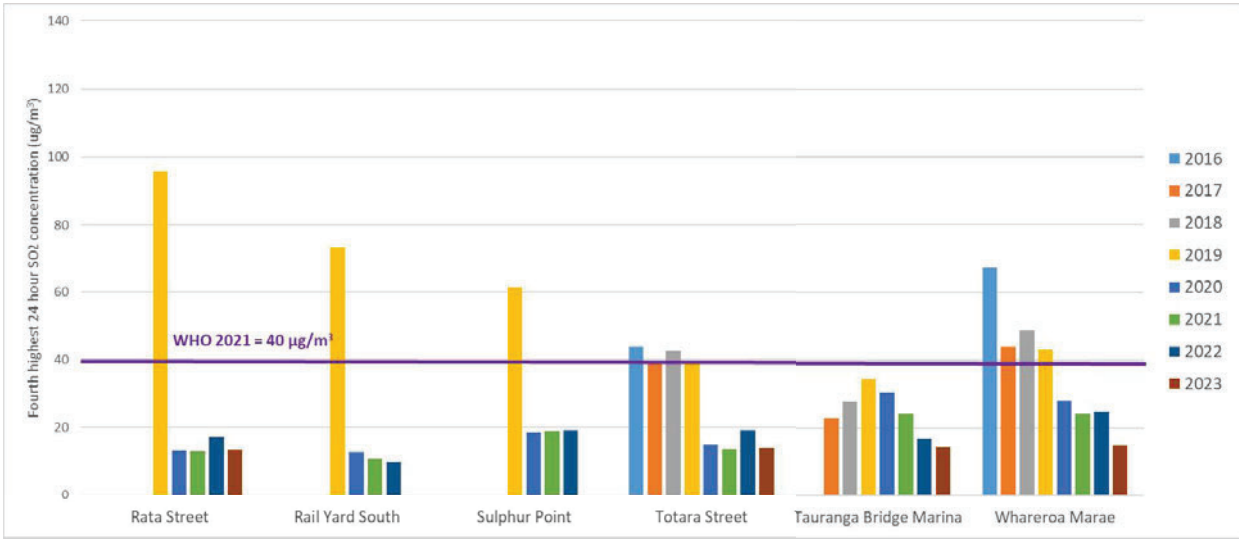

Figure 39: Fourth Highest 24-hour Average SO_2 Air Quality (for Comparison with WHO 2021 Air Quality Guideline)

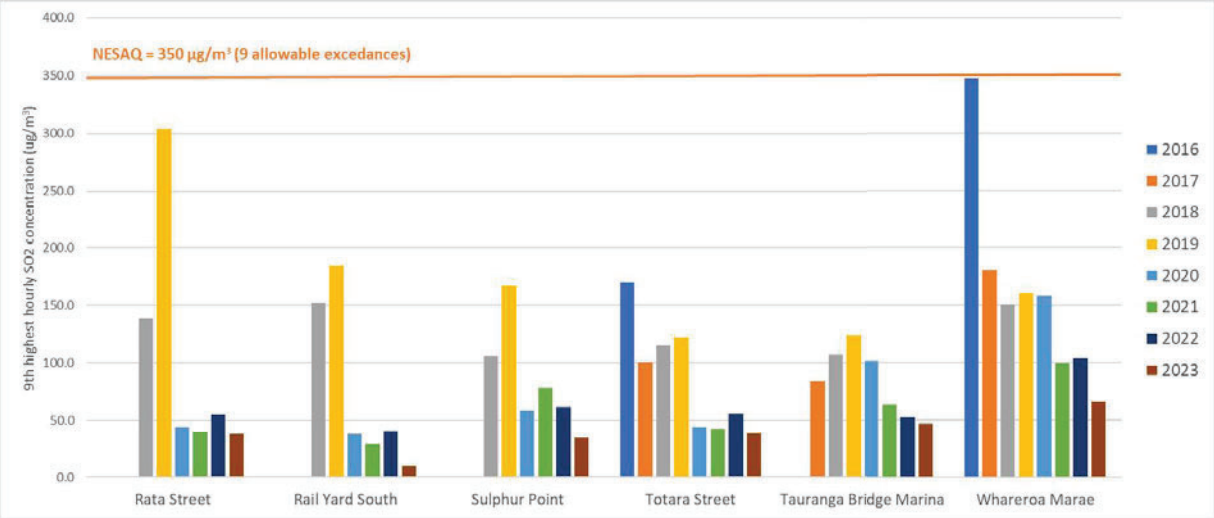

Figure 40: Ninth Highest 1-hour Average SO_2 Air Quality (for Comparison with NESAQ)

7.5.5 NO_2 Air Quality

NO_2 air quality monitoring commenced in November 2023 at Whareroa Marae. As there is less than one years' data, the monitoring results should not be directly compared to air quality standards and guidelines. However, key summary statistics for the available data are presented in Table 20 and a polar plot is presented in Figure 41.

Table 20: NO_2 Air Quality at Whareroa Marae (1 November 2023 – 31 March 2024)

Averaging period	NO_2 concentration (µg/m³)	Standard/guideline (µg/m³)
Maximum 1-hour average	37.2	200 (NESAQ)
Maximum 24-hour average	25.2	100 (AAQG) 25 (WHO 2021)[b]
Average over all hours	7.7	40 (AAQG) 10 (WHO 2021)
Count of days	209 (57% of year)[a]	

a BOPRC datasets start in August 2023 for 24 hr NO_2 concentrations and November 2023 for 1-hour NO_2 concentrations

b The WHO 2021 guidelines apply to the 99th percentile and therefore allow 3 to 4 exceedances per year

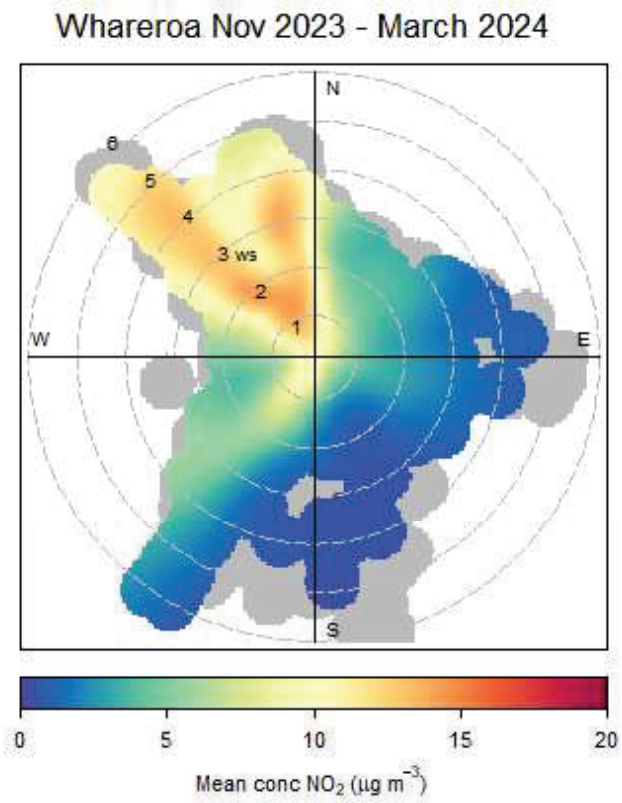

Figure 41: Polar Plot of Mean 1-hour NO_2 Air Quality at Whareroa Marae (November 2023 - March 2024)

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A

Appendix A – Water Quality Guidelines

Table 19. ETI Classifications

ETI Classifications
Intermittently closed/open lakes and lagoons estuaries (ICOLLs)
Shallow intertidal dominated estuaries (SIDEs)
Shallow, short residence time tidal river and tidal river with adjoining lagoon estuaries (SSRTREs)
Deeper subtidal dominated, longer residence time estuaries (DSDEs)

Table 20. ETI classifications for Tauranga Harbour.

	NZCHS code	NZCHS class	ETI class
Tauranga Harbour	8	Shallow drowned valley	SIDE

Table 21. Interim rating thresholds for phytoplankton chlorophyll-a concentrations in NZ estuaries (B. M. Robertson, et al., 2016).

Band	A	B	C	D
Ecological Quality	Ecological communities are healthy and resilient.	Ecological communities are slightly impacted by additional phytoplankton growth arising from nutrients levels that are elevated	Ecological communities are moderately impacted by phytoplankton biomass elevated well above natural conditions. Reduced water clarity likely to affect habitat available for native macrophytes	Excessive algal growth making ecological communities at high risk of undergoing a regime shift to a persistent, degraded state without macrophyte/seagrass cover.
Euhaline Estuaries	<3 mg/m^3	3 – 8 mg/m^3	>8 – 12 mg/m^3	>12 mg/m^3

Table 22. Marine water quality guidelines.

Parameter	Unit	ANZG (2018)	ANZECC (2000)	MfE and MoH (2003)
Chlorophyll a (CHLa)	mg/L	-	0.004[1]	
Dissolved Oxygen (DO)	mg/L	-	-	-

Parameter	Unit	ANZG (2018)	ANZECC (2000)	MfE and MoH (2003)
Conductivity	Us/cm	-	-	-
Dissolved Oxygen (DO)	%	-	80/110 (min/max)[1]	-
Dissolved Reactive Phosphorus (DRP)	mg/L	-	0.005[1]	-
Enterococci (Ent)	cfu/100mL	-	-	No single sample > 140[3]
Escherichia Coli (E. coli)	cfu/100mL	-	-	-
Faecal Coliforms (FC)	cfu/100mL	-	-	-
Ammoniacal Nitrogen (NH_4-N)	mg/L	0.91[2]	-	-
Nitrate Nitrite Nitrogen (NNN)	mg/L	-	0.015[1]	-
Nitrite Nitrogen (NO_2-N)	mg/L	-	-	-
Nitrate Nitrogen (NO_3-N)	mg/L	-	-	-
Salinity	ppt	-	-	-
Total Nitrogen (TN)	mg/L	-	0.30[1]	-
Total Phosphorus (TP)	mg/L	-	0.030[1]	-
Total Suspended Solids (TSS)	mg/L	-	-	-
Turbidity	NTU	-	10[1]	-
Arsenic (As)	µg/L	-	-	-
Copper (Cu)	µg/L	-	1.3[4]	-
Lead (Pb)	µg/L	-	4.4[4]	-
Zinc (Zn)	µg/L	-	8.0[4]	-
Nickel (Ni)	µg/L	-	70[4]	-
Mercury (Hg)	µg/L	-	0.4[4]	-

Parameter	Unit	ANZG (2018)	ANZECC (2000)	MfE and MoH (2003)
Cadmium (Cd)	µg/L	-	5.5[4]	-
Chromium (Cr)	µg/L	-	4.4[4]	-
Total Petroleum Hydrocarbons (TPH)	mg/L	-	-	-

[1]Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems.

[2]Toxicity trigger value for protection of 95% species measured as (NH_3-N) at pH 8.

[3]Acceptable/Green Mode for Marine Waters: No single sample greater than 140 Enterococci /100 mL.

[4]Toxicity trigger value for protection of 95% species.

B

Appendix B – Stormwater Quality Consent Conditions and Monitoring

Appendix B – Stormwater Quality Monitoring

Tauranga City Council

Stormwater quality monitoring data was provided by TCC for eleven monitoring locations within the Port of Tauranga (as shown in Figure 1). It should be noted that monitoring locations Portside/ Te Maire New Southern, Mid Southern, and True Southern are in the same location as the stormwater quality samples are collected from a triple barrel outlet. The stormwater samples are collected after rainfall events and are monitored for 20 parameters, including NH_4-N, As, Cd, Cr, Pb, COD, conductivity, Cu, Hg, Zn, DO (mg/L), *E. coli*, Ni, NO_3-N, NO_2-N, PAH, pH, salinity, TSS, and temperature.

Port of Tauranga Sulphur Point

POTL monitor two stormwater monitoring locations at their Sulphur Point site, the 'East Road outlet' and the 'Pond Site'. Sampling occurs at least twice annually at each location (with the aim of collecting five samples at each site per year). Samples are collected using an automated sampler. Ideally, at least three consecutive days without significant rainfall should precede the sampled rainfall event. Significant rainfall is defined as any precipitation likely to result in stormwater runoff into POTL owned stormwater infrastructure.

Five to seven samples are collected during each rain event and each individual sample are amalgamated. The composite samples are monitored for 20 parameters, including pH, turbidity, TSS, TPH, and for total and dissolved As, Cu, Lead, Zn, Ni, Hg, Cd, and Cr. Additionally, each sample is individually analysed for TSS and turbidity.

Port of Tauranga Mount Maunganui Wharves

POTL undertook a two-year interim stormwater monitoring period (2020 to 2021) to assess and review the TSS trigger values as required in resource consent RM18-0005. A summary of the review and assessment of the interim monitoring period is provided in Section 3.1.3. Condition 7.1 of the consent (RM18-0005) requires POTL to undertake long term discharge and receiving environment monitoring in accordance with the most recently approved Port of Tauranga Stormwater Monitoring Plan (Port of Tauranga Ltd, 2023).

The following monitoring plan applies to the two-year interim monitoring period (2020 to 2021) and the long-term monitoring plan (which commenced immediately after the completion of the two-year interim monitoring period). POTL collects stormwater quality samples at three monitoring locations at their Mount Maunganui Wharves site. Samples are collected using automated samplers. There is one monitoring location upstream of the stormwater discharge and two monitoring locations at the discharge sites. Automated sampling commences upon detection of a minimum of 5 mm of rainfall within a 90-minute timeframe, triggered by a rain tipper gauge integrated with the sampler. There are three monitoring sites, one in the P9 catchment and two in the P10 catchment. The P9 catchment is approximately 101,706 m^2 with 75% of the catchment used as log storage areas. The PC10 catchment is approximately 26,405 m^2 and 72% of the catchment is used for log storage and 17% is made up of the Tasman Quay roadway which is a main throughfare for port heavy traffic.

Stormwater quality samples are amalgamated, and composite samples are analysed for pH, TPH, Cu, Pb, Zn, Ni, Hg, Cd, Cr, COD, TOC, VSS, and absorbance at 340nm and 440nm. Additionally, individual samples are analysed for TSS concentrations. Receiving water quality samples are collected at the same time as stormwater quality samples. Receiving water quality samples will undergo analysis for Cu, Pb, Zn, Ni, Hg, Cd, Cr, Cl, TSS, TPH, and pH, conducted simultaneously with stormwater sampling (receiving water quality locations are listed in Table 1).

The monitoring locations included, and the monitoring periods are listed in Table 1 and are shown in Figure 1.

Figure 1. Stormwater quality monitoring locations in relation to the Port Zone.

Table 1. Stormwater monitoring locations and monitoring periods

Stormwater Monitoring Location	Monitoring Period
Tauranga City Council Monitoring Locations	
Totara Street (SW1)	12/09/2013 to 20/09/2023
Existing northern (SW2)	10/06/2013 to 19/12/2023
Portside/Te Maire new southern (SW3)	08/07/2015 to 14/12/2023
Mid southern (SW4)	08/07/2015 to 16/01/2024
True southern (SW5)	23/06/2016 to 05/09/2023
Hewletts Road North (SW6)	14/07/2016 to 15/012024
Hewletts Road South (SW7)	07/08/2020 to 15/01/2024
Den Place (SW8)	25/09/2013 to 06/11/2023
Cross Road East (SW9)	14/08/2018 to 6/11/2023
Cross Road West (SW10)	14/08/2018 to 06/11/2023
Reid Place (SW11)	14/08/2018 to 06/11/2023
Port of Tauranga Sulphur Point Monitoring Locations	
East Road Outlet (SW12)	16/03/2018 to 3/03/2024
Pond Site (SW13)	16/03/2018 to 3/03/2024
Port of Tauranga Stormwater Mount Maunganui Wharves Monitoring Locations	
P9-B (SW15)	1/06/2020 to 15/01/2024
PC10-A (SW16)	18/06/2020 to 15/01/2024
PC10-B (SW17)	18/06/2020 to 15/01/2024

Harbour Water Quality Analysis Methodology

Ten years' worth of data (2014 to 2024) was provided by BOPRC for five monitoring locations within Tauranga Harbour. However, as stated in Section 3.3.1, due to the sampling time change which came into effect in July 2015 only data from this point onwards has been included in the data analysis.

A 5 and 8-year analysis of the datasets was undertaken for the BOPRC monitoring locations. The 5-year minimum, maximum, median, and 95th percentile values for each parameter at each monitoring location was compared against ANZG (2018) and ANZECC (2000) guideline values, where applicable. A summary of the data

analysis is presented in Figure 1. This analysis was undertaken to provide an indication of the current state of each of the water quality attributes assessed and it is considered a 5-year period is appropriate for this analysis.

To determine any trends in water quality attributes, the longer 8-year data period was statistically analysed using the Mann-Kendall test[1]. The Mann-Kendall test is used to evaluate whether a given dataset exhibits a significant increasing or decreasing trend over time. It is specifically designed to determine the presence of a statistically significant trend, without providing information about the magnitude of change. The trend analysis output was classified into three categories: 'Increasing', 'Decreasing', and 'Indeterminate'. A trend was classified as 'Indeterminate' when there was insufficient statistical evidence of a significant trend at the specified level of significance (using a p-value of 0.05). In the context of the final reporting, the terms 'Increasing', 'Decreasing', and 'Indeterminate' were interpreted and expressed as 'Improving', 'Worsening', or 'Uncertain', depending on their respective implications for environmental conditions. For example, an increasing trend in a parameter such as Total Nitrogen (TN) is considered a degradation, while an increasing trend in clarity is regarded as an improvement. Table 2 shows the results of the Mann-Kendall statistical analysis.

Box and whisker plots were used to summarise 8-year water quality data at each site, the use of box plots allows a visual representation of data distribution across multiple monitoring locations. The boxes show the range between the 25th and 75th percentiles, and the horizontal line inside represents the median concentration. The whiskers indicate the range from the 5^{th} to the 95^{th} percentile value.

POTL provided two years of water quality data for monitoring locations 6 to 9 (Te Awanui Harbour at North Bridge Marina to Te Awanui Harbour at No. 6 marker). Due the limited number of samples collected during this period (9 samples), it is more appropriate to compare the minimum, maximum, and average concentrations against ANZECC (2000) standards. Moreover, due to the small dataset, no statistical analysis will be performed for these monitoring sites.

Although monitoring locations 10 to 12 (70 m from discharge to North of Bridge Marina) are sampled in the receiving environment due to the differences in sampling methodology and a limited dataset concentrations of individual water quality samples collected at these sites will be assessed in accordance with the applicable consent limits. This includes comparing applicable parameters concentrations from individual water samples against ANZECC (2000) guideline values.

Stormwater Quality Analysis Methodology

Stormwater data from 17 monitoring locations was supplied by TCC and POTL, monitoring location names and monitoring periods are provided in Table 1. Both TCC and POT compare their stormwater monitoring findings against relevant consent conditions (refer to Section 3.2.2), highlighting any samples exceeding their respective guideline limits after each sampling event. An assessment of total number of exceedances for each monitoring year (from 2018 to 2024) where applicable, was undertaken and is provided in **Appendix A.**

It is important to note that the stormwater monitoring locations are not situated in the receiving environment (Tauranga Harbour). As a result, it is expected that these locations may exhibit higher concentrations of pollutants compared to the standards outlined in ANZECC (2000) and the concentrations recorded at the receiving environment monitoring locations (listed in Section 3.2.1). Therefore, making direct comparisons between the harbour water quality monitoring results and ANZECC (2000) would not be appropriate in this context and concentrations will only be compared against relevant consent condition

[1] **Statistical Software: ProUCL 5.2 for Environmental Applications for Data Sets with and without Nondetect Observations.**

C

Appendix C – Stormwater Compliance Assessment

Table 24. Number of exceedances of relative consent conditions

Parameters	Monitoring Period	10	11	12	TCC1	TCC2	TCC3	TCC4	TCC5	TCC6	TCC7	TCC8	TCC9	TCC10	TCC11	PTL12	PTL13	PTL14	PTL15	PTL16
NN_4-N	2018	-	-	-	0	4	0	6	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	4	1	6	0	-	-	-	0	0	-	-	-	-	-	-
	2020	-	-	-	0	2	0	4	0	0	0	-	0	0	-	-	-	-	-	-
	2021	-	-	-	0	3	0	4	0	0	0	0	0	0	0	-	-	-	-	-
	2022	-	-	-	0	4	0	2	0	0	0	0	0	0	0	-	-	-	-	-
	2023	-	-	-	0	4	0	0	2	0	0	0	0	0	0	-	-	-	-	-
	2024	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-
As (ug/L)	2018	-	-	-	0	0	0	0	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	0	0	0	0	-	-	-	0	0	-	-	-	-	-	-
	2020	-	-	-	0	0	0	0	0	0	0	-	0	0	-	-	-	-	-	-
	2021	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
	2022	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
	2023	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-
Cd	2018	-	-	-	0	0	0	0	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	0	0	0	0	-	-	-	0	0	-	-	-	-	-	-
	2020	0	0	0	0	0	0	0	0	0	0	-	0	0	-	-	-	0	0	0
	2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	-	0
	2022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2023	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	0
Cr	2018	-	-	-	0	0	0	0	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	0	0	0	0	-	-	-	0	0	-	-	-	-	-	-
	2020	0	0	0	0	0	0	0	0	0	0	-	0	0	-	-	-	0	0	0

Parameters	Monitoring Period	10	11	12	TCC1	TCC2	TCC3	TCC4	TCC5	TCC6	TCC7	TCC8	TCC9	TCC10	TCC11	PTL12	PTL13	PTL14	PTL15	PTL16
	2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	-	0
	2022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2023	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2024	-	-	-	-	-	-			0	0	-	-	-	-	-	-	0	0	0
COD	2018	-	-	-	0	0	0	0	2	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	1	0	0	1	-	-	-	0	0	-	-	-	-	-	-
	2020	-	-	-	0	0	0	0	-	0	0	-	0	0	-	-	-	-	0	0
	2021	-	-	-	0	1	0	0	0	0	0	0	0	0	0	-	-	-	-	0
	2022	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	-	0	0
	2023	-	-	-	0	0	0	0	1	0	0	0	0	0	0	-	-	-	0	0
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	0	0
Cu	2018	-	-	-	2	2	0	2	2	-	-	-	1	1	1	-	-	-	-	-
	2019	-	-	-	1	2	0	2	1	-	-	-	1	1	-	-	-	-	-	-
	2020	0	0	0	0	0	0	1	-	1	1	-	1	1	-	-	-	0	0	0
	2021	0	0	0	1	1	1	1	2	2	2	2	2	3	2	-	-	0	-	0
	2022	0	0	0	1	0	0	1	1	1	1	0	0	0	0	-	-	0	0	0
	2023	-	-	-	1	0	0	1	2	1	1	1	1	1	0	-	-	0	0	0
	2024	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	0	0	0
E. coli	2018	-	-	-	2	2	0	2	1	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	1	2	1	2	0	-	-	-	0	0	-	-	-	-	-	-
	2020	-	-	-	1	1	1	2	-	0	0	-	0	1	-	-	-	-	-	-
	2021	-	-	-	1	1	1	1	2	0	0	0	0	3	0	-	-	-	-	-
	2022	-	-	-	1	1	1	3	0	0	0	0	0	0	0	-	-	-	-	-
	2023	-	-	-	1	0	2	1	0	0	0	0	0	0	0	-	-	-	-	-
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-
Pb	2018	-	-	-	1	0	0	1	1	-	-	-	1	0	1	-	-	-	-	-

Parameters	Monitoring Period	10	11	12	TCC1	TCC2	TCC3	TCC4	TCC5	TCC6	TCC7	TCC8	TCC9	TCC10	TCC11	PTL12	PTL13	PTL14	PTL15	PTL16
	2019	-	-	-	0	0	0	0	0	-	-	-	0	1	-	-	-	-	-	-
	2020	0	0	0	0	0	0	0	-	1	1	-	1	0	-	-	-	0	0	0
	2021	0	0	0	0	0	0	0	1	0	0	2	1	0	2	-	-	0	-	0
	2022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2023	-	-	-	0	0	0	0	1	0	0	0	1	0	0	-	-	0	0	0
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	0
Ni	2018	-	-	-	0	0	0	0	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	0	0	0	0	-	-	-	0	0	-	-	-	-	-	-
	2020	0	0	0	0	0	0	0	-	0	0	-	0	0	-	-	-	0	0	0
	2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	-	0
	2022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2023	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	0
PAH	2018	-	-	-	0	0	0	0	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	0	0	0	0	-	-	-	0	0	-	-	-	-	-	-
	2020	-	-	-	0	0	0	0	-	0	0	-	0	0	-	-	-	-	-	-
	2021	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
	2022	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
	2023	-	-	-	0	0	0	1	0	0	0	0	0	0	0	-	-	-	-	-
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-
pH	2018	-	-	-	0	0	0	0	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	0	0	0	0	-	-	-	0	0	-	-	-	-	-	-
	2020	-	-	-	0	0	0	0	-	0	0	-	0	0	-	-	-	0	0	0
	2021	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	0	-	0
	2022	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2023	-	-	-	0	0	0	0	0	0	0	1	0	0	0	-	-	0	0	0

Parameters	Monitoring Period	10	11	12	TCC1	TCC2	TCC3	TCC4	TCC5	TCC6	TCC7	TCC8	TCC9	TCC10	TCC11	PTL12	PTL13	PTL14	PTL15	PTL16
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	0
TSS	2018	-	-	-	1	0	0	0	2	-	-	-	0	0	0	3	0	-	-	-
	2019	-	-	-	0	1	0	0	1	-	-	-	0	1	-	1	1	-	-	-
	2020	-	-	-	0	0	0	0	-	1	0	-	1	0	-	1	0	0	0	0
	2021	-	-	-	0	0	0	0	0	0	0	0	1	0	0	0	0	0	-	0
	2022	-	-	-	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
	2023	-	-	-	0	0	0	0	1	0	0	0	0	0	0	-	0	0	0	0
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	0	0	0	0	0
Hg	2018	-	-	-	0	0	0	0	0	-	-	-	0	0	0	-	-	-	-	-
	2019	-	-	-	0	1	0	0	0	-	-	-	0	0	-	-	-	-	-	-
	2020	0	0	0	0	0	0	0	-	0	0	-	0	0	-	-	-	0	0	0
	2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	-	0
	2022	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2023	-	-	-	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0
	2024	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	0	0	0
Zn	2018	-	-	-	4	4	2	4	2	-	-	-	1	1	1	-	-	-	-	-
	2019	-	-	-	1	2	2	5	1	-	-	-	1	1	-	-	-	-	-	-
	2020	0	0	0	1	2	2	3	-	1	1	-	1	1	-	-	-	0	0	0
	2021	0	0	0	1	2	1	5	2	2	2	2	2	3	2	-	-	0	-	1
	2022	0	0	0	1	3	1	4	1	1	1	1	1	1	1	-	-	0	0	1
	2023	-	-	-	2	1	0	5	2	1	1	1	2	1	1	-	-	0	0	0
	2024	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	0	0	0

D

Appendix D – Water quality monitoring results for heavy metals and hydrocarbons in Tauranga Harbour

Table 25. Water quality monitoring results for heavy metals and hydrocarbons in Tauranga Harbour.

Monitoring Location		As (ug/L)	Cd (ug/L)	Cr (ug/L)	Cu (ug/L)	Pb (ug/L)	Ni (ug/L)	Zn (ug/L)	TPH (mg/L)
Te Awanui Harbour at North of Bridge Marina (6)	Max	1.20	0.25	0.25	0.10	0.15	0.05	0.20	0.15
	Min	2.10	0.50	0.95	0.47	0.15	0.61	3.70	0.96
	Average	1.63	0.28	0.37	0.25	0.15	0.20	1.78	0.42
Te Awanui Harbour at Middle of channel (7)	Max	1.20	0.25	0.25	0.10	0.15	0.05	0.29	0.15
	Min	2.00	0.50	2.50	1.00	0.50	0.50	5.20	0.45
	Average	1.59	0.28	0.56	0.35	0.19	0.19	2.13	0.33
Te Awanui Harbour at Te Paritaha (8)	Max	1.40	0.25	0.25	0.10	0.15	0.05	0.20	0.15
	Min	1.90	0.50	0.76	0.62	0.38	0.36	5.90	0.40
	Average	1.67	0.28	0.38	0.20	0.18	0.15	1.77	0.31
Te Awanui Harbour at No. 6 marker (9)	Max	1.30	0.25	0.25	0.10	0.15	0.05	0.20	0.15
	Min	2.10	0.50	0.64	0.47	0.98	0.46	2.50	1.30
	Average	1.74	0.33	0.36	0.20	0.28	0.19	1.34	0.57

E

Appendix E – Bay of Plenty Regional Policy Statement (RPS), set 3 page 240 of the RPS

Intactness

2.8 Natural systems are intact and aesthetically coherent and do not display significant visual signs of human modification, intervention or manipulation; visually intact and highly aesthetic natural landscapes.

Expressiveness (Legibility)

2.9 Natural features and landscapes clearly demonstrate the natural processes that formed them. Exceptional examples of natural process in landscape exemplify the particular processes that formed that landscape.

Transient values

2.10 The consistent occurrence of transient features (for example the seasonal flowering of pohutukawa) contributes to the character, qualities and values of the landscape; landscapes are widely recognised for their transient features and the contribution these make to the landscape.

Shared and recognised values

2.11 Natural features and landscapes are widely known and valued by the immediate and wider community for their contribution to a sense of place leading to a strong community association with or high public esteem for the place.

Māori values

2.12 Natural features and landscapes are clearly special or widely known and influenced by their connection to the Māori values inherent in the place.

(Refer also to set 4 - Māori Culture and Traditions criteria).

Historical associations

2.13 Natural features and landscapes are clearly and widely known and influenced by their connection to the historical values inherent in the place.

(Refer also to set 5 - Historic heritage criteria).

Set 3 Indigenous vegetation and habitats of indigenous fauna

Policies CE 9B, EI 5B, GR 1A, GR 4A, IW 2B, IW 5B, MN 1B, MN 2B, MN 3B, MN 7B and MN 8B

Methods 1, 2, 3, 11, 12 and 70

Representativeness

3.1 Indigenous vegetation or habitat of indigenous fauna contains associations of indigenous species representative, typical or characteristic of the natural diversity of the region or any relevant ecological districts.

Rarity or distinctive features

3.2 Indigenous vegetation or habitat of indigenous fauna supports an indigenous species or associations of indigenous species threatened or rare nationally, regionally or within the relevant ecological district.

3.3 Indigenous vegetation or habitat of indigenous fauna can contribute to the maintenance or recovery of a species threatened or rare nationally, regionally or within the relevant ecological district.

3.4 Indigenous vegetation or habitat of indigenous fauna is distinctive, of restricted occurrence, or at the limits of its natural distribution range, or has developed as a result of factors such as natural geothermal activity, historical cultural practices, altitude, water table, or soil type.

3.5 Indigenous vegetation or habitat of indigenous fauna is one of the largest remaining examples of its type within the region or any relevant ecological district.

3.6 Indigenous vegetation or habitat of indigenous fauna is significantly reduced in area and is degraded but retains key natural ecosystem functions (for example hydrology) and has a high potential for restoration.

Diversity and pattern

3.7 Indigenous vegetation or habitat of indigenous fauna contains a high diversity of indigenous ecosystem or habitat types, or changes in species composition, reflecting the existence of

diverse natural features (for example landforms, soil types or hydrology), or communities along an ecological gradient.

Naturalness

3.8 Indigenous vegetation or habitat of indigenous fauna is in a natural state or healthy condition, or is in an original condition.

Ecological context

3.9 Indigenous vegetation or habitat of indigenous fauna contributes to the ecological viability of adjoining natural areas and biological communities, by providing or contributing to an important ecological linkage or network, or providing a buffer from adjacent land uses.

3.10 Indigenous vegetation or habitat of indigenous fauna provides habitat for indigenous species at key stages of their life cycle.

Viability and sustainability

3.11 Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape and has the capacity to maintain its ecological viability over time.

3.12 Indigenous vegetation or habitat of indigenous fauna supports intact habitats and healthy functioning ecosystems.

3.13 Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape to resist changes initiated by external agents.

Māori

3.14 Indigenous vegetation or habitat of indigenous fauna contributes to the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga.

(Refer also to set 4 - Māori Culture and Traditions criteria).

Historical

3.15 Indigenous vegetation or habitat of indigenous fauna is known and valued for its connection to the history of the place.

Community association

3.16 Indigenous vegetation or habitat of indigenous fauna is known and valued by the immediate and wider community for its contribution to a sense of place leading to community association with or public esteem for the place, or due to its value for recreation or education.

3.17 Indigenous vegetation or habitat of indigenous fauna is valued for the contribution it is making to research into the Bay of Plenty's or New Zealand's ecosystems.

Set 4 Māori culture and traditions[8]

Policies EI 5B, IW 2B, IW 5B, MN 1B, MN 3B, MN 7B and MN 8B

Methods 1, 2, 3, 11, 12 and 70

Mauri

4.1 Ko te mauri me te mana o te waahi, te taonga rānei, e ngākaunuitia ana e te Māori.

The mauri (for example life force and life supporting capacity) and mana (for example integrity) of the place or resource holds special significance to Māori.

Waahi Tapu

4.2 Ko tērā waahi, taonga rānei he waahi tapu, arā, he tino whakahirahira ki ngā tikanga Māori, ki ngā puri mahara, me ngā wairua ā te Māori.

The place or resource is a waahi tapu of special, cultural, historic and or spiritual importance to Māori.

Kōrero Tūturu/Historical

4.3 Ko tērā waahi e ngākaunuitia ana e te Māori ki roto i ōna kōrero tūturu.

The place has special historical and cultural significance to Māori.

Rawa Tūturu/Customary resources

[8] In the event of any conflict in meaning between the Māori and the English versions of the Māori culture and traditions criteria, the Māori version shall prevail.

F

Appendix F – Air Quality Classifications of Monitoring Sites

Appendix F - Classification of monitoring sites

Monitoring sites are typically classified according to location as shown in Table 3 (MfE, 2009). The BOPRC does not use this classification approach, however it can provide useful context for air quality monitoring data. For example, it can be useful to understand which sites are classed as "peak" sites, i.e. representative of localised air quality adjacent to specific point or fugitive sources, and which are "neighbourhood" sites, i.e. not directly impacted by specific sources so they are more representative of air quality that people might be exposed to over a wider geographical area.

Recommended site category	Site scale equivalent	Typical area
Traffic	Peak (metres to 10s of metres)	Typically very close to high-traffic-use roads and intersections. Site should be between 2 to 5 m from the roadside.
Industrial	Peak (metres to 10s of metres) or Neighbourhood (10s of metres to 0.5 km)	Peak – close to one large point source or fugitive emissions. Typically used for compliance monitoring. Neighbourhood – with large and varied point source industry emissions and high population density. Such areas may contain heavy commercial and processing industries.
Residential	Peak (metres to 10s of metres) or Neighbourhood (0.5 to 10s of kilometres)	Peak – a monitoring site located somewhere not truly representative (so it is not neighbourhood scale) but does not exactly fit the 'traffic' or 'industrial' peak site descriptions. Neighbourhood – suburban areas in larger cities with a relatively high population density, but not in the immediate vicinity of congested roads or industry. This category also includes residential areas in smaller towns in rural areas.
Special (site description)	Regional (10s to 100s of kilometres)	Airsheds that are distinct in their geographical, meteorological and emissions characteristics. Included are the effects of any point sources or urban plumes on the regional air quality. Could include places where natural emissions are significant (eg, Rotorua), in which case the category would be *Special (Geothermal)*.
	National	National background sites that contribute to the global network; eg, *Special (National)*.

Table 13: Monitoring site classifications and scales (reproduced from MfE, 2009 Table 3)

Using the regime set out in Table 3, most of the monitoring sites in the Mount Maunganui area would be classed as peak or traffic sites as they are close to local point or fugitive sources of air pollutants from industrial sources, including the port, or highly trafficked roads. Air quality measured at these locations is likely to be representative of air quality within a few tens of metres of the monitor. This helps to explain the large variability in the patterns of air pollutant concentrations between the different monitoring sites, which has been identified by BOPRC[1].

Table 4 shows a suggested classification for each of the monitoring sites and also indicates whether there is residential activity within 50 m of the monitor. A distance of 50 m has been considered as, for peak monitoring sites, measured air quality is generally only representative of air quality within a few tens of metres of the monitor.

[1] BOPRC, 2023 p 104.

The Mt Maunganui Library (PoTL) and Ranch Rd (BOPRC EP301713) monitoring sites are considered to be sufficiently separated from specific point or fugitive air pollutant sources to be classified as "neighbourhood" sites, where air quality is likely to be representative of air quality over a wider area (500 m or more from the monitor). PM_{10} monitoring has only recently commenced at these locations (20/12/2023 and 16/3/23, respectively) and there is insufficient monitoring data to include the air quality results in this report.

Table 14: Classification of air quality monitoring locations

Monitoring station name	BOPRC Identifier[2]	Suggested classification	Residential within 50 m
Rata Street	EP102897	Peak industrial	No
Rail Yard South	EP106779	Peak industrial	No
Totara St Rail Crossing	EP11578	Peak industrial	No
Totara Street	EP116688	Traffic	No
Whareroa Marae	EP079602	Peak residential (close to industrial sources)	Yes
Tauranga Bridge Marina	EP045607	Peak industrial	Possible (on boats)
Sulphur Point	DP955711	Neighbourhood industrial	No
De Havilland Way	EP262582	Peak industrial	Yes
Ranch Rd	EP301713	Neighbourhood residential	Yes
Shed 6		Peak industrial	No
Library		Neighbourhood residential	Yes

[2] Identifiers used in BOPRC Environmental Data Portal: https://envdata.boprc.govt.nz/Data

G

Appendix G – Air Quality Standards and Guidelines

Appendix G - Standards and guidelines

1.1.1 Air quality standards and guidelines

The NESAQ includes ambient air quality standards for five air pollutants. The New Zealand ambient air quality guidelines (AAQG) cover a wider range of pollutants and averaging periods.

In February 2020, the Ministry for the Environment released proposed amendments to the NESAQ for public consultation. The amendments included addition of new standards for ambient $PM_{2.5}$ concentrations (as 24-hour and annual averages) equating to the corresponding WHO 2005 Air Quality Guideline values. Given the release of the WHO 2021 air quality guidelines, which are lower, it is unlikely that these proposed $PM_{2.5}$ standards will be adopted, but they are included for completeness.

The New Zealand ambient air quality standards and guidelines for the pollutants shown in Table 1, are presented in Table 5.

Table 15: New Zealand ambient air quality guidelines and standards

	Time average	Concentration ($\mu g/m^3$)	Allowable annual exceedances	Source
Fine particulates (PM_{10})	24-hour	50	1	NESAQ
	Annual	20	N/A	AAQG
Fine particulates ($PM_{2.5}$)	24-hour	25	3	Proposed NESAQ
	Annual	10	N/A	Proposed NESAQ
Sulphur dioxide (SO_2)	1-hour	350	9	NESAQ
	1-hour	570	0	NESAQ
	24-hour	120	N/A	AAQG
Nitrogen dioxide (NO_2)	1-hour	200	9	NESAQ
	24-hour	100	N/A	AAQG

In September 2021 the WHO published updated global ambient air quality guidelines (WHO 2021 guidelines), which are reproduced in Table 6. The WHO 2021 guidelines are intended to be used as science-based recommendations to policymakers at a national or local level for consideration in setting their own standards and frameworks for managing air pollution. The WHO 2021 guidelines are generally lower than the current New Zealand air quality standards and guidelines.

Table 16: WHO 2021 ambient air quality guidelines

Contaminant	Time average	Concentration ($\mu g/m^3$)	Allowable annual exceedances
Fine particulates (PM_{10})	24-hour	45	99th percentile (i.e. 3–4 exceedance days per year)
	Annual	15	
Fine particulates ($PM_{2.5}$)	24-hour	15	99th percentile (i.e. 3–4 exceedance days per year)

	Annual	5	
Sulphur dioxide (SO_2)	24-hour	40	99th percentile (i.e. 3–4 exceedance days per year)
Nitrogen dioxide (NO_2)	24-hour	25	99th percentile (i.e. 3–4 exceedance days per year)
	Annual	10	

1.1.2 Where air quality guidelines and standards apply

Ambient air quality standards and guidelines apply anywhere in the open air where people can be exposed for the relevant averaging period. This is summarised in Table 7, which is taken from Ministry for the Environment guidance (note: annual average standards generally apply at the same locations as 24-hour average standards).

In regard to the locations where air quality monitoring is carried out in the Mount Maunganui area, 24-hour and annual average exposure can occur at the locations identified in Table 4 as being within 50 m of a residential activity.

Averaging period	Locations where assessment against the ambient standards should apply	Locations where assessment against the ambient standards should not apply
1 hour	This includes any outdoor areas where the public might reasonably be expected to spend one hour or longer, including pavements in shopping streets, as well as accessible facades (eg, balconies, terraces).	Any industrial premises that have resource consents (for that pollutant).
8 hours	This includes all outdoor locations where members of the public are likely to be exposed for eight hours as well as the facades of residential properties, schools, hospitals, libraries, etc.	Any industrial premises that have resource consents (for that pollutant). Any location where people are not likely to be exposed for 8 hours – for example roads and footpaths.
24 hours	This includes all outdoor locations where members of the public might reasonably be exposed for 24 hours.	Any industrial premises that have resource consents for that pollutant. Any location where people are not likely to be exposed for 24 hours – for example roads, footpaths and industrial areas where residential use is not allowed.
All		In any enclosed space (ie, not in the open air), including: • indoors • inside tunnels • inside vehicles.

Table 17: Location and applicability of the ambient standards for assessment purposes (reproduced from MfE, 2016 Table 3)

1.1.3 Workplace exposure standards

Exposure to air pollutants within the Port of Tauranga and other industrial sites in the Mount Maunganui area is managed under the Health and Safety at Work Act and related regulations. The Workplace Exposure Standards (WES)[1] are used as a tool to assist in managing the risk associated with exposure to air pollutants in workplaces. The WES apply to personal exposure and not to static measurements of air quality. Compliance with the WES is measured using personal samplers that measure a person's exposure they go about their day-to-day work. In this regard, the WES are different to air quality standards or guidelines and are not considered relevant to understanding the state of air quality.

[1] https://www.worksafe.govt.nz/topic-and-industry/monitoring/workplace-exposure-standards-and-biological-exposure-indices/

Appendix 6

Avifauna Management Plan for the Port of Tauranga Sand Storage Site, Wharf Extensions, and Wider Port Environs

Contract Report No. 5154f

Providing outstanding ecological services to sustain and improve our environments

Wildlands

Avifauna Management Plan for the Port of Tauranga Sand Storage Site, Wharf Extensions, and Wider Port Environs

Contract Report No. 5154f

September 2024

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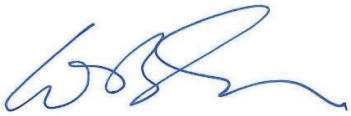

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27/09/2024
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Preface

The Port of Tauranga is Aotearoa New Zealand's largest port and intends to expand to meet current and future demands from exporters and importers. The proposed expansion is for a southern extension to the Sulphur Point wharves and a new berth between existing berths at the Mount Maunganui wharves.

The Sulphur Point extension is adjacent to a site used to store and manage dredged sand, which is heavily used by a range of Threatened and At Risk coastal birds.

The Mount Maunganui site will affect a rock wall used as a tarāpuka/red-billed gull nesting colony and also has kororā/blue penguin nesting burrows.

This document provides an 'Avifauna Management Plan' to address ongoing monitoring and management of birds at the Port of Tauranga in association with the following activities:

- Sand storage and management at Sulphur Point.
- Extensions to the wharf at Mount Maunganui.
- Coastal bird monitoring at the Port.
- Lighting at the Port.

The plan has been prepared to formalise existing practices and to provide enhanced management measures to protect bird colonies and avoid adverse effects during port operations and the proposed development work. Implementation of the plan will safeguard avifauna utilising the Port as a breeding site. It will be revised and updated every five years, or sooner if required, to address changes in breeding success or population trends.

The Management Plan comprises the following four sections:

- Ecological Management Plan for the Port of Tauranga Sand Pile at Sulphur Point. Previously presented as *Wildland Consultants Ltd Contract Report No. 5414e.*
- Korarā/Blue Penguin and Avian Management Plan for the Proposed Mount Maunganui Wharf Extension at the Port of Tauranga. Previously presented as *Wildland Consultants Ltd Contract Report No. 5154c.*
- Monitoring of Coastal Birds at the Port of Tauranga. Previously presented as *Wildland Consultants Ltd Contract Report No. 5154b.*
- Assessment of lighting at the Port of Tauranga. A 'new' assessment, provided as part of this report.

The 'Draft Blue Penguin and Avian Management Plan (BPAMP)' – presented as Section 2 of this report - was initially prepared in response to the December 2023 Environment Court Interim Decision for the proposed Stella Passage Development. The draft combined BPAMP was prepared to facilitate updating of avifauna management measures in consultation with the Department of Conservation and tangata whenua. Discussions were also undertaken with Ngā Tai ki Mauao with regards to opportunities to manage and restore site(s) on Matakana Island or elsewhere to provide better protection and enhance shorebird habitat. These matters will also be addressed in the Plan as they develop.

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SECTION 1 - ECOLOGICAL MANAGEMENT PLAN FOR THE PORT OF TAURANGA SAND PILE AT SULPHUR POINT

1.0 Summary

As part of the ongoing use and maintenance of the Sulphur Point sand storage pile, the Port of Tauranga has developed this ecological management plan to minimise adverse effects on coastal roosting and nesting bird species that use the sand pile. The sand pile is a primary and important high tide roost for the southern half of Tauranga Harbour and provides a protected site for roosting birds during all tides. Two other small historical roost sites at Omokoroa and Tahunamanu are both subject to tidal and weather restrictions and influences[1]. The primary goal of the plan is to sustain a high tide roost suitable for Threatened and At Risk bird species while maintaining the sand pile at its current size of 5,000 square metres as a location to deposit and store dredged sand to be used for beach renourishment. The plan also provides measures to further enhance the sand pile as habitat for birds through the implementation of additional pest animals and exotic plants and other site management.

2.0 Introduction

The Sulphur Point sand pile is the site within Port of Tauranga land used to store and manage sand dredging material. The sand pile is an active work site, but nevertheless is heavily used by a range of At Risk and Threatened coastal birds as no other site within the southern half of Tauranga Harbour is protected during all tidal events[2]. It is used for depositing dredged sand from the Stella Passage, and the sand is occasionally used for beach regeneration around the Tauranga area and Port-related development. As the Port has developed and operations have expanded, the sand pile has regularly reduced in shape and size, to a remnant of its former extent. Nevertheless, a considerable diversity of avifauna species, and significant numbers of some species, have continued to use the sand pile. These bird species have high philopatry to nesting grounds and will continue to return to their natal breeding site. These species also have a certain tolerance level for anthropogenic changes over time and the levels of disturbance inevitable due to the sand pile position and use within a large and active port.

The sand pile is partially surrounded by shipping containers, providing a degree of buffering, albeit limited, from adjacent 24/7 port activities and helping to reduce disturbance of roosting and nesting birds. Furthermore, the sand pile receives protection through the Port's current mammalian predator control measures and lack of disturbance by dogs and people as it is contained within the fenced Port boundary. The sand pile is also elevated above the mean high tide level, beside the harbour margin and coast, and is unaffected by tides or extreme storm surges. However, birds do experience some disturbance from port activities, as the sand pile is adjacent to shipping container storage, and near a Port access road. In addition, in recent decades, dredged sand was deposited, moved, and taken for use elsewhere as required.

In 2023, the Environment Court directed the Port of Tauranga to protect the sand pile, and to avoid use of the sand pile for Port operational purposes. Activities on the sand pile - to provide sand for beach renourishment, including the deposition of some dredged sand on to the sand pile - will still continue.

To address requirements for the protection of the sand pile and associated At Risk and Threatened coastal birds, Port of Tauranga commissioned Wildland Consultants to provide an ecological management plan for the sand pile, which is to be implemented to protect and maintain the site as a high tide roosting and breeding site.

[1] John Heapy, Department of Conservation, pers. comm.
[2] John Heapy, Department of Conservation, pers. comm.

3.0 Bird species

3.1 Field surveys overview

The Ornithological Society of New Zealand (also known as Birds New Zealand) has undertaken surveys of waders around Tauranga Harbour since 1994. In October 2021, Port of Tauranga commenced weekly surveys during the breeding season (September to February) at the sand pile and two-weekly surveys during the non-breeding period (March to August), and the survey methodology is outlined in Chapter 3 of this report. A summary of the Ornithological Society of New Zealand and Port of Tauranga survey results are outlined in Appendix 1.

3.2 Kuaka/eastern bar-tailed godwit

Kuaka/eastern-bar tailed godwit (*Limosa lapponica baueri*, At Risk – Declining) breed in western Alaska. After breeding, the birds make an annual migration, including one to three non-stop flights of 6,000-12,000 kilometres to reach Aotearoa New Zealand (Conklin *et al*. 2021). Birds fly to Aotearoa New Zealand using the East Asian- Australasian Flyway, arriving in early September and departing early March (Battley *et al*. 2012).

Kuaka then spend their non-breeding season at different feeding and roosting sites around the country, including the Manukau Harbour, Farewell Spit, Firth of Thames, and Tauranga Harbour. Adult kuaka, along with other migratory birds and New Zealand coastal species, are highly sedentary and show high fidelity to breeding and non-breeding sites (Nechaev 1998; Battley *et al*. 2012). These areas provide benefits to individuals, including finding resources, reproducing at breeding grounds, and increasing the chance of survival from predators. While at the non-breeding grounds, kuaka undergo primary feathers moult and prepare for the northward return migration. By observing marked individuals, birds have been recorded to the age of 24 years in Aotearoa New Zealand and 29 years in southeast Australia (Conklin *et al.* 2017).

The report for regional prioritisation of migratory shorebirds of the East Asian-Australasian Flyway (Conklin *et al*. 2014) recognises Tauranga Harbour as a site of international importance. This is because it regularly supports more than 1% of the total kuaka numbers worldwide. Conklin *et al.* (2014) rank Tauranga Harbour as the fourth most important location within Aotearoa New Zealand for kuaka. High tide roosts are critical to maintaining wading and coastal bird species. The southern half of Tauranga Harbour has only three regularly used roosts, of which Sulphur Point sand pile is the largest and most important as it is always available during all tides and weather conditions. The other roosts at Omokoroa and Tahunamanu are vulnerable to spring tides and extreme weather events making them less available.

Kuaka remaining in Aotearoa New Zealand over winter are presumed to be mostly young birds less than approximately three years of age. These immature birds are highly mobile and 'sample' potential non-breeding sites before settling on a site where they will remain faithful as adults (Battley *et al*. 2020). However, it is now known that some adults occasionally overwinter in Aotearoa New Zealand. A potential explanation for overwintering kuaka is delayed maturity of young birds, injury/illness, poor condition or skipped migration as adults, but data are currently insufficient to evaluate this possibility (Conklin *et al*. 2016). Recently, *c.*400-600 kuaka have been observed overwintering in Tauranga Harbour (John Heaphy, pers comm.).

3.3 Oystercatchers

Tōrea pango/variable oystercatcher (*Haematopus unicolor*, At Risk – Recovering) have been recorded during biannual national wader counts in Tauranga Harbour during summer and winter (average 130,

range 0-218) 2005 to 2019 (Riegen and Sagar 2020). Site-specific counts at Port of Tauranga indicate that variable oystercatcher roosted on the warehouse roof (summer: average 13 birds, range 2-35; winter: average 8 birds, range 3-12) and at the sand pile (summer: average 3 birds, range 1-6; winter: average 5 birds, range 2- 10) during 2009 to 2021 (Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1).). The two warehouse sheds that were mainly used have now been dismantled due to changes in Port activity (Shed 12 May/June 2017 and Shed 11 between May/September 2020).

Weekly surveys by Port of Tauranga staff indicate the presence of variable oystercatcher in low numbers throughout the year at the sand pile (summer 2023-2024: average 4 birds, range 2-6; winter: average 2 birds, range 2-4; Appendix 1 Table 3). This is similar to the Ornithological Society of New Zealand's biannual wader surveys for the sand pile. There are no observations of tōrea pango/variable oystercatcher attempting to breed at the sand pile.

Tōrea/South Island pied oystercatcher (*Haematopus finschi*, At Risk – Declining) similarly have been recorded during site-specific counts at Port of Tauranga, indicating that South Island oystercatcher roosted on the warehouse roof (summer: average 103 birds, range 20-220; winter: average 539 birds, range 292-700) and at the sand pile with two individuals in summer of 2009 and 338 individuals during winter 2011 (Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). Weekly surveys by Port of Tauranga staff have not detected any South Island pied oystercatcher (Appendix 1 Table 2).

3.4 Dotterels

Two dotterel species have been recorded at the sand pile:

- Tūturiwhatu/northern New Zealand dotterels (*Charadrius obscurus aquilonius*, Threatened – Nationally Increasing) were observed in low numbers during the 2008 to 2021 breeding season (average of 4 individuals, range 1-10 birds) and periodic flocks during the non-breeding season (sand pile: average of 6 individuals, range 1-20 birds; warehouse roof: 11 birds in 2011; Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). The Port of Tauranga weekly surveys identify a similar trend, with an average of 5 individuals (range 1-6) during the 2023-2024 breeding season and 5 individuals (range 2-7) during the 2023 non-breeding (Appendix 1 Table 3).

  In October 2021, six juvenile birds and one nest with three eggs were recorded. Two further nests were identified in November 2021 with either three eggs or a single egg). In February 2022, three eggs were unhatched and covered in flies. October 2022 had two nests with three eggs each, however, both nests had no eggs in September. In December 2022, two new nests were detected with six eggs and five eggs successfully hatched. In November 2023, a nest contained three eggs and two chicks hatched.

  Numbers at the sand pile during the non-breeding season of 2010 were below the 1% population level (25 individuals or 11 pairs) with 20 individuals (Ornithological Society of New Zealand unpublished data). Like many other shorebirds, the species is significantly affected by introduced predators and southern black-backed gulls. In 2011, a total population estimate of about 2,500 northern New Zealand dotterels was counted during the national breeding-season census, including about 1,100 pairs (Dowding 2019).

- Pohowera/banded dotterel (*Charadrius bicinctus bicinctus*, At Risk – Declining) have been recorded around Tauranga Harbour and at the sand pile. In June 2010, a flock of 100 individuals were observed. The national population is estimated at a maximum of 50,000 birds and are declining (Pierce 2013). The species breeds throughout Aotearoa New Zealand, from coastal beaches to inland rivers, to

terrestrial habitats such as the Central Plateau. However, no records are known of birds breeding within the Tauranga Harbour.

3.5 Terns

Three tern species have been recorded at the sand pile:

- Tara/white-fronted tern (*Sterna striata striata*; At Risk – Declining) established a breeding colony at the sand pile in 2009 (150 nests), 2017 (200 nests) and 2020 (200 nests); Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). On average, 175 individuals (range 5- 400 birds) have been recorded between 2008 and 2021 at the sand pile. On four occasions, tara/white-fronted tern were recorded on the warehouse roof (summer 2011: 2 individuals; winter 2011: 1 individual and 5 individuals 2021). During the 2023-2024 breeding season, POT recorded an average of 165 birds were observed (range 30-300 individuals; Appendix 1 Table 3). Tara/white-fronted tern nest in pairs on piles within the Port of Tauranga. White-fronted tern breeds along the coast of Aotearoa New Zealand and offshore islands (Heather and Robertson 2015). Sites used successfully one year may be abandoned the following year, but many sites are regularly used. Surveys undertaken by the Ornithological Society in 1997 indicated a national population of 30,000-40,000 individuals (Heather and Robertson 2015). White-fronted tern is considered to be declining, primarily due to the effects of introduced predators (BirdLife International 2017). This species is difficult to monitor as colony locations can change between years.

- Taranui/Caspian terns (*Hydroprogne caspia*, Threatened – Nationally Vulnerable) have been observed during the breeding season at the sand pile (average 2, range 1-3 individuals; 2011-2013, 2017 [Ornithological Society of New Zealand unpublished data] and 2021; Appendix 1 Table 1). Breeding activity has not been observed at the sand pile, but within the inner harbour of Matakana Island and the northern Tauranga Harbour shellbank (John Heapy pers. comm.) An average of 18 Caspian tern (range 2-28) have also been observed at the sand pile during winter. Only one individual has been observed on the warehouse roof in 2009. The POT surveys have only detected one individual at the sand pile during the 2021-2022 breeding season (Table 3). Caspian tern is a relatively rare species, with around 1,300-1,400 breeding pairs around Aotearoa New Zealand (Fitzgerald 2013). The species is considered to be in decline, primarily due to the effects of introduced predators, human disturbance, off-road vehicles and dog disturbance.

- Tara/New Zealand fairy tern (*Sternula nereis davisae*, Threatened – Nationally Critical) have been observed during the breeding season of 2011 at the sand pile (Ornithological Society of New Zealand unpublished data).

3.6 Gulls

All three gull species known in Aotearoa New Zealand have been recorded at the sand pile:

- Tarāpuka/black-billed gull (*Chroicocephalus bulleri*, At Risk – Declining) bred at the sand pile in 2016 (five nests; Ornithological Society of New Zealand unpublished data) and on the Mount Maunganui rock wall. Two hundred and ten Individuals were observed in winter at the sand pile in 2008, and between 1-12 individuals between 2014-2017. An average of 12 individuals (range 5-20) were observed during a Port of Tauranga 2023-2024 breeding season sand pile survey (Appendix 1 Table 3). Five eggs were observed in November 2023 and 15 juveniles. Black-billed gulls are highly mobile, and colonies do not necessarily establish in the same location each year (Heather and Robertson 2015). While it is a relatively abundant species, numbers in the North Island are very low. A national census of black-billed gulls in 2016-2017 recorded a total of 60,256 nests, of which 992 nests, or 1.6%, were in the North Island (Mischler 2017).

- Tarāpunga/red-billed gull (*Chroicocephalus novaehollandiae scopulinus*, At Risk- Declining) established a breeding colony of approximately 200 nests in 2018, two nests in 2020 (Ornithological Society of New Zealand unpublished data), and produced 10 juveniles in 2021 (Port of Tauranga surveys). Tarāpunga/red-billed gull use to breed at the sand pile before shifting as a large colony to the Mount Maunganui rock wall. However, during the Port of Tauranga surveys (2023-2024), an average of 267 individuals (range 1-800 birds) were observed during the breeding season and an average of 20 individuals (range 4- 60 birds) during the2021-2022 non-breeding season at the sand pile (Appendix 1 Table 3). The species regularly breeds in a much larger colony on the rock wall of the Mount Maunganui Wharf.

- A single karoro/southern black-backed gull (*Larus dominicanus dominicanus*, Not Threatened) nest was recorded in 2016 and 2020 during the Ornithological Society of New Zealand surveys (unpublished data). During the breeding season surveys, an average of 6 individuals (range 1-20 birds) were observed between 2010 and 2020 (Ornithological Society of New Zealand unpublished data; Appendix 1 Table 1). The 2023-2024 Port of Tauranga surveys identified an average of 4 individuals (range 1-16 birds; Appendix 1 Table 3). One black-backed gull egg was observed in November 2023, but this was not incubated. Black-backed gull is a super-abundant native species that has significantly benefitted from the activities of people. It is also a predator of other bird species, taking eggs and chicks (Department of Conservation 2018). Black-backed gull control is undertaken in certain locations by DOC where predation of vulnerable species (such as braided river birds or shorebirds) is known. This is a predatory species which may require control if foraging on chicks and eggs within the sand pile or other areas within the Port.

3.7 Other species

Ngutupare/wrybill (*Anarhynchus frontalis*, Threatened – Nationally Vulnerable) is a specialist braided river bird, mostly breeding in Canterbury, with smaller populations in Otago. It migrates to estuaries and harbours of the northern North Island after breeding. The national population is estimated to be approximately 5,000-5,500 birds (Dowding 2013). Ngutupare/wrybill visit Tauranga Harbour as a wintering site and have been known to use the sand pile. Wrybill flocks have been present at three of the 14 annual Ornithological Society of New Zealand winter counts at the sand pile. Each time, numbers have been close to or above the 1% population level (71, 52, 8, and 48 birds; Appendix 1 Table 1).

Poaka/pied stilt (*Himantopus himantopus leucocephalus,* Not Threatened) have been recorded nesting at the sand pile in the early 2000's. More recently, they have only been recorded at the sand pile twice, with two birds recorded in 2011 (winter) and 2014 (summer), respectively. The size of the national population is poorly known; the estimate of 30,000 birds dates back to the early 1990s (Adams 2013). This species can be easily displaced by other species if overwhelmed and dominated by a more aggressive nesting species.

Huahou/red knot (*Calidris canutus rogersi*, At Risk – Declining) are the second most common Arctic wader to reach New Zealand. Large flocks of over 5000 birds have been recorded at Kaipara and Manakua harbours, and at Farewell Spit. Flocks between 1000-5000 have been recorded in harbours including Whangarei and Waitemata harbours and the Firth of Thames. Smaller flocks have been recorded at other estuaries and coastal lagoons. Individual birds have been recorded around the Bay of Plenty area since 2000 (eBird data search).

Ruddy turnstone (*Arenaria interpres*, Non-resident Native – Migrant) are the third most numerous Arctic wader and concentrate in locations including Parengarenga, Rangaunu, Kaipara, Manukau and Tauranga Harbours, and the Firth of Thames in the North Island. Small numbers visit coastal lagoons or estuaries when heading south (late Sept-Oct) and northwards in March-April. Individual birds and

small flocks of up to four birds have been recorded around Tauranga Harbour since 2000 (eBird data search).

4.0 Sand pile management and bird use

4.1 Overview

Sand in the sand pile is not to be used for Port operational purposes. However the use of the sand for beach replenishment is permitted in accordance with this plan, and this will require some continued deposition of sand on the sand pile.

The area currently used to store dredged sand is approximately 35 metres wide by 130 metres long, covering *c.5*,000 square metres or 0.5 hectares. The sand pile height averages 2-3 metres or about 2.5 metres above road level when full. When the site is prepared to receive dredged sand, the site is reshaped to make a 'bath' shape. The base of the 'bath' can be lower than road level (approximately 0.5 metres), and the sides are formed from sand currently on-site.

When filled with pumped dredged sand, approximately 10,000 cubic metres of sand is brought ashore as a slurry consisting of approximately 25% sand and 75% water. The water drains away over several days and returns to the harbour. As the sand is pumped in, an excavator is used to move the sand around to aid drainage and to sculpt the sand pile (Plate 1). The sand can be walked on after 2-3 days. The last excavation and refill was undertaken in June 2019, during the non-breeding season, over a period of approximately three weeks. During this time, karoro/southern black-backed gulls were seen foraging in the 'bath' area (Plate 2). Two to three toreapango/variable oystercatchers were also seen, either on the 'bath' sand wall or foraging in the bath area (Plates 2 and 3). Two tuturiwhatu/New Zealand dotterel were seen on the seaward sand wall of the bath (Plate 4). These observations indicate that there is a degree of tolerance of sand pile maintenance and associated human activities.

Plate 1: Pumping of dredged sand into the sand pile site. June 2019. Image supplied by POT.

Plate 2: Karoro/southern black-backed gulls and three variable oystercatchers foraging at the sand pile site. June 2019. Image supplied by POT.

Plate 3: Two tōrea pango/variable oystercatchers foraging along the seaward sand wall of the sand pile site. June 2019. Image supplied by POT.

Plate 4: Two tuturiwhatu/New Zealand dotterels on the seaward margin of the sand pile site. June 2019. Image supplied by POT.

4.2 High tide roost requirements

Basic Requirements

High-tide roosting sites are selected and used by birds when they contain adequate roosting habitat, are protected from inundation, reduce the risk of individual predation or disturbance risk, lack cover or weeds, and are close to foraging habitat (Rogers 2003). Population declines in migratory shorebirds has been attributed to the loss of reliable stopover sites along the East Asian Australasian Flyway (Piersma *et al*. 2016, Studds *et al*. 2017). However, there is limited information on the area required per bird as a roosting site.

Kuaka roosting density can be estimated by comparing it with a smaller wader in the Scolopacidae family, the semipalmated sandpiper (*Calidris pusilla*, Non-resident Native – Vagrant; Jamieson 2013). Beauchamp (2012) observed roosting semipalmated sandpiper densities that ranged from 1.2 birds per square metre to an estimate for tightly grouped 100 birds per square metre. Kuaka/eastern bar-tailed godwits are considerably larger (male length 39 centimetres, 275-400 grams; female length 41 centimetres, 325-600 grams; Woodley 2013) than semipalmated sandpipers (both sexes: length 15 centimetres and 25 grams; Jamieson 2013). It is a reasonable assumption, although very conservative, that a roosting density of one kuaka/eastern bar-tailed godwit per square metre would be more than adequate. Using this assumption, and based on the Ornithological Society of New Zealand survey in October 2021, Port surveys (Table 1), 3,000 kuaka roosting on the Port of Tauranga sand pile could need *c.*3,000 square metres for roosting (one bird per square metre), plus separation between different bird species (typically beyond pecking distance to a metre or more), the sand pile edge, or areas of noise and human activity, e.g. vehicles, cranes.

White-fronted tern (*Sterna striata*) nest at densities of 3.75 nests per square metre as observed on the Ashburton/Hakatere River in 2017 (Bell and Harborne 2019). Based on the October 2021 Port surveys (Table 2), 400 white-fronted terns (200 pairs) nesting on the sand pile would require a minimum area of 54 square metres, excluding any buffer zones.

Tarāpunga/red-billed gulls (*Chroicocephalus novaehollandiae scopulinus*) are of a similar size to tarāpuka/black-billed gull (*Chroicocephalus bulleri*) and nest density can be estimated. Nest density was 1.2 nests per square metre at eight colonies and up to 3.8 nests per square metre in dense colonies (McClellan 2009). Based on the November 2023 Port surveys (Table 2), 800 red-billed gulls (400 pairs) nesting on the sand pile would require a minimum area of 334 square metres, in addition to any buffer zones.

Shorebird roost sites should have at least 100 metre buffer zones from areas of noise and human activity (Kaldor 2019). However, this is not possible at the Port of Tauranga due to the proximity of port operations and current position of the sand pile. Nevertheless, Schlacher *et al*. (2013) state that a separation distance of at least 25 metres between birds and vehicles, combined with vehicles travelling 30 kilometres per hour or slower, reduces disturbance. Based on these calculations, the sand pile site of 5,000 square metres currently provides a sufficiently-large surface area for nesting and roosting requirements.

Timing of Works

Changes in the shape and size of the sand pile, when undertaken outside of the breeding season, will not adversely affect birds as long as the general height and contour of the 5,000 square metre minimum sand pile roosting area remains similar. This is supported by the continual use of the sand pile by birds during Port operations and sand pile operations in the past. Addition or removal of sand should only be undertaken outside of the breeding season and for the purpose of providing sand for beach replenishment. See the section on 'Sand Deposition at the Site' below for further information on the sand pile roosting area shape/size during the 'bath' refilling process.

Works should be carried out within the period that spans four hours each side of low tide (i.e. eight hours in total), when birds have left the high-tide roost to forage. However, if works are required to continue during the two hour period on each side of high tide (i.e. four hours in total), then a Port of Tauranga bird survey staff member or another suitably qualified ornithologist (member of the OSNZ with a minimum of three years of shorebird identification experience), must be on-site to monitor for any returning birds to the roost site. A minimum setback distance of at least 25 metres will need to be maintained between any returning birds and all operating machinery.

Sand pile contractors should be vigilant and watch for any returning birds outside of the two hours prior to high tide. If birds return earlier, a Port of Tauranga bird survey staff member or other suitably qualified ornithologist should be notified and works should cease until a bird assessment is carried out.

Monitoring Pre-works

Prior to work commencing each day, a survey should be undertaken by a Port of Tauranga bird survey staff member or another suitably qualified ornithologist, to ensure that no roosting birds are present within the sand pile works area. If any Threatened or At Risk species are present within the sand pile site, works cannot commence. If a Non-Threatened species is present, a minimum setback distance of at least 25 metres will need to be maintained between these birds and all operating machinery.

Sand Pile Dimensions

Based on evaluation of historic photographs of the sand pile (using Google Earth Pro) with its current constraints (roading and shipping container wall, as shown in Plate 5), the minimum sand area for roosting kuaka, while including a 25 metre buffer area from East Road, should be no smaller than 5,000 square metres. This area would enable the retention of a continuous island of sand suitable for high-tide roosting habitat.

Plate 5: Aerial photograph of the sand pile and adjacent shipping container storage area and roading. November 2022.

It is appropriate for the overall height to be altered to allow for ongoing sand management, in accordance with provisions set out in Section 4.3, below.

Sand Deposition at the Site

Excavation and formation of a 'bath'-shaped basin suitable for sand deposition and dewatering should be undertaken immediately prior to any dredging and placement of sand at the site (i.e. within five days of dredging). This will maximise the length of time that the sand pile area is of an adequate size/shape for roosting shorebirds. Long periods of time in a 'bath' configuration will not provide sufficient area for roosting as birds roost together in groups, as a safety mechanism. 'Bath' formation should not be undertaken prior to a breeding season if refilling with sand is not going to occur until after that breeding season.

Adjacent to the harbour, the top surface of the sand 'wall' around the 'bath' basin should be shaped as a flattened platform, at least two metres wide on top, to allow birds to continue to use the site for roosting while excavation or infilling with pumped dredged sand is being undertaken.

Harbour Margin of the Sand Pile

The harbour side of the sand pile, down to mean high tide level, should be maintained and shaped, particularly after storm events, to maintain a slope that birds can use to access the site by walking. This will allow easy movement of birds between the high- tide roost and exposed tidal habitat, minimising energy expenditure.

Overall Effects

By limiting the use of sand for beach renourishment only and avoiding the removal of sand from the sand pile during the breeding season, maintaining an overall sand pile size/shape/volume, and

continuing to operate the sand pile in the same way as it is currently, the continued use of the sand pile will avoid adverse effects on Threatened and At Risk bird species which live and breed at the site.

4.3 Management measures

Timing of Works

- Addition and removal of sand from the sand pile must only be undertaken during the non-breeding season, which includes April, May, June, and July.

Sand Removal

- Sand removal for beach nourishment should be undertaken predominantly at the northern end of the sand pile. This will allow birds to roost at the greatest distance from East Road.

Sand Pile Extent and Dimensions

- Maintain an overall sand pile size, shape, and volume to provide a high-tide roost or nesting site during the breeding and non-breeding seasons.

- Preferably maintain with undulating topography to restrict sight lines so that multiple bird species can utilise the site with minimal conflict.

- Overall height can be altered to allow for sand associated with beach renourishment and to maintain a minimum footprint of 5,000 square metres (i.e. sufficiently large for a roosting/breeding area, including a buffer zone). This area must be a single body/island of sand and should be as square as practicable (avoid increasing the current width to length ratio).

- Sand removal for beach nourishment must only be accessed from East Road (at the northern end of the sand pile). The sand pile can slope towards the southern end, subject to the gradient being gentle and the overall height being comparable to the northern aspect, as birds will roost on the raised area.

- When the sand pile is predominantly situated towards the southern end footprint - more than 50 metres away from East Road - the sand pile height can be reduced to a minimum overall height of 0.5 metres above mean high spring water springs (MHWS).

Sand Deposition

- Prior to pumping of sand into the site, excavation and formation of the deposition ‘bath’ should only be undertaken within five days prior to dredging.

Works During the Non-Breeding Season

- A daily pre-works survey must be undertaken by a Port of Tauranga bird survey staff member or another suitably qualified ornithologist, prior to works commencing, to ensure that no birds are roosting on the sand pile.

- If any Threatened or At Risk species are present within the sand pile site, works cannot commence. If a Non-Threatened species is present, a minimum setback distance of at least 25 metres will need to be maintained between these birds and all operating machinery.

- Works should be carried out within the period four hours on each side of low tide, when birds will have left the high-tide roost to forage.

- If works have not been completed before the two hours each side of high tide, a Port of Tauranga bird survey staff member or another suitably qualified ornithologist must be on-site to monitor any birds returning to the roost site and to ensure that work activity has a separation distance of at least 25 metres from any returning birds, and does not disturb them.

- If birds are present, works will not be able to commence unless the birds leave of their own accord (a Wildlife Act Authority could potentially be sought to allow disturbance of birds but this should not be necessary if the parameters above are implemented).

5.0 Noise

5.1 Overview

Noise-related disturbance of birds can affect habitat usage, life cycle stage (breeding or non-breeding period) and level of habituation (Harbrow *et al.* 2011). Also, the variation in characteristics, duration and frequency can add complexity to reactions. For example, the most extreme noise results in major impacts, which may include increased physiological stress (e.g. increased energy expenditure, reduced breeding success or reduced energy accumulation) or behavioural responses (e.g. tolerance, aversion and flight response). Several studies have been undertaken to assess an acceptable decibel (db(A)) level; however, given the different background noise levels, type of disturbance, and response, behaviour varies substantially between species and across sites and seasons (see Wright *et al.* 2010).

Habituation occurs when a reaction to a stimulus reduces over time after repeated exposure (Harbrow *et al*. 2011). Port activity noise occurs in the vicinity of the sand pile, and roosting and breeding birds are exposed to levels of activity and noise, including vehicle movements and shifting of cargo and containers. The species present are already currently subjected to unavoidable disturbance and noise from wharf activities and continue to breed and roost at the sand pile, showing habituation. However, it is acknowledged that noise is detrimental and may be having a negative effect on breeding success, possibly causing some birds to temporarily relocate (e.g. to a cargo shed roof) during short impulsive noise (e.g. pile driving or sudden loud noises; Wright *et al.* 2010), or sudden sight and sound of an aircraft or other human disturbance. Although the disturbance will be short-term, the use of the sand pile may temporarily change, which can lead to eggs or chicks being unguarded and exposed to temperature fluctuations (e.g. overheating or chilling) or predation by southern black-backed gulls or mammalian predators.

5.2 Management measures

- Continue to use shipping containers as a protective barrier to provide a noise buffer from general Port activity.

- Road traffic should approach and pass the sand pile at speeds not exceeding 30 km/h.

- All activities around the sand pile (within 100 metres of the edge of the sand pile) should be undertaken at as low a noise level as possible, as experienced at the sand pile; c.f. Wright *et al.* 2010.

- Current container maintenance practices include surface grinding and structural container repair. Grinding and structural repair should not occur closer than 50 metres and 100 metres, respectively, from the sand pile.

- Control for mammalian predators.

6.0 Pest animals

6.1 Overview

Pest animals and predatory birds (e.g. southern black-backed gulls) can disturb and possibly kill roosting birds, eat eggs, kill chicks and nesting or roosting adult birds. Rabbits can modify or destroy habitat by digging up and fouling the ground, as well as opportunistically eating eggs from nests. Karoro/southern black-backed gulls are a main predator of chicks and eggs of shorebird species that utilise braided rivers. Predator control has the potential to mitigate some of the negative effects of disturbance from Port construction work, particularly for breeding birds.

Port of Tauranga is undertaking control of some pest species around the Port, particularly rats and feral cats, which will be helping to protect breeding and roosting birds. Currently, two live feral cat traps are used at the sand pile during the nesting season and rat bait stations are being used on the southern and western boundaries.

Other pest species may also be present at the Port, such as stoats and hedgehogs. The installation of kill/bait traps for mustelids, feral cats, hedgehogs and rodents should be intensified at the sand pile, to further protect birds. If there is a continuous capture rate of rats, a toxic baiting programme may be required to reduce the population more effectively.

Cholecalciferol should be used as a knockdown toxin for rats. Cholecalciferol does not require a controlled substance licence, is effective, and is readily available. In the form of Feracol paste, Cholecalciferol is used in bait stations, reducing the risk to the public and non-target animals. It does not leave a long-term residue or bioaccumulate. The risk of secondary poisoning and by-kill from Cholecalciferol in bait stations is low (NPCA 2015). If access to Feracol paste is limited, an alternative is to use Diphacinone, in D-block or RatAbate products.

Rabbit burrows should have Magtoxin pills introduced down each burrow. Two to five pills should be placed in each burrow, as far down as possible, after all other burrows have been blocked to prevent exit. Water may need to be added to start the reaction, which releases phosphine gas. The contractor used by POT can advise on the best procedure when working on-site.

Domestic and feral cats can cause extensive losses of eggs, chicks and adults within breeding colonies. Kill traps (e.g. Timms traps) should be used during the breeding season. It is acknowledged that domestic cats could be killed by this method. To reduce this risk, notification to local business and homeowners should suggest that cats are kept inside, especially during the night and early morning, during the breeding season. During the non-breeding season, live traps could be used and feral cats should be shot. If a domestic cat is caught and released away from the Port, the cat should not have learnt that the site has a potential avian food source.

Dogs are excluded from the Port of Tauranga. However, it may nevertheless be appropriate to install a sign at the sand pile to inform truck drivers and other Port users that access to the sand pile is subject to specific authorisation and that dogs are strictly prohibited, to protect any birds at the site.

Predator control should be implemented at key sites around the sand pile at the Port to target rats, cats, and possibly hedgehogs and stoats (if present) to minimise the possibility of birds being killed and eggs being destroyed. All captures should be recorded to assess the effectiveness and whether any changes in trap location, type or clearing/maintenance frequency are required.

6.2 Management measures

Current Pest control consists of the following:

- Two live traps for cats should be operated during nesting season.
- Fourteen rat bait stations, monitored and refilled every two months (or as needed) by a contractor.

Trapping and pest control using toxins should be enhanced to consist of the following:

- Two Timms traps for feral cats during breeding and non-breeding seasons. Traps should be baited with fresh meat (rabbit, hare, fish, or chicken) once every two weeks. Traps should be checked 2-3 times per week. Traps should be placed at either end of the sand pile, near Reid Place and East Road.
- Eight to ten Timms traps, DOC150s or DOC200s for mustelids and hedgehogs. These should be baited with a hen egg and checked once every two weeks. Traps should be positioned 100 x 100 metres apart around the perimeter of the sand pile. An additional trap line should be placed as a buffer up to 200 metres from the sand pile where practicable.
- Magtoxin should be used to reduce the rabbit populations by placing 2-5 pellets into each burrow. Rabbits can breed all year round and regular checks and control will be needed.
- Rat bait stations should use either Cholecalciferol paste (Feracol), or Diphacanone D-block or RatAbate, depending on the type of bait stations used. Check 1-2 times per month and refill as required. Rat bait stations should be spaced on a 50 × 50 metres grid around the sand pile (e.g. four stations per hectare). Care must be taken, with regular checks, and any spilled bait should be removed to avoid invertebrates eating the bait or non-targeted species being exposed to secondary poisoning, e.g. banded dotterel eating invertebrates.
- Karoro/southern black-backed gull culls may be required if individuals are observed predating eggs or chicks. Pre-feed the gull(s) four to six times with bread spread with margarine to confirm that the bird(s) will take the bait and that the bread is eaten within minutes. Feed bread baited with alphachloralose mixed into the margarine after the pre-feeding period. Alphachloralose is an anaesthetic compound registered for the control of southern black-backed gulls. Remove any uneaten bread after baiting has been completed.

7.0 Pest plants

7.1 Overview

Pest plants can easily become established at the sand pile and will reduce the quality of the area as a roosting or breeding site. They also provide cover for predators. Pest plant establishment will limit the available open space for birds for roosting or breeding. Plant density will increase bird vigilance and threat awareness through scanning for potential predators and will provide cover for mammalian predators to easily approach breeding birds (e.g. predation of eggs and chicks). The sand pile site should be cleared of weeds during the non-breeding season. All activity at the sand pile must be undertaken during the four hours either side of low tide as the shorebirds will have left the site to forage, or two hours either side of high tide when following the process set out in Section 4.2 above. This will prevent any disturbance of roosting birds. Minor maintenance could be undertaken at low tide if incubating birds are not disturbed, e.g. around the edges of the sand pile area.

7.2 Management measures

Non-Breeding Season (April, May, June, and July)

- During the non-breeding season, pest plants should be pulled out and removed during the period four hours either side of low tide. It may be appropriate to undertake mechanised removal. All plant material must be removed and disposed of off-site.

- Spot-spraying could be undertaken using a biodegradable herbicide as a last resort if hand or mechanical removal is less effective.

Breeding Season (August – March, inclusive)

- Pest plant removal should only be undertaken by hand-pulling, hand-cutting or raking. All plant material must be removed and disposed of off-site.

All activity at the sand pile must be undertaken during the four hour period on each side of low tide. A Port of Tauranga bird survey staff member or another suitably qualified ornithologist must be on-site to monitor any birds returning to the roost site and to ensure that work activity has a separation distance of at least 25 metres from any birds, eggs, and chicks, and that the activity does not disturb them.

8.0 Bird monitoring

8.1 Overview

Port of Tauranga currently undertakes weekly surveys of the sand pile during the breeding season to provide baseline survey data and to further understand how birds are using the Port environs (Wildlands Consultants 2021). Bi-weekly survey counts are undertaken during the non-breeding season and non-count (bi-weekly) checks are carried out to identify that nothing unexpected is occurring (evidence of predation, sudden increase/decrease in bird numbers). All surveys are undertaken during high tide. The sand pile storage site has been subdivided into seven sub-zones, and all individuals within each count zone are recorded and totalled to give a total count for each species.

Care must be taken to ensure that no bird is recorded twice within a survey period and that no birds are assumed to be present. Each survey targets all breeding and roosting coastal birds, including kuaka/eastern bar-tailed godwit, tuturiwhatu/New Zealand dotterel, pied oystercatcher, toreapango/ variable oystercatcher, tara/white-fronted tern, karuhiruhi/ pied shag, and all other coastal birds.

8.2 Management measures

- For consistency between surveys, each survey will record the same details as previous surveys including details of the date, time, location, tide, wind direction, wind speed, weather condition, temperature, species, number of individuals (adult and juvenile), general breeding behaviour (nest building, incubating, feeding young, foraging, roosting), and number of eggs. Monitoring will also include recording of all stages of juvenile development (in the nest or moving around, fed by adult, or fledged).

- Surveys are ideally undertaken around high tide to provide consistence between survey records and allows for a more robust estimate between assessments.

- Land-based photographs can be used for counts of large numbers of birds, such as kuaka/ eastern-bar tailed godwit and tarāpunga/red-billed gulls.
- Trail cameras or security type cameras could be used to monitor and record predator interaction and to guide additional trapping or culling measures.
- Survey results and trends will inform adaptive management actions.

Further monitoring details are outlined in the report on 'Monitoring of coastal birds at the Port of Tauranga' (Wildland Consultants 2021).

9.0 Management plan review

This management plan provides prescriptions for the sand pile dimensions, noise, pest animal and pest plant control, and bird monitoring. This plan should be reviewed every five years or more frequently if there are substantial changes to the Port activities, population abundances, or pest threats.

10.0 People involved

- Rowan Johnstone, Engineering Manager, Port of Tauranga. Project management of the Stella Passage Development works.
- A nominated representative for mana whenua Ngāi Tamarawaho hapū, to review this plan.
- Department of Conservation representative, to review this plan and assist as required.
- Fenna Beets or Kate Bristow, Port of Tauranga, to undertake weekly surveys at the sand pile and avian species present during the breeding season (August to March, inclusive) and monthly surveys during the non-breeding season (April to July, inclusive).

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SECTION 2 - KORORĀ/BLUE PENGUIN AND TARĀPUNGA/RED-BILLED GULL MANAGEMENT PLAN FOR THE PORT OF TAURANGA

11.0 Introduction

Port of Tauranga Limited is proposing to build new wharf extensions over several years to meet increased demands. Wharf construction is proposed for both the Sulphur Point Wharf and the Mount Maunganui Wharf. The Mount Maunganui Wharf works include a 315 metre extension with 1.6 hectares of reclamation behind the wharf, Mooring and Breasting Dolphins north and south of the Tanker Berth, as well as minor structures and reclamation of 0.18 hectares associated with Butters Landing (Figure 1). Development of the 315 metre extension to the Mount Maunganui Wharves would involve the loss of a rock wall where kororā/blue penguins (*Eudyptula minor iredalei*; At Risk – Declining) burrows have been found (Figure 2) and tarāpunga/red-billed gulls (*Chroicocephalus novaehollandiae scopulinus*; At Risk – Declining) roost and breed (Figure 3). There is also potential for kororā/blue penguins to be discovered in the rock wall along the Sulphur Point Wharf reclamation and extension site (Figure 2).

The proposed reclamation for the proposed Mount Maunganui wharf extension will cover approximately the same length of the existing rock wall as the wharf extension. Partial removal of this rock wall between Berths 11 and 16 (Cement Tanker Berth) will directly affect the red-billed gull colony that roosts and breeds here, and a small number of kororā/northern blue penguin that breed and moult within the sections of rock revetment proposed for construction of the wharf sections and for infilling/reclamation. Red-billed gulls utilise the rock wall throughout the year to roost, with breeding only occuring mid-September to February. To avoid affecting breeding birds or moulting kororā/penguins, removal of the rock wall must be scheduled to begin at the end of the penguin breeding season, which is mainly within the period July to March. However, individuals do visit the site during June for approximately five days (*c.*30 days before egg laying in July). As kororā/penguins may be present in their burrows at any time of the year, known burrows will need to be checked for kororā/penguin presence before any work is undertaken within a section of revetment. Any active breeding nests or moulting birds will be avoided, and resting birds will be removed by an approved kororā/penguin handler. However, there will be an ongoing risk of mortality of resting or moulting adults for birds that are not relocated. The actions described in this report are designed to avoid this possibility. Kororā/blue penguins are highly tolerant of noise and human activity as they currently roost and breed within a noisy Port environment. Following completion of the works, it is expected that recolonisation of any new wall will occur quickly (e.g. modified rock wall for tarāpunga/red-billed gull roosting and breeding).

No penguins were found to be present within the area to be affected by the proposed Sulphur Point extension. However, should they be found, then the protocols applied to the Mount Maunganui wharf extension will be implemented.

To address requirements for the protection of kororā/blue penguins and tarāpunga/red-billed gulls, Port of Tauranga commissioned Wildland Consultants to prepare a kororā/ penguin and avian management plan, which is to be implemented through the construction process. This involves the enhancement of the remaining section of existing rock wall to replace the habitat lost for the tarāpunga/red-billed gulls (which may also be used by kororā/penguin) and a kororā/penguin nest colony.

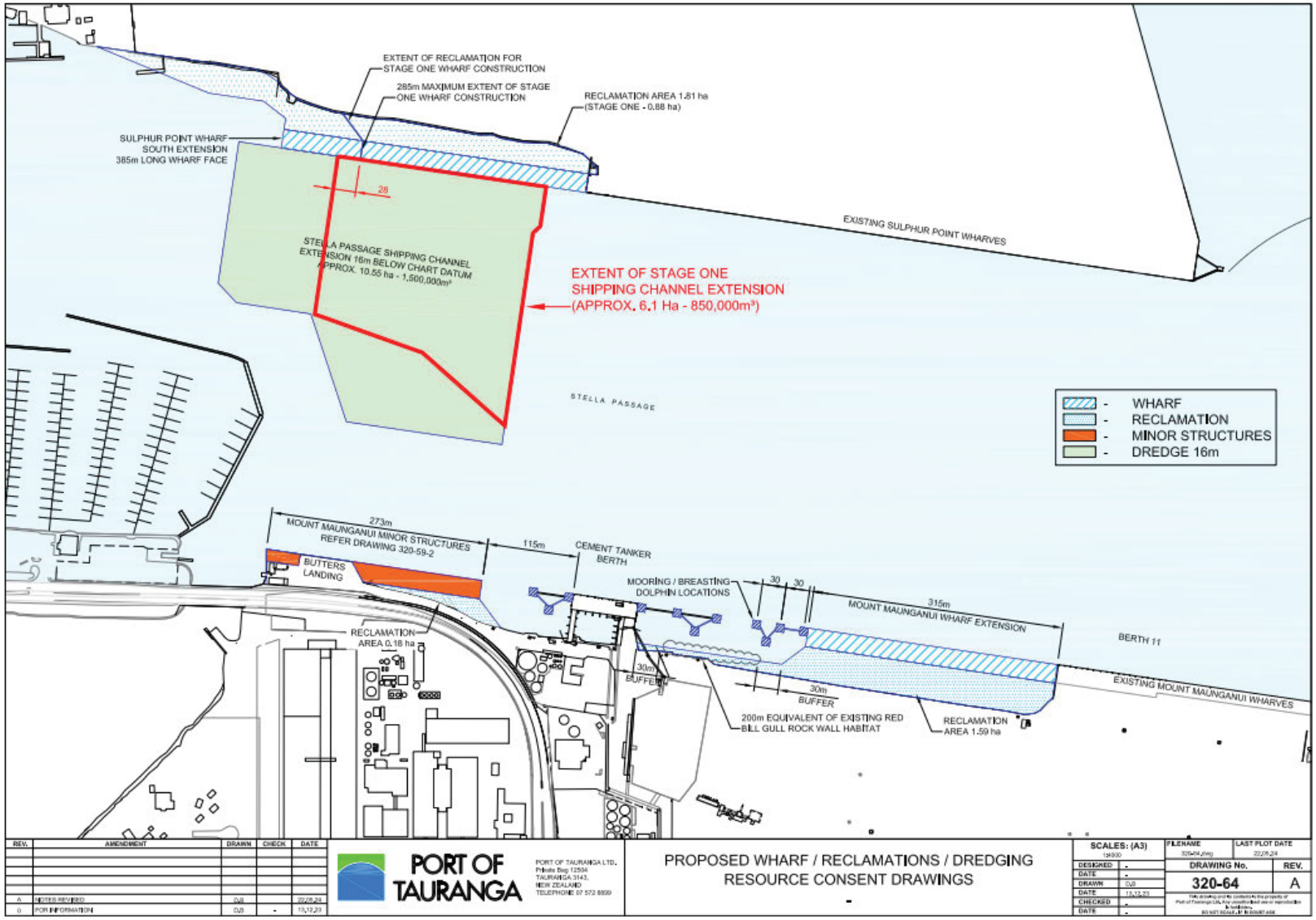

Figure 1: Location of the proposed Mount Maunganui Wharf extension, Mooring/Breasting Dolphins, minor structures, and reclamations.

12.0 Management plan summary

12.1 Overview

As part of the Mount wharf extension and Sulphur Point reclamation and wharf extension, the Port of Tauranga has developed this kororā/blue penguin and avian management plan to minimise adverse effects on the tarāpunga/red-billed gull and kororā/blue penguin populations within the existing rock wall and surrounding construction site. The primary goal of the plan is to achieve no net loss of tarāpunga/red-billed gulls and kororā/blue penguins in the vicinity of the works. The aim of no net loss acknowledges that some individuals may leave the area for a period of time, new individuals may take up residence at the site during construction, or a permanently lost individual is replaced by fledglings from the current population. Monitoring will be undertaken to assess penguin numbers prior to construction (baseline) and post-construction.

This management plan has been compiled based on experience with the Whakarire Avenue (Napier) Penguin Management Plan (Wildland Consultants 2020a), Hardinge Road (Napier) Penguin Management Plan (Wildland Consultants 2019a), and the Napier Port Avian Management Plan (Wildland Consultants 2019b).

Kororā/blue penguin are a charismatic species and of great interest to the Tauranga community and iwi, information regarding the proposed surveying, relocation and future housing (nesting box colony and alternative nesting sites within the replacement rock walls) will be provided on the Port of Tauranga website.

The following section is a summary of the 'Kororā/Blue Penguin and Avian Management Plan for the Port of Tauranga'.

12.2 Kororā/blue penguin – summary of management measures

- Prior to Mount Maunganui rock wall removal: The Mount Maunganui Wharf kororā/penguin population, including the area to be affected (Figure 3), will be surveyed twice during the breeding season using a conservation dog trained to locate kororā/penguin burrows (e.g. October and December). GPS coordinates will be recorded for all burrows. A survey was undertaken in August 2019 at the beginning of the breeding season where a trained kororā/penguin dog indicated 16 active sites along the Mount Manganui rock wall. More birds would be expected to be located during the peak of the breeding season in October to December.

- Prior to wall removal: a new nesting box colony will be developed and landscaped ready to receive kororā/penguins.

- Prior to wall removal: potential burrows in the affected area will be located by a trained kororā/penguin dog during the start of the non-breeding season (April to June) and checked using a burrowscope. All burrows will be made inaccessible by rock wall wrapping, including any potential roosting crevices. Any kororā/penguins which are detected within the rock wall will be relocated to the nesting box colony.

- During Mount Maunganui rock wall dismantling: a kororā/penguin handler will be available to relocate any kororā/penguins which are incidentally detected within the rock wall area and relocated to the nesting box colony.

- Action plan: to manage all situations (e.g. resting, breeding and moulting) where kororā/penguins, their chicks or eggs are discovered within the revetment to be affected.

- Nest box colony: Port of Tauranga will construct a nest box colony within the Port environs to offset the permanent loss of nesting habitat within adjacent revetments. It is suggested that the colony could be located south of Berth 16, immediately adjacent to the Butters offices and workshop. An existing rock wall at this site faces south and west. However, the rock wall is not of a construction which is suitable for kororā/penguins to form burrows within the structure. Modification of the site is required. The southern end (Plate 1) has an area of ground on which nesting boxes can be installed and some indigenous plants are already present in this area. The western section of wall (Plate 2) contains lengths of concrete and would need to be added to (e.g. rocks) before nesting boxes can be established. Both sites will need ramps installed to allow easy penguin access. Penguins may also choose to nest under the Butters office building, and the area should be fenced off. The nesting box colony site should be covered with soil, grassed, and planted with indigenous shrubs and flaxes (e.g. *Phormium cookianum*), to provide shade and shelter. Approximately 13 boxes will be established to provide burrow habitat for translocated penguins and individuals looking for a new nesting site prior to and during rock wall covering and replacement may also utilise these boxes (Appendix 2). This colony would provide the opportunity to transfer resting or near moult completion kororā/penguins from the affected revetment area, if they are present. Moulting kororā/penguins from the Mount Maunganui Wharf site will be translocated to this nest box colony, which is a short distance from the construction site.

- Concrete pipes within the new Mount Maunganui rock wall: During the construction of the new Mount Maungnui wharves, large concrete pipes (*c.*300 millimetre diameter) will be embedded in the new wall approximately one metre above mean high tide and angled to allow any water to drain. Each of the 20 pipes will be located approximately every 10 metres along the rock wall. Furthermore, the replacement rock wall will be constructed with rocks of a similar size to the existing rock wall, allowing kororā/penguins to establish new burrows as the wall is completed. These concrete pipe burrows can also be established in the Sulphur Point rock wall or strategically within the sand pile.

- Post-construction: kororā/penguin population will be surveyed twice during the first two breeding season after construction of the Mount Maunganui Wharves has been completed (e.g. October and December), to confirm whether kororā/penguins have taken up residence in any new wall structures (e.g. construction of a purpose-built rock wall for red-billed gulls south of the dismantled wall, closer to the Tanker Berth).

Figure 2: Location of kororā/blue penguins found in the 2019 survey. The red and blue lines are in the general location of the two Mount Maunganui Wharf extensions. The green and orange lines are located within the Port's Sulphur Point wharf. The yellow line is outside of the Port (from Wildland Consultants 2020). Sixteen kororā/blue penguins were identified in the red area and two within the yellow area. No kororā/blue penguins were detected within the blue, orange or green areas.

Figure 3: Port of Tauranga key bird locations

Plate 1: Location of proposed kororā/blue penguin nest box colony at Butters Point, looking east.

Plate 2: Location of proposed kororā/blue penguin nest box colony at Butters Point, looking north.

12.3 Tarāpunga/red-billed gulls – summary of management measures

Prior to wall removal: The Port of Tauranga will either retain 200 metres of the existing rock wall, or modify a section of the existing wall to provide the same footprint, or construct a purpose-built rock wall south of the dismantled wall, closer to the Tanker Berth. This area will provide tarāpunga/red-billed gull with a site further along the rock wall to roost and breed. The modification will involve increasing the height of the wall as it is current too low for red-billed gulls to use.

During rock wall removal: Partial construction of the southern Mount Maunganui Wharf extension and building activity will influence birds returning to the Port of Tauranga for the breeding season to seek an alternative roosting and nesting site. This disturbance will displace birds to roost and breed further along the rock wall within the modified area.

13.0 Kororā/blue penguin biology and ecology

13.1 Population status

Kororā/blue penguin are found throughout Aotearoa New Zealand[3] and are classified as At Risk – Declining (Robertson *et al.* 2021). Kororā/penguins present around the Port of Tauranga are the northern blue penguin subspecies.

Tauranga supports a significant kororā/penguin population, concentrated at Mauao (Mount Maunganui) 800 nests, Moturiki (Leisure Island) 200 nests, and Motuotau (Rabbit Island) 400 nests[4], with at least 1,400 nests in total at these three sites. Other locations around the wider Tauranga area include Waikareao, Matapihi and Waipu.

13.2 Habitat

Kororā/blue penguins are widespread around the coastline of Aotearoa New Zealand, roosting and nesting in colonies or sometimes singly. Colonies are generally small, numbering only a few pairs. The largest colonies include the Oamaru population that comprises more than 450 breeding pairs (Agnew and Houston 2020). Birds can nest some distance inland, and in virtually any habitat, including coastal dunes, scrub and forest, farmland, and residential areas (Marchant and Higgins 1990).

Birds breed in a wide variety of burrow types, including burrows that they excavate, burrows they commandeer off other birds (such as sooty shearwaters, *Puffinus gavia*), or they use logs, caves, crevasses in rocky shorelines, under houses and custom-made nest boxes (Braidwood *et al.* 2011, Marchant and Higgins 1990). At Port of Tauranga, kororā/penguins' nest within the seawall at the Mount Maunganui Wharf and possibly within the Sulphur Point seawall.

Nest sites are used throughout the year, and the same nest site is often used year-to-year.

[3] Recent genetic research recommends that the New Zealand blue penguin and Australian fairy penguin be split into distinct species (Grosser *et al.* 2015).

[4] https://www.westernbaywildlife.nz/penguin-monitoring/

13.3 Breeding cycle

The breeding cycle of kororā/blue penguin is shown in Table 1. Dates can vary between locations. In some instances, egg-laying can occur as late as December, resulting in a protracted breeding season.

Table 1 – Indicative breeding cycle of kororā/blue penguins, based on Flemming (2013) and Dann (2013). Red highlighting indicates burrow occupancy stage in the breeding cycle.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Burrow occupation												
Egg laying												
Guarding young												
Moulting												

Moulting usually occurs after breeding has been completed. During this period of 2-3 weeks, the loss of waterproofing means that an adult bird cannot enter water. After moulting, the birds undertake extensive foraging trips, which can last for more than a week before they return to their burrow. This short period around April-May is the only time when kororā/blue penguin presence in burrows is significantly reduced. Prior to the onset of breeding (June), a pair will remain in the nest together for about five days, approximately 30 days before the first egg is laid. The pair then return to the sea for a number of days before returning and remaining ashore for another five days, when the first egg is laid.

Kororā/blue penguins usually lay two eggs which are incubated by both the male and female in stints of 1-10 days. Incubation lasts approximately 35 days. Chicks fledge at 7-9 weeks. Pairs can re-lay if clutches fail, and sometimes begin a second nest after breeding successfully (Agnew *et al.* 2014).

13.4 Foraging

Kororā/blue penguins are known to travel significant distances from the colony when foraging, with examples of more than 45 kilometres and up to 214 kilometres (Hoskins *et al.* 2008; Poupart *et al.* 2017; Preston *et al.* 2007).

Kororā/blue penguins are typically demersal divers - feeding on the sea bottom - and are thought to use the seabed to trap their prey (Chiaradia *et al.* 2007). They have been shown to dive to 55 metres, but generally feed in shallower waters (e.g. Chiaradia *et al.* 2007; Hoskins *et al.* 2008). The few dietary studies undertaken in Aotearoa New Zealand indicate that the species takes a variety of inshore species of small fish and squid (Flemming *et al.* 2013; Fraser and Lalas 2004; van Heezik 1990).

13.5 Threats

Kororā/blue penguins are potentially affected by many threats and perhaps the most widely recognised is introduced predators. Cats (*Felis catus*), dogs (*Canis familiaris*), ferrets (*Mustela furo*), and stoats (*Mustela erminea*) can prey on eggs, chicks, and adult kororā/penguins; and rats (*Rattus* spp.) may prey on eggs (Agnew *et al.* 2014). The impact of particular pest predators appears to vary between sites (see Challies and Burleigh 2004; Stahel and Gales 1987; Perriman and Steen 2000; Karl and Best 1982; Stevenson and Woehler 2008; Dann 1992; Heber *et al.* 2008).

Perhaps the most striking reports of predation have been those resulting from dogs. A population at Cape Foulwind was decimated by dogs over a few nights, losing 22 adults (Musson 2012), and the predator involved was confirmed by veterinarians.

Kororā/blue penguins are also vulnerable to collisions with vehicles when they cross roads to obtain access to breeding sites (Heber *et al.* 2008; Dann 2013), with small boats within the marinas, and possible effects of climate change have been relatively well researched in Australia, with authors identifying both positive and negative effects resulting from sea temperature increases (references in Dann 2013). In early 2018, high levels of mortality of kororā/penguins were reported, particularly from northern areas of Aotearoa New Zealand and western Bay of Plenty. Department of Conservation seabird expert Graeme Taylor suggested a rapid change from an El Niño period to a La Niña event caused major food supply changes, resulting in mass mortality of newly fledged birds[5].

Other threats include encroachment of coastal developments into breeding areas, as well as increased activities within marine areas, and pollution, particularly oil spills (e.g. Stella Passage Mobile oil spill in 2015). The wreck of the Rena resulted in 383 oiled kororā/penguins being admitted to a wildlife facility for rehabilitation, and 90 dead oiled birds were collected (Sievwright 2014; Riddell and Kessels 2013).

13.6 Port of Tauranga kororā/penguin population

Port of Tauranga undertook a kororā/blue penguin survey at various locations within the Port during the early breeding period in August 2019. The survey was undertaken with a specialist conservation dog trained to detect seabirds, and the handler, Joanna Sim (DabChickNZ). Sixteen detections were made within the rock wall by the Mount Maunganui Wharf (Figures 2 and 3). Kororā/penguins may also nest under some of the logs and shipping containers and along the Sulphur Point reclamation area.

14.0 Tarāpunga/red-billed gull biology and ecology

14.1 Population status

Tarāpunga/red-billed gulls are found throughout Aotearoa New Zealand and are classified as At Risk-Declining due to the significant declines at three of Aotearoa New Zealand's largest colonies at Three Kings Islands, Mokohinau Islands, and Kaikoura (Mills *et al*. 2018).

14.2 Habitat

Tarāpunga/red-billed gulls are widespread around the Aotearoa New Zealand coastline, and generally breed and roost in large colonies (Heather and Robertson 2015), frequenting estuaries, harbours, open coastlines, and parks in coastal cities. Most birds will leave the breeding colony in autumn and undertake seasonal movements to wintering sites, e.g. from Kaikoura to Wellington Harbour. Most birds will remain within 400 kilometres of their breeding colony (Heather and Robertson 2015).

14.3 Breeding cycle

The breeding season has a long egg-laying period from mid-September to February (Heather and Robertson 2015). Colony numbers will start building up around mid-July, but nesting sites are not occupied until early August. Nests are usually at ground level on shellbanks, sandspits, gravel beaches, rocky headlands, and rocky inlets. Incubation takes 21-27 days; chicks fledge at about 37 days and are fed for another *c.*30 days (Heather and Robertson 2015). The normal clutch size is two eggs, and adults and chicks have high site fidelity and return to the same colony they previously bred or were hatched. If successful at a particular site, adults will return the next year to that colony (Mills *et al.* 2018).

[5] https://www.nzherald.co.nz/nz/little-blue-penguins-death-numbers-cause-concern/GRKRPJ7SBSR77YKKQVKLNVM6Y4/

14.4 Foraging

Birds will commute 20 kilometres or more each day from a roosting/breeding site and offshore foraging sites (Heather and Robertson 2015). The diet of breeding adult red-billed gulls and nestlings consists mainly of krill, but also small fish, terrestrial invertebrates, fishing discards, and food discards in urban areas and rubbish dumps.

14.5 Threats

Tarāpunga/red-billed gulls are threatened by mammalian predators, including cats (*Felis catus*), ferrets (*Mustela furo*), stoats (*Mustela erminea*), hedgehogs (*Erinaceus europaeus*), and rats (*Rattus* spp.), as well as avian predators, such as southern black-backed gulls (*Larus dominicanus dominicanus*) (Mills et al. 2018). Long-term declines in red-billed gull numbers may also be driven by changing sea temperatures altering the distribution and abundance of marine organisms (Mills *et al*. 2008; Frost and Taylor 2016; Frost 2017).

14.6 Port of Tauranga tarāpunga/red-billed gulls

During a site visit 6 December 2021, approximately 600 red-billed gulls were roosting and nesting at the rock wall of the Mount Maunganui Wharf (Plate 5). Regular monthly bird surveys at the site commenced in January 2022. During the November 2023 survey of the southern log yards and rock wall, up to 800 red-billed gulls were recorded (Figure 3).

Plate 5: Tarāpunga/red-billed gulls roosting and nesting at the rock wall at the Mount Maunganui Wharf, looking south.

15.0 Potential ecological effects

15.1 Overview

The area affected by rock wall removal is an important roosting and nesting site for tarāpunga/red-billed gulls and is the largest coastal mainland colony in the Bay of Plenty[6]. The affected rock wall also comprises a relatively small proportion of potential and known kororā/blue penguin habitat provided by rock revetments that extend around the Port of Tauranga.

Removal of rock wall between Berths 11 and 16 should be programmed for the period between late March and early July as this will minimise potential overlap with the breeding period for tarāpunga/red-billed gulls and kororā/blue penguins, and therefore minimise the possibility of penguin eggs and chicks being present in burrows when work commences, as well as impacts on breeding tarāpunga/red-billed gulls.

15.2 Kororā/blue penguins

Port of Tauranga estimates that the construction or extension of the Mount wharf will take approximately 18-24 months to complete. Dismantling of the rock wall and construction of the wharf could be staged, starting and finishing one section at a time. Alternatively, the rock wall could be removed, and the revetment made inaccessible prior to wharf construction, e.g. the revetment could be wrapped, preventing access or the large boulders could be removed to the high water line and lowered into the water as part of the construction programme.

At the time when removal of the rock wall commences (e.g. early April), all or most chicks will have fledged, and adults that have bred may be moulting or heading out to sea for a number of weeks following their moult, or may be resting in the burrow. This means that the proposed rock wall removal is unlikely to affect nests, but could affect adults if they are present in the burrow. Worst-case scenarios include the loss of late-season nests or fledglings that should have fledged due to rolling rocks or entrapment, or forcing a moulting adult to escape to the sea, where it will not survive without waterproof feathers.

15.3 Tarāpunga/red-billed gulls

Construction of the Mount wharf extension will remove the existing rock wall where tarāpunga/red-billed gulls currently roost and nest, requiring the colony to relocate elsewhere (e.g. sand pile, within or outside of Port environs).

The gull colony is likely to attempt to re-establish in relatively close proximity to its last location, such as further south along the rock wall, a cargo shed roof, the Sulphur Point sand pile or another relatively undisturbed location with suitable surfaces for breeding. Alternatively, if no suitable habitats exist within the Port, birds will move elsewhere. This could include birds relocating nearer to or within the Tauranga Airport boundary, which may increase the risk of bird strikes with aircraft. Tauranga Airport is situated close to Tauranga Harbour and estuary, which are used by many bird species, and the airport has mitigation measures to address these risks. Nevertheless, increased numbers of red-billed gulls at or close to the airport environment is not desirable.

The colony's current location within the Port is likely to provide the birds with considerable protection from predation by terrestrial mammals. If birds re-establish outside of the Port, this protection may be

[6] Colony size details provided by John Heaphy, Department of Conservation.

lost, and productivity may be reduced as a result. If the gull colony remains at the present location to breed while construction is occurring nearby. In that case, the colony will be subjected to increased levels of disturbance and this may lead to reduced productivity. To minimise this effect, the Port of Tauranga will leave approximately 200 metres or equivalent surface area of the existing rock wall or construct a purpose-built rock wall south of the dismantled wall, closer to the Tanker Berth, enabling the gulls to remain within their present colony location. Monthly monitoring of the site will assess changes in tarāpunga/red-billed gull colony numbers.

Management actions set out in the following sections aim to avoid any loss of nests or adults as a result of the dismantling of the rock wall. Successful implementation of management actions will result in minimising adverse effects (primarily the temporary loss of burrows).

16.0 Kororā/penguin management and mitigation

16.1 Identification and monitoring of affected burrows

As noted above, the Port environs were surveyed for kororā/blue penguins in August 2019 and that survey located burrows within the area to be affected. Good site knowledge will enable stringent management to be implemented.

During the pre-construction phase, the 16 potential kororā/penguin burrows identified using a conservation dog in 2019 should be searched thoroughly to properly locate each burrow and identify its inhabitants. Furthermore, the whole rock wall which will be affected during works will be searched by a kororā/penguin dog and handler to identify any additional breeding/roosting sites that are now being occupied. A burrowscope should be used where burrows are too deep to view or reach by hand. If a nest is present, then the burrow obviously contains a breeding pair. Otherwise, burrows may require a return visit in the early evening to determine the presence of inhabitants. Joanna Sim and her dog Rua (or another dog handler with similar skills and experience) will undertake this search before any rock wall removal commences. Any handling and translocation of kororā/penguins during the construction phase will be undertaken by appropriately trained, experienced and permitted personnel.

Burrows that are identified during the search should be marked. A small mark should be made on the footpath above the burrow, and the burrow should be photographed and described in detail, so that they can be revisited as required.

This initial check would address the following:

- Locate kororā/blue penguin burrows during the breeding season and adult moult (typically July to April, inclusive) and obtain information on resident birds and burrow construction.
- Allow for dismantling of the rock wall outside of the breeding season, to avoid nesting birds, over the period April to early July, or thereabouts.
- Identify and undertake a staged programme to pre-construction wrap the rock wall outside of the breeding season (as per the Napier Port methodology) to discourage birds from using the rock wall. This would be once the trained kororā/penguin dog and handler have confirmed that each section is clear of penguins. If all staged works cannot be completed during the non-breeding period, some deconstruction work can be completed for a short period within the breeding season.
- This would only be undertaken once the nesting box colony is built and monitoring of nest box occupancy has commenced.

16.2 Action plan

Dismantling of the Mount Maunganui rock wall will be undertaken outside of the typical kororā/blue penguin breeding and moult season, which is usually July-March However, it is possible that some older chicks may remain in burrows, or that adults may be present during the day. These adults may be resting, moulting, or possibly guarding a late chick. Similarly, the proposed construction period may take 18-20 months, and some limited dismantling of the wall may be necessary during the breeding season, but only in the event that successful relocation of kororā/penguin and tarāpunga/red-billed gulls has occurred. This will be assessed during the regular Port avifauna surveys.

The Action Plan will be implemented during the dismantling of the rock wall. Details are set out below and address the possibility that nests will be uncovered containing eggs and/or chicks, moulting adults, resting adults, and the possible injury of individuals.

Methods

Prior to wrapping of a section of the rock wall, burrow sites identified during the survey prior to removal of the rock wall will be checked using a burrowscope. If a burrow is found to be active, three main actions will be implemented subject to the contents of the burrow:

- One or two resting adults (no down feathers present): ensure that the nest site does not contain eggs or chicks.
    - If adult(s) can be reached by hand, capture and box the adult(s) and relocate to the nest box colony. This would be undertaken by someone with a permit to handle kororā/blue penguins.
    - After the relocation of any birds to the nest box colony, ensure that all burrows and wall section has been wrapped by the end of the day to prevent birds from re-entering.
    - If adult(s) are present but cannot be reached, move further along the rock wall and confirm no birds are present before wrapping. The new section being assessed should be at least a minimum of 10 metres away from the occupied nest, or 15 metres where practicable.
    - Return to the occupied burrow the following day to check on the inhabitants. Continue work when the adults have left.

- One or two moulting adults: if the moult is near completion (new feathers are evident over most of the body), transfer the bird(s) to the Port nest box colony by someone with a permit to handle kororā/blue penguins.
    - If adult(s) can be reached by hand, box the adult(s) and relocate to the nest box colony. This would be undertaken by someone with a permit to handle kororā/blue penguins.
    - If adult(s) cannot be reached, return to the burrow the following day to check on the inhabitants. Note that the moulting period lasts 10-18 days. Continue work when the adults have left.
    - After the relocation of any birds to the nest box colony, ensure that the burrow and wall section has been wrapped by the end of the day to prevent birds from re-entering.

- Egg and/or chick: Avoid the area until the nest is complete, i.e. a chick has fledged. Wrapping of the rock wall will commence within another section that is at least a minimum of 10 metres away from the nest, or 15 metres where practicable.

For rock wall removal/creation, the following measures will be implemented:

- Excavation around the revetment, and placement of new rocks on the existing rock wall, will be undertaken using an excavator and a highly-skilled operator. Any removal or addition of rocks using the excavator must be done carefully, to avoid rolling or movement of other rocks. All work

must be based on the assumption that kororā/penguins may be present in other parts of the rock wall but were not identified in previous surveys.

- If an adult does manage to find a gap in the wrapped wall and is uncovered while the rock wall is being dismantled, all work will cease until a person with a kororā/penguin handling permit indicates that the work can start again.
- The permitted handler will be in attendance during all deconstruction activity and will be fully equipped to deal with all possible outcomes. Equipment will include:
- Gloves.
- Special boxes for the transfer of adults.
- Nets with a long pole for the retrieval of moulting birds from the water if they initially elude capture.
- If a kororā/penguin is injured then it must be taken immediately to Tauranga Animal Rescue and Rehabilitation Centre[7]. Further assistance can be provided by the Western Bay Wildlife Trust[8] who have permitted penguin handlers. The local Department of Conservation office must be notified immediately (0800 ASK DOC [0800 275 362] or info@doc.govt.nz). If advice is required on management of a particular bird, specialist veterinarians at the Auckland Zoo[9] can also be consulted.
- If a kororā/penguin is killed, the local Department of Conservation office must be notified immediately.

16.3 Key risks and management of them

- ***Risk***: A late chick or egg is found in a burrow within the affected revetment.
- ***Management***: Work will not be undertaken within this section of revetment until the chick has fledged, and in the case of an egg, until the egg has hatched and the chick has fledged. Work can proceed at another section of the revetment that is at least a minimum of 10 metres away from the nest, or 15 metres where practicable.
- ***Risk***: One or more adults are found in a burrow within the affected revetment, but are out of reach and cannot be removed by hand.

  Management: Work will not be undertaken within this section of revetment until the birds are absent. In the case of a resting bird, this is likely to be the following day. In the case of a moulting bird, this may be many days.
- ***Risk***: It is possible that new burrows may have been occupied since the 2019 survey and the pre-construction survey, and the search dog may not have found some of the burrows that are present.

  Management: The revetment to be affected will be checked using a burrowscope by on-site personnel prior to wrapping. All of the revetment will be treated as if burrows may be present

[7] Tauranga Animal Rescue and Rehabilitation Centre, 56 Fraser Street, Tauranga 3112; phone (07) 579 9115.
[8] Western Bay Wildlife Trust; phone 0800 Sick Penguin (0800 742 573).
[9] Auckland Zoo, Motions Road, Western Springs, Auckland 1022; phone (09) 360 3805

during deconstruction with appropriate handlers on site. If added directly to the existing rock wall, boulders will be placed to avoid rolling rocks during construction.

- ***Risk***: An adult (or a pair of birds) that are found in a burrow and relocated to the nest box colony return to another location within the affected revetment that has not been previously identified.

  Management: The affected revetment will be checked using a burrowscope by on-site personnel prior to wrapping. All of the revetment will be treated as if burrows may be present during deconstruction with appropriate handlers on site. If added directly to the existing rock wall, boulders will be placed to avoid rolling rocks during construction.

- ***Risk***: Birds transferred as pairs to the nest box colony abandon the box, and return to the revetment. Kororā/blue penguins have strong homing tendencies, and this may be a significant risk.

  Management: The affected revetment will be wrapped at the start of the non-breeding season to prevent birds from re-accessing the site. All of the revetment will be treated as if burrows may be present during deconstruction with appropriate permitted penguin handlers on site. If added directly to the existing rock wall, boulders will be placed to avoid rolling rocks during construction.

- ***Risk***: Work will be undertaken at a time when kororā/penguins are least likely to be present. However, in the event that a kororā/penguin is present, injury or mortality is possible.

  Management: The Department of Conservation will be notified of the work programme. If injury occurs, work will stop and methods will be reviewed in consultation with the Department. If rocks cannot be removed precisely, work will stop and methods will be reviewed.

16.4 Monitoring

The Port of Tauranga will investigate the potential for the Butters Point nesting box colony to be used as a research site. The nesting box colony provides an ideal location for ongoing monitoring within a controlled environment. Each nesting box will provide easy access for scientific research on the nesting success of each breeding pair. Each penguin and any fledglings should be flipper banded and marked with a microchip Passive Integrated Transponder (PIT tag) using subcutaneous implantation at the base of the neck, by a permitted practitioner. This will allow each bird's activity to and from the colony to be recorded by installing a PIT tag reader on the access ramps to the nesting box colony. Each bird should also be sexed and measured: weight, flipper length, and bill length, width, and depth.

Nest boxes should be inspected fortnightly throughout the breeding season (July to January, inclusive), and nest box contents should be recorded during each visit (e.g. adult, egg, or chick). These data will provide ongoing information about the kororā/penguins utilising the Port of Tauranga and breeding success. This will inform ongoing management of kororā/penguin within the Port of Tauranga

During the non-breeding period (April-June), each nesting box should be checked and replenished with dry native grass as nesting material. The condition of the nesting box (e.g. dry/weatherproof) should be checked before the breeding season commences.

17.0 Tarāpunga/red-billed gull management and mitigation

17.1 Overview

Avoidance of adverse effects on tarāpunga/red-billed gulls requires that all work involving the dismantling of the Mount Maunganui rock wall should be undertaken outside of the breeding season and must also align with the non-breeding season of the kororā/penguin (April-June, inclusive). Activity associated with wrapping the rock wall to prevent kororā/penguins from accessing the burrows and dismantling the rock wall will influence tarāpunga/red-billed gulls to relocate to alternative habitat. The 200 metres of existing rock wall to be retained, a modified section of the existing wall, or a purpose-built rock wall will be completed to enable the tarāpunga/red-billed gull colony to relocate. This work will be undertaken during the kororā/penguin non-breeding season one year before any construction work is undertaken on the remaining rock wall.

17.2 Action plan

Attraction to the new rock wall location will be facilitated using a combination of gull decoys and a stereo system playing recordings of gull calls at colonies. This should be done without altering the existing colony location (by asphalting, for example) to allow gulls to start moving along the rock wall and begin using the *c.*200 metre new location due to attraction alone. This will allow birds to become settled in the new location before stopping them from using their existing location.

This Action Plan will be implemented before and during the dismantling of the Mount Maunganui rock wall, and the following methods will be used:

- Prior to rock wall removal: the purpose-built rock wall or modification of the existing rock wall will be undertaken close to the Tanker Berth. Before constructing this wall, a trained kororā/penguin dog and handler will confirm the section of wall is clear of any breeding or moulting adult penguins and fledgling. The rock wall section will be wrapped to prevent birds from accessing the site while the new red-billed gull all is constructed. Once complete, all wrapping will be removed to allow kororā/penguins to use the concrete pipes and naturally occurring areas what can be used as burrows within the rock wall.

- New tarāpunga/red-billed gull colony: gull decoys and a stereo system playing recordings of gull calls should be installed to attract tarāpunga/red-billed gulls. Calls should be played during daylight hours and should commence no later than July, as birds return for the next breeding season. Once the system is in place, calls should be played daily. Monitoring of the site should be undertaken once a week to assess whether birds are attracted to the site and whether nesting activity occurs.

- During rock wall removal: by undertaking partial construction of the southern Mount Maunganui Wharf extension would leave a significant area of rock wall undisturbed, allowing time for the gulls to relocate further south along the wall. Building activity will influence birds returning to the area to seek an alternative roosting and nesting site.

- Tauranga Airport: Port of Tauranga should inform the Tauranga Airport wildlife control team prior to dismantling of the rock wall, so that they can monitor any changes in tarapunga/red-billed gull attendance levels at the airport. If bird numbers increase beyond the previously surveyed levels, then further mitigation may be required, such as further modification or increased construction of the purpose-built rock wall or modification of the existing rock wall.

18.0 People to be involved

- Rowan Johnstone, Engineering Manager, Port of Tauranga. Project management of the Stella Passage Development works.
- A nominated representative for mana whenua Ngāi Tukairangi hapū to review this plan.
- Department of Conservation representative to review this plan and assist as required.
- Port of Tauranga staff persons who holds a permit that allows them to handle and move kororā/blue penguins within the Port environs and may be called upon to handle kororā/penguins during construction.
- Additional assistance and support of penguin permit holding members of the Western Bay Wildlife Trust could support and assist during the pre-construction surveys, dismantling of the rock wall, penguin relocation and ongoing monitoring of the nesting box colony.
- Iwi representative may also assist with monitoring by joining the Port of Tauranga staff during their monitoring surveys.
- Joanna Sim (DabchickNZ) and her dog Rua undertook the surveys in August 2019, and should undertake further surveys before construction.

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Rowan Johnstone of Port of Tauranga provided useful background information and very useful discussion during a site visit in December 2021.

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SECTION 3 – MONITORING OF COASTAL BIRDS AT THE PORT OF TAURANGA

1.0 Introduction

Port of Tauranga Limited commissioned Wildland Consultants to provide a bird monitoring plan to assess the numbers of birds roosting and nesting in the port environs. Tauranga Harbour is a very large tidal estuary that supports internationally, nationally, and locally significant populations of many shorebird and wetland species. Port of Tauranga is located on the eastern side of the harbour. As the Port continues to operate and develop over the coming years, the bird survey data collected will provide a baseline and will establish and maintain a good understanding of bird use of the Port environs. This data will be used to help make informed decisions about future Port management options and how best to manage the presence of avifauna within the Port environment.

This report provides the Port of Tauranga with a survey design, monitoring frequency, and methodology for undertaking bird counts.

2.0 Survey methods

2.1 Overview

The Port environment has been divided into count zones based on:

- Port infrastructure.
- Known sites of interest, e.g. the red-billed gull colony and the sand storage site.

The intention is to undertake total counts within each count zone, similar to the methods used by Smith *et al.* (2015) and Bycroft and Shaw (2021).

2.1.1 Survey Zones

The Port environment has been divided into 10 zones for the bird counts, as shown in Figure 1.

The count zones include terrestrial sites and sites on-water, within *c.*100 metres of wharf infrastructure:

- 1 – Northern old wharf – commonly used by variable oystercatchers.
- 2 – Harbour adjacent to northern wharf.
- 3 – Central wharf.
- 4 – Harbour adjacent to Central wharf.
- 5 – Seawall and proposed new wharf (red-billed gull colony).
- 5a – Adjacent to Butters buildings.
- 6 – Harbour adjacent to 5 and 5a.
- 7 – Sand storage site.
- 8 – Harbour adjacent to Sulphur Point.
- 9 – Northern end of Sulphur Point.
- 10 – Container terminal

Note that the boundaries of these count zones can be amended to reflect physical habitat character and the practicalities of undertaking counts but, after initial field evaluation, zone 'boundaries' should be maintained as much as it is possible to do so.

Figure 1: Proposed bird count zones at the Port of Tauranga

Bird counting within the zones with the exception of Site 7 Sand Storage Pile is carried out from accessible locations that may or may not be available every count (e.g. free berths adjacent to areas 2 and 4) and predominately confined to observations from internal Port Roads due to safety in operational areas. Nevertheless, any restriction to data collection will be noted to identify data collection issues during analysis, including weather conditions, tide, traffic or Port operations which are impeding the assessment and any increased noise.

2.1.2 Health and Safety

All staff undertaking avifauna surveys within the Port of Tauranga must comply with all health and safety policies and procedures, including wearing the appropriate PPE.

2.1.3 Bird Counts

All individuals within each count zone are recorded and totalled to provide a total count for each species. Five-minute bird count will be undertaken at each count zone and no bird will be knowingly counted twice.

Port of Tauranga staff have already been undertaking counts at the sand storage site since October 2021, which has been subdivided into seven sub-zones. Counts should continue on the same basis at this site, and sub-zones could also be created in other zones if it is useful to do so.

Care should be taken so that no bird is recorded twice within a survey period and no birds are assumed to be present. Each survey should target all breeding and roosting coastal birds, including kuaka/eastern bar-tailed godwit, tuturiwhatu/New Zealand dotterel, pied oystercatcher, toreapango/variable oystercatcher, tara/white-fronted tern, karuhiruhi/pied shag, and all other coastal birds.

Other methods could also be used, such as:

- Land-based photographs, which can be used for counts of large numbers of birds, such as the red-billed gull colony.
- Drone/UAV images – if care is taken to not disturb birds (small UAV model, quiet, good camera, and no flashing lights), this would be a useful technique for counting large numbers of birds at the red-billed gull colony and the sand storage site.

The following must be noted, however:

- The Port is within the flight path zone for Tauranga Airport.
- A licensed drone/UAV operator would be required to do this work.

2.1.4 Survey Timing

Monthly surveys are being undertaken throughout the Port of Tauranga to establish a good baseline data set. Each survey is based around high tide.

<u>Sand pile surveys</u>

The sand pile surveys are undertaken weekly during the summer (September to February) to identify all species roosting and breeding activity at the site, providing insight into general breeding behaviour, including number of nests, eggs and fledglings. All surveys are undertaken during high tide. If early breeders are detected, weekly surveys should commence in August and continue until any late nesters have completed. This may require weekly surveys to continue into March.

Fortnightly surveys are undertaken to record shorebirds that utilise the sand pile site during the winter months (March to August). A further site check is undertaken during the non-count week to identify that nothing unexpected is occurring (evidence of predation, sudden increase/decrease in bird numbers). All surveys are undertaken during high tide.

These surveys will also determine whether more tarāpunga/red-billed gulls are using the site during the Mount Manganui Wharf development compared to previous survey periods.

Tarāpunga/red-billed gulls

Monthly monitoring has been undertaken at the sand pile since October 2021 and January 2022 throughout the Port environment. These surveys provide baseline data on general tarāpunga/red-billed gulls' habitat use.

As a proactive approach, weekly surveys should be initiated approximately one year prior to the start of Mount Manganui Wharf development commencing. These surveys should continue during the 18-24 months of works, and for at least two years after completion. These surveys will provide further in-depth information on seawall use, movement and any displacement of tarāpunga/red-billed gulls during the development, ensuring that there is no net loss of gulls from the area. Monthly monitoring should then continue in line with the pre-construction monitoring plan.

Kororā/blue penguin

In August 2019, a trained kororā/penguin dog and handler surveyed Mount Manganui Wharf and identified 16 active sites along the rock wall. This survey will be repeated during the breeding season before works commence to identify the current occupancy of the rock wall at the Mount Manganui Wharf. A further survey will be undertaken the end of the breeding season and moult period to confirm no birds are present within the rock wall. As each section is confirmed clear, the rock wall section will be wrapped. Deconstruction of the wall will commence once the area has been secured. At the conclusion of each deconstruction day, the wall section will be re-wrapped if works have not been completed.

Once the kororā/penguin nesting box colony is completed, monthly monitoring checks should be undertaken to assess if kororā/penguins start using the site of their own accord.

2.1.5 Survey Data

Each survey should record date, time, location, tide details, wind direction, wind speed, weather condition (e.g. fine, mist, rain), temperature, species, number of individuals (adult and juvenile), behaviour (nest building, incubating, feeding young, foraging), and the number of eggs (Appendix 3). Monitoring should also include the stages of juvenile development.

2.1.6 Survey Personnel

All Port of Tauranga field observers should be familiar with undertaking bird counts and must be very familiar with coastal species. Counts should be undertaken by as few observers as possible, to prevent any violations of assumptions and observer bias (e.g. differences in skill levels). It is possible that interested iwi or Bay of Plenty Birds NZ members could join the Port's observer through prior arrangement and assist with counts.

2.1.7 Survey Equipment

Equipment required for each survey includes maps of survey zones and observation points, binoculars or spotting scope (e.g. sand pile or hard to access sites), data sheets or iPad (or equivalent), plastic

thermometer, watch, a method to move between sites (walking or by car), appropriate safety PPE (e.g. Hi-Viz vest). Trail or surveillance cameras can be used to monitor areas as an additional method. Footage can be used to identify fledgling and egg loss by predators (e.g. cats, rats, hedgehogs, and southern black-backed gulls).

2.1.8 Data Storage

Data should be stored electronically, and entering the data directly into an iPad or similar device will reduce handling time and minimise potential for data entry errors. Data should be collated, copied, and stored on a second hard drive for backup security. If data storage is designed well at the start, this will make analysis and interpretation much easier. Ensure that the data is checked for missing information and errors before storing the data. Appropriate file formats include .xls and .csv. All data should be updated into eBird so that it is available to all interested parties.

2.1.9 Incidental Records

A repository of incidental records should be established, which should include:

- Notable different species (e.g. reef heron).
- Bird deaths that can be attributed to port operations.

2.1.10 Data analysis

As data is collected, a biannual assessment should be undertaken to evaluate nesting success and population trends at regularly used sites within the Port. These sites should include the sand pile, tarāpunga/red-billed gull colony and kororā/penguins nesting boxes (once established), at a minimum. This information will help us make informed decisions about future Port management options. Annual reports should summaries the main findings and identify any trends or changes over time. These reports should be made available to interested parties and available on the Port of Tauranga's website.

3.0 Management of pest plants and animals

Predator control should be implemented at key sites at the Port to target rats, cats, and hedgehogs, to minimise the possibility of birds being killed and eggs destroyed.

The sand storage site should be cleared of weeds during the non-breeding season. Minor maintenance could be undertaken at low tide if incubating birds are not disturbed, e.g. around the edges of the sand storage area.

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SECTION 4 – ASSESSMENT OF PORT LIGHTING AT THE PORT OF TAURANGA

1.0 Introduction

Port of Tauranga Ltd commissioned Wildland Consultants to provide an assessment of artificial lighting to minimise the potential for adverse effects on avifauna within the Port environment. Tauranga Harbour supports internationally, nationally, and locally significant populations of many shorebird and wetland bird species. As the Port continues to operate and develop over the coming years, appropriate artificial lighting is required for operational health, safety, and productivity, without compromising avifauna.

As lighting technology is changing rapidly, and biological responses to artificial light varies between species, it is not possible to set prescriptive limits on lighting. This report provides the Port of Tauranga with guidelines on how lighting affects avifauna and suggests prescriptions for lighting limits.

2.0 Effects of artifical lighting on avifauna

2.1 Overview

Many bird species, including shorebird and seabird species, can be attracted to or be disorientated by artificial lighting at night (ALAN). Light pollution can hide navigational aids (sun, moon and stars), and bright lights can attract birds, causing them to divert from efficient migratory routes (death through exhaustion) or collide with infrastructure. This effect can be significantly pronounced when visibility is poor, such as on foggy nights (Mclaren *et al*. 2018). Attraction to artificial night lighting may result in other adverse effects on birds, such as reducing fuel stores and delaying migration (Gauthreaux and Belser 2006). The most commonly affected species are Procellariformes (including petrels, shearwaters, albatross, and terns), migrating shorebirds (e.g. kuaka/eastern bar-tailed godwit) and some penguins. Currently, 56 petrel species have been identified worldwide, and the birds at greatest risk are burrow-breeding seabirds (Rodriguez *et al*. 2017a, 2017b). Adult Procellariforme are less vulnerable than fledglings, but nocturnal activities do play an important role in the annual breeding cycle (Rodriguez *et al*. 2017a, 2017a). Fledglings of burrow breeding species are at a greater risk to artificial lights, particularly during their maiden flight to sea.

2.2 Terrestrial effects

Attraction to ALAN can lead to seabirds' crash landing (termed 'fallout') in urban areas. Fallout birds cannot get airborne once on the ground without assistance, leading to being run over by vehicles, starvation, succumbing to injuries, or mammalian predation. For example, Kaikōura tītī/Hutton's shearwater (*Puffinus huttoni*, Threatened – Nationally Vulnerable) fledglings undertake their maiden flight to sea from two alpine colonies and their flight path passes over the Kaikōura township where birds are often found grounded in and around the town during March and April (Deppe *et al*. 2017). Furthermore, the street lighting around Punakaiki has been identified as a contributor to fallout events with tāiko/Westland petrels (*Procellaria westlandica*, At Risk – Naturally Uncommon) between November and January (Naish 2020). Westland petrels also nest and breed close to an urban environment on the mainland.

Other reports of light-induced collisions in northern Aotearoa New Zealand include birds colliding with the lighthouse on Burgess Island (Pokohinu, Mokohinau Islands) and being grounded by lights in Auckland City and various coastal towns (Lukies *et al*. 2021; Whitehead *et al*., 2019), and grey-faced petrels (*Pterodroma gouldi*) found below streetlights in the eastern Bay of Plenty (W.B. Shaw, Wildlands, pers. comm.).

In the Canary Islands, a GPS data-logger study on the flight tracks of Cory's shearwater (*Calonectris borealis*, Non-resident Native – Vagrant) found grounded fledglings on their maiden flight within 16 kilometres of their breeding grounds. This issue was found to be more severe for inland colonies and was directly linked to light pollution (Rodriguez *et al*. 2015). Another study revealed that over 10,000 shearwaters, storm petrels, and Atlantic puffins (*Fratercula arctica*) were found grounded in the village of Hirta, St Kilda, Outer Hebrides. These birds were attracted to the lights of village buildings at night and to street lamps along the shorefront, which are now no longer in use (Miles *et al*. 2010).

It is not just the direct impact of artificial lights on wildlife that is concerning. Light pollution can also disorientate migratory shorebirds and alter their flight trajectories. Moreover, it can disrupt the invertebrates that shorebirds rely on, leading to a decline in food supplies and creating challenges at their refuelling stopovers.

A study on penguins at a naturally dark site in Australia showed that exposure to artificial lighting along preferred paths to reach their nests helped the penguins to find their way, reduced predation risk and possibly improved vision (Rodriguez *et al*. 2018). The study showed that the penguins habituated to artificial light and were unaffected by an increase of 15 lux. However, lighting may also attract penguins to undesirably lit sites.

2.3 At-sea affects

Artificial lighting can also disorientate birds which collide with artificial structures while flying or foraging. The risk is considerably higher if the structure is associated with an attractive food source, such as commercial fishing vessels. For example, seabirds colliding with vessels and warp cables of longline and trawling boats is a major source of mortality for many seabird species. An extreme case is of a trawler travelling in darkness on a calm, foggy night with strong ice lights on, and at dawn, almost 900 prions, storm petrels, and diving petrels were found on deck, of which more than a quarter were dead (Black 2005). Furthermore, ship lighting at anchor is important for maritime safety. However, artificial lighting at sea can lead to bird fallout events on ships. Approximately 70 Buller's shearwaters (*Adrenna bulleri*, At Risk – Declining) landed on a cruise ship in Aotearoa New Zealand, and approximately half of the birds died (Cropp 2019). Cruise ships are now being asked to dim their night lighting to avoid further events from November to June (DOC 2019).

3.0 Seabird and shorebird species

An assessment of seabird and shorebird data obtained from the eBird database for the period January 2000 to April 2023 and the Port of Tauranga bird survey data (October 2021 to May 2024) identified 25 species, including four classified as Threatened and 17 At Risk species (Table 1; Robertson *et al.* 2021). Of these species, six are burrow-breeding seabirds which nest on islands within the Bay of Plenty, and adjacent to Tauranga Harbour. These species are found on the following islands:

- Northern diving petrel/kuaka (*Pelecanoides urinatrix urinatrix*, At Risk – Relict) breed and nest on Moturiki (Leisure) Island, Motuotau (Rabbit) Island, Mōtītī Island and Motunau (Plate), Karewa Island, Tūhua/Mayor Island, Moutohorā (Whale) Island, Moutoki Island, and Rūrima Island.

- New Zealand white-faced storm petrel/takahikare (*Pelagodroma marina maoriana*, At Risk – Relict) breed and nest on Moturiki (Leisure) Island, Motunau (Plate) Island, Moutoki Island, and Rūrima Island.

Table 1 – Bird survey data compiled from eBird checklists and Port of Tauranga bird survey data (October 2021 to May 2024). Common names, species names, and threat classifications are from Robertson *et al.* (2021).

Common name	Scientific name	Threat classification	Port	Harbour	Coastal
Black-fronted tern/tarapirohe	*Chlidonias albostriatus*	Threatened – Nationally Endangered		Y	
Northern New Zealand dotterel/tūturiwhatu	*Charadrius obscurus aquilonius*	Threatened – Nationally Increasing	Y		Y
Black petrel/tāiko	*Procellaria parkinsoni*	Threatened – Nationally Vulnerable			Y
Caspian tern/taranui	*Hydroprogne caspia*	Threatened – Nationally Vulnerable	Y	Y	Y
Banded dotterel/pohowera	*Charadrius bicinctus bicinctus*	At Risk – Declining	Y		
Black-billed gull/tarāpuka	*Chroicocephalus bulleri*	At Risk – Declining	Y	Y	Y
Buller's shearwater/rako	*Adrenna bulleri*	At Risk – Declining			Y
Eastern bar-tailed godwit/kuaka	*Limosa lapponica baueri*	At Risk – Declining	Y		
Northern blue penguin/kororā	*Eudyptula minor iredalei*	At Risk – Declining	Y	Y	Y
Red-billed gull/tarāpunga	*Chroicocephalus novaehollandiae scopulinus*	At Risk – Declining	Y	Y	Y
Red knot/huahou	*Calidris canutus rogersi*	At Risk – Declining		Y	Y
South Island pied oystercatcher/tōrea	*Haematopus finschi*	At Risk – Declining	Y		
White-fronted tern/tara	*Sterna striata striata*	At Risk – Declining	Y	Y	Y
Little black shag/kawau tūī	*Phalacrocorax sulcirostris*	At Risk – Naturally Uncommon		Y	Y
Pied shag/kāruhiruhi	*Phalacrocorax varius varius*	At Risk – Recovering	Y	Y	Y
Variable oystercatcher/tōrea pango	*Haematopus unicolor*	At Risk – Recovering	Y	Y	Y
Black shag/māpunga	*Phalacrocorax carbo novaehollandiae*	At Risk – Relict	Y	Y	Y
Fairy prion/tītī wainui	*Pachyptila turtur*	At Risk – Relict			Y
Flesh-footed shearwater/toanui	*Ardenna carneipes*	At Risk – Relict			Y
Fluttering shearwater/pakahā	*Puffinus gavia*	At Risk – Relict			Y
New Zealand white-faced storm petrel/takahikare	*Pelagodroma marina maoriana*	At Risk – Relict			Y
Northern diving petrel/kuaka	*Pelecanoides urinatrix urinatrix*	At Risk – Relict			Y
Ruddy turnstone	*Arenaria interpres*	Non-resident Native – Migrant		Y	Y
Little pied shag/kawaupaka	*Microcarbo melanoleucos melanoleucos*	Non-resident Native – Vagrant		Y	Y

- Flesh-footed shearwater/toanui (*Ardenna carneipes*, At Risk – Relict) breed and nest on Karewa Island and Tūhua/Mayor Island.
- Fluttering shearwater/pakahā (*Puffinus gavia*, At Risk – Relict) breed and nest on Motuotau (Rabbit) Island, Mōtītī Island and Motunau (Plate), Karewa Island, Tūhua/Mayor Island.
- Grey-faced petrel/ōi (*Pterodroma gouldi*, Not Threatened) breed and nest on Mauao/Mount Maunganui, Motuotau (Rabbit) Island, Motunau (Plate) Island, Karewa Island, Moutohorā (Whale) Island, Moutoki Island, Tūhua/Mayor Island, Taumaihi (The Knoll) Island, Rūrima Island, and Whakaari/White Island.
- Black petrel/tāiko (*Procellaria parkinsoni*, Threatened – Nationally Vulnerable) breed and nest on Moutoki Island and Rūrima Island.

4.0 Review of light character and potential effects

4.1 LED technology and potential effects

Light emitting diodes (LEDs) are now widely used to replace previous technology and provide a new range of spectral characteristics (Longcore *et al*. 2018). This makes them safer than high-pressure sodium, low-pressure sodium, metal halide, and fluorescent lights, which take a long time to warm up and cool down and were generally left on all night. LED bulbs are more energy efficient, and light control is instant when turned on or off. However, all LED lights contain blue wavelengths.

The spectral composition of lights is thought to affect attraction by birds: white and blue light is highly attractive to all seabirds (kelvin ≥ 2200; Longcore *et al*. 2018). All seabirds are sensitive to the violet-blue spectrum and short wavelength (380-500 nanometres). Different LED lights can have the same colour-correlated temperature (CCT) but can have very different blue content (Figure 1). This light colouration, however, can appear the same to the human eye as we are not sensitive to violet-blue spectrum.

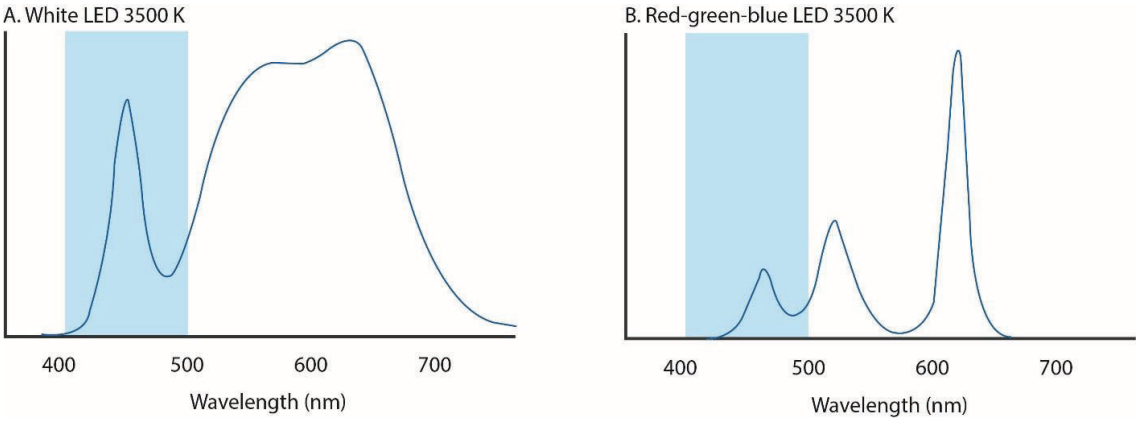

Figure 1: A comparison of the blue wavelength spectral content of two LED lights with the same CCT (3500k). The blue band shows the blue region of the visible spectrum (400–500 nm). The light in A has a much greater blue light content than B yet the two appear to the human eye as the same colour. For animals with differing sensitivities to light wavelength from humans, they may appear very different. Figure copied from National Light Pollution Guidelines (2020).

Animals and humans perceive light differently, and commercial lighting focuses on the best solution for human activity without considering the effects on other species. As lighting sources are upgraded within urban and commercial areas from high-pressure sodium, low-pressure sodium, metal halide and fluorescent lights, consideration is needed to assess the extent of sky glow, light source intensity, direction, duration and spectrum of the lights (e.g. wavelength)

4.2 Sky glow

Sky glow is the effect of lighting illumination on atmospheric conditions that influence the amount and nature of reflection and scattering of light. Sky glow can be seen from a great distance from cities and can be highly attractive to wildlife, including birds, turtles, and insects (National Light Pollution Guidelines 2020; Longcore *et al*. 2018). Lights of different spectra, intensity and configuration will affect sky glow differently.

Vertical lights that illuminate the sky can significantly impact birds flying at night and attract birds to an area. Regardless of location within the Port, all outside high mast floodlights should be shielded above, and the edge of the shield should be below the whole of the light source, preventing any upward illumination and reducing horizontal light spread. This will greatly reduce any attraction of birds flying at night. However, the overall sky glow of Tauranga is contributed to by all commercial businesses (during business hours), sports facilities (during training or competitions) residents (generally early evening), and road lighting (all night).

4.3 Light intensity and wavelength

Light Intensity

Light intensity may be more important than colour for seabirds. Very bright light will attract seabirds regardless of colour (Raine *et al*. 2007). It is important to keep light intensity to a minimum (National Light Pollution Guidelines 2020; Longcore *et al*. 2018). Light intensity should be appropriate for the activity, and only use the minimum number of lights to meet the requirements.

Wavelength

Numerous studies have reported attractiveness to different wavelengths. White light has the greatest effect as it contains all wavelengths of light (Reed 1986) and different animals perceive light differently to humans (Figure 2; Longcore *et al*. 2018). Human vision ranges from 400-700 nanometres, with a peak of 555 nanometres. It has been shown that potential physical damage can occur when exposed to 400-490 nanometres for extended periods and changes in physiological function when exposed to these wavelengths at night (changes in circadian rhythms to the 24-hour light/dark cycle in animals; Longcore *et al*. 2018). Artificial light at night can suppress production melatonin, the “sleep hormone”. This hormone is a key contributor to circadian clock regulation, which is a natural, internal process that regulates the sleep-wake cycle and repeats/resets on each rotation of the Earth roughly every 24 hours. These 24 hour rhythms have been observed widely in plants, animals, fungi, and cyanobacteria. Melatonin can be suppressed, affecting, movement to or from nests or roosts, timing of the dawn chorus, and changing movement and breeding patterns such as migration and egg laying.

Research on the photoreceptors of wedge-tailed shearwaters (*Ardenna pacifica pacificus*, At Risk – Relict) has revealed that they have four cone-based visual pigments that are most sensitive to light wavelengths of 406, 450, 503, and 566 nanometres, approximately corresponding to violet, blue-violet, green and yellow-green light, respectively (Hart 2004). This heightened sensitivity to wavelengths of <380-500 nanometres may explain why fledglings show an increased attraction to blue and cool colour temperature light (Rodriguez *et al*. 2017). Understanding the specific light preferences of seabirds can help in designing more effective conservation strategies.

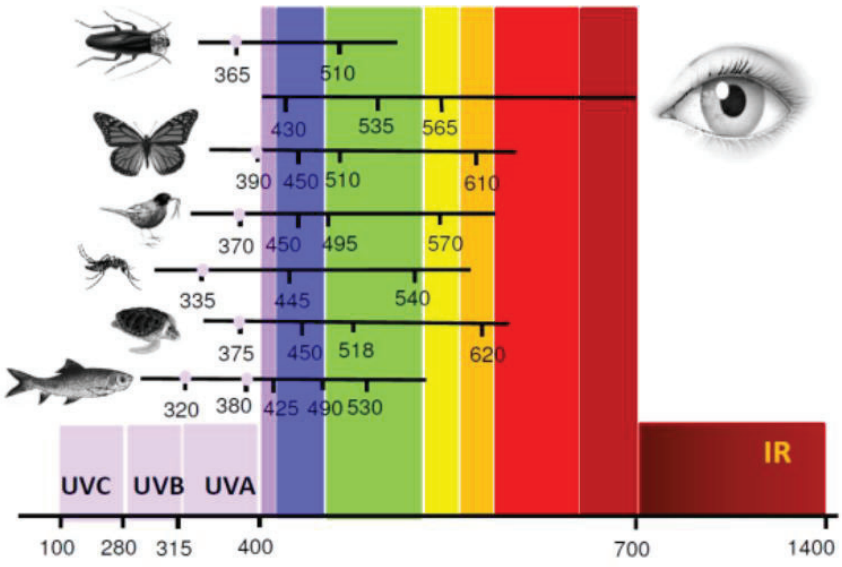

Figure 2: Ability to perceive different wavelengths of light in humans and wildlife is shown by horizontal lines. Numbers indicate peak sensitivity. Figure copied from Carneiro (2021).

4.4 Direction

The direction of the light is also extremely important. All lights must be fully shielded from above and directed onto the intended object or area to prevent light pollution and the attraction of avifauna (Figure 3). It is also important to assess the type of material the lights are directed toward. It is important that surfaces are of low reflective surface (e.g. avoid surfaces that are highly polished, shiny or of a light colour, such as white paint).

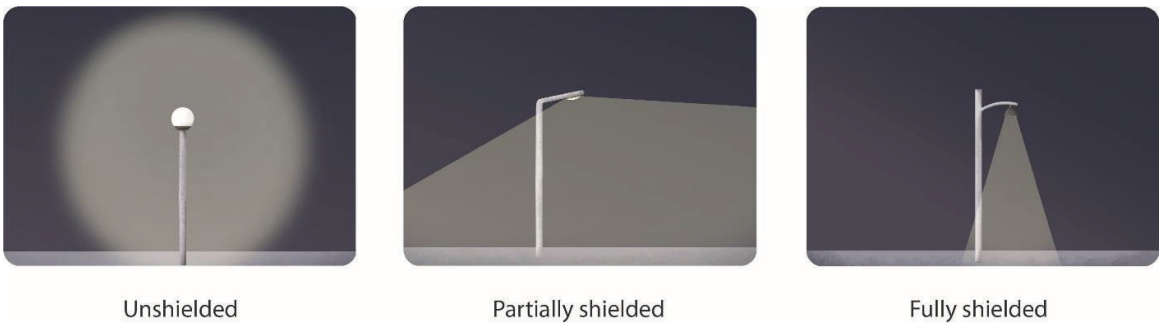

Figure 3: Lights should be shielded to avoid lighting anything but the target area or object. Figure copied from National Light Pollution Guidelines (2020).

4.5 Colour correlated temperature

Colour correlated temperature (CCT) of a light source is one way to minimise the potential for adverse effects on avifauna. Although all LEDs contain blue light, use of a low kelvin bulb reduces the CCT. Lamps containing a warm yellow colour are of a low colour temperature (between 1000-3000 kelvin), whereas cool bluish lamps have a colour temperature over 5000 kelvin. For birds that are sensitive to blue light, LEDs with a low amount of short wavelength should be used (e.g. 2700-3500 kelvin; Figure 4). If lighting must be nearer 6000 kelvin for human safety requirements, low light intensity,

long wavelength (e.g. over 560 nanometres), and downward-facing lights illuminating only the intended object or area as practicable, including motion sensor lighting where appropriate.

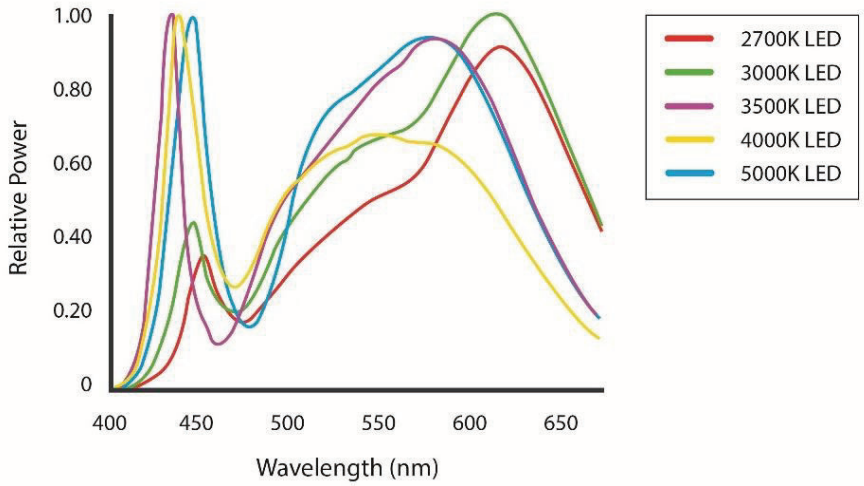

Figure 4: Spectral curves showing the blue content of white 2700-5000 K LED lights. Note the difference in relative power output in the blue (400-500 nanometre) wavelength range. Figure copied from National Light Pollution Guidelines (2020).

5.0 Lighting management at the Port

The following measures should be implemented for all new and replacement lights:

- All outside high mast floodlights should be fully shielded and mounted horizontally, preventing upward illumination and reducing horizontal light spread (Figure 3).
- Use as low a colour-correlated temperature for LEDs as practicable, preferably as low as 3,000 kelvin (warm light), but no greater than 6,000 kelvin. If up to 6,000 kelvin is used, control of light spread and intensity is imperative.
- All lights must have as little or no short wavelength (380-500 nanometres) violet or blue light as possible.
- Light intensity and the number of lights used should only light the intended object or area.
- Use motion sensor lighting where practicable and appropriate, to reduce unnecessary illumination.
- Use high quality, low glare lighting.

It is also suggested that any new or repainting of storage tanks, buildings, and structures are painted with a non-reflective paint to reduce sky glow.

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Appendix 1

Survey results

The Ornithological Society of New Zealand (OSNZ; also known as Birds New Zealand) has undertaken surveys of waders around Tauranga Harbour since 1994. Survey findings for the Sulphur Point warehouse shed roofs (OSNZ OSNZ Site 17) and the Sulphur Point sand pile (OSNZ Site 18; 2008-2021) are summarised in Table A1-1. Records for Sulphur Point (OSNZ Site 17) related to various sites, including Sulphur Point, Sulphur Point shed roof, Sulphur Point warehouse, Cargo Shed, and shed/ wharf. It is not clear if these descriptors include more than one structure (e.g. Shed 11 and Shed 12). Variation in species numbers and the shed roof usage is related to the decrease in size of the sand pile and also the removal of some sheds.

The warehouse shed roof 12 is discussed first as this was initially used as a high tide roost for various species until the shed was removed in May-June 2017. At this time, wading birds, dotterels, gulls and terns generally relocated to the sand pile site. However, a second warehouse shed (Shed 11) that was situated further inland, was then probably used as a high tide roost by some individuals. This structure was then removed between May and September 2020. Nevertheless, it is unclear whether both roofs were used between 2008 and 2017. The OSNZ surveys does identify that kuaka/eastern-bar tailed godwits (*Limosa lapponica baueri*, At Risk-Declining) did use the Sulphur Point cargo wharf as a roosting site in 2018, after Shed 12 was deconstructed. The OSNZ surveys also continue to identify individuals roosting on a 'cargo roof' during November 2020, June 2021 and November 2021. It is assumed that this roosting structure is the Sulphur Point Cold Store. The OSNZ surveys have recorded the presence of eight wader species, along with gulls and tern species, at the sand pile.

In October 2021, Port of Tauranga commenced weekly surveys during the breeding season (September to February) at the sand pile and bi-weekly surveys during the non-breeding period (March to August), and the survey methodology is outlined in Chapter 3 of this report. Current survey results are outlined in Table A1-2.

Table A1-1 – Bird survey counts at the Sulphur Point warehouse shed roofs (Shed 11 and 12) and the sand pile, 2008-2021, combined (source: Ornithological Society of New Zealand). *Shed 12 was used as roost site between 2008 and May/June 2017. ^Shed 11 was used also as roost site between November 2017 and May/September 2020. [+]Probable roosting on the Cold Store roof. [#]Bar-tailed godwits and other avian species observed roosting on the Cargo wharf after Shed 12 was removed. Winter months (March to August) and summer months (September to February). Common names, species names, and threat classifications are from Robertson *et al.* (2021).

Species	Threat Classification	Season	Site	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Waders																	
Banded dotterel/ pohowera	At Risk - Declining	Winter	Shed														
			Sand pile			100											
		Summer	Shed														
			Sand pile														
Eastern bar-tailed godwit/kuaka	At Risk - Declining	Winter	Shed						132*	43*	5*	115*					
			Sand pile			22							50				
		Summer	Shed						200*	1,000*	1,500*	2,000*		1,200[#]			
			Sand pile	1,000	3,500	860	3,000	2,200	2,000				1,500		2,000	2,000	2,000
Northern New Zealand dotterel/ tuturiwhatu	Threatened - Nationally Increasing	Winter	Shed				11*										
			Sand pile			20		10	1	6	3		2	3		4	4
		Summer	Shed														
			Sand pile	6	10	9	2	2	2	5	2	3	1	2	4	2	2
Pied stilt/poaka	Not Threatened	Winter	Shed														
			Sand pile				2										
		Summer	Shed														
			Sand pile							2							
South Island pied oystercatcher/ torea	At Risk - Declining	Winter	Shed			400*		700*	750*	492*	600*	292*	500*	211^		200^	550[+]
			Sand pile				338										
		Summer	Shed	20*	85*	107*	35*	120*	220*	95*	110*	138*	110^	100^	170^	95[+]	
			Sand pile		2												
Spur-winged plover	Not Threatened	Winter	Shed														
			Sand pile			2											
		Summer	Shed														
			Sand pile	2													
Variable oystercatcher/	At Risk - Recovering	Winter	Shed				3*				12*						
			Sand pile			10		6	2				5	3		2	4

Species	Threat Classification	Season	Site	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
toreapanga		Summer	Shed	25*	25*	4*	16*		13*	10*	35*	5*	10^	2^	4#	4	
			Sand pile	6	2	2		3		6	4	3	1	3	2		2
Wrybill/ ngutuparore	Threatened - Increasing	Winter	Shed														
			Sand pile			71		52	48								
		Summer	Shed														
			Sand pile					8									
Gulls																	
Black-backed gull/karoro	Not Threatened	Winter	Shed						14*	14*	14*	20*		1^		1^	1+
			Sand pile			2		46	20				2	2		4	2
		Summer	Shed			62*	12*					41*	2^	165^	42^	48+	
			Sand pile				20	12	7		1	2	1		3	2	2
Black-billed gull/ tarāpuka	At Risk - Declining	Winter	Shed														
			Sand pile														
		Summer	Shed	15*													
			Sand pile	210						1	4	12	5				
Red-billed gull/ tarāpunga	At Risk - Declining	Winter	Shed				8*				1*						5+
			Sand pile										6	1			
		Summer	Shed											16#			
			Sand pile	400	800			30	4	8	90	200	20	400		14	120
Terns																	
Caspian tern/ taranui	Threatened - Nationally Vulnerable	Winter	Shed														
			Sand pile			16		26	28								2
		Summer	Shed		1*												
			Sand pile				1	3	3				2				
New Zealand fairy tern/tara	Threatened - Nationally Critical	Winter	Shed														
			Sand pile														
		Summer	Shed														
			Sand pile				2										
White-fronted tern/tara	At Risk - Declining	Winter	Shed				1*										5+
			Sand pile														
		Summer	Shed				2*										
			Sand pile	250	150			300	100	5	120	200	35	200	240	400	100

Table A1-2 – Sand pile bird survey counts, 2021-2024 (source: Port of Tauranga Ltd). Average monthly counts and range (minimum and maximum). Winter months (March to August) and summer months (September to February). Common names, species names, and threat classifications are from Robertson *et al.* (2021).

Species	Threat Classification	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24
Waders																																	
Banded dotterel/ pohowera	At Risk – Declining																																
Eastern bar-tailed godwit/ kuaka	At Risk – Declining	643 (140-1,200)	963 (900-1,000)	733 (400-900)	1,100 (1,000-1,200)	62 (35-100)			1	1			20	377 (330-400)	1000	590 (500-700)	434 (1-800)	200 (100-300)								850 (600-1,200)	1,133 (1,000-1,200)	550 (400-700)	567 (500-700)				
Northern New Zealand dotterel/ tuturiwhatu	Threatened – Nationally Increasing	6	4 (2-4)	5	6	1		2	4 (2-6)	6	6	5 (4-6)	5 (4-6)	4 (2-6)	4 (2-6)	5 (4-6)	4	2 (2-6)		6 (5-7)	2	3 (2-4)	4	6	6	5 (4-6)	5 (4-6)	3	2 (1-3)		5	2 (1-2)	2
Pied stilt/ poaka	Not Threatened																																
South Island pied oystercatcher/ torea	At Risk – Declining																																
Spur-winged plover	Not Threatened																	2	2													2	
Variable oystercatcher/ tōrea panga	At Risk – Recovering	2 (1-2)	3 (2-4)	2	1	2 (1-2)	2 (1-2)	2	2	4	2	2	2	2	3 (2-4)	3 (2-4)	4	6 (4-8)	3 (2-4)	4	2	3 (2-4)	4	3 (2-4)	4	4	5 (4-6)	3 (2-4)	4 (2-5)	4 (2-6)	3 (2-4)	2	2
Wrybill/ ngutuparore	Threatened – Nationally Increasing																																
Gulls																																	
Black-backed gull/karoro	Not Threatened	2 (1-3)	1	2 (2-3)	2	2 (1-3)	1			2	4	8	5	5 (3-6)	7 (4-10)	6 (3-10)	6 (3-8)	3				1	5		4 (2-6)	6 (1-15)	2 (1-3)	3 (2-3)	7 (2-16)	5 (3-6)	4 (2-5)	2 (1-3)	1
Black-billed gull/taraapuka	At Risk – Declining	2																						3 (1-4)		5	14 (5-20)	18 (15-20)	12 (10-15)	10			
Red-billed gull/taraapunga	At Risk – Declining	4 (1-10)	35 (20-50)	30 (20-40)	62 (30-100)	38 (15-65)	4			8		34 (8-60)	21 (10-35)	41 (15-50)	130 (100-150)	152 (120-200)	200	63 (8-150)		1		1		23 (15-30	160 (30-300)	400 (300-500)	538 (250-800)	350 (300-400)	163 (100-250)	13 (1-30)	3 (2-3)		
Terns																																	
Caspian tern/ taranui	Threatened – Nationally Vulnerable	1																															
New Zealand fairy tern/tara	Threatened – Nationally Critical																																
White-fronted tern/tara	At Risk – Declining	190 (20-400)	98 (40-200)	33 (20-50)	43 (20-65)		1							52 (20-110)	50	34 (20-60)	50									175 (150-200)	188 (100-300)	225 (200-250)	108 (30-200)				

OSNZ summer counts averaged 1,854 kuaka (range 860-3,500) in Tauranga over 13 years. However, these data include sightings of birds roosting on the former warehouse roof. Interestingly, in 2018 kuaka/eastern-bar tailed godwits were observed roosting on the Sulphur Point cargo wharf. The recent sand pile survey undertaken by Port of Tauranga staff for the 2023-2024 summer months averaged 800 (range 400-1,200) birds. Only one individual has been observed during the winter months of 2022 (Table A1-3).

Table A1-3 – Sand pile bird survey data, 2021-2024 (source: Port of Tauranga Ltd). Average survey counts and range (minimum and maximum) for summer (September to February) and winter months (March to August).

Species	Threat Classification	Summer			Winter		
		Oct-21 - Feb-22	Sep-22 - Feb-23	Sep-23 - Feb-24	Mar-22 - Aug-22	Mar-23 - Aug-23	Mar-24 - May-24
Waders							
Banded dotterel/pohowera	At Risk – Declining						
Eastern bar-tailed godwit/kuaka	At Risk – Declining	688 (35-1,200)	517 (1-1,000)	800 (400-1,200)	1		
Northern New Zealand dotterel/tuturiwhatu/	Threatened – Nationally Increasing	4 (1-6)	4 (2-6)	5 (1-6)	4	1	
Pied stilt/poaka	Not Threatened						
South Island pied oystercatcher/torea	At Risk – Declining						
Spur-winged plover	Not Threatened		2			2	2
Variable oystercatcher/ tōrea panga	At Risk – Recovering	2 (1-4)	3 (2-8)	4 (2-6)	2 (1-4)	3 (2-4)	2 (2-4)
Wrybill/ngutuparore	Threatened – Nationally Increasing						
Gulls							
Black-backed gull/karoro	Not Threatened	2 (1-3)	5 (3-10)	4 (1-16)	4 (1-8)	3 (1-5)	2 (1-5)
Black-billed gull/tarāpuka	At Risk – Declining	2		12 (5-20)			
Red-billed gull/ tarāpunga	At Risk – Declining	34 (1-100)	96 (8-200)	268 (1-800)	20 (4-60)	12 (1-30)	3 (2-3)
Terns							
Caspian tern/taranui	Threatened – Nationally Vulnerable	1					
New Zealand fairy tern/tara	Threatened – Nationally Critical						
White-fronted tern/tara	At Risk – Declining	95 (20-400)	44 (20-110)	165 (30-300)	1		1

Appendix 2

Proposed nesting box colony configuration

Appendix 3

Example of a field count data sheet

Observer _____ Date _____

Time			
Location			
Tide			
Time (24-h)			
Temp (1-6)			
Wind direction			
Wind (0-3)			
Other Noise (0-2)			
Cloud Cover (%)			
Precipitation Type (N,M,R,H,S)			
Precipitation Value (0-5)			
Photo No.			

Species	Adult	Juv	Egg	Heard	Behaviour	Adult	Juv	Egg	Heard	Behaviour	Adult	Juv	Egg	Heard	Behaviour

Cloud cover: percentage of sky cover
Time: 24 h clock at the beginning of each count

Temperature
1 Freezing <0 °C
2 Cold 0-5 °C
3 Cool 6-10 °C
4 Mild 11-15 °C
5 Warm 16-22 °C
6 Hot >22 °C

Wind scale: The average for each 5-min count
0 Leaves still or move without noise
1 Leaves rustle
2 Leavesand branches in constant motion
3 Branches or trees sway

Seen & Heard: Birds that are first heard should be entered under **Heard** (even if they are later seen); birds that are first seen should be entered under **Adult or Juv**. Add columns to get the total number of birds observed.

Unbounded: Counts are unbounded

Other Noise:
Other than wind, the ave for 5-mins
0 Not important
1 Moderate
2 Loud

Precipitation Type:
Average for each count
N None
M Mist
R Rain
H Hail
S Snow

Precipitation Value:
0 None
1 Drip of structure
2 Drizzle
3 Light
4 Moderate
5 Heavy

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NGĀ TAI KI MAUAO
Hapū Collective

To: Rowan Johnstone and Dan Kneebone, Port of Tauranga Limited

cc: Della Bennet, Wildlands

From: Jason Murray, Ngā Tai ki Mauao and Dr Elizabeth Parlato, The Catalyst Group

Date: 16 July 2024

Subject: **Draft Avifauna Management Plan**

Tēnā kōrua Rowan and Dan,

Thank you for providing the revised draft Avifauna Management Plan (AMP) for our review and comment. The revised AMP has incorporated some of the more detailed comments provided by us as tracked changes to the draft AMP we received on 9 May 2024. However, we are concerned that the revised draft AMP still does not address a number of the issues we identified in our Memorandum dated 27 May.

As identified in our previous Memorandum, there are a number of overarching aspects that we consider should be included or amended in the AMP. These fall into two main categories:

1) Additional avian management measures to enhance abundance outcomes.
2) Specific input to the initial draft AMP we received.

While the revised draft has gone some way towards addressing (2) Specific input to the initial draft AMP; the draft AMP still does not address the points raised in relation to (1) Additional avian management measures to enhance abundance outcomes. We expand on this below.

Additional avian management measures to enhance abundance outcomes

As previously explained, the desire of hapū is for the birds to have high quality roosting and breeding sites away from Port-related disturbances and along their movement pathway, such as from Te Kura a Maia to Rangiwaea and Matakana Islands. As we discussed, this type of restoration work will require a long-term progression plan and commitment to the resourcing required for management into the future, such as ongoing pest control, native plantings, and monitoring to assess outcomes against identified objectives.

Since our last Memo, there has been no further substantive discussion about restoration of additional sites. It is important to recognise that restoration of additional sites is not being proposed to offset values lost at the Sulphur Point sandpile due to Port activities and encroachment. The purpose of

restoring additional sites is to provide additional habitat for manu that visit or reside at Te Awanaui and the islands and achieve positive outcomes for these taonga that are impacted by Port activities.

Another key concern identified by hapū is the impact of ship lighting on shearwaters. As discussed, we have observed that ships are frequently moored close to the islands with bright lights at night and the numbers of ships have been increasing over time. We understand that you are looking into options for alternative mooring locations to avoid ships anchoring within 3-5 km of the islands. We fully support the exclusion of ship anchorage within 5 km of the islands. This would both reduce the risk of lights disorienting seabirds and reduce the risk of predator incursion from ships to the islands. Karewa is of particular concern as it is an important seabird breeding site and is currently predator free, with a number of taonga species such as tuatara that are highly vulnerable to mammalian predators.

The draft AMP has been revised to include a section on lighting, but the management measures proposed are specifically in relation to lighting management at the Port, rather than ship lighting. It is essential that measures to address the adverse effects of ship lighting, including minimum anchorage distances from the islands, are included in the AMP.

We also highlighted the importance of an overarching multi-site monitoring framework given the mobile nature of the species covered by the AMP. While a monitoring section has now been added to the draft AMP, it is currently limited to the localised Port environment. We understand that this is likely to be because the draft AMP is currently still narrowly focused on two specific issues, i.e., management of the Sulphur Point Sandpile and management to address adverse effects on kororā and tarāpunga associated with the Mount Maunganui Wharf extension. As noted above and discussed with you, hapū consider the AMP should have a wider scope to address the broader impacts of Port activities on manu and include measures to enhance abundance across more sites. Monitoring across multiple sites will enable changes in species abundance at specific sites to be tracked over time, as well as changes in abundance across the whole area of interest, including new restoration sites. A cohesive multi-site monitoring programme will provide important data to assess the overall outcomes of the strategies and measures outlined in the AMP.

Specific input to the draft AMP

We appreciate the changes made to the draft AMP in light of the detailed tracked comments/edits we provided on the initial draft received. We acknowledge that the Port has made the changes it considers possible at this time, with a number of critical additional broader issues still to be worked through. Therefore, we have not provided detailed comments on the revised AMP as it will be more efficient to provide additional detailed feedback once the other key issues have been resolved.

Nevertheless, Ngā Tai ki Mauao consider that an important point raised in specific feedback on the draft AMP has still not been addressed. The Court directed that:

> [571] To enable Stage 1 of the Sulphur Point Wharf extension to proceed, the use of the sand pile at the southern end of the wharf by birds should be protected on a year-round basis. This should

include avoiding all use of the sand pile for port operational purposes and enlarging the area available for birds towards the area available at the time of the 2011 consent hearing.

We previously noted that this direction is not currently acknowledged in the AMP, and the AMP is silent on what, if anything, is being proposed in response to this direction. It was also noted that if increasing the size of the sandpile is not proposed by the Port, it is important that alternative restoration opportunities are proposed in lieu of this. As you are aware, the sandpile is within the rohe of Ngāti Ranginui and any measures to address loss of values in relation to that site will appropriately be identified by them. Ngā Tai ki Mauao supports the position set out by the Department of Conservation that the sandpile area should be enlarged to the area available in 2011 (~1.65 ha) on the basis that the habitat provides for positive abundance outcomes for manu. Ngā Tai ki Mauao also agrees that the cessation of deposition of dredged sand and sand removal for beach renourishment would avoid adverse effects on the birds (displacement, disturbance, etc.) relating to these activities. Additionally, the hapū collective looks forward to reviewing the views provided, if any, of Ngāti Ranginui in relation to the matters identified above and welcomes the opportunity to work collectively for the purposes of enhancing outcomes for manu.

We are more than happy to discuss any of the points raised and look forward to continuing to work together to develop an AMP that aligns with hapū values and aspirations.

Nā māua noa, nā

Jason Murray

Te Ngare
Ngā Hapu o ngā Moutere Trust
Ngā Tai ki Mauao

Dr Elizabeth Parlato

Senior Ecologist
The Catalyst Group

Draft Conditions for Resource Consent No RM21-0341 – Reclamation and Structures

Port of Tauranga Limited

A resource consent:

- Under section 12(1) of the RMA and Rules PZ8 and PZ11 of the Bay of Plenty Regional Coastal Environment Plan to undertake a restricted discretionary activity being the **Stage 1 construction, reclamation and deposition onto the foreshore or seabed** within the area of the Port of Tauranga that has been granted a s.384A occupation consent;
- Under section 15(1) of the RMA and Rules PZ8 and PZ11 of the Bay of Plenty Regional Coastal Environment Plan to undertake a restricted discretionary activity being to **discharge contaminants to the coastal marine area associated with the construction of Stage 1 reclamations and structures** within the area of the Port of Tauranga that has been granted a s.384A occupation.

subject to the following conditions:

PURPOSE, LOCATION, SCOPE

A. **Purpose of this Resource Consent**

A.1 Te Awanui is a taonga and is important to:

- the iwi/hapū that have a deep rooted and long standing connection to Te Awanui;
- the Port of Tauranga Limited who depends on Te Awanui for its operations; and
- the community who live, work and play in and around the harbour.

A.2 The purpose of this consent is to manage the effects on Te Awanui, and those that have a relationship with Te Awanui, by:

a) authorising and setting conditions to reclaim seabed and foreshore of Tauranga Harbour to provide for the use of the Sulphur Point ~~and Mount Maunganui wharf~~ facilities and to ensure the configuration of the new ~~wharves are~~wharf is aligned or contiguous with existing facilities.

b) authorising and setting conditions to discharge settled dredge water to Tauranga Harbour for the dewatering of dredged material that will be used in the reclamation.

c) authorising and setting conditions to construct Stage 1 Sulphur Point wharf ~~extensions, minor structures~~extension and reclamation retaining structures and associated activities including dredging related to construction of structures and under wharf batter.

Advice Note: The extension of Sulphur Point wharf is the first stage in the proposed extensions of both Sulphur Point and Mount Maunganui wharves and the conditions reflect the reduced work limited to Stage 1 only.

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B. **Location**

B.1 The area to be reclaimed and for structures to be constructed is located in the Stella Passage of Tauranga Harbour as shown as Stage 1 on the ~~plans~~plan attached to this consent titled~~:~~ "Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-67."

~~• Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-61.~~

~~• Proposed Bunker Berth Jetty General Arrangement – Concept Plan Resource Consent Drawings, Drawing No. 320-59-2.~~

~~• Proposed Loading/Unloading Ramp General Arrangement – Concept Plan Resource Consent Drawings, Drawing No. 320-59-3.~~

C. **Map Reference**

C.1 At or about NZTM 1879960.9E, 5826419.3N for Sulphur Point~~, 1880486.2E, 5826381.1N for Mount extensions south of the tanker berth and 1880584.3E, 5826913.7N for Mount extensions north of the tanker berth~~.

D. **Area of Reclamation**

D.1 The reclamation shall occupy an area no larger than ~~1.81~~0.88 hectares at Sulphur Point ~~and 1.77 hectares at Mount Maunganui~~ and shall conform with the dimensions shown on the plan~~s~~ referenced in condition B.1 above and attached to this consent**.**

1 **INTEGRATED MANAGEMENT**

1.1 In recognition of the importance of Te Awanui and the need for integrated and holistic management to improve the health of Te Awanui over time, the Consent Holder shall invite ~~the Tauranga Moana Advisory Group~~iwi, hāpu and the Regional Council to participate in a series of at least four wānanga to facilitate the preparation of a Southern Te Awanui Harbour Health Plan.

~~–~~*Advice Note: The Tauranga Moana Advisory Group is an existing forum that acts under a partnership agreement, between iwi and local authorities. The stated purpose of the group is to continue building strong working relationships to support and enhance the health of the harbour and catchments.*

1.2 The purpose of the Southern Te Awanui Harbour Health Plan is to foster a partnership approach between the Port of Tauranga Limited, councils and iwi in setting the direction for the management of Southern Te Awanui and associated catchments to achieve an overall improvement in the health of Te Awanui over time. The Plan will:

a) Identify a long term vision and key principles for improvement of the ecological and cultural health of Te Awanui.

b) Identify priority focus areas and describe the past state, current state ~~versus~~and future desired state.

c) Recommend actions and roles~~-~~/ responsibilities to achieve the future desired state.

1.3 The Consent Holder will complete the preparation of a draft Southern Te Awanui Harbour Health Plan within two years of the commencement of the consent~~.~~ in accordance with

the scoping document. The draft Southern Te Awanui Harbour Health Plan will be presented by the Consent Holder to the Tauranga Moana Advisory Group for feedback.

1.4 If completion of the Southern Te Awanui Harbour Health Plan is not completed within two years of commencement of the consent as required by condition 1.3, the consent holder shall provide reasons in writing for the Regional Council and an estimated timeframe for completion.

~~1.4~~1.5 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health Plan to the Tauranga Moana Advisory Group along with comments on any recommendations of changes not incorporated and the reasons why within 3 months of presenting the draft (in accordance with condition 1.3).

~~1.5~~1.6 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health Plan on its website (Condition 6.6), including details of the progress towards achieving any actions of the Consent Holder identified in the Plan.

Advice Note: The Consent Holder has offered conditions 1.1 to 1.~~5~~6 and agrees to be bound by them pursuant to the Augier principle. The Southern Te Awanui Harbour Health Plan will identify actions of a number of parties in order to achieve holistic and integrated management.

Commented [HB1]: In the event that parties agree to a tangata whenua-led development of the Southern Te Awanui Harbour Health Plan in accordance with an agreed framework then this condition would be removed and replaced with a Port contribution towards the preparation of the Plan.

RELATIONSHIPS

2 **Relationship of Iwi and Hapū with Te Awanui**

2.1 The Relationship of iwi and hapū with Te Awanui is to be recognised and provided for by the Consent Holder through:

a) Funding the transitional Iwi Liaison Group ("ILG") (Condition 4) and an ongoing Te Awanui Advisory Group ("TAAG") (Condition 5) for involvement as required in ~~the~~this consent.

b) Invitations to either the ILG or TAAG (whichever is established at the time) to engage as follows:

i. at least quarterly for the first two years of the commencement of the consent and thereafter twice per year (in accordance with condition 4.5). These meetings may occur concurrently with consent [dredging ref.]

ii. Annual strategic planning with the Port of Tauranga CEO and Chair of the Board of Directors (Condition 2.3).

c) An invitation to Ngāi Tamarāwaho to engage prior to any works commencing ~~at Sulphur Point~~ under this consent, and at least quarterly during works to provide a progress update on the works and discuss any issues arising from the works authorised by this consent.

d) Facilitating the preparation of an Integrated Southern Te Awanui Harbour Health Plan (Conditions 1.1 to 1.~~6~~5).

e) Provision for involvement of the ILG and TAAG under ~~the~~this consent in accordance with their defined role, in:

i. Discussion about design details (condition ~~10~~8.1);

ii. Preparation of a Mātauranga Monitoring Plan (Condition ~~19~~16.1);

iii. Annual strategic planning with the Port of Tauranga CEO and Chair of the Board of Directors (Condition 2.3);

iv. Review of Management Plan/s (Conditions ~~15~~13.1, ~~16~~14.1, ~~17~~15.1);

v. Appointment of a marine mammal observation auditor (~~16~~14.1(~~h~~i)).

f) Providing an opportunity for iwi and hapu that have a relationship with Te Awanui and the specific locations of the extensions to carry out ceremonies in accordance with condition 2.2.

g) Inviting the preparation of a Mātauranga Monitoring Plan (Condition ~~19~~16.1) and funding support towards the preparation and delivery of Matauranga Monitoring (Condition ~~19~~16.5).

h) A contribution of funds to the TAAG to provide for ongoing projects that benefit the health of Te Awanui or that directly benefit iwi and hapū that have a relationship with Te Awanui (Condition ~~20~~17.1).

2.2 At least 20 working days prior to carrying ~~out any stage of~~ works under this consent, the Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to carry out a ceremony at the site of the extension. The Consent Holder shall confirm by notice in writing to the Chief Executive of the Regional Council or delegate that the opportunity to carry out a ceremony has been given and that it has been carried out where deemed appropriate by the ILG or TAAG.

2.3 The Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to attend a hui annually with at least the Port of Tauranga Limited's Chief Executive Officer and Chair of the Board of Directors. The purpose of the annual hui is for the purpose of involving iwi and hapū that have a relationship with Te Awanui to be part of the strategic planning of the Port of Tauranga. This includes, but is not limited to, a discussion around the details of the ~~proposed staging of the port development~~works authorised by these consents ~~including what is included in each stage, design details of each stage (condition 10.1)~~ and ~~the timing of each stage (condition 9.1).~~proposed future stages subject to other consent processes.

Advice note: the Consent Holder has offered condition 2.3 and agrees to be bound by it pursuant to the Augier principle.

3 **Relationship Agreements Port, Iwi, Hapū and entities**

3.1 The consent holder shall facilitate the preparation of relationship agreements with the following Iwi, hapū and/or entitles within 12 months of the commencement of this consent:

a) The Ngāti Ranginui Fisheries Trust;

b) Te Rūnanga O Ngāi Te Rangi Iwi Trust and Ngāti Tapu;

c) Ngāti Kuku And The Whareroa Marae Trust;

d) Ngā Hapū O Ngā Moutere Trust;

e) Ngāti Kaahu A Tamapahore Trust and Ngāti He;

f) Ngāti Pūkenga; and

g) Ngāti Ranginui Incorporated Society.~~; and~~

~~h) Tupuna Trust.~~

Commented [HB2]: Tupuna Trust has been deleted as per POTL's commentary in its memorandum.

3.2 The purpose of the relationship agreements is to agree and record how the consent holder and other parties will establish a long term organisation-wide relationship with each other, including a forum to discuss matters which are outside the scope of or are not covered by this resource consent.

3.3 Within 13 months of the commencement of this resource consent, the consent holder shall either:

~~i)~~h) Provide copies of finalised relationship agreements to the consent authority (except to the extent that any agreements contain confidentiality provisions); and/or

~~j)~~i) Provide details to the consent authority as to why relationship agreements have not been concluded (including, if relevant, details of the consent holder's endeavors to agree relationship agreements).

ADVISORY GROUPS

4 **Transitional Iwi Liaison Group ("ILG")**

4.1 Within two months of the commencement of these consents, the Consent Holder shall invite Tauranga Moana iwi (see Advice note) and hapū with a relationship with Te Awanui to establish and maintain a transitional (see condition 4.4) Iwi Liaison Group. The Consent Holder shall invite nominations for the following representatives to form the group:

~~k)~~j) Whareroa Marae may nominate two representatives, at least one of whom shall ahi kaa to the Whareroa Marae;

~~l)~~k) Ngāi Te Rangi, who may nominate one representative;

~~m)~~l) Ngāti Ranginui, who may nominate one representative; and

~~n)~~m) Ngāti Pūkenga, who may nominate one representative.

4.2 If nominations for representatives are not received from iwi and hapū within five months of the commencement of the consent then the ~~transitional Iwi Liaison Group will be formed by the~~ Consent Holder ~~and consist of either~~will invite the following to form the transitional ILG:

a) Those representatives that have been nominated; or

b) In the case that no nominations have been received, the Tauranga Moana Iwi Customary Fisheries Trust.

4.3 The purpose of the transitional ILG is to provide a forum that the Consent Holder can undertake immediate engagement activities to effect the implementation of these consents. The ILG will also be responsible for determining the separate tikanga based process of establishing the ongoing Te Awanui Advisory Group. The functions of the transitional ILG are:

a) Determine the tikanga based process to be used to establish, and facilitate the establishment of, a Te Awanui Advisory Group (Condition 5) that comprises of iwi and hapū representatives that have a relationship with Te Awanui.

b) Finalise the name of the Te Awanui Advisory Group.

c) Provide a forum for liaison with the Consent Holder and iwi and hapū that have a relationship with Te Awanui in regards to the implementation of this consent. This includes providing information back to iwi and hapū on progress on the implementation of the ~~consents~~consent and providing feedback to the Consent Holder on any particular concerns arising from the implementation of the ~~consents~~consent that iwi and hapū may raise with the ILG.

d) Be an immediate liaison point for the Consent Holder in the engagement over the Management Plan/s under the consent (conditions ~~15~~13.1, ~~16.1, 17~~14.1 and ~~18~~15.1).

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies deemed appropriate by iwi and hapū who have a relationship with Te Awanui (condition 2.2).

f) Attend an annual strategic planning meeting with the Port of Tauranga CEO and Chair of Board of Directors (Condition 2.3).

g) Appoint the marine mammal observation auditor (condition ~~16~~14.1(~~hj~~)).

4.4 The ILG will remain in place until such time as a Te Awanui Advisory Group is established (Condition 5).

4.5 The Consent Holder shall:

a) Facilitate the administration of each formal meeting of the ILG. The first ILG meeting shall be held as soon as practicable after the establishment of the ILG. The ILG shall meet quarterly for the first two years from the commencement of consents and thereafter twice per year (unless a different frequency of meetings is agreed between the Consent Holder and the ILG) until such time as a Te Awanui Advisory Group is established (Condition 5).

b) Take minutes of the ILG meetings, which shall be forwarded to members within 10 days of each meeting being held for those members to confirm they are true and correct record.

c) Give members at least three weeks' advance notice of the date, time and location of ILG meetings.

d) With the agreement of ILG members make minutes available on the Ports website (condition 6.~~7~~6(c)).

4.6 The Consent Holder shall provide $25,000 per year for up to five years following the commencement of consent, or until the Te Awanui Advisory Group is established (condition 4.4), whichever is the soonest so that the ILG can perform their functions under the consent.

4.7 Within 10 working days of the ILG being formed, or any changes being made to its membership, the Consent Holder shall provide details of its membership to the

Regional Council.

5 **Te Awanui Advisory Group**

5.1 The Consent Holder will provide (in accordance with condition 5.1 (h)) for the ongoing involvement in these consents of a Te Awanui Advisory Group (TAAG) [or alternative name as determined by the ILG] established by iwi and hapu in accordance with condition 4.3 (a). The Purpose of the TAAG is to provide an iwi and hapū-led forum that provides on-going advice to the Consent Holder in the implementation of these consents and is the main liaison point for the Consent Holder in regards to the requirements of this resource consent. In particular, the purpose of the TAAG is to:

a) Recognise the importance of Te Awanui as a taonga and to recognise and provide for the kaitiakitanga of iwi and hapū who have a relationship with Te Awanui;

b) Provide a means of liaison between iwi and hapū who have a kaitiaki relationship with Te Awanui and the Consent Holder through providing a forum for regular discussion about the implementation of this consent and consent [dredging ref.]~~X, including details of the ongoing staging plans of the development~~;

c) Facilitate the development of a Mātauranga Monitoring Plan in accordance with Condition ~~19~~16.1;

d) Evaluate the data obtained from any mātauranga monitoring undertaken in accordance with condition ~~19~~16.~~35~~ insofar as they relate to the cultural values and the effects of the works authorised by these consents on Te Awanui and advise the Consent Holder and Regional Council of any unforeseen effects arising. In the case of any unforeseen adverse changes to effects on cultural values being identified as a result of the implementation of these consents, to advise and make recommendations to the Consent Holder and the Regional Council on the nature of the review (in accordance with condition ~~26~~22.1) and appropriateness of any mitigation, response and/or contingency measures;

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies under condition 2.2;

f) Be a liaison point for the Consent Holder in the engagement over the Management Plan/s under the consent (condition ~~15~~13.1, ~~16~~14.1, ~~17~~15.1);

g) Appoint the marine mammal observation auditor (condition ~~16~~14.1(~~hj~~)); and

h) Administer the funds provided by the Consent Holder under condition ~~20~~15.4 and 17.1 to be used for the functions of the TAAG under this consent and for restoration projects.

6 **Notification**

6.1 The consent holder shall notify (in writing) the following parties of its intention to commence reclaiming no less than 10 working days prior to beginning construction activities:

a) Ngāti Ranginui;

b) Ngāi Te Rangi;

c) Ngāti Pūkenga;

d) Ngāi Tamarāwaho;

e) Ngāi Tukairangi;

f) Ngāti Kahu;

g) Ngāti Kuku and Whareroa Marae;

h) Ngāti Tapu;

i) Waitaha Iwi;

j) Tauranga Moana Iwi Customary Fisheries Trust ("TMICFT");

k) Ngāti Ranginui Fisheries Trust;

l) Ngāti He;

m) Ngā Hapū o Ngā Moutere o Matakana me Rangiwaea; and

n) Bay of Plenty Regional Council.

6.2 In addition to the above named parties, the Consent Holder shall provide notice on their website (in accordance with condition 6.6) of their intention to commence reclamation ~~in any particular construction stage~~ at least 10 working days prior to any reclamation authorised by this consent.

6.3 The consent holder shall erect and maintain a prominent sign at the relevant access points to the Port for the duration of works. The sign shall clearly display, as a minimum, the following information:

a) The name of the consent and consent holder.

b) The main site contractor.

c) A 24 hour contact telephone number for the consent and consent holder or appointed agent.

d) A clear explanation that the contact telephone number is for the purpose of receiving complaints and information from the public about dust nuisance, noise, or any relevant problem that may occur as a result of the exercise of this consent.

6.4 Not less than five working days prior to the start of works of any reclamation or structures authorised under this consent, the consent holder shall, in writing, request a site meeting between the principal contractor and the Chief Executive of the Regional Council or delegate. Notification at this time shall include details of who is responsible for on-site management and compliance with consent conditions.

6.5 Within five working days of the completion of any reclamation or demolition/construction of structures authorised under this consent, the consent holder shall, in writing, notify the Chief Executive of the Regional Council or delegate.

6.6 The Consent Holder shall establish and maintain for the duration of these consents a dedicated page on its website for the purpose of ensuring all monitoring and reports required under these consent conditions is publicly available. The following documents or reports must be uploaded to the website as soon as practicable and no later than 20 working days after being received or prepared by the Consent Holder:

a) The final certified Management Plan/s, including any variations to those Plans if amended (conditions ~~15~~13.1, ~~16.1, 17~~14.1 and ~~18~~15.1);

b) The results of all monitoring and sampling undertaken pursuant to the consent;

c) Minutes of the meetings of the ILG and TAAG agreed by members as appropriate for public dissemination;

d) Copies of reports required in conditions ~~16~~14.3; and

e) Any other information reasonably related to the exercise of this consent~~, including information on the stages for construction~~.

6.7 Within 30 working days of completion of reclamation or structures in the Coastal Marine Area authorised under this resource consent, the Consent Holder shall provide to the Regional Council certification from a suitably qualified and experienced engineer stating that the reclamations and structures have been constructed in accordance with the requirements of this resource consent and good engineering practice.

WORKS

7 **Reclamation Works and Structures**

a) All works shall be undertaken in accordance with the information submitted in the resource consent application titled Stella Passage Development Resource Consent Application, Assessment of Environmental Effects dated May 2021 and supporting materials (except to the extent modified by these conditions), and in general accordance with Stage 1 of the ~~plans~~plan attached to this consent ~~as follows:~~titled 'Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-67'.

~~b) Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-61.~~

~~c) Proposed Bunker Berth Jetty General Arrangement – Concept Plan Resource Consent Drawings, Drawing No. 320-59-2.~~

~~d) Proposed Loading/Unloading Ramp General Arrangement – Concept Plan Resource Consent Drawings, Drawing No. 320-59-3.~~

~~7.2 Subject to compliance with relevant statutes and regulations, the consent holder shall continue to provide barge ramp access at the Port of Tauranga of the same scale as the existing ramp (as shown on Plan titled "Proposed Loading/Unloading Ramp General Arrangement – Concept Plan Resource Consent Drawings, Drawing No. 320-59-3) for the duration of consent so long as there remains a need for cargo to be transferred from Matakana and Rangiwaea Island to the Port of Tauranga.~~

~~8 **Minor Structures**~~

~~8.1 The consent holder shall limit the structures in the area marked 'minor berths' on Plan titled 'Proposed Wharf / Reclamations / Dredging Resource Consent Drawings', Drawing No. 320-61 for a maximum ship weight (dead weight) of 2,000 tonnes.~~

~~8.2 Shore power will be provided for the use of berthed vessels at the new minor structure (as shown on plan titled Proposed Bunker Berth Jetty General Arrangement - Concept Plan Resource Consent Drawings, Drawing No. 320-59-2).~~

~~9 **Staging**~~

~~9.1 Sections of the reclamation and wharf extension will be completed by way of a staged programme. The order of the staging and timing is as follows:~~

~~1. Up to 285m wharf extension at Sulphur Point, associated reclamation and extension to the shipping Channel, and berth south of the existing tanker berth to accommodate a shore power bunker barge operation – work to commence immediately.~~

~~2. Mount Maunganui between Berth 11 and the Tanker Berth – work to commence no sooner than 3 years following consent commencement.~~

~~3. Remainder of Sulphur Point wharf extension, associated reclamation – work to commence no sooner than 10 years from the date of commencement of the consent.~~

~~4. Subsequent staged dredging to extend the shipping channel to match Sulphur Point wharf extensions.~~

~~5. Subsequent dredging to deepen the shipping channel to match deepening carried out under 65806 or renewed consent.~~

~~6. Minor structures south of existing tanker berth – works can commence as required.~~

~~10~~8 **Design**

~~10.1~~8.1 The Consent Holder shall discuss with the ILG or TAAG the proposed design of structures and reclamation and invite feedback on opportunities to incorporate cultural elements subject to minimum design standards, building code requirements and to the extent practical. Prior to ~~any~~ works ~~stage~~ commencing, the Consent Holder shall provide to the Bay of Plenty Regional Council the final design for the works ~~included in that stage~~, including design assumptions, parameters and methodology used for the design and any cultural elements included as a result of engagement with the ILG or TAAG or explanation as to why not included. The final design shall include certification, via an independent peer review, by a suitably qualified and experienced Chartered Professional Engineer specialised in Geotechnical and/or Structural Engineering.

~~10.2~~8.2 The construction and lining of the rock wall and/or retaining wall surrounding the reclamation shall be such that all dredged material (other than that authorised to be discharged by consent 65806 and 65807 or any deposition consent which replaces consents 65806 or 65807) is contained within the reclamation.

~~10.3~~8.3 Rock rip-rap and fill shall be of a suitable density, clean and weathering resistance and placed in a manner to ensure structural integrity of the embankment.

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~~11~~9 **Construction**

~~11.1~~9.1 The Consent Holder shall engage an appropriately qualified and experienced Chartered Professional Engineer to supervise the construction. On completion of the ~~works or any stage of the~~works the Consent Holder shall provide a certificate from the Chartered Professional Engineer certifying that the subject matter has been constructed in general accordance with the requirements of this resource consent. That certificate shall be provided to the Bay of Plenty Regional Council no later than two (2) months after the relevant construction works are completed.

~~11.2~~9.2 All structures shall be constructed using materials appropriate for a marine environment with consideration as to the level of corrosion that will occur over the life of the structure. The consent holder shall continuously monitor the structures during the construction period to ensure that they are stable and do not represent a danger to the public.

~~11.3~~9.3 Excavated foreshore material shall be managed to ensure that discharge and suspension of material is avoided.

~~11.4~~9.4 The consent holder shall ensure that no water associated with the mixing, pouring, placing and cleaning of concrete structures and/or equipment is released into the Tauranga Harbour, except where concrete is required to be placed under water for ~~minor structures such as the relocation of the boat ramp at Butters Landing~~structures.

~~11.5~~9.5 The consent holder shall control particulate matter resulting from these works so that dust nuisance does not occur beyond the boundary of the work area where it can have an adverse effect on other harbour users.

~~11.6~~9.6 The reclamation works shall not result in an increase in water turbidity of more than 20 NTU above ambient level at any point 50 metres or greater from the reclamation works.

~~11.7~~

~~11.8~~9.7 Within three months of completion ~~of the reclamation, or the completion of any stage~~ of the reclamation, the permit holder shall submit a survey plan that details the extent of the reclamation~~, or stage of the reclamation~~ to the Regional Council.

~~11.9~~9.8 The construction and reclamation site shall be clearly defined, prior to the commencement of work, to the satisfaction of the Chief Executive of the Regional Council or delegate.

~~11.10~~9.9 All controls required, as identified in the Reclamation and Construction Management Plan (condition ~~15~~13.1), shall be put in place prior to the commencement of work.

~~11.11~~9.10 Piling operations and other significant noise emitting activities shall not be undertaken on Sundays and Public Holidays; and shall only be performed between the following times subject to the further limitation set out in condition ~~16~~14.8 where daylight hours are shorter than the hours listed below:

a) Monday to Friday 7.30am to 8.00pm

b) Saturday 9.00am to 7.00pm

~~11.8 Piling at the Butters Landing/Bunker wharf area will be suspended for 3 days where piling noise is above 50dB LAeq and when the Port has been advised 24 hours in~~

~~advance of a Tangihanga at the Whareroa Marae.~~

~~11.12~~9.11 ~~Works undertaken for the reclamation and construction of each wharf extension or berth/stage~~Works authorised under this consent shall be completed as soon as practicable after commencement.

~~11.13~~9.12 Machinery shall, as far as practicable, be kept out of the coastal marine area. Machinery required within the CMA shall be identified in the Reclamation and Construction Management Plan (condition ~~15~~13.1).

~~11.14~~9.13 The consent holder shall employ methods to avoid or minimise any fuel spillage, including the provision of appropriate security and containment measures, where necessary. No fuel storage or machinery refuelling shall occur where fuel could enter a water body in the event of a spillage.

~~11.15~~9.14 The consent holder shall ensure that all materials stockpiled for use in the construction work or waste materials are placed in such a manner that they cannot enter the harbour.

~~11.16~~9.15 All plant, machinery, equipment and debris associated with this operation shall be removed from the foreshore and work area at the completion of the operation, to the satisfaction of the Chief Executive of the Regional Council or delegate.

~~12~~10 **Settling Pond**

~~12.1~~10.1 Where a settling pond is required to de-water dredged material to be used in the reclamation, the following shall apply to the discharge quality:

a) The mixing zone is defined as being 250 meters from any discharge point.

b) The turbidity shall not increase more than 15 NTU above ambient level at any point beyond the mixing zone.

c) No conspicuous oil or grease films, scums, or foams, or floatable or suspended material.

d) No conspicuous change in colour or visual clarity outside the mixing zone.

e) No emission or objectionable odour.

f) No significant adverse effect on aquatic life.

~~12.2~~10.2 The Consent Holder shall provide to Bay of Plenty Regional Council certification from a suitably qualified and experienced engineer stating that the settling pond is designed and built to recognised and appropriate engineering standards. The certification shall be provided to the Bay of Plenty Regional Council within two (2) weeks of the construction of the settling pond being completed.

~~13~~11 **Maintenance**

~~13.1~~11.1 The consent holder shall ensure that all controls required, as identified in the Reclamation Construction Management Plan, are maintained in an effective capacity at all times.

~~13.2~~11.2 The consent holder shall ensure that the ~~reclamations~~reclamation authorised by this consent ~~are~~is maintained in a safe and structurally sound condition at all times, and

shall undertake any maintenance work immediately, if so directed by the Chief Executive of the Bay of Plenty Regional Council or delegate.

~~13.3~~11.3 The Consent Holder shall maintain records of every inspection carried out of the condition of the reclamation and structures and the date and description of any maintenance work carried out. These records shall be provided to the Bay of Plenty Regional Council upon request.

MANAGEMENT PLANS

~~14~~12 **Management Plans certification and amendment process**

12.1 Prior to works commencing ~~in any stage~~, the Consent Holder shall submit to the Regional Council for its certification the following management plans ~~for Sulphur Point development~~:

a) Reclamation and Structures Management Plan (Condition ~~15~~13.1);

b) Marine Mammal Effects Management Plan (Condition ~~16~~14.1);

~~c) Sandpile Management Plan (Condition 18.1).~~

~~12.2 Prior to works commencing in any stage, the Consent Holder shall submit to the Regional Council for its certification the following management plans for Mount Maunganui development:~~

~~d) Reclamation and Structures Management Plan (Condition 15.1);~~
~~e) Marine Mammal Effects Management Plan (Condition 16.1);~~
~~f) Blue Penguin and Avifauna Management Plan (Condition 17.1).~~

(together the "**Management Plans**").

~~12.3~~12.2 If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 20 working days of the date of submission of the Management Plan/s for certification (including that the Regional Council is unable to certify with Management Plan within the 20 working days) the Management Plan/s will be deemed to be certified. If Bay of Plenty Regional Council's response is that it is unable to certify the Management Plan/s it must provide the Consent Holder with reasons and recommendations for changes needed to the Management Plan/s in writing. The Consent Holder must consider any reasons and recommendations of the Bay of Plenty Regional Council and submit an amended management plan for certification. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 10 working days of the date of resubmission, the M~~m~~anagement P~~p~~lan /s will be deemed to be certified.

~~12.4~~12.3 For the purpose of this consent, certification means that the Management Plan/s meet the purpose and contain the minimum requirements outlined in the consent condition. For the avoidance of doubt, Management Plans may be peer reviewed by the Consent Authority.

~~12.5~~12.4 The Consent Holder shall provide 30 working days for the ILG or TAAG to provide feedback on the draft Management Plans (in accordance with condition ~~15~~13.1 and~~,~~ ~~16.1, 17~~14.1 ~~and 18.1~~) before submitting a final version to the Bay of Plenty Regional Council.

~~12.6~~12.5 The Consent Holder shall undertake all works authorised by this consent and

Commented [HB3]: The Avian Management Plan (that includes previous details of sandpile management Plan) has been through a separate court approval process and so is removed from conditions 12.1 to 12,5 inclusive requiring council certification. Conditions 15.1 to 15.3 now cover the Avian Management Plan (works in accordance with and process for amendment).

proposed management in accordance with the certified Management Plans.

Process for Amending the Management Plans

~~12.7~~12.6 At time during the implementation of these consents, or on the advice of the ILG or TAAG, the Consent Holder may submit a request to amend the Management Plans to the Regional Council for re-certification.

~~12.8~~12.7 Where the Consent Holder provides an amended ~~Monitoring~~Management Plan to the Regional Council for re-certification, if no response is received from the Regional Council within 20 working days then certification shall be deemed to have been given (unless the Regional Council provides an alternative timeframe for certification to the Consent Holder).

13 Reclamation and Construction Management Plan

13.1 The consent holder shall prepare a Reclamation and Construction Management Plan (RCMP) for all works within the Coastal Marine Area authorised by this consent. The RCMP shall be provided to the ILG or TAAG for feedback. The purpose of the RCMP is to ensure that ~~all~~ wharf construction and associated activities are managed in a way that is in general accordance with the information referred to in Conditions 7 to ~~13~~11 (inclusive) of this resource consent and that effects on water quality, other harbour users, navigation and public safety are minimised.

13.2 The RCMP required by Condition ~~15~~13.1 shall include as a minimum:

a) Construction methodology, including measures to complete work as soon as practicable;

b) Construction programme and timeframes (or schedule of works) of the main activities;

c) Staff and contractors roles and responsibilities;

d) Stakeholder and communication management;

e) Sediment and erosion control plan;

f) Sediment discharge and suspension mitigation measures;

g) Dust Management;

h) Noise Management, including the use of timber piles where suitable and the use of vibratory piling rather than impact piling where practicable;

i) A water quality monitoring schedule detailing the methodology for monitoring compliance with requirements of condition ~~12~~10.1 for water discharging from any settling pond; and~~.~~

j) The plan shall include any feedback from ILG or TAAG or provide an explanation why the Consent Holder can not accommodate any recommendation. If no feedback is received within 20 working days the Consent Holder shall state so in the RC~~MME~~MP.

14 Marine Mammal Effects Management

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14.1 A Marine Mammal Effects Management Plan (**MMEMP**) shall be prepared with advice from a suitably qualified marine mammal expert. The MMEMP shall be provided to the Department of Conservation and the ILG or TAAG for feedback. The objective of the MMEMP is to reduce the risk of harm to marine mammals from activities associated with this consent, particularly in relation to the effects of underwater noise from piling. The MMEMP shall include, butnot be limited to:

(a) Introduction;

(b) Marine Mammals that may be present within Tauranga Harbour area;

(c) Potential for adverse effects;

(d) Control or mitigation measures:

i. Piling methodology to reduce noise at source including the use of bubble curtains for impact pile driving;

ii. Identification of the Marine Mammal Observation Zone (MMOZ) including a process for reviewing this in response to acoustic monitoring results;

iii. An inner harbour observation zone that is observed for 30 minutes prior to the start of piling each day;

iv. Details of a vantage point for the inner harbour observation zone that extends from the Harbour Bridge towards Maungatapu bridge and method of observation to be used (including the potential use of a fixed camera with sufficient resolution to view the extent of the inner harbour);

v. Identification of a shutdown zone/s, including a process for reviewing these in response to acoustic monitoring results;

vi. Trained personnel to act as observers that have the appropriate training to search the whole of the MMOZ for marine mammals as far as reasonably practical;

vii. Pre-start, normal works and standby observations;

viii. Soft Start Protocols;

ix. Shutdown Protocols;

x. Hours of operation; and

xi. Construction vessel speed management and marine mammal.

(e) The appropriate number, roles and use of appropriately trained marine mammal observers to provide a continuous lookout for marine mammals, white pointer sharks and green turtles (noting these are not marine mammals but are at-risk species) as required under this consent;

(f) Requirements for a marine mammal sighting log to be kept which includes reporting requirements. Reporting requirements are to include actions taken by the Consent Holder upon sighting of marine mammals to avoid effects on them;

(g) Principles of the acoustic monitoring methodology;

(h) Training and experience of:

i. All relevant personnel:

ii. Vessel masters;

iii. Marine Mammal Observers; and

iv. Environmental monitoring teams.

(i) Compliance with legislation;

(j) Provision for a marine mammal observation auditing role appointed by the ILG or TAAG, including details of the frequency of periodic checks to be undertaken during piling operations to check consistency with the MMEMP; and

(k) The plan shall include any feedback from DOC, ILG or TAAG or provide an explanation why the Consent Holder can not accommodate any recommendation. If no feedback is received within 20 working days the Consent Holder shall state so in the MMEMP.

14.2 At least 20 working days prior to Piling works occurring ~~for any stage~~, the Consent Holder will invite the ILG or TAAG for a wānanga. The objective of the wānanga is for tangata whenua to share knowledge and exchange information of marine mammals in the area. The Consent holder shall be present and invite the following parties to the wānanga:

a) ILG or TAAG (which ever is established) and any representative that may be nominated by the ILG or TAAG;

b) Piling Contractor representative; and

c) The suitably qualified marine mammal expert preparing the MMEMP.

14.3 The Consent Holder shall provide to the Bay of Plenty Regional Council, Department of Conservation and ILG or TAAG at the end of each calendar year in which pile driving operations occur, or as requested, a summary report detailing the date and number of marine mammals sighted and any actions taken by the consent holder to manage potential effects on them.

14.4 A Marine Mammal Observation Zone (MMOZ) and Shutdown Zone (SZ) shall be established during all pile driving activities. The MMOZ and SZ shall be defined as follows:

a) a MMOZ of a 500m radius around the construction site, extending down the main shipping channel towards the harbour entrance as far as practicable given visibility conditions.

b) SZ for medium and high frequency cetaceans (e.g. Hector's dolphins, bottlenose dolphins, killer whales, common dolphin, false killer whale, pilot whales and beaked whales) and fur seals of 500 metres radius from the construction site.

c) a SZ for baleen whales and leopard seals as described in condition ~~16~~14.13.

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14.5 The consent holder may, through the Management Plan amendment process identified in condition ~~14.7~~12.6 and ~~14.8~~12.7, provide a methodology for reducing the requirements and radius of the MMOZ and SZ through the introduction of mitigation, to manage the noise generated.

14.6 In addition to general amendments to the MMEMP in accordance with condition ~~14.7~~12.6 and ~~14.8~~12.7, the radius of the MMOZ and SZ may be revised following results from the acoustic monitoring identified in Condition ~~16~~14.12. To achieve this, the Consent Holder shall provide to the Bay of Plenty Regional Council a report from a suitably qualified and experienced marine mammal specialist identifying the results of acoustic monitoring and providing justification for a change in the MMOZ and SZ radius. The Bay of Plenty Regional Council may peer review the recommendation. No change to the MMOZ and SZ shall be undertaken unless authorised by the Bay of Plenty Regional Council following the review.

14.7 The Consent Holder shall designate appropriately trained marine mammal observers to provide a continuous lookout for marine mammals, white pointer sharks and green turtles within the MMOZ during pile driving, in accordance with the certified MMMP. In addition:

(a) Prior to the start of pile driving for the day, the marine mammal observers shall undertake a 30 minute visual observation search of the MMOZ to assess whether any marine mammals, white pointer sharks or green turtles are present.

(b) Pile Driving shall cease or shall not commence if any marine mammal (including fur seals, white pointer sharks and green turtles) is located by the marine mammal observers within the SZ.

(c) Soft start Pile Driving may commence or recommence after the marine mammal observers have undertaken a search of the MMOZ and have assessed there are no marine mammals, white pointer sharks and green turtles present within or about to enter the SZ.

14.8 Pile Driving shall be limited to daylight hours only.

14.9 Prior to commencing piling operations each day 'inner harbour observations' to detect marine mammals up-harbour of Stella Passage will be made from a suitable vantage point. Inner harbour observations will be made by a trained marine mammal observer, either in-person or using a suitable resolution camera system to allow cetacean detection over the required field of view (as described in the MMEMP required in condition ~~16~~14.1).

14.10 At the outset of each piling day, piling shall only commence once 30 minutes of 'inner harbour observations' have been made in accordance with condition ~~16~~14.9 and no cetaceans have been detected.

14.11 If any cetacean is reported within the inner harbour whilst piling is underway, piling will immediately cease for the remainder of the day or until the animal/s are seen to depart through Stella Passage and are clear of the relevant shut down zone.

14.12 The Consent Holder shall carry out acoustic monitoring of impact pile driving operations to measure the one hour and twenty four hour cumulative Sound Exposure level (SELcum(1h); SELcum(24h)). The SELcum shall be derived from the maximum combined noise at all water depths. These measurements must be made by an appropriately qualified person. The acoustic monitoring shall:

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(a) Commence immediately once driving piles to founding layer begins for each of the different pile diameters used in the operation. Measurements shall occur over a minimum of three days for each pile diameter;

(b) Be completed as soon as practicable after pile driving operations commencing as described in (a) above;

(c) Be reported within two weeks of completion of measurements to the Bay of Plenty Regional Council and the Department of Conservation. Each report shall describe in detail the acoustic monitoring methodology and the results of the monitoring (including the estimation of appropriate MMOZ and SZs) undertaken.

14.13 If a baleen whale or leopard seal is reported within Tauranga Harbour, pile driving shall cease and shall not recommence until they are present north of a line between Panepane Point and Stony Point as shown on the map titled 'Tauranga Harbour Baleen Whales & Leopard Seal Shutdown Zone, 270-94–8 attached to this consent, or have not been detected within the harbour for at least 24 hours. Records of all actions taken in accordance with this condition shall be provided in the marine mammal sighting log required by the MMEMP.

14.14 All vessel operations shall comply with the Marine Mammal Protection Act Regulations (1992).

14.15 A Waste Management Plan will be developed and followed to ensure the appropriate management and disposal of waste is undertaken and no waste enters the environment where it may impact on marine mammals.

14.16 Any reports of injured or dead marine mammals in the vicinity of the works or any near misses between the operation and marine mammals, must be reported immediately to the Bay of Plenty Regional Council and Department of Conservation including details of the incident and any mitigation action taken.

15 **Avian Management**

15.1 The Consent Holder shall ~~invite the Department of Conservation, representatives of Ngāi Tukairangi~~ undertake all works authorised by this consent and ~~the ILG or TAAG (whichever is established at the time), to provide feedback on the Blue Penguin~~proposed management in accordance with the Avian Management Plan (**AMP**) certified by Environment Court and ~~Avian Management Plan (**BPAMP**),~~ dated September 2024 (or any subsequent version amended in accordance with conditions 15.2 and 15.3). The Objective of the ~~BPAMP shall be~~ AMP is to avoid adverse effects from loss of habitat caused by the ~~removal of the rock wall between Berth 11 and 16 on the population of Blue Penguin and the existing red-billed gull colony. The primary goal of the plan is to direct activities the subject of the plan to achieve no net loss of tarāpunga/red-billed gulls and kororā/blue penguins in the vicinity of the works over the period of the wharf construction.~~proposed works on avifauna.

~~15.1~~15.2 At any time during the implementation of these consents, or on the advice of the ILG or TAAG, the Consent Holder may submit a request to amend the Avian Management Plan to the Regional Council for re-certification in accordance with the management plan certification processes in conditions 12.1 to 12.3 inclusive.

~~15.2 The BPAMP shall, at a minimum, address the following:~~

~~(a) Description of existing populations, location within the Port of Tauranga,~~

Commented [HB4]: This condition has been amended to reflect that the Avian Management Plan has been through an approval/certification process with Environment Court and so there is no need for detail in conditions as to what the plan should cover or for a certification process.

Commented [HB5]: The primary goal from this condition has been removed as it is specific to the Mount Wharves side which is not the subject of this consent.

breeding/foraging and threats.

(b) Details of pre- and post- rock wall demolition surveys of tarāpunga/red-billed gulls and kororā/blue penguins (including burrow surveys).

(c) Methods for establishing new habitat, and details of the new nest box colony habitat for blue penguins to be undertaken prior to the rock wall dismantling.

(d) Methods and timeframes (avoiding the breeding season) for dismantling of the rock wall between Berth 11 and 16 and actions required if blue penguin eggs, chicks, adults, moulting adults etc. are found within the wall.

(e) Methods to encourage red-billed gulls to an alternative habitat on the Northern rock wall of Sulphur Point and associated monitoring.

(f) Measures of red-billed gull relocation success and a process for providing a 200m equivalent area of suitable rock wall habitat in general accordance with the plan attached to this consent titled 'Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-61' should relocation be unsuccessful.

(g) Daily blue penguin monitoring requirements of rock wall during dismantling.

(h) Triggers and thresholds linked to a monitoring and response framework if the objectives of the plan are not being met.

(i) Details for handling penguins, such as permitted handlers, equipment.

(j) Details of people or agencies who can care for blue penguin eggs, chicks, moulting adults or injured birds.

(k) Required training of Port of Tauranga Staff and/or Contractors.

(l) The plan shall include the feedback from DOC, ILG or TAAG and Ngai Tukairangi or provide explanation why the Consent Holder can not accommodate any recommendation. If no feedback is received within 20 working days the Consent Holder shall state so in the BPAMP.

15.3 At least one breeding cycle of the following Penguin burrow investigations shall be conducted prior to any dismantling of the rock wall between berths 11 and 16:

(a) Burrows to be identified and assessed during breeding season.

(b) Identified burrows to be checked during April - May and blocked if confirmed empty.

(c) Burrows to be identified and assessed during the following breeding season afterblocking a nest and/or prior to dismantling the rock wall.

15.4 In association with the Department of Conservation and Ngāi Tukairangi the Consent Holder shall establish Penguin nests in alternate locations prior to the blocking of any burrows and/or dismantling of the existing rock wall.

15.5 The existing rock wall between berths 11 and 16 shall not be dismantled during 1 July to 31 March, unless relocation of the red-billed colony and blue penguins has been successful.

~~15.6 The equivalent of a minimum length of 200m of rock wall habitat shall remain along the waters edge, unless relocation of the red billed colony and blue penguins relocation as described in the BPAMP has been successful.~~

~~16 **Sand Pile Management Plan**~~

~~The Consent Holder shall, invite the Department of Conservation, ILG or TAAG and representatives of Ngāi Tamarāwaho to provide feedback on the Sand Pile Management Plan (**SPMP**). The Objective of the SPMP shall be to maintain the sand pile and document management controls of the sand pile operations in recognition of the bird habitat that it provides. The SPMP shall address the following:~~

~~(a) Description of avian species present.~~

~~(b) Sand pile location, dimensions and use (including timing of operations in recognition of breeding seasons.~~

~~(c) Pest control.~~

~~(d) Monitoring.~~

~~(e) Roles and responsibilities.~~

~~(f) Process for amending the SPMP.~~

~~16.1~~15.3 ~~The plan shall include the feedback from DOC, ILG or TAAG and Ngāi Tamarāwaho or provide explanation why~~Where the Consent Holder ~~cannot accommodate any recommendation. If~~provides an amended Avian Management Plan to the Regional Council for re-certification, if no ~~feedback~~response is received from the Regional Council within 20 working days then certification shall be deemed to have been given (unless the Regional Council provides an alternative timeframe for certification to the Consent Holder~~ shall state so in the SPMP.~~).

~~16.2 Ongoing management of the sand pile shall be undertaken in accordance with the SPMP.~~

15.4 The Consent Holder shall establish a one off fund of $150,000 to be used for the purpose of assessing and developing opportunities to enhance avifauna habitat in and around Te Awanui. The fund is to be administered by the TAAG.

Commented [HB6]: Tthe sandpile plan has been removed as it is now combined with Avian Management Plan (condition 15.1).

Commented [HB7]: This condition has been included as per POTL's memorandum to the Court as an alternative to enlargement of the sandpile as required by the Court's interim decision.

Advice note: the Consent Holder has offered conditions ~~18~~15.1 ~~and 18.2~~to 15.3 and agrees to be bound by them pursuant to the Augier principle.

~~17.~~16 **Mātauranga Monitoring Plan**

~~17.1~~16.1 Within two months of the TAAG being established (Condition 5.1), the Consent Holder will invite TAAG to facilitate the preparation of a Mātauranga Monitoring Plan (MMP).

~~17.2~~16.2 The purpose of the MMP is to detail how the cultural health of Te Awanui, to the extent it overlaps with the Port Zone, is surveyed, monitored and reported upon to provide the state of the marine environment and kaimoana from a cultural perspective.

~~17.3~~16.3 The MMP shall include:

a) A plan and description of the area subject to the MMP;

b) The cultural indicators to be surveyed and monitored, including appropriate baseline measures to monitor change against;

c) Methodologies for the cultural indicators to be surveyed and monitored;

d) A description of how the monitoring obtained under the MMP will be integrated with any wider mātauranga monitoring undertaken for Te Awanui; and

e) Reporting requirements including the extent to which any information obtained is to be included on the consent holder's website in accordance with (condition 6.6).

~~17.4~~16.4 Upon being provided with the final MMP, the Consent Holder shall forward the MMP to the consent authority for its records. If the Consent Holder becomes aware of any changes to the MMP, the Consent Holder shall notify the Regional Council within 5 days of being made aware of the changes (including a copy of the updated MMP if the Consent Holder has been provided with a copy by the TAAG).

~~17.5~~16.5 The consent holder shall support the preparation and delivery of the MMP to the value of $25,000 per annum (jointly with consent [dredging ref.]~~XX~~) from the time the TAAG is established (condition 5) until the expiry of this resource consent. The annual amount payable shall be adjusted annually for inflation in accordance with the CPI index.

RESTORATION AND MITIGATION

~~18~~17 **Restoration**

~~18.1~~17.1 The Consent Holder shall provide a one off payment of $~~2~~1,000,000 (when combined with resource consent [dredging ref.]~~XXX~~) for the TAAG to invest into projects of its choosing. The purpose of the fund is to provide support for administration of the TAAG and projects that:

a) contribute to the restoration of the health of Te Awanui;~~-~~

b) abundance projects; and

c) projects that benefit iwi and hapū that have a relationship with Te Awanui.

~~18.2~~17.2 An annual payment of $25,000 (when combined with resource consent [dredging ref.] ~~XXX~~) to the Whareroa Marae Reservation Trust towards Whareroa Marae Infrastructure projects, adjusted annually for inflation in accordance with the CPI index, from the time works commence pursuant to this consent until the expiry of this consent.

Advice note: the Consent Holder currently contributes $50,000 per annum (CPI adjusted) to the Ngā Mātarae Charitable Trust under the conditions of resource consent 65806. For the avoidance of doubt, the contributions specified in conditions ~~20~~17.1 and ~~20~~17.2 of this consent are additional to the contribution specified in resource consent 65806.

~~18.3~~17.3 If the TAAG is not established within 5 years from the commencement of this resource

consent then the payment of funds in condition ~~20~~17.1 shall be held by the Consent Holder in an interest bearing Trust until such time as the TAAG is established. Should a TAAG not be established by the time of consent expiry, the Consent Holder shall provide the funds to the Regional Council for use towards Council led harbour restoration projects.

~~19~~18 **Biosecurity**

~~19.1~~18.1 The Consent Holder shall provide $27,000 to the Bay of Plenty Regional Council ~~for each stage of development involving the construction of new structures within the coastal marine area. The contribution is~~ towards the Bay of Plenty led biosecurity programme ~~and will~~to enable that programme to be extended so that the new wharf structures ~~authorized~~authorised by this consent are included for surveillance of the presence of any invasive species.

~~20~~19 **Navigation**

~~20.1~~19.1 The permit holder shall ensure that all structures under this permit are appropriately marked and/or lit in accordance with "System of Buoyance and Beaconage for New Zealand" (document prepared by the Maritime Safety Authority of New Zealand) or any subsequent superseding document.

~~21~~20 **Sites of Archaeological, Historic or Cultural Significance**

~~21.1~~20.1 In the event of any archaeological site or koiwi being uncovered during the exercise of this consent, activities in the vicinity of the discovery shall cease. The consent holder shall contact the Regional Council to obtain details of the relevant iwi authority. The consent holder shall then consult with the relevant iwi authority and Heritage New Zealand and shall not recommence works in the area of the discovery until the relevant Heritage New Zealand approvals or other approvals to damage, destroy or modify such sites have been obtained, where necessary.

Advice Note: The RegionalCouncil is able to advise of contact details for the relevant iwi authority.

~~22 **Lapse of Consent**~~

~~22.1 Under section 125(1) of the Resource Management Act 1991, this consent will lapse on the tenth anniversary of the date of commencement, as defined by section 116 of the Resource Management Act 1991, unless it is given effect to prior to that date.~~

~~23~~21 **Surrender of Consent**

~~23.1~~21.1 The Consent Holder will surrender consent 62920 upon commencement of this consent.

~~24~~22 **Review**

~~24.1~~22.1 The Regional Council may serve notice on the permit holder under s128(1)(a)(iii), and/or s128(1)(b) and/or s128(1)(ba) of the Resource Management Act 1991 of its intention to review the conditions of this resource consent on 1 November of each year.

The purpose of such a review is to:

a) give effect to any Act of Parliament, Regulation, National Policy Statement,

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Regional Policy Statement or relevant Operative Regional Plan, which controls or restricts activities in the coastal marine area in locations where works are authorized by this consent; and/ or;

b) address any effects on cultural values that are identified by the ILG or TAAG or parties involved in the cultural monitoring undertaken in accordance with condition 19.5 and that:

i. have not yet been identified; and,

ii. result from the implementation of this resource consent.

~~25~~23 **Term of Consent**

~~25.1~~23.1 This consent shall expire on [10 years from commencement of the consent].~~31 March 2057. [35 Years]~~

~~25.2~~23.2 **The Coastal Consent** hereby authorised is granted under the Resource Management Act 1991 and does not constitute an authority under any other Act, Regulation or Bylaw.

Advice Notes:

1. *This consent does not authorise the holder to modify or disturb any archaeological or historic sites or deposits within the area affected by this consent. Should anyartefacts, bones, shell midden or any other sites of archaeological or cultural significance be discovered within the area affected by this operation, written authorisation should be obtained from the Historic Places Trust before any further damage, modification or destruction is undertaken.*

2. *The consent holder is advised that under the provisions of section 64A of the Resource Management Act 1991, this consent may become subject to charges for the occupation of Crown seabed and/or foreshore. At the time of issuing this consent there is no charging system in place however this consent may be affected by any charging regime implemented in the future.*

3. *Notification and reporting required by this consent should be made in writing to the Manager Pollution Prevention, Bay of Plenty Regional Council, Box 364 or fax 0800 884 882 or email notify@boprc.govt.nz and should include the consent number RM21-0341.*

4. *The consent holder is responsible for ensuring that all contractors carrying out works under this consent are made aware of the relevant consent conditions, plans and associated documents.*

5. *The consent holder is advised that non-compliance with consent conditions may result in enforcement action against the consent holder and/or their contractors.*

6. *Section 245 of the Resource Management Act 1991 sets out the process for the vesting of the land once reclaimed.*

7. *For the purposes of this consent Tauranga Moana Iwi means Ngāti Ranginui Iwi Society, Ngāi Te Rangi and Ngāti Pūkenga*

8. *[Advice note to be added by the Regional Council with iwi contact details for the purposes*

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of compliance with condition 61.

Draft Conditions for Resource Consent No RM21-0341 – Reclamation and Structures

Port of Tauranga Limited

A resource consent:

- Under section 12(1) of the RMA and Rules PZ8 and PZ11 of the Bay of Plenty Regional Coastal Environment Plan to undertake a restricted discretionary activity being the **Stage 1 construction, reclamation and deposition onto the foreshore or seabed** within the area of the Port of Tauranga that has been granted a s.384A occupation consent;
- Under section 15(1) of the RMA and Rules PZ8 and PZ11 of the Bay of Plenty Regional Coastal Environment Plan to undertake a restricted discretionary activity being to **discharge contaminants to the coastal marine area associated with the construction of Stage 1 reclamations and structures** within the area of the Port of Tauranga that has been granted a s.384A occupation.

subject to the following conditions:

PURPOSE, LOCATION, SCOPE

A. **Purpose of this Resource Consent**

A.1 Te Awanui is a taonga and is important to:

- the iwi/hapū that have a deep rooted and long standing connection to Te Awanui;
- the Port of Tauranga Limited who depends on Te Awanui for its operations; and
- the community who live, work and play in and around the harbour.

A.2 The purpose of this consent is to manage the effects on Te Awanui, and those that have a relationship with Te Awanui, by:

a) authorising and setting conditions to reclaim seabed and foreshore of Tauranga Harbour to provide for the use of the Sulphur Point facilities and to ensure the configuration of the new wharf is aligned or contiguous with existing facilities.

b) authorising and setting conditions to discharge settled dredge water to Tauranga Harbour for the dewatering of dredged material that will be used in the reclamation.

c) authorising and setting conditions to construct Stage 1 Sulphur Point wharf extension and reclamation retaining structures and associated activities including dredging related to construction of structures and under wharf batter.

Advice Note: The extension of Sulphur Point wharf is the first stage in the proposed extensions of both Sulphur Point and Mount Maunganui wharves and the conditions reflect the reduced work limited to Stage 1 only.

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B. **Location**

B.1 The area to be reclaimed and for structures to be constructed is located in the Stella Passage of Tauranga Harbour as shown as Stage 1 on the plan attached to this consent titled "Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-67."

C. **Map Reference**

C.1 At or about NZTM 1879960.9E, 5826419.3N for Sulphur Point.

D. **Area of Reclamation**

D.1 The reclamation shall occupy an area no larger than 0.88 hectares at Sulphur Point and shall conform with the dimensions shown on the plan referenced in condition B.1 above and attached to this consent**.**

1 **INTEGRATED MANAGEMENT**

1.1 In recognition of the importance of Te Awanui and the need for integrated and holistic management to improve the health of Te Awanui over time, the Consent Holder shall invite iwi, hāpu and the Regional Council to participate in a series of at least four wānanga to facilitate the preparation of a Southern Te Awanui Harbour Health Plan.

Advice Note: The Tauranga Moana Advisory Group is an existing forum that acts under a partnership agreement, between iwi and local authorities. The stated purpose of the group is to continue building strong working relationships to support and enhance the health of the harbour and catchments.

1.2 The purpose of the Southern Te Awanui Harbour Health Plan is to foster a partnership approach between the Port of Tauranga Limited, councils and iwi in setting the direction for the management of Southern Te Awanui and associated catchments to achieve an overall improvement in the health of Te Awanui over time. The Plan will:

a) Identify a long term vision and key principles for improvement of the ecological and cultural health of Te Awanui.

b) Identify priority focus areas and describe the past state, current state and future desired state.

c) Recommend actions and roles/ responsibilities to achieve the future desired state.

1.3 The Consent Holder will complete the preparation of a draft Southern Te Awanui Harbour Health Plan within two years of the commencement of the consent in accordance with the scoping document. The draft Southern Te Awanui Harbour Health Plan will be presented by the Consent Holder to the Tauranga Moana Advisory Group for feedback.

1.4 If completion of the Southern Te Awanui Harbour Health Plan is not completed within two years of commencement of the consent as required by condition 1.3, the consent holder shall provide reasons in writing for the Regional Council and an estimated timeframe for completion.

1.5 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health Plan to the Tauranga Moana Advisory Group along with comments on any recommendations of changes not incorporated and the reasons why within 3 months

of presenting the draft (in accordance with condition 1.3).

1.6 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health Plan on its website (Condition 6.6), including details of the progress towards achieving any actions of the Consent Holder identified in the Plan.

Advice Note: The Consent Holder has offered conditions 1.1 to 1.6 and agrees to be bound by them pursuant to the Augier principle. The Southern Te Awanui Harbour Health Plan will identify actions of a number of parties in order to achieve holistic and integrated management.

RELATIONSHIPS

2 **Relationship of Iwi and Hapū with Te Awanui**

2.1 The Relationship of iwi and hapū with Te Awanui is to be recognised and provided for by the Consent Holder through:

a) Funding the transitional Iwi Liaison Group ("ILG") (Condition 4) and an ongoing Te Awanui Advisory Group ("TAAG") (Condition 5) for involvement as required in this consent.

b) Invitations to either the ILG or TAAG (whichever is established at the time) to engage as follows:

i. at least quarterly for the first two years of the commencement of the consent and thereafter twice per year (in accordance with condition 4.5). These meetings may occur concurrently with consent [dredging ref.]

ii. Annual strategic planning with the Port of Tauranga CEO and Chair of the Board of Directors (Condition 2.3).

c) An invitation to Ngāi Tamarāwaho to engage prior to any works commencing under this consent, and at least quarterly during works to provide a progress update on the works and discuss any issues arising from the works authorised by this consent.

d) Facilitating the preparation of an Integrated Southern Te Awanui Harbour Health Plan (Conditions 1.1 to 1.6).

e) Provision for involvement of the ILG and TAAG under this consent in accordance with their defined role, in:

i. Discussion about design details (condition 8.1);

ii. Preparation of a Mātauranga Monitoring Plan (Condition 16.1);

iii. Annual strategic planning with the Port of Tauranga CEO and Chair of the Board of Directors (Condition 2.3);

iv. Review of Management Plan/s (Conditions 13.1, 14.1, 15.1);

v. Appointment of a marine mammal observation auditor (14.1(j)).

f) Providing an opportunity for iwi and hapu that have a relationship with Te Awanui and the specific locations of the extensions to carry out ceremonies

in accordance with condition 2.2.

g) Inviting the preparation of a Mātauranga Monitoring Plan (Condition 16.1) and funding support towards the preparation and delivery of Matauranga Monitoring (Condition 16.5).

h) A contribution of funds to the TAAG to provide for ongoing projects that benefit the health of Te Awanui or that directly benefit iwi and hapū that have a relationship with Te Awanui (Condition 17.1).

2.2 At least 20 working days prior to carrying works under this consent, the Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to carry out a ceremony at the site of the extension. The Consent Holder shall confirm by notice in writing to the Chief Executive of the Regional Council or delegate that the opportunity to carry out a ceremony has been given and that it has been carried out where deemed appropriate by the ILG or TAAG.

2.3 The Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to attend a hui annually with at least the Port of Tauranga Limited's Chief Executive Officer and Chair of the Board of Directors. The purpose of the annual hui is for the purpose of involving iwi and hapū that have a relationship with Te Awanui to be part of the strategic planning of the Port of Tauranga. This includes, but is not limited to, a discussion around the details of the works authorised by these consents and proposed future stages subject to other consent processes.

Advice note: the Consent Holder has offered condition 2.3 and agrees to be bound by it pursuant to the Augier principle.

3 **Relationship Agreements Port, Iwi, Hapū and entities**

3.1 The consent holder shall facilitate the preparation of relationship agreements with the following Iwi, hapū and/or entitles within 12 months of the commencement of this consent:

a) The Ngāti Ranginui Fisheries Trust;

b) Te Rūnanga O Ngāi Te Rangi Iwi Trust and Ngāti Tapu;

c) Ngāti Kuku And The Whareroa Marae Trust;

d) Ngā Hapū O Ngā Moutere Trust;

e) Ngāti Kaahu A Tamapahore Trust and Ngāti He;

f) Ngāti Pūkenga; and

g) Ngāti Ranginui Incorporated Society.

3.2 The purpose of the relationship agreements is to agree and record how the consent holder and other parties will establish a long term organisation-wide relationship with each other, including a forum to discuss matters which are outside the scope of or are not covered by this resource consent.

3.3 Within 13 months of the commencement of this resource consent, the consent holder shall either:

h) Provide copies of finalised relationship agreements to the consent authority (except to the extent that any agreements contain confidentiality provisions); and/or

i) Provide details to the consent authority as to why relationship agreements have not been concluded (including, if relevant, details of the consent holder's endeavors to agree relationship agreements).

ADVISORY GROUPS

4 **Transitional Iwi Liaison Group ("ILG")**

4.1 Within two months of the commencement of these consents, the Consent Holder shall invite Tauranga Moana iwi (see Advice note) and hapū with a relationship with Te Awanui to establish and maintain a transitional (see condition 4.4) Iwi Liaison Group. The Consent Holder shall invite nominations for the following representatives to form the group:

j) Whareroa Marae may nominate two representatives, at least one of whom shall ahi kaa to the Whareroa Marae;

k) Ngāi Te Rangi, who may nominate one representative;

l) Ngāti Ranginui, who may nominate one representative; and

m) Ngāti Pūkenga, who may nominate one representative.

4.2 If nominations for representatives are not received from iwi and hapū within five months of the commencement of the consent then the Consent Holder will invite the following to form the transitional ILG:

a) Those representatives that have been nominated; or

b) In the case that no nominations have been received, the Tauranga Moana Iwi Customary Fisheries Trust.

4.3 The purpose of the transitional ILG is to provide a forum that the Consent Holder can undertake immediate engagement activities to effect the implementation of these consents. The ILG will also be responsible for determining the separate tikanga based process of establishing the ongoing Te Awanui Advisory Group. The functions of the transitional ILG are:

a) Determine the tikanga based process to be used to establish, and facilitate the establishment of, a Te Awanui Advisory Group (Condition 5) that comprises of iwi and hapū representatives that have a relationship with Te Awanui.

b) Finalise the name of the Te Awanui Advisory Group.

c) Provide a forum for liaison with the Consent Holder and iwi and hapū that have a relationship with Te Awanui in regards to the implementation of this consent. This includes providing information back to iwi and hapū on progress on the implementation of the consent and providing feedback to the Consent Holder on any particular concerns arising from the implementation of the consent that iwi and hapū may raise with the ILG.

d) Be an immediate liaison point for the Consent Holder in the engagement over the Management Plan/s under the consent (conditions 13.1, 14.1 and 15.1).

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies deemed appropriate by iwi and hapū who have a relationship with Te Awanui (condition 2.2).

f) Attend an annual strategic planning meeting with the Port of Tauranga CEO and Chair of Board of Directors (Condition 2.3).

g) Appoint the marine mammal observation auditor (condition 14.1(j)).

4.4 The ILG will remain in place until such time as a Te Awanui Advisory Group is established (Condition 5).

4.5 The Consent Holder shall:

a) Facilitate the administration of each formal meeting of the ILG. The first ILG meeting shall be held as soon as practicable after the establishment of the ILG. The ILG shall meet quarterly for the first two years from the commencement of consents and thereafter twice per year (unless a different frequency of meetings is agreed between the Consent Holder and the ILG) until such time as a Te Awanui Advisory Group is established (Condition 5).

b) Take minutes of the ILG meetings, which shall be forwarded to members within 10 days of each meeting being held for those members to confirm they are true and correct record.

c) Give members at least three weeks' advance notice of the date, time and location of ILG meetings.

d) With the agreement of ILG members make minutes available on the Ports website (condition 6.6(c)).

4.6 The Consent Holder shall provide $25,000 per year for up to five years following the commencement of consent, or until the Te Awanui Advisory Group is established (condition 4.4), whichever is the soonest so that the ILG can perform their functions under the consent.

4.7 Within 10 working days of the ILG being formed, or any changes being made to its membership, the Consent Holder shall provide details of its membership to the Regional Council.

5 Te Awanui Advisory Group

5.1 The Consent Holder will provide (in accordance with condition 5.1 (h)) for the ongoing involvement in these consents of a Te Awanui Advisory Group (TAAG) [or alternative name as determined by the ILG] established by iwi and hapu in accordance with condition 4.3 (a). The Purpose of the TAAG is to provide an iwi and hapū-led forum that provides on-going advice to the Consent Holder in the implementation of these consents and is the main liaison point for the Consent Holder in regards to the requirements of this resource consent. In particular, the purpose of the TAAG is to:

a) Recognise the importance of Te Awanui as a taonga and to recognise and provide for the kaitiakitanga of iwi and hapū who have a relationship with Te

Awanui;

b) Provide a means of liaison between iwi and hapū who have a kaitiaki relationship with Te Awanui and the Consent Holder through providing a forum for regular discussion about the implementation of this consent and consent [dredging ref.];

c) Facilitate the development of a Mātauranga Monitoring Plan in accordance with Condition 16.1;

d) Evaluate the data obtained from any mātauranga monitoring undertaken in accordance with condition 16.3 insofar as they relate to the cultural values and the effects of the works authorised by these consents on Te Awanui and advise the Consent Holder and Regional Council of any unforeseen effects arising. In the case of any unforeseen adverse changes to effects on cultural values being identified as a result of the implementation of these consents, to advise and make recommendations to the Consent Holder and the Regional Council on the nature of the review (in accordance with condition 22.1) and appropriateness of any mitigation, response and/or contingency measures;

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies under condition 2.2;

f) Be a liaison point for the Consent Holder in the engagement over the Management Plan/s under the consent (condition 13.1, 14.1, 15.1);

g) Appoint the marine mammal observation auditor (condition 14.1(j)); and

h) Administer the funds provided by the Consent Holder under condition 15.4 and 17.1 to be used for the functions of the TAAG under this consent and for restoration projects.

6 **Notification**

6.1 The consent holder shall notify (in writing) the following parties of its intention to commence reclaiming no less than 10 working days prior to beginning construction activities:

a) Ngāti Ranginui;

b) Ngāi Te Rangi;

c) Ngāti Pūkenga;

d) Ngāi Tamarāwaho;

e) Ngāi Tukairangi;

f) Ngāti Kahu;

g) Ngāti Kuku and Whareroa Marae;

h) Ngāti Tapu;

i) Waitaha Iwi;

j) Tauranga Moana Iwi Customary Fisheries Trust (“TMICFT”);

k) Ngāti Ranginui Fisheries Trust;

l) Ngāti He;

m) Ngā Hapū o Ngā Moutere o Matakana me Rangiwaea; and

n) Bay of Plenty Regional Council.

6.2 In addition to the above named parties, the Consent Holder shall provide notice on their website (in accordance with condition 6.6) of their intention to commence reclamation at least 10 working days prior to any reclamation authorised by this consent.

6.3 The consent holder shall erect and maintain a prominent sign at the relevant access points to the Port for the duration of works. The sign shall clearly display, as a minimum, the following information:

a) The name of the consent and consent holder.

b) The main site contractor.

c) A 24 hour contact telephone number for the consent and consent holder or appointed agent.

d) A clear explanation that the contact telephone number is for the purpose of receiving complaints and information from the public about dust nuisance, noise, or any relevant problem that may occur as a result of the exercise of this consent.

6.4 Not less than five working days prior to the start of works of any reclamation or structures authorised under this consent, the consent holder shall, in writing, request a site meeting between the principal contractor and the Chief Executive of the Regional Council or delegate. Notification at this time shall include details of who is responsible for on-site management and compliance with consent conditions.

6.5 Within five working days of the completion of any reclamation or demolition/construction of structures authorised under this consent, the consent holder shall, in writing, notify the Chief Executive of the Regional Council or delegate.

6.6 The Consent Holder shall establish and maintain for the duration of these consents a dedicated page on its website for the purpose of ensuring all monitoring and reports required under these consent conditions is publicly available. The following documents or reports must be uploaded to the website as soon as practicable and no later than 20 working days after being received or prepared by the Consent Holder:

a) The final certified Management Plan/s, including any variations to those Plans if amended (conditions 13.1, 14.1 and 15.1);

b) The results of all monitoring and sampling undertaken pursuant to the consent;

c) Minutes of the meetings of the ILG and TAAG agreed by members as appropriate for public dissemination;

d) Copies of reports required in conditions 14.3; and

e) Any other information reasonably related to the exercise of this consent.

6.7 Within 30 working days of completion of reclamation or structures in the Coastal Marine Area authorised under this resource consent, the Consent Holder shall provide to the Regional Council certification from a suitably qualified and experienced engineer stating that the reclamations and structures have been constructed in accordance with the requirements of this resource consent and good engineering practice.

WORKS

7 **Reclamation Works and Structures**

a) All works shall be undertaken in accordance with the information submitted in the resource consent application titled Stella Passage Development Resource Consent Application, Assessment of Environmental Effects dated May 2021 and supporting materials (except to the extent modified by these conditions), and in general accordance with Stage 1 of the plan attached to this consent titled 'Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-67'.

8 **Design**

8.1 The Consent Holder shall discuss with the ILG or TAAG the proposed design of structures and reclamation and invite feedback on opportunities to incorporate cultural elements subject to minimum design standards, building code requirements and to the extent practical. Prior to works commencing, the Consent Holder shall provide to the Bay of Plenty Regional Council the final design for the works, including design assumptions, parameters and methodology used for the design and any cultural elements included as a result of engagement with the ILG or TAAG or explanation as to why not included. The final design shall include certification, via an independent peer review, by a suitably qualified and experienced Chartered Professional Engineer specialised in Geotechnical and/or Structural Engineering.

8.2 The construction and lining of the rock wall and/or retaining wall surrounding the reclamation shall be such that all dredged material (other than that authorised to be discharged by consent 65806 and 65807 or any deposition consent which replaces consents 65806 or 65807) is contained within the reclamation.

8.3 Rock rip-rap and fill shall be of a suitable density, clean and weathering resistance and placed in a manner to ensure structural integrity of the embankment.

9 **Construction**

9.1 The Consent Holder shall engage an appropriately qualified and experienced Chartered Professional Engineer to supervise the construction. On completion of the works the Consent Holder shall provide a certificate from the Chartered Professional Engineer certifying that the subject matter has been constructed in general accordance with the requirements of this resource consent. That certificate shall be provided to the Bay of Plenty Regional Council no later than two (2) months after the relevant construction works are completed.

9.2 All structures shall be constructed using materials appropriate for a marine environment with consideration as to the level of corrosion that will occur over the life of the structure. The consent holder shall continuously monitor the structures during the construction period to ensure that they are stable and do not represent a danger to the public.

9.3 Excavated foreshore material shall be managed to ensure that discharge and suspension of material is avoided.

9.4 The consent holder shall ensure that no water associated with the mixing, pouring, placing and cleaning of concrete structures and/or equipment is released into the Tauranga Harbour, except where concrete is required to be placed under water for structures.

9.5 The consent holder shall control particulate matter resulting from these works so that dust nuisance does not occur beyond the boundary of the work area where it can have an adverse effect on other harbour users.

9.6 The reclamation works shall not result in an increase in water turbidity of more than 20 NTU above ambient level at any point 50 metres or greater from the reclamation works.

9.7 Within three months of completion of the reclamation, the permit holder shall submit a survey plan that details the extent of the reclamation to the Regional Council.

9.8 The construction and reclamation site shall be clearly defined, prior to the commencement of work, to the satisfaction of the Chief Executive of the Regional Council or delegate.

9.9 All controls required, as identified in the Reclamation and Construction Management Plan (condition 13.1), shall be put in place prior to the commencement of work.

9.10 Piling operations and other significant noise emitting activities shall not be undertaken on Sundays and Public Holidays; and shall only be performed between the following times subject to the further limitation set out in condition 14.8 where daylight hours are shorter than the hours listed below:

a) Monday to Friday 7.30am to 8.00pm

b) Saturday 9.00am to 7.00pm

9.11 Works authorised under this consent shall be completed as soon as practicable after commencement.

9.12 Machinery shall, as far as practicable, be kept out of the coastal marine area. Machinery required within the CMA shall be identified in the Reclamation and Construction Management Plan (condition 13.1).

9.13 The consent holder shall employ methods to avoid or minimise any fuel spillage, including the provision of appropriate security and containment measures, where necessary. No fuel storage or machinery refuelling shall occur where fuel could enter a water body in the event of a spillage.

9.14 The consent holder shall ensure that all materials stockpiled for use in the construction work or waste materials are placed in such a manner that they cannot enter the harbour.

9.15 All plant, machinery, equipment and debris associated with this operation shall be removed from the foreshore and work area at the completion of the operation, to the satisfaction of the Chief Executive of the Regional Council or delegate.

10 **Settling Pond**

10.1 Where a settling pond is required to de-water dredged material to be used in the reclamation, the following shall apply to the discharge quality:

a) The mixing zone is defined as being 250 meters from any discharge point.

b) The turbidity shall not increase more than 15 NTU above ambient level at any point beyond the mixing zone.

c) No conspicuous oil or grease films, scums, or foams, or floatable or suspended material.

d) No conspicuous change in colour or visual clarity outside the mixing zone.

e) No emission or objectionable odour.

f) No significant adverse effect on aquatic life.

10.2 The Consent Holder shall provide to Bay of Plenty Regional Council certification from a suitably qualified and experienced engineer stating that the settling pond is designed and built to recognised and appropriate engineering standards. The certification shall be provided to the Bay of Plenty Regional Council within two (2) weeks of the construction of the settling pond being completed.

11 **Maintenance**

11.1 The consent holder shall ensure that all controls required, as identified in the Reclamation Construction Management Plan, are maintained in an effective capacity at all times.

11.2 The consent holder shall ensure that the reclamation authorised by this consent is maintained in a safe and structurally sound condition at all times, and shall undertake any maintenance work immediately, if so directed by the Chief Executive of the Bay of Plenty Regional Council or delegate.

11.3 The Consent Holder shall maintain records of every inspection carried out of the condition of the reclamation and structures and the date and description of any maintenance work carried out. These records shall be provided to the Bay of Plenty Regional Council upon request.

MANAGEMENT PLANS

12 **Management Plans certification and amendment process**

12.1 Prior to works commencing, the Consent Holder shall submit to the Regional Council for its certification the following management plans:

a) Reclamation and Structures Management Plan (Condition 13.1);

b) Marine Mammal Effects Management Plan (Condition 14.1);

(together the "**Management Plans**").

12.2 If the Consent Holder has not received a response from the Bay of Plenty Regional

Council within 20 working days of the date of submission of the Management Plan/s for certification (including that the Regional Council is unable to certify with Management Plan within the 20 working days) the Management Plan/s will be deemed to be certified. If Bay of Plenty Regional Council's response is that it is unable to certify the Management Plan/s it must provide the Consent Holder with reasons and recommendations for changes needed to the Management Plan/s in writing. The Consent Holder must consider any reasons and recommendations of the Bay of Plenty Regional Council and submit an amended management plan for certification. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 10 working days of the date of resubmission, the Management Plan /s will be deemed to be certified.

12.3 For the purpose of this consent, certification means that the Management Plan/s meet the purpose and contain the minimum requirements outlined in the consent condition. For the avoidance of doubt, Management Plans may be peer reviewed by the Consent Authority.

12.4 The Consent Holder shall provide 30 working days for the ILG or TAAG to provide feedback on the draft Management Plans (in accordance with condition 13.1 and 14.1) before submitting a final version to the Bay of Plenty Regional Council.

12.5 The Consent Holder shall undertake all works authorised by this consent and proposed management in accordance with the certified Management Plans.

Process for Amending the Management Plans

12.6 At time during the implementation of these consents, or on the advice of the ILG or TAAG, the Consent Holder may submit a request to amend the Management Plans to the Regional Council for re-certification.

12.7 Where the Consent Holder provides an amended Management Plan to the Regional Council for re-certification, if no response is received from the Regional Council within 20 working days then certification shall be deemed to have been given (unless the Regional Council provides an alternative timeframe for certification to the Consent Holder).

13 **Reclamation and Construction Management Plan**

13.1 The consent holder shall prepare a Reclamation and Construction Management Plan (RCMP) for all works within the Coastal Marine Area authorised by this consent. The RCMP shall be provided to the ILG or TAAG for feedback. The purpose of the RCMP is to ensure that wharf construction and associated activities are managed in a way that is in general accordance with the information referred to in Conditions 7 to 11 (inclusive) of this resource consent and that effects on water quality, other harbour users, navigation and public safety are minimised.

13.2 The RCMP required by Condition 13.1 shall include as a minimum:

a) Construction methodology, including measures to complete work as soon as practicable;

b) Construction programme and timeframes (or schedule of works) of the main activities;

c) Staff and contractors roles and responsibilities;

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d) Stakeholder and communication management;

e) Sediment and erosion control plan;

f) Sediment discharge and suspension mitigation measures;

g) Dust Management;

h) Noise Management, including the use of timber piles where suitable and the use of vibratory piling rather than impact piling where practicable;

i) A water quality monitoring schedule detailing the methodology for monitoring compliance with requirements of condition 10.1 for water discharging from any settling pond; and

j) The plan shall include any feedback from ILG or TAAG or provide an explanation why the Consent Holder can not accommodate any recommendation. If no feedback is received within 20 working days the Consent Holder shall state so in the RCMP.

14 Marine Mammal Effects Management

14.1 A Marine Mammal Effects Management Plan (**MMEMP**) shall be prepared with advice from a suitably qualified marine mammal expert. The MMEMP shall be provided to the Department of Conservation and the ILG or TAAG for feedback. The objective of the MMEMP is to reduce the risk of harm to marine mammals from activities associated with this consent, particularly in relation to the effects of underwater noise from piling. The MMEMP shall include, butnot be limited to:

(a) Introduction;

(b) Marine Mammals that may be present within Tauranga Harbour area;

(c) Potential for adverse effects;

(d) Control or mitigation measures:

i. Piling methodology to reduce noise at source including the use of bubble curtains for impact pile driving;

ii. Identification of the Marine Mammal Observation Zone (MMOZ) including a process for reviewing this in response to acoustic monitoring results;

iii. An inner harbour observation zone that is observed for 30 minutes prior to the start of piling each day;

iv. Details of a vantage point for the inner harbour observation zone that extends from the Harbour Bridge towards Maungatapu bridge and method of observation to be used (including the potential use of a fixed camera with sufficient resolution to view the extent of the inner harbour);

v. Identification of a shutdown zone/s, including a process for reviewing these in response to acoustic monitoring results;

vi. Trained personnel to act as observers that have the appropriate training to search the whole of the MMOZ for marine mammals as far as reasonably practical;

vii. Pre-start, normal works and standby observations;

viii. Soft Start Protocols;

ix. Shutdown Protocols;

x. Hours of operation; and

xi. Construction vessel speed management and marine mammal.

(e) The appropriate number, roles and use of appropriately trained marine mammal observers to provide a continuous lookout for marine mammals, white pointer sharks and green turtles (noting these are not marine mammals but are at-risk species) as required under this consent;

(f) Requirements for a marine mammal sighting log to be kept which includes reporting requirements. Reporting requirements are to include actions taken by the Consent Holder upon sighting of marine mammals to avoid effects on them;

(g) Principles of the acoustic monitoring methodology;

(h) Training and experience of:

i. All relevant personnel:

ii. Vessel masters;

iii. Marine Mammal Observers; and

iv. Environmental monitoring teams.

(i) Compliance with legislation;

(j) Provision for a marine mammal observation auditing role appointed by the ILG or TAAG, including details of the frequency of periodic checks to be undertaken during piling operations to check consistency with the MMEMP; and

(k) The plan shall include any feedback from DOC, ILG or TAAG or provide an explanation why the Consent Holder can not accommodate any recommendation. If no feedback is received within 20 working days the Consent Holder shall state so in the MMEMP.

14.2 At least 20 working days prior to Piling works occurring, the Consent Holder will invite the ILG or TAAG for a wānanga. The objective of the wānanga is for tangata whenua to share knowledge and exchange information of marine mammals in the area. The Consent holder shall be present and invite the following parties to the wānanga:

a) ILG or TAAG (which ever is established) and any representative that may be nominated by the ILG or TAAG;

b) Piling Contractor representative; and

c) The suitably qualified marine mammal expert preparing the MMEMP.

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14.3 The Consent Holder shall provide to the Bay of Plenty Regional Council, Department of Conservation and ILG or TAAG at the end of each calendar year in which pile driving operations occur, or as requested, a summary report detailing the date and number of marine mammals sighted and any actions taken by the consent holder to manage potential effects on them.

14.4 A Marine Mammal Observation Zone (MMOZ) and Shutdown Zone (SZ) shall be established during all pile driving activities. The MMOZ and SZ shall be defined as follows:

a) a MMOZ of a 500m radius around the construction site, extending down the main shipping channel towards the harbour entrance as far as practicable given visibility conditions.

b) SZ for medium and high frequency cetaceans (e.g. Hector's dolphins, bottlenose dolphins, killer whales, common dolphin, false killer whale, pilot whales and beaked whales) and fur seals of 500 metres radius from the construction site.

c) a SZ for baleen whales and leopard seals as described in condition 14.13.

14.5 The consent holder may, through the Management Plan amendment process identified in condition 12.6 and 12.7, provide a methodology for reducing the requirements and radius of the MMOZ and SZ through the introduction of mitigation, to manage the noise generated.

14.6 In addition to general amendments to the MMEMP in accordance with condition 12.6 and 12.7, the radius of the MMOZ and SZ may be revised following results from the acoustic monitoring identified in Condition 14.12. To achieve this, the Consent Holder shall provide to the Bay of Plenty Regional Council a report from a suitably qualified and experienced marine mammal specialist identifying the results of acoustic monitoring and providing justification for a change in the MMOZ and SZ radius. The Bay of Plenty Regional Council may peer review the recommendation. No change to the MMOZ and SZ shall be undertaken unless authorised by the Bay of Plenty Regional Council following the review.

14.7 The Consent Holder shall designate appropriately trained marine mammal observers to provide a continuous lookout for marine mammals, white pointer sharks and green turtles within the MMOZ during pile driving, in accordance with the certified MMMP. In addition:

(a) Prior to the start of pile driving for the day, the marine mammal observers shall undertake a 30 minute visual observation search of the MMOZ to assess whether any marine mammals, white pointer sharks or green turtles are present.

(b) Pile Driving shall cease or shall not commence if any marine mammal (including fur seals, white pointer sharks and green turtles) is located by the marine mammal observers within the SZ.

(c) Soft start Pile Driving may commence or recommence after the marine mammal observers have undertaken a search of the MMOZ and have assessed there are no marine mammals, white pointer sharks and green turtles present within or about to enter the SZ.

14.8 Pile Driving shall be limited to daylight hours only.

14.9 Prior to commencing piling operations each day 'inner harbour observations' to detect marine mammals up-harbour of Stella Passage will be made from a suitable vantage point. Inner harbour observations will be made by a trained marine mammal observer, either in-person or using a suitable resolution camera system to allow cetacean detection over the required field of view (as described in the MMEMP required in condition 14.1).

14.10 At the outset of each piling day, piling shall only commence once 30 minutes of 'inner harbour observations' have been made in accordance with condition 14.9 and no cetaceans have been detected.

14.11 If any cetacean is reported within the inner harbour whilst piling is underway, piling will immediately cease for the remainder of the day or until the animal/s are seen to depart through Stella Passage and are clear of the relevant shut down zone.

14.12 The Consent Holder shall carry out acoustic monitoring of impact pile driving operations to measure the one hour and twenty four hour cumulative Sound Exposure level (SELcum(1h); SELcum(24h)). The SELcum shall be derived from the maximum combined noise at all water depths. These measurements must be made by an appropriately qualified person. The acoustic monitoring shall:

(a) Commence immediately once driving piles to founding layer begins for each of the different pile diameters used in the operation. Measurements shall occur over a minimum of three days for each pile diameter;

(b) Be completed as soon as practicable after pile driving operations commencing as described in (a) above;

(c) Be reported within two weeks of completion of measurements to the Bay of Plenty Regional Council and the Department of Conservation. Each report shall describe in detail the acoustic monitoring methodology and the results of the monitoring (including the estimation of appropriate MMOZ and SZs) undertaken.

14.13 If a baleen whale or leopard seal is reported within Tauranga Harbour, pile driving shall cease and shall not recommence until they are present north of a line between Panepane Point and Stony Point as shown on the map titled 'Tauranga Harbour Baleen Whales & Leopard Seal Shutdown Zone, 270-94–8 attached to this consent, or have not been detected within the harbour for at least 24 hours. Records of all actions taken in accordance with this condition shall be provided in the marine mammal sighting log required by the MMEMP.

14.14 All vessel operations shall comply with the Marine Mammal Protection Act Regulations (1992).

14.15 A Waste Management Plan will be developed and followed to ensure the appropriate management and disposal of waste is undertaken and no waste enters the environment where it may impact on marine mammals.

14.16 Any reports of injured or dead marine mammals in the vicinity of the works or any near misses between the operation and marine mammals, must be reported immediately to the Bay of Plenty Regional Council and Department of Conservation including details of the incident and any mitigation action taken.

15 **Avian Management**

15.1 The Consent Holder shall undertake all works authorised by this consent and proposed management in accordance with the Avian Management Plan (**AMP**) certified by Environment Court and dated September 2024 (or any subsequent version amended in accordance with conditions 15.2 and 15.3). The Objective of the AMP is to avoid adverse effects from loss of habitat caused by the proposed works on avifauna.

15.2 At any time during the implementation of these consents, or on the advice of the ILG or TAAG, the Consent Holder may submit a request to amend the Avian Management Plan to the Regional Council for re-certification in accordance with the management plan certification processes in conditions 12.1 to 12.3 inclusive.

15.3 Where the Consent Holder provides an amended Avian Management Plan to the Regional Council for re-certification, if no response is received from the Regional Council within 20 working days then certification shall be deemed to have been given (unless the Regional Council provides an alternative timeframe for certification to the Consent Holder).

15.4 The Consent Holder shall establish a one off fund of $150,000 to be used for the purpose of assessing and developing opportunities to enhance avifauna habitat in and around Te Awanui. The fund is to be administered by the TAAG.

Advice note: the Consent Holder has offered conditions 15.1 to 15.3 and agrees to be bound by them pursuant to the Augier principle.

16 **Mātauranga Monitoring Plan**

16.1 Within two months of the TAAG being established (Condition 5.1), the Consent Holder will invite TAAG to facilitate the preparation of a Mātauranga Monitoring Plan (MMP).

16.2 The purpose of the MMP is to detail how the cultural health of Te Awanui, to the extent it overlaps with the Port Zone, is surveyed, monitored and reported upon to provide the state of the marine environment and kaimoana from a cultural perspective.

16.3 The MMP shall include:

a) A plan and description of the area subject to the MMP;

b) The cultural indicators to be surveyed and monitored, including appropriate baseline measures to monitor change against;

c) Methodologies for the cultural indicators to be surveyed and monitored;

d) A description of how the monitoring obtained under the MMP will be integrated with any wider mātauranga monitoring undertaken for Te Awanui; and

e) Reporting requirements including the extent to which any information obtained is to be included on the consent holder's website in accordance with (condition

6.6).

16.4 Upon being provided with the final MMP, the Consent Holder shall forward the MMP to the consent authority for its records. If the Consent Holder becomes aware of any changes to the MMP, the Consent Holder shall notify the Regional Council within 5 days of being made aware of the changes (including a copy of the updated MMP if the Consent Holder has been provided with a copy by the TAAG).

16.5 The consent holder shall support the preparation and delivery of the MMP to the value of $25,000 per annum (jointly with consent [dredging ref.]) from the time the TAAG is established (condition 5) until the expiry of this resource consent. The annual amount payable shall be adjusted annually for inflation in accordance with the CPI index.

RESTORATION AND MITIGATION

17 **Restoration**

17.1 The Consent Holder shall provide a one off payment of $1,000,000 (when combined with resource consent [dredging ref.]) for the TAAG to invest into projects of its choosing. The purpose of the fund is to provide support for administration of the TAAG and projects that:

a) contribute to the restoration of the health of Te Awanui;

b) abundance projects; and

c) projects that benefit iwi and hapū that have a relationship with Te Awanui.

17.2 An annual payment of $25,000 (when combined with resource consent [dredging ref.]) to the Whareroa Marae Reservation Trust towards Whareroa Marae Infrastructure projects, adjusted annually for inflation in accordance with the CPI index, from the time works commence pursuant to this consent until the expiry of this consent.

Advice note: the Consent Holder currently contributes $50,000 per annum (CPI adjusted) to the Ngā Mātarae Charitable Trust under the conditions of resource consent 65806. For the avoidance of doubt, the contributions specified in conditions 17.1 and 17.2 of this consent are additional to the contribution specified in resource consent 65806.

17.3 If the TAAG is not established within 5 years from the commencement of this resource consent then the payment of funds in condition 17.1 shall be held by the Consent Holder in an interest bearing Trust until such time as the TAAG is established. Should a TAAG not be established by the time of consent expiry, the Consent Holder shall provide the funds to the Regional Council for use towards Council led harbour restoration projects.

18 **Biosecurity**

18.1 The Consent Holder shall provide $27,000 to the Bay of Plenty Regional Council towards the Bay of Plenty led biosecurity programme to enable that programme to be extended so that the new wharf structures authorised by this consent are included for surveillance of the presence of any invasive species.

19 **Navigation**

19.1 The permit holder shall ensure that all structures under this permit are appropriately marked and/or lit in accordance with “System of Buoyance and Beaconage for New Zealand” (document prepared by the Maritime Safety Authority of New Zealand) or any subsequent superseding document.

20 **Sites of Archaeological, Historic or Cultural Significance**

20.1 In the event of any archaeological site or koiwi being uncovered during the exercise of this consent, activities in the vicinity of the discovery shall cease. The consent holder shall contact the Regional Council to obtain details of the relevant iwi authority. The consent holder shall then consult with the relevant iwi authority and Heritage New Zealand and shall not recommence works in the area of the discovery until the relevant Heritage New Zealand approvals or other approvals to damage, destroy or modify such sites have been obtained, where necessary.

Advice Note: The RegionalCouncil is able to advise of contact details for the relevant iwi authority.

21 **Surrender of Consent**

21.1 The Consent Holder will surrender consent 62920 upon commencement of this consent.

22 **Review**

22.1 The Regional Council may serve notice on the permit holder under s128(1)(a)(iii), and/or s128(1)(b) and/or s128(1)(ba) of the Resource Management Act 1991 of its intention to review the conditions of this resource consent on 1 November of each year.

The purpose of such a review is to:

a) give effect to any Act of Parliament, Regulation, National Policy Statement, Regional Policy Statement or relevant Operative Regional Plan, which controls or restricts activities in the coastal marine area in locations where works are authorized by this consent; and/ or;

b) address any effects on cultural values that are identified by the ILG or TAAG or parties involved in the cultural monitoring undertaken in accordance with condition 19.5 and that:

i. have not yet been identified; and,

ii. result from the implementation of this resource consent.

23 **Term of Consent**

23.1 This consent shall expire on [10 years from commencement of the consent].

23.2 **The Coastal Consent** hereby authorised is granted under the Resource Management Act 1991 and does not constitute an authority under any other Act, Regulation or Bylaw.

Advice Notes:

1. *This consent does not authorise the holder to modify or disturb any archaeological or historic sites or deposits within the area affected by this consent. Should anyartefacts, bones, shell midden or any other sites of archaeological or cultural significance be discovered within the area affected by this operation, written authorisation should be obtained from the Historic Places Trust before any further damage, modification or destruction is undertaken.*

2. *The consent holder is advised that under the provisions of section 64A of the Resource Management Act 1991, this consent may become subject to charges for the occupation of Crown seabed and/or foreshore. At the time of issuing this consent there is no charging system in place however this consent may be affected by any charging regime implemented in the future.*

3. *Notification and reporting required by this consent should be made in writing to the Manager Pollution Prevention, Bay of Plenty Regional Council, Box 364 or fax 0800 884 882 or email notify@boprc.govt.nz and should include the consent number RM21-0341.*

4. *The consent holder is responsible for ensuring that all contractors carrying out works under this consent are made aware of the relevant consent conditions, plans and associated documents.*

5. *The consent holder is advised that non-compliance with consent conditions may result in enforcement action against the consent holder and/or their contractors.*

6. *Section 245 of the Resource Management Act 1991 sets out the process for the vesting of the land once reclaimed.*

7. *For the purposes of this consent Tauranga Moana Iwi means Ngāti Ranginui Iwi Society, Ngāi Te Rangi and Ngāti Pūkenga*

8. *[Advice note to be added by the Regional Council with iwi contact details for the purposes of compliance with condition 6].*

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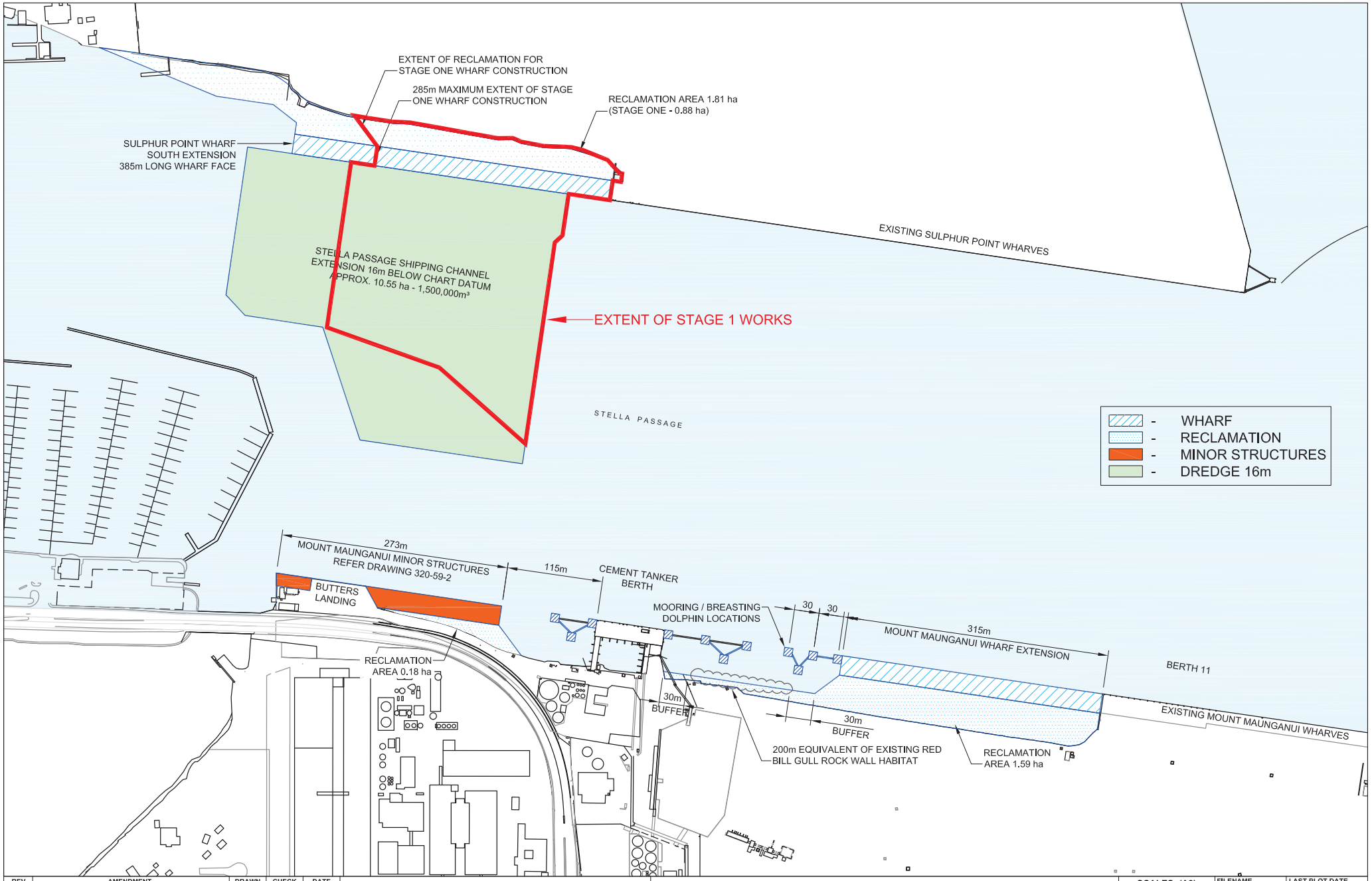

REV.	AMENDMENT	DRAWN	CHECK	DATE
0	FOR INFORMATION	D.B	-	24.04.24

PORT OF TAURANGA

PORT OF TAURANGA LTD.
Private Bag 12504
TAURANGA 3143,
NEW ZEALAND
TELEPHONE 07 572 8899

PROPOSED WHARF / RECLAMATIONS / DREDGING RESOURCE CONSENT DRAWINGS

-

SCALES: (A3) 1:4000	
DESIGNED	-
DATE	-
DRAWN	D.B
DATE	24.04.24
CHECKED	-
DATE	-

FILENAME	LAST PLOT DATE
320-67.dwg	24.04.24
DRAWING No.	REV.
320-67	0

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Draft Conditions for Resource Consent No RM21-0341 - Dredging

Port of Tauranga Limited

A resource consent:

- Under section 12(1) of the RMA and Rule PZ10 of the Bay of Plenty Regional Coastal Environment Plan for the **discharge to and disturbance of the foreshore and seabed associated with dredging activities** for Stage 1 of the Sulphur Point ~~and Mount Maunganui~~ Wharf ~~Extensions~~Extension, south sitting basin and shipping channel;

- Under section 12(1) of the RMA and Rule PZ5 of the Bay of Plenty Regional Coastal Environment Plan to undertake a controlled activity for the **discharge to and disturbance of the foreshore and seabed associated with maintenance dredging activities** associated with Stage 1 of the Sulphur Point ~~and Mount Maunganui~~ Wharf Extensions,south sitting basin and shipping channel.

subject to the following conditions:

PURPOSE, LOCATION, SCOPE

A. **Purpose of this Resource Consent**

A.1 Te Awanui is a taonga and is important to:

- the iwi/hapū that have a deep rooted and long standing connection to Te Awanui;
- the Port of Tauranga Limited who depends on Te Awanui for its operations; and
- the community who live, work and play in and around the harbour.

A.2 The purpose of this consent is to manage the effects associated with the excavation by capital dredging and ongoing maintenance dredging of material from the foreshore and seabed of Te Awanui.

A.3 The dredging is required to create the sitting basins and to extend the shipping channel to a depth of up to 16 metres below chart datum for the use of the Sulphur Point ~~and Mount Maunganui~~ wharf ~~extensions.~~extension.

Advice Note: The extension of Sulphur Point wharf is the first stage in the proposed extensions of both Sulphur Point and Mount Maunganui wharves and it is anticipated any future consents granted will be combined into a comprehensive consent for all works proposed.

B. **Location**

B.1 The area to be dredged is located in the Stella Passage of Tauranga Harbour as shown on the plans attached to this consent titled as follows:

- Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-~~61~~64 Rev A;
- Channel Dredging Coordinates Resource Consent Drawing, Drawing No. 320-59-1

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Rev B.

C. **Map Reference**

C.1 At or about map reference NZTM 1880215.5E, 5826356.8N.

D. **Quantity**

D.1 The total volume of material excavated as capital dredging under this consent shall not exceed ~~1,500~~850,000 cubic metres.

D.2 The total volume of material excavated as maintenance dredging under this consent and 65806 and 65807 (or any variation made to them) jointly shall not exceed 185,000 cubic meters per year averaged over a rolling five year period.

INTEGRATED MANAGEMENT

1.1 In recognition of the importance of Te Awanui and the need for integrated and holistic management to improve the health of Te Awanui over time, the Consent Holder shall invite ~~the Tauranga Moana Advisory Group~~iwi, hāpu and the Regional Council to participate in a series of at least four wānanga to facilitate the preparation of a Southern Te Awanui Harbour Health Plan.

Advice Note: The Tauranga Moana Advisory Group is an existing forum that acts under a partnership agreement, between iwi and local authorities. The stated purpose of the group is to continue building strong working relationships to support and enhance the health of the harbour and catchments.

1.2 The purpose of the Southern Te Awanui Harbour Health Plan is to foster a partnership approach between the Port of Tauranga Limited, councils and iwi in setting the direction for the management of Southern Te Awanui and associated catchments to achieve an overall improvement in the health of Te Awanui over time. The Plan will:

a) Identify a long term vision and key principles for improvement of the ecological and cultural health of Te Awanui.

b) Identify priority focus areas and describe the past state, current state ~~versus~~and future desired state.

c) Recommend actions and roles/ responsibilities to achieve the future desired state.

1.3 The Consent Holder will complete the preparation of a draft Southern Te Awanui Harbour Health Plan within two years of the commencement of the consent~~.~~ in accordance with the scoping document. The draft Southern Te Awanui Harbour Health Plan will be presented by the Consent Holder to the Tauranga Moana Advisory Group for feedback.

1.4 If completion of the Southern Te Awanui Harbour Health Plan is not completed within two years of commencement of the consent as required by condition 1.3, the consent holder shall provide reasons in writing for the Regional Council and an estimated timeframe for completion.

~~1.4~~1.5 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health Plan to the Tauranga Moana Advisory Group along with comments on any recommendations of changes not incorporated and the reasons why within 3 months of

presenting the draft (in accordance with condition 1.3).

~~1.5~~1.6 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health Plan on its website (Condition 6.5), including details of the progress towards achieving any actions of the Consent Holder identified in the Plan.

Advice Note: The Consent Holder has offered conditions 1.1 to 1.~~5~~6 and agrees to be bound by them pursuant to the Augier principle. The Southern Te Awanui Harbour Health Plan will identify actions of a number of parties in order to achieve holistic and integrated management.

Commented [A1]: In the event that parties agree to a tangata whenua-led development of the Southern Te Awanui Harbour Health Plan in accordance with an agreed framework then this condition would be replaced with a Port contribution towards the preparation of the Plan.

RELATIONSHIPS

2. **Relationship of Iwi and Hapū with Te Awanui**

2.1 The Relationship of iwi and hapū with Te Awanui is to be recognised and provided for by the Consent Holder through:

i. Funding the transitional Iwi Liaison Group ("ILG") (Condition 4) and an ongoing Te Awanui Advisory Group ("TAAG") (Condition 5) for involvement as required in ~~the~~this consent.

ii. Invitations to either the ILG or TAAG (whichever is established at the time) to engage as follows:

i. at least quarterly for the ~~first two years~~term of ~~the commencement of the~~this consent ~~and thereafter twice per year (in accordance with condition 4.5)~~. These meetings may occur concurrently with consent [structures ref].

ii. Annual strategic planning with the Port of Tauranga CEO and Chair of the Board of Directors (Condition 2.3).

iii. Facilitating the preparation of an Integrated Southern Te Awanui Harbour Health Plan (Conditions 1.1 to 1.~~5~~6).

iv. Provision for involvement of the ILG and TAAG under ~~the~~this consent in accordance with their defined role, in:

~~i. Selection of a Cultural monitor (Condition 13.1).~~

~~ii.~~i. Preparation of a Mātauranga Monitoring Plan (Condition ~~14~~13.1).

~~iii.~~ii. Review of the Dredge Management Plan~~/s~~ (Condition 10.1).

v. Providing an opportunity for iwi and hapū that have a relationship with Te Awanui to carry out ceremonies in accordance with condition 2.2.

vi. Inviting the preparation of a Mātauranga Monitoring Plan (Condition ~~14~~13.1) and funding support towards the preparation and delivery of Mātauranga Monitoring (Condition ~~14~~13.5).

vii. A contribution of funds to the TAAG to provide for ongoing projects that benefit the health of Te Awanui or that directly benefit iwi and hapū that have a relationship with Te Awanui (Condition ~~17~~16.1).

viii. Funding towards education and research scholarships for iwi and hapū that have a relationship with Te Awanui (Condition ~~17~~16.4).

2.2 At least 20 workings days prior to carrying out ~~any~~ capital dredging ~~stage~~ under this consent, the Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to carry out a ceremony at the site of the proposed dredging. The Consent Holder shall confirm by notice in writing to the Chief Executive of the Regional Council or delegate that the opportunity to carry out a ceremony has been given and that it has been carried out where deemed appropriate by the ILG or TAAG.

2.3 The Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to attend a hui annually with at least the Port of Tauranga Limited's Chief Executive Officer and Chair of the Board of Directors. The purpose of the annual hui is for the purpose of involving iwi and hapū that have a relationship with Te Awanui to be part of the strategic planning of the Port of Tauranga. ~~This includes, but is not limited to, a discussion around the details of the proposed staging of the works authorised by these consents.~~

Advice note: the Consent Holder has offered condition 2.3 and agrees to be bound by it pursuant to the Augier principle.

3. **Relationship Agreements Port, Iwi, Hapū and entities**

3.1 The consent holder shall facilitate the preparation of relationship agreements with the following Iwi, hapū and/or entitles within 12 months of the commencement of this consent:

i. The Ngāti Ranginui Fisheries Trust;

ii. Te Rūnanga O Ngāi Te Rangi Iwi Trust and Ngāti Tapu;

iii. Ngāti Kuku And The Whareroa Marae Trust;

iv. Ngā Hapū O Ngā Moutere Trust;

v. Ngāti Kaahu A Tamapahore Trust and Ngāti He;

vi. Ngāti Pūkenga; and

vii. Ngāti Ranginui Incorporated Society.; ~~and~~

~~viii. Tupuna Trust.~~

Commented [A2]: Tupuna Trust has been deleted as per POTL's commentary in its memorandum.

3.2 The purpose of the relationship agreements is to agree and record how the consent holder and other parties will establish a long term organisation-wide relationship with each other, including a forum to discuss matters which are outside the scope of or are not covered by this resource consent.

3.3 Within 13 months of the commencement of this resource consent, the consent holder shall either:

i. Provide copies of finalised relationship agreements to the consent authority (except to the extent that any agreements contain confidentiality provisions); and/or

ii. Provide details to the consent authority as to why relationship agreements have not been concluded (including, if relevant, details of the consent holder's endeavors to agree relationship agreements).

ADVISORY GROUPS

4. **Transitional Iwi Liaison Group ("ILG")**

4.1 Within two months of the commencement of these consents, the Consent Holder shall invite Tauranga Moana iwi (see Advice Note) and hapū with a relationship with Te Awanui to establish and maintain a transitional Iwi Liaison Group ("ILG"). The Consent Holder shall invite nominations for the following representatives to form the group:

i. Whareroa Marae may nominate two representatives, at least one of whom shall ahi kaa to the Whareroa Marae;

ii. Ngāi Te Rangi, who may nominate one representative;

iii. Ngāti Ranginui, who may nominate one representative; and

iv. Ngāti Pūkenga, who may nominate one representative.

4.2 If nominations for representatives are not received from iwi and hapū within five months of the commencement of the consent then the Consent Holder will invite the following to form the transitional ILG ~~will be formed by the Consent Holder and consist of either~~:

a) Those representatives that have been nominated; or

b) In the case that no nominations have been received, the Tauranga Moana Iwi Customary Fisheries Trust.

4.3 The purpose of the ILG is to provide a forum that the Consent Holder can undertake immediate engagement activities to effect the implementation of these consents. The ILG will also be responsible for determining the separate tikanga based process of establishing the ongoing Te Awanui Advisory Group. The functions of the transitional ILG are:

a) Determine the tikanga based process to be used to establish, and facilitate the establishment of, a Te Awanui Advisory Group (Condition 5) that comprises of iwi and hapu representatives that have a relationship with Te Awanui.

b) Finalise the name of the Te Awanui Advisory Group.

c) Provide a forum for liaison with the Consent Holder and iwi and hapū that have a relationship with Te Awanui in regards to the implementation of ~~this consent.~~these consents. This includes providing information back to iwi and hapū on progress on the implementation of the consents and providing feedback to the Consent Holder on any particular concerns arising from the implementation of the consents that iwi and hapū may raise with the ILG.

d) Be an immediate liaison point for the Consent Holder in the engagement over the Dredge Management Plan~~/s~~ under the consent (condition 10.1).

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies deemed appropriate by iwi and hapū who have a relationship with Te Awanui (condition 2.2).

~~f) Identifying a cultural monitor for capital dredging in accordance with condition 13.1.~~

Commented [A3]: Removed for consistency as this is done under existing consent 65806

~~g)~~f) Attend an annual strategic planning meeting with the Port of Tauranga CEO and Chair of Board of Directors (Condition 2.3).

4.4 The ILG will remain in place until such time as a Te Awanui Advisory Group is established (Condition 5).

4.5 The Consent Holder shall:

a) Facilitate the administration of each formal meeting of the ILG. The first ILG meeting shall be held as soon as practicable after the establishment of the ILG. The ILG shall ~~meet quarterly~~meet quarterly for the ~~first two years from~~ duration of the ~~commencement of consents and thereafter twice per year~~consent (unless a different frequency of meetings is agreed between the Consent Holder and the ILG) until such time as a Te Awanui Advisory Group is established (Condition 5~~).~~)..

b) Take minutes of the ILG meetings, which shall be forwarded to members within 10 days of each meeting being held for those members to confirm they are true and correct record.

c) Give members at least three weeks' advance notice of the date, time and location of ILG meetings.

d) With the agreement of ILG members make minutes available on the Ports website (condition 6.5).

4.6 The Consent Holder shall provide $25,000 per year for ~~up to five years following~~ the ~~commencement~~duration of this consent, or until the Te Awanui Advisory Group is established (condition 4.4), whichever is the soonest, so that the ILG can perform their functions under the consent.

4.7 Within 10 working days of the ILG being formed, or any changes being made to its membership, the Consent Holder shall provide details of its membership to the Regional Council.

5. **Te Awanui Advisory Group**

5.1 The Consent Holder will provide (in accordance with condition 5.1 h) for the ongoing involvement in these consents of a Te Awanui Advisory Group ("TAAG") (or alternative name as determined by the ILG) established by iwi and hapū in accordance with condition 4.3 (a). The Purpose of the TAAG is to provide an iwi and hapū-led forum that provides on-going advice to the Consent Holder in the implementation of these consents and is the main liaison point for the Consent Holder in regards to the requirements of this resource consent. In particular, the purpose of the TAAG is to:

a) Recognise the importance of Te Awanui as a taonga and to recognise and provide for the kaitiakitanga of iwi and hapū who have a relationship with Te Awanui;

b) Provide a means of liaison between iwi and hapū who have a kaitiaki relationship with Te Awanui and the Consent Holder through providing a forum for regular discussion about the implementation of this consent and consent [structures ref], including details of the ongoing staging plans of the development;

c) Facilitate the development of a Mātauranga Monitoring Plan in accordance with Condition ~~14~~13.1;

d) Evaluate the data obtained from any mātauranga monitoring undertaken in

accordance with condition ~~14~~13.~~3~~5 insofar as they relate to the cultural values and the effects of the works authorised by these consents on Te Awanui and advise the Consent Holder and Regional Council of any unforeseen effects arising. In the case of any unforeseen adverse changes to effects on cultural values being identified as a result of the implementation of these consents, to advise and make recommendations to the Consent Holder and the Regional Council on the nature of the review (in accordance with condition ~~22~~1921~~4~~.1) and appropriateness of any mitigation, response and/or contingency measures;

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies under condition 2.2;

~~f) Identify a cultural monitor for capital dredging in accordance with condition 13.1;~~

~~g)~~f) Be a liaison point for the Consent Holder in the engagement over the Dredge Management Plan~~s~~ under the consent (condition 10.1); and

~~h)~~g) Administer the funds provided by the Consent Holder under condition ~~17~~16.1 to be used for the functions of the TAAG under this consent and for restoration projects.

Commented [A4]: As per the above comment

6. **Notification**

6.1 The consent holder shall notify (in writing) the following parties of its intention to commence dredging no less than 20 working days prior to each dredging operation:

a) Ngāti Ranginui;

b) Ngāi Te Rangi;

c) Ngāti Pūkenga;

d) Ngāi Tamarāwaho;

e) Ngāi Tukairangi;

f) Ngāti Kahu;

g) Ngāti Kuku and Whareroa Marae;

h) Ngāti Tapu;

i) Waitaha Iwi;

j) Tauranga Moana Iwi Customary Fisheries Trust ("TMICFT");

k) Ngāti Ranginui Fisheries Trust;

l) Ngāti He;

m) Ngā Hapū o Ngā Moutere o Matakana me Rangiwaea; and

n) Bay of Plenty Regional Council.

6.2 In addition to the above named parties, the Consent Holder shall provide notice on their website (in accordance with condition 6.5) of their intention to commence dredging at least 10 days prior to any capital dredging authorised by this consent or consents 65806

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and 65807.

6.3 Notice under conditions 6.1 and 6.2 shall include as a minimum:

a) The area to be dredged;

b) The depths proposed to be achieved;

c) An assessment of dredging volumes and whether those volumes consist of capital or maintenance dredging;

d) An assessment of the material types expected to be dredged;

e) The expected duration of the dredging operation;

f) A plan for the disposal of dredged materials; and

g) The name and contact details of the person with responsibility for supervising the works.

6.4 At least 10 working days prior to the start of dredging the consent holder shall notify (in writing) the Coastguard, Tauranga Bridge Marina, Sulphur Point Marina and the Tauranga Harbourmaster and shall post notices in the Bay of Plenty Times and at the Whareroa Boat Ramp, Sulphur Point and Pilot Bay boat ramps advising the general public of the following:

a) The intention to start dredging;

b) The area to be dredged;

c) A contact number of the Consent Holder;

d) The period during which dredging is expected to occur; and

e) Any restrictions that will apply to navigation during the dredging operations.

6.5 The Consent Holder shall establish and maintain for the duration of ~~these consents~~this consent a dedicated page on its website for the purpose of ensuring all monitoring and reports required under these consent conditions is publicly available. The following documents or reports must be uploaded to the website as soon as practicable and no later than 20 working days after being received or prepared by the Consent Holder:

a) The final certified Dredge Management Plan~~/s~~, including any variations to ~~those Plans~~that Plan if amended in accordance with condition 10.7;

b) The results of all monitoring and sampling undertaken pursuant to the consent;

c) Minutes of the meetings of the ILG and TAAG agreed by members as appropriate for public dissemination;

~~d) A copy of the 'Port of Tauranga State of the Environment Plan' (condition 18.1);~~

~~e)~~d) Copies of reports required in condition ~~19~~178.1; and

~~f)~~e) Any other information reasonably related to the exercise of this consent.

WORKS

7. **Details of Works Authorised**

7.1 All excavation dredging works under this resource consent shall be undertaken in accordance with the resource consent application titled Stella Passage Development Resource Consent Application, Assessment of Environmental Effects and supporting materials dated May 2021 (except to the extent modified by these conditions), and in accordance with Stage 1 shown on the ~~updated~~ Port of Tauranga Plan titled 'Proposed Wharf / Reclamations / Dredging Resource Consent Drawings', Drawing No. 320-~~61~~67 as appended to this consent.

7.2 The dredging works may be completed in one continuous work programme or by way of a staged programme in which portions of the excavation are completed at a time.

8. **Restrictions/Standards**

8.1 Trailer Suction Hopper dredging shall be undertaken with no overflow on the flood tide and a maximum of 15 minutes with overflow per load on the ebbing tide.

~~8.2 No dredging shall occur adjacent to Butters Landing and in a direct line out to the point in the Stella Passage channel (on the Mount Maunganui side) as shown on the updated Port of Tauranga Plan, titled 'Channel Dredging Coordinates Resource Consent Drawings', Drawing No. 320-59-1 appended to this consent.~~

~~8.3~~8.2 Trailer Suction Hopper Dredges shall have a Green Valve, or similar technology, installed to limit suspension of particles in the discharge water.

~~8.4~~8.3 The consent holder shall ensure that no contaminants, including fuel oils but excluding bed material and sediments, are permitted to enter the harbour waters as a result of these works.

~~8.5~~8.4 Dredge equipment will be regularly maintained, including lubrication and repair of winches, generators, propulsion components and other potential noise sources to reduce underwater noise. Maintenance records shall be provided to the Bay of Plenty Regional Council upon request.

~~8.6~~8.5 The consent holder shall submit a plan to the Harbourmaster for approval of any proposed changes to the navigational aids as a consequence of the dredging prior toaltering the existing navigational aids.

9. **Disposal of Dredged Material**

9.1 All dredged material shall be disposed of in accordance with the reclamation authorised by this resource consent, or in accordance with consents 65806 and 65807(or any variation made to them) or any deposition consent which replaces consents 65806 or 65807 and is subject to the conditions of those consents.

10. **DREDGE MANAGEMENT PLAN**

10.1 The Consent Holder shall prepare a Dredge Management Plan prior to ~~any~~ dredging operations commencing. The Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to provide feedback on the draft DMP.

10.2 The purpose of the Dredge Management Plan is to provide details of the planned dredging activities, detail the measures that will be in place to reduce the potential effects of

dredging (particularly in relation to the risk of redistribution of invasive pest species that may be present and the effects of sediment plumes), outline the process for monitoring and the response framework. The Dredge Management Plan shall include as a minimum:

a) the area to be dredged ~~in that stage~~.

b) identification of any dredging to be undertaken under resource consent 65806 and 65807 and, if so, how compliance with relevant conditions of those consents will be achieved.

c) methodology for undertaking the dredging activity.

d) controls for minimising sediment discharges.

e) results of the most recent invasive species survey undertaken through regular biosecurity monitoring by the Bay of Plenty Regional Council and measures taken to prevent the spread of any invasive species that may have been identified from that survey within the area to be dredged.

f) contingency measures proposed to manage discharge activities and methods for the avoidance of ecological effects from turbidity.

g) The feedback on the Dredge Management Plan provided by the ILG or TAAG, including details on recommendations not incorporated in the Plan and the reasons why.

h) Details of Water Quality Monitoring to be undertaken as required by condition ~~15~~14.1.

i) In addition to Monitoring required by condition ~~15~~14.1, ongoing background measurements from fixed turbidity monitors and a response framework using turbidity triggers and environmental limits as outlined in the table below:

Port/location	Trigger 1 (NTU)	Trigger 2 (NTU)	Environmental limit (NTU)	Term/Notes
Pilot Bay	15	20	35	6 hr Moving Avg.
No. 10	12	17	25	2 Week Moving Avg.
Butters	12	17	25	2 Week Moving Avg.
Otumoetai	15	20	35	6 hr Moving Avg.
Response framework				
Trigger 1	Investigation into the elevated turbidity. Assess impact of on-going operational dredge.			
Trigger 2	Modification to methodology of operational dredging. Including, but not limited to; • relocation of dredge • changing dredging equipment • operate dredge during certain tides times • modify frequency of dredging operation • a combination of methods			
Environmental limit	Upon reaching the environmental limit dredge operation should cease.			

Port/location	Trigger 1 (NTU)	Trigger 2 (NTU)	Environmental limit (NTU)	Term/Notes
Pilot Bay	15	20	35	6 hr Moving Avg.
No. 10	12	17	25	2 Week Moving Avg.
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Otumoetai	15	20	35	6 hr Moving Avg.
Response framework				
Trigger 1	Investigation into the elevated turbidity. Assess impact of on-going operational dredge.			
Trigger 2	Modification to methodology of operational dredging. Including, but not limited to; • relocation of dredge • changing dredging equipment • operate dredge during certain tides times • modify frequency of dredging operation • a combination of methods			
Environmental limit	Upon reaching the environmental limit dredge operation should cease.			

Advice Note: The triggers in condition~~the~~ 10.2 (i) above relates to the fixed, continuous turbidity monitoring and is in addition to the triggers and response framework identified in conditions ~~15~~14.2 to ~~15~~14.4 of this consent.

10.3 The Consent Holder shall provide ~~30~~15 working days for the ILG or TAAG to provide feedback on the draft DMP (in accordance with condition 10.1) before submitting a final version to the Bay of Plenty Regional Council.

10.4 The Consent Holder shall provide the Dredge Management Plan to the Bay of Plenty Regional Council for certification at least ~~30~~15 working days prior to any dredging operations commencing. For the purposes of this condition, certification shall mean confirmation that the Dredge Management Plan has provided appropriate detail and methodology to address the above identified matters.

10.5 No works shall be undertaken until the Dredge Management Plan required by condition 10.1 has been certified by the Bay of Plenty Regional Council. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within ~~20~~10 working days of the date of submission under clause 10.3 (including a response that more time is needed for certification), the Dredge Management Plan will be deemed to be certified. If Bay of Plenty Regional Council's response is that it is unable to certify the management plan it must provide the Consent Holder with reasons and recommendations for changes needed to the Dredge Management Plan in writing. The Consent Holder must consider any reasons and recommendations of the Bay of Plenty Regional Council and submit an amended management plan for certification. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within ~~10~~5 working days of the date of resubmission (including a response that more time is needed for certification), the management plan will be deemed to be certified.

10.6 All works shall be undertaken in accordance with the certified Dredge Management Plan.

10.7 At any time during the consent, or on advice of the ILG or TAAG, the Consent Holder may submit a request to amend the Dredge Management Plan to the Bay of Plenty Regional Council for re-certification. Where the Consent Holder provides an amended Monitoring Plan to the Bay of Plenty Regional Council for re-certification, if no response is received from the Bay of Plenty Regional Council within 20 working days then certification shall be deemed to have been given (unless the Bay of Plenty Regional Council provides an alternative timeframe for certification to the Consent Holder).

MONITORING AND MONITORING PLANS

~~11. **Te Paritaha Scientific Baseline Monitoring**~~

~~11.1 At least 20 working days prior to the commencement of activities authorised under this consent, the Consent Holder shall undertake baseline scientific monitoring of Te Paritaha to determine the population and distribution of pipi. The monitoring is to include:~~

~~a) A survey of the presence of pipi, their size and abundance; and~~

~~b) The sediment characteristics of the sandbank~~

~~11.2 Within 1 month of completion of any final report the results are to be provided to the Bay of Plenty Regional Council and to either the ILG or the TAAG (whichever is established at the time).~~

~~12.~~11. **Te Paritaha Ongoing Monitoring**

~~12.1 Within 1 year of commencement of this resource consent the Consent Holder shall provide a Te Paritaha Monitoring Plan to the Bay of Plenty Regional Council for certification that it meets the requirements of condition 12.2. The purpose of the Te Paritaha Monitoring Plan (TPMP) is to provide scientific information on the abundance and diversity of pipi and changes to the sandbank over time.~~

~~12.2 The Te Paritaha Monitoring Plan shall include as a minimum:~~

~~a) The roles and responsibilities of parties who will conduct the monitoring.~~

~~b) The frequency and extent of monitoring.~~

~~c) Survey methods to assess the abundance and diversity of pipi and record changes over time.~~

~~d) Survey methods to record associated species that may adversely impact the pipi if present in large numbers (such as sand dollars/starfish).~~

~~e) Monitoring the stability and geomorphological changes of the sandbank through bathymetric surveys.~~

~~f) Monitoring of sediment characteristics of the sandbank over time.~~

~~g) A reporting mechanism for results of monitoring to be provided to the Bay of Plenty Regional Council and the ILG or TAAG.~~

~~12.3 If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 20 working days of the date of submission under clause 12.1, the TPMP will be deemed to be certified. If Bay of Plenty Regional Council's response is that it is unable to certify the TPMP within the timeframes or as a result of the content of the TPMP~~

~~it must provide the Consent Holder with an updated timeframe for certification or reasons and recommendations for changes needed to the TPMP in writing. The Consent Holder must consider any reasons and recommendations of the Bay of Plenty Regional Council and submit an amended monitoring plan for certification. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 10 working days of the date of resubmission (or an updated date certification can be provided by the Bay of Plenty Regional Council as notified by the Council), the monitoring plan will be deemed to be certified.~~

~~12.4 The Consent Holder may submit a request to the Bay of Plenty Regional Council to amend the TPMP at any time. The request for amendment will be accompanied with reasons for the requested change. Where the Consent Holder submits an amended Monitoring Plan to the Bay of Plenty Regional Council for certification, if no response is received from the Bay of Plenty Regional Council within 20 working days either with the results of the certification or providing a date by which certification can be provided, then certification of the amended TPMP shall be deemed to have been given.~~

11.1

The Consent Holder shall undertake annual monitoring of Te Paritaha in accordance with the Tauranga Harbour Marine Monitoring Methodologies Plan dated 27 September 2024 or any subsequent amended plan) for the duration of this consent.

Advice note: ~~the Consent Holder has offered conditions 12.1 to 12.5 and agrees to be bound by them pursuant to the Augier principle.~~The Kaimoana Restoration Programme required under resource consent 65806 requires specific monitoring of Te Paritaha on an annual basis and so this condition achieves consistency in approach across consents. ~~For the avoidance of doubt, the monitoring carried out pursuant to conditions 12.1 to 12.5~~condition 11.1 is of the physical characteristics of the site and is separate to any mātauranga monitoring that may be undertaken~~.~~ in accordance with condition 13 of this consent).

~~13.~~12. **Cultural Monitoring of Dredge Operations**

~~13.1~~12.1 Subject to condition ~~13~~12.4, the Consent Holder shall provide an opportunity for a Cultural Monitor ~~appointed by either the ILG or TAAG (whichever is established at the time)~~ to be present during capital dredging works under this consent, provided that the Cultural Monitor can comply with all health and safety requirements.

~~13.2~~12.2 The role of the cultural monitor includes:

a) Being present on the dredge (Trailer Suction Hopper Dredge or Back Hoe Dredge) to observe the dredge plume;

b) Observing that TSHD dredging is undertaken with no overflow on a flood tide (in accordance with condition 8.1);

c) Reporting back to the ILG and TAAG as may be required by those groups;

d) identification of any cultural artifacts that may be uncovered during dredging;

e) Checking that deposition of dredged material is occurring in the consented deposition site (in accordance with condition 9.1); and

f) Checking that any rubbish collected in the draghead is taken ashore and disposed

of appropriately.

~~13.3~~12.3 The Consent Holder shall pay the reasonable costs associated with the Cultural Monitoring carried out in accordance with clause ~~13~~12.1.

~~13.4~~12.4 ~~For the first four years from commencement of the consent, cultural~~Cultural monitoring shall be undertaken in accordance with consent 65806.

Advice Note: Consent 65806 has a requirement for cultural monitoring. Given that this consent is aligned with the duration of 65806 and the disposal of dredged material under this consent will be in accordance with consent 65806, this condition provides for monitoring to be integrated and occur under the framework of 65806 for the duration of ~~that consent~~both consents.

~~14.~~13. Mātauranga Monitoring Plan

~~14.1~~13.1 Within two months of the TAAG being established (Condition 5.1), the Consent Holder will invite TAAG to facilitate the preparation of a Mātauranga Monitoring Plan (MMP).

~~14.2~~13.2 The purpose of the MMP is to detail how the cultural health of Te Awanui, to the extent it overlaps with the Port Zone, is surveyed, monitored and reported upon to provide the state of the marine environment and kaimoana from a cultural perspective.

~~14.3~~13.3 The MMP shall include:

a) A plan and description of the area subject to the MMP;

b) The cultural indicators to be surveyed and monitored, including appropriate baseline measures to monitor change against;

c) Methodologies for the cultural indicators to be surveyed and monitored;

d) A description of how the cultural indicators monitored will be integrated with the scientific monitoring carried out under this consent pursuant to ~~(~~conditions ~~12~~11 and ~~15~~14~~)~~;

e) A description of how the monitoring obtained under the MMP will be integrated with any wider mātauranga monitoring undertaken for Te Awanui; and

f) Reporting requirements including the extent to which any information obtained is to be included on the consent holder's website in accordance with (condition 6.5).

~~14.4~~13.4 Upon being provided with the final MMP, the Consent Holder shall forward the MMP to the consent authority for its records. If the Consent Holder becomes aware of any changes to the MMP, the Consent Holder shall notify the Bay of Plenty Regional Council within 5 days of being made aware of the changes (including a copy of the updated MMP if the Consent Holder has been provided with a copy by the TAAG).

~~14.5~~13.5 The consent holder shall support the preparation and delivery of the MMP to the value of $25,000 per annum (jointly with consent [structures ref]) from the time the TAAG is established (condition 5) until the expiry of this resource consent. The annual amount payable shall be adjusted annually for inflation in accordance with the CPI index.

~~15.~~14. Water Quality Monitoring

~~15.1~~14.1 On every second day that excavations occur during dredging operations measurements

using a back-scatter or nephelometric shall be taken at the following sites:

(a) To determine the natural background turbidity levels:

- 500m up current (away from the direction of the sediment plume) from the actively dredged area.

(b) To determine the turbidity within the water column during dredging operations for a Trailing Suction Hopper Dredger:

- 200m down current from the actively dredged area and/or at Aerodrome Bridge if the plume is going under Aerodrome Bridge.

(c) To determine the turbidity within the water column during dredging operations for a Backhoe Dredger:

- 500m down current from the actively dredged area and/or at Aerodrome Bridge if the plume is going under Aerodrome Bridge.

Advice Note: For the purpose of this consent the 'actively dredged area' means the area identified in the Dredge Management Plan required by condition 10.1 that is to be dredged ~~in that particular stage~~.

~~15.2~~14.2 The results from the measurements taken in accordance with condition ~~15~~14.1 shall not be greater than 15 NTU above the natural background turbidity levels.

~~15.3~~14.3 If three consecutive measurements are taken and found to comply with condition ~~15~~14.2 monitoring may be suspended for 7 days.

~~15.4~~14.4 If three consecutive measurements are taken and found to exceed the limits specifiedin condition ~~15~~14.2 above, the Consent Holder shall:

(a) Cease the dredging operations that caused the exceedance.

(b) Notify the Bay of Plenty Regional Council and the ILG or TAAG (whichever is established at the time).

(c) Consult with the Chief Executive of the Bay of Plenty Regional Council or delegate and the ILG or TAAG (whichever is established at the time) over possible explanations for the exceedance and any proposed measures to rectify the non-compliance (including an amendment to the Dredge Management Plan, if required, under condition 10.7).

(d) Not recommence the dredging activities that caused the exceedance until any modification to the dredging operation receives the written certification of the Chief Executive of the Bay of Plenty Regional Council, or Delegate, that the amended methodology will ensure compliance with condition ~~15~~14.2. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 20 working days of the date of submission of the amended methodology the methodology will be deemed to be certified. If Bay of Plenty Regional Council's response is that it is unable to certify the methodology it must provide the Consent Holder with reasons and recommendations for changes needed to the methodology in writing. The Consent Holder must consider any reasons and recommendations of the Bay of Plenty Regional Council and submit an amended methodology for certification. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within five working days of the date of

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resubmission, the methodology will be deemed to be certified.

~~15.5~~14.5 The water sampling in Condition ~~15~~14.1 shall be carried out as follows:

(a) Turbidity measurements shall be undertaken from a depth of 1m below the surface. A series of at least two readings shall be taken at each location and averaged to provide the measurement for that site.

(b) At the time the samples are taken, the Consent Holder shall note:

(i) The time;

(ii) The stage of the tide;

(iii) The weather conditions;

(iv) The sea conditions, including prevailing wind direction, speed, wave or chop height.

~~16.~~15. **Bathymetric Survey**

~~16.1~~15.1 The Consent Holder shall carry out bathymetric surveys at ~~all~~the dredge ~~sites~~site both immediately prior to and immediately after the completion of the dredging works. The bathymetric survey should be sufficient to enable an assessment of the volume of material dredged. A copy of the results of the surveys shall be provided to the Bay of Plenty Regional Council within 10 working days of the Consent Holder receiving the completed post dredge survey reports.

RESTORATION AND MITIGATION

~~17.~~16. Restoration

~~17.1~~16.1 The Consent Holder shall provide a one off payment of $~~2~~1,000,000 (when combined with resource consent [structures ref]) for the TAAG to invest into projects of its choosing. The purpose of the fund is to provide support for administration of the TAAG and projects that:

(a) contribute to the restoration of the health of Te Awanui.

(b) abundance projects.

(c) projects that benefit iwi and hapu that have a relationship with Te Awanui.

~~17.2~~16.2 An annual payment of $25,000 (when combined with resource consent [structures ref]) to the Whareroa Marae Reservation Trust towards Whareroa Marae Infrastructure projects, adjusted annually for inflation in accordance with the CPI index, from the time works commence pursuant to this consent until the expiry of this consent.

Advice note: the Consent Holder currently contributes $50,000 per annum (CPI adjusted) to the Ngā Mātarae Charitable Trust under the conditions of resource consent 65806. For the avoidance of doubt, the contributions specified in conditions ~~17~~16.1 and ~~17~~16.2 of this consent are additional to the contribution specified in resource consent 65806.

16.3 ~~If the TAAG is not established within 5 years from the commencement of this resource consent then the payment of funds in condition 17.1 shall be held by the Consent Holder~~

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~~in an interest bearing Trust until such time as the TAAG is established.~~ Should a TAAG not be established by the time of ~~consent~~ expiry of this consent, the Consent Holder shall provide the funds ~~to the Bay of Plenty Regional Council~~required in condition 16.1 in accordance with consent [structures ref].

Advice Note: The Restoration and Mitigation offered in conditions 16.1 and 16.2 reflect an amount commensurate with Stage 1 of the wider development originally applied for ~~use towards Council led harbour~~. It is anticipated that further restoration ~~projects.~~and mitigation will form the conditions of any future consents associated with the wider development that may be authorised.

Scholarships

~~17.3~~16.4 The Consent Holder shall establish a fund of $250,000 to provide for research and education scholarships for iwi and hapū that have a relationship with Te Awanui for the duration of the consent. The fund is to be administered by the University of Waikato, and details of the scholarships awarded by the University of Waikato are to be made available by the Consent Holder on the project website (Condition 6.5).

~~17.4~~16.5 The purpose of the scholarships is to provide for education and/or research that promotes a better understanding of Te Awanui, improvements to the health of Te Awanui and capacity enhancement within iwi/hapū. Research funded by the scholarships may include (but is not limited to):

(a) Kaimoana species / restoration of kaimoana.

(b) Ecological corridors within Te Awanui and how they may be enhanced.

(c) Mātauranga māori.

(d) Cultural health indicators.

(e) Living seawalls/living structures.

(f) Coastal erosion management.

(g) Climate change (such as impacts or blue carbon initiatives).

~~17.5~~16.6 The Consent Holder shall arrange for the results of research funded under conditions ~~17~~16.4 and ~~17~~16.5 to be provided to the ILG or TAAG (whichever is established at the time) within 2 months of completion of the research.

RECORDING AND REPORTING

~~18. **Port 'State of the Environment' Report**~~

~~18.1 Within one year of the commencement of this consent, the Consent Holder shall prepare a 'Port of Tauranga State of the Environment' Report. The purpose of the report is to compile all of the existing information on the environment within the Port Zone (as defined by the Regional Coastal Environment Plan) held by the Consent Holder to form a comprehensive 'environmental snapshot'. This may be information collected as part of other resource consents, through past monitoring, commissioned studies or information provided to the Consent Holder by other parties. The report will collate available information on the following as it relates to the Port Zone (Regional Coastal Environment Plan):~~

Commented [A5]: Removed as this has been completed as per interim decision directions.

~~(a) Sediment characteristics.~~

~~(b) Sediment quality (e.g. presence of contaminants).~~

~~(c) Marine ecology.~~

~~(d) Harbour water quality.~~

~~(e) Stormwater quality.~~

~~(f) Air quality.~~

~~*Advice note: the Consent Holder has offered condition 18.1and agrees to be bound by it pursuant to the Augier principle.*~~

~~19.~~17. **Dredging Completion Report**

~~19.1~~17.1 The consent holder shall forward a report to the Bay of Plenty Regional Council within 30 working days of completion of ~~each~~ dredging ~~campaign~~under this consent describing:

a) The area excavated;

b) The quantity of sediment disposed and the areas to which the sediment has been disposed;

c) The quantity of sediment removed from the coastal marine area;

d) The results of the bathymetric survey taken over the dredged areas; and

e) An analysis of the results of the bathymetric surveys showing areas and extent of geomorphologic change.

~~20.~~18. **Sites of Archaeological, Historic or Cultural Significance**

~~20.1~~18.1 In the event of any archaeological site or koiwi being uncovered during the exercise of this consent, activities in the vicinity of the discovery shall cease. The consent holder shall contact the Bay of Plenty Regional Council to obtain details of the relevant iwi authority.The consent holder shall then consult with the relevant Iwi authority and Heritage New Zealand and shall not recommence works in the area of the discovery until the relevant Heritage New Zealand approvals or other approvals to damage, destroy or modify such sites have been obtained, where necessary. Advice Note: The Bay of Plenty RegionalCouncil is able to advise of contact details for the relevant iwi authority.

~~21. **Lapse of Consent**~~

~~21.1 Under section 125(1) of the Resource Management Act 1991, this consent will lapseon the tenth anniversary of the date of commencement, as defined by section 116 ofthe Resource Management Act 1991, unless it is given effect to prior to that date.~~

~~22.~~19. **Review**

~~22.1~~19.1 The Bay of Plenty Regional Council may serve notice on the permit holder under s128(1)(a)(iii), and/or s128(1)(b) and/or s128(1)(ba) of the Resource Management Act 1991 of its intention to review the conditions of this resource consent on 1 November of each year.

The purpose of such a review is to:

a) give effect to any Act of Parliament, Regulation, National Policy Statement, Regional Policy Statement or relevant Operative Regional Plan, which controls or restricts activities in the coastal marine area in locations where works are authorised by this consent; and/ or;

b) address any effects on cultural values that are identified by the ILG or TAAG or parties involved in cultural monitoring undertaken in accordance with condition 134.1 to 134.5 and that:

i. have not yet been identified; and

ii. Result from the implementation of this resource consent.

~~22.2~~19.2 The Bay of Plenty Regional Council may, within three months of the completion of any impact, environmental investigation or compliance report carried out by the Bay of Plenty Regional Council that shows there is an adverse effect on the environment as a result of any discharge or other activity, serve notice on the permit holder under s. 128(1)(a)(i) and/or (iii) of the Resource Management Act 1991 of its intention to review the conditions of this consent. The purpose of the review is to assess the need for monitoring or mitigation measures that may be necessary to address an effect that is appropriate to deal with at a later stage.

~~23.~~20. **Term of Consent**

~~23.1~~20.1 This consent shall expire on ~~31 March 2057 (35 years)~~.6 June 2027.

~~23.2~~20.2 The Coastal Consent hereby authorised is granted under the ResourceManagement Act 1991 and does not constitute an authority under any other Act, Regulation or Bylaw.

Advice Notes:

1 *This consent does not authorise the holder to modify or disturb any archaeological or historic sites within the area affected by this consent. Should any artefacts, bones orany other sites of archaeological or cultural significance be discovered within the areaaffected by this operation, written authorisation should be obtained from Heritage New Zealand before any damage, modification or destruction is undertaken.*

2 *The Bay of Plenty Regional Council is able to advise of contact details for the relevant iwi authority and hapu that has a recognised relationship with Te Awanui.*

3 *Reporting, notification and submission of plans required by conditions of this consentbe directed (in writing) to the Pollution Prevention Manager, Bay of Plenty Regional Council, PO Box 364, Whakatane or fax 0800 884 882 or email notify@boprc.govt.nz, this notification shall include the consent number RM21-0341.*

4 *The consent holder is responsible for ensuring that all contractors carrying out worksunder this consent are made aware of the relevant consent conditions, plans and associated documents.*

5 *The consent holder is advised that non-compliance with consent conditions may result in enforcement action against the consent holder and/or their contractors.*

6 *For the purposes of this consent Tauranga Moana Iwi means Ngāti Ranginui Iwi Society, Ngāi Te Rangi and Ngāti Pūkenga.*

7 *[Advice note to be added with iwi contact details for purposes of compliance with condition*

Commented [A6]: In accordance with Court Direction, this is date of expiry of 65806

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6].

8 *Disposal of material dredged under this consent is to occur under resource consent 65806. All conditions of that consent therefore apply to the disposal activity.*

Draft Conditions for Resource Consent No RM21-0341 - Dredging

Port of Tauranga Limited

A resource consent:

- Under section 12(1) of the RMA and Rule PZ10 of the Bay of Plenty Regional Coastal Environment Plan for the **discharge to and disturbance of the foreshore and seabed associated with dredging activities** for Stage 1 of the Sulphur Point Wharf Extension, south sitting basin and shipping channel;

- Under section 12(1) of the RMA and Rule PZ5 of the Bay of Plenty Regional Coastal Environment Plan to undertake a controlled activity for the **discharge to and disturbance of the foreshore and seabed associated with maintenance dredging activities** associated with Stage 1 of the Sulphur Point Wharf Extensions,south sitting basin and shipping channel.

subject to the following conditions:

PURPOSE, LOCATION, SCOPE

A. **Purpose of this Resource Consent**

A.1 Te Awanui is a taonga and is important to:

- the iwi/hapū that have a deep rooted and long standing connection to Te Awanui;
- the Port of Tauranga Limited who depends on Te Awanui for its operations; and
- the community who live, work and play in and around the harbour.

A.2 The purpose of this consent is to manage the effects associated with the excavation by capital dredging and ongoing maintenance dredging of material from the foreshore and seabed of Te Awanui.

A.3 The dredging is required to create the sitting basins and to extend the shipping channel to a depth of up to 16 metres below chart datum for the use of the Sulphur Point wharf extension.

Advice Note: The extension of Sulphur Point wharf is the first stage in the proposed extensions of both Sulphur Point and Mount Maunganui wharves and it is anticipated any future consents granted will be combined into a comprehensive consent for all works proposed.

B. **Location**

B.1 The area to be dredged is located in the Stella Passage of Tauranga Harbour as shown on the plans attached to this consent titled as follows:

- Proposed Wharf / Reclamations / Dredging Resource Consent Drawings, Drawing No. 320-64 Rev A;
- Channel Dredging Coordinates Resource Consent Drawing, Drawing No. 320-59-1 Rev B.

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C. **Map Reference**

C.1 At or about map reference NZTM 1880215.5E, 5826356.8N.

D. **Quantity**

D.1 The total volume of material excavated as capital dredging under this consent shall not exceed 850,000 cubic metres.

D.2 The total volume of material excavated as maintenance dredging under this consent and 65806 and 65807 (or any variation made to them) jointly shall not exceed 185,000 cubic meters per year averaged over a rolling five year period.

INTEGRATED MANAGEMENT

1.1 In recognition of the importance of Te Awanui and the need for integrated and holistic management to improve the health of Te Awanui over time, the Consent Holder shall invite iwi, hāpu and the Regional Council to participate in a series of at least four wānanga to facilitate the preparation of a Southern Te Awanui Harbour Health Plan.

Advice Note: The Tauranga Moana Advisory Group is an existing forum that acts under a partnership agreement, between iwi and local authorities. The stated purpose of the group is to continue building strong working relationships to support and enhance the health of the harbour and catchments.

1.2 The purpose of the Southern Te Awanui Harbour Health Plan is to foster a partnership approach between the Port of Tauranga Limited, councils and iwi in setting the direction for the management of Southern Te Awanui and associated catchments to achieve an overall improvement in the health of Te Awanui over time. The Plan will:

a) Identify a long term vision and key principles for improvement of the ecological and cultural health of Te Awanui.

b) Identify priority focus areas and describe the past state, current state and future desired state.

c) Recommend actions and roles/ responsibilities to achieve the future desired state.

1.3 The Consent Holder will complete the preparation of a draft Southern Te Awanui Harbour Health Plan within two years of the commencement of the consent in accordance with the scoping document. The draft Southern Te Awanui Harbour Health Plan will be presented by the Consent Holder to the Tauranga Moana Advisory Group for feedback.

1.4 If completion of the Southern Te Awanui Harbour Health Plan is not completed within two years of commencement of the consent as required by condition 1.3, the consent holder shall provide reasons in writing for the Regional Council and an estimated timeframe for completion.

1.5 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health Plan to the Tauranga Moana Advisory Group along with comments on any recommendations of changes not incorporated and the reasons why within 3 months of presenting the draft (in accordance with condition 1.3).

1.6 The Consent Holder will provide a copy of the final Southern Te Awanui Harbour Health

Plan on its website (Condition 6.5), including details of the progress towards achieving any actions of the Consent Holder identified in the Plan.

Advice Note: The Consent Holder has offered conditions 1.1 to 1.6 and agrees to be bound by them pursuant to the Augier principle. The Southern Te Awanui Harbour Health Plan will identify actions of a number of parties in order to achieve holistic and integrated management.

RELATIONSHIPS

2. **Relationship of Iwi and Hapū with Te Awanui**

2.1 The Relationship of iwi and hapū with Te Awanui is to be recognised and provided for by the Consent Holder through:

i. Funding the transitional Iwi Liaison Group ("ILG") (Condition 4) and an ongoing Te Awanui Advisory Group ("TAAG") (Condition 5) for involvement as required in this consent.

ii. Invitations to either the ILG or TAAG (whichever is established at the time) to engage as follows:

i. at least quarterly for the term of this consent. These meetings may occur concurrently with consent [structures ref.].

ii. Annual strategic planning with the Port of Tauranga CEO and Chair of the Board of Directors (Condition 2.3).

iii. Facilitating the preparation of an Integrated Southern Te Awanui Harbour Health Plan (Conditions 1.1 to 1.6).

iv. Provision for involvement of the ILG and TAAG under this consent in accordance with their defined role, in:

i. Preparation of a Mātauranga Monitoring Plan (Condition 13.1).

ii. Review of the Dredge Management Plan (Condition 10.1).

v. Providing an opportunity for iwi and hapū that have a relationship with Te Awanui to carry out ceremonies in accordance with condition 2.2.

vi. Inviting the preparation of a Mātauranga Monitoring Plan (Condition 13.1) and funding support towards the preparation and delivery of Mātauranga Monitoring (Condition 13.5).

vii. A contribution of funds to the TAAG to provide for ongoing projects that benefit the health of Te Awanui or that directly benefit iwi and hapū that have a relationship with Te Awanui (Condition 16.1).

viii. Funding towards education and research scholarships for iwi and hapū that have a relationship with Te Awanui (Condition 16.4).

2.2 At least 20 workings days prior to carrying out capital dredging under this consent, the Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to carry out a ceremony at the site of the proposed dredging. The Consent Holder shall

confirm by notice in writing to the Chief Executive of the Regional Council or delegate that the opportunity to carry out a ceremony has been given and that it has been carried out where deemed appropriate by the ILG or TAAG.

2.3 The Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to attend a hui annually with at least the Port of Tauranga Limited's Chief Executive Officer and Chair of the Board of Directors. The purpose of the annual hui is for the purpose of involving iwi and hapū that have a relationship with Te Awanui to be part of the strategic planning of the Port of Tauranga.

Advice note: the Consent Holder has offered condition 2.3 and agrees to be bound by it pursuant to the Augier principle.

3. **Relationship Agreements Port, Iwi, Hapū and entities**

3.1 The consent holder shall facilitate the preparation of relationship agreements with the following Iwi, hapū and/or entitles within 12 months of the commencement of this consent:

i. The Ngāti Ranginui Fisheries Trust;

ii. Te Rūnanga O Ngāi Te Rangi Iwi Trust and Ngāti Tapu;

iii. Ngāti Kuku And The Whareroa Marae Trust;

iv. Ngā Hapū O Ngā Moutere Trust;

v. Ngāti Kaahu A Tamapahore Trust and Ngāti He;

vi. Ngāti Pūkenga; and

vii. Ngāti Ranginui Incorporated Society.

3.2 The purpose of the relationship agreements is to agree and record how the consent holder and other parties will establish a long term organisation-wide relationship with each other, including a forum to discuss matters which are outside the scope of or are not covered by this resource consent.

3.3 Within 13 months of the commencement of this resource consent, the consent holder shall either:

i. Provide copies of finalised relationship agreements to the consent authority (except to the extent that any agreements contain confidentiality provisions); and/or

ii. Provide details to the consent authority as to why relationship agreements have not been concluded (including, if relevant, details of the consent holder's endeavors to agree relationship agreements).

ADVISORY GROUPS

4. **Transitional Iwi Liaison Group ("ILG")**

4.1 Within two months of the commencement of these consents, the Consent Holder shall invite Tauranga Moana iwi (see Advice Note) and hapū with a relationship with Te Awanui to establish and maintain a transitional Iwi Liaison Group ("ILG"). The Consent Holder shall invite nominations for the following representatives to form the group:

i. Whareroa Marae may nominate two representatives, at least one of whom shall ahi kaa to the Whareroa Marae;

ii. Ngāi Te Rangi, who may nominate one representative;

iii. Ngāti Ranginui, who may nominate one representative; and

iv. Ngāti Pūkenga, who may nominate one representative.

4.2 If nominations for representatives are not received from iwi and hapū within five months of the commencement of the consent then the Consent Holder will invite the following to form the transitional ILG:

a) Those representatives that have been nominated; or

b) In the case that no nominations have been received, the Tauranga Moana Iwi Customary Fisheries Trust.

4.3 The purpose of the ILG is to provide a forum that the Consent Holder can undertake immediate engagement activities to effect the implementation of these consents. The ILG will also be responsible for determining the separate tikanga based process of establishing the ongoing Te Awanui Advisory Group. The functions of the transitional ILG are:

a) Determine the tikanga based process to be used to establish, and facilitate the establishment of, a Te Awanui Advisory Group (Condition 5) that comprises of iwi and hapu representatives that have a relationship with Te Awanui.

b) Finalise the name of the Te Awanui Advisory Group.

c) Provide a forum for liaison with the Consent Holder and iwi and hapū that have a relationship with Te Awanui in regards to the implementation of these consents. This includes providing information back to iwi and hapū on progress on the implementation of the consents and providing feedback to the Consent Holder on any particular concerns arising from the implementation of the consents that iwi and hapū may raise with the ILG.

d) Be an immediate liaison point for the Consent Holder in the engagement over the Dredge Management Plan under the consent (condition 10.1).

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies deemed appropriate by iwi and hapū who have a relationship with Te Awanui (condition 2.2).

f) Attend an annual strategic planning meeting with the Port of Tauranga CEO and Chair of Board of Directors (Condition 2.3).

4.4 The ILG will remain in place until such time as a Te Awanui Advisory Group is established (Condition 5).

4.5 The Consent Holder shall:

a) Facilitate the administration of each formal meeting of the ILG. The first ILG meeting shall be held as soon as practicable after the establishment of the ILG. The ILG shall meet quarterly for the duration of the consent (unless a different frequency of meetings is agreed between the Consent Holder and the ILG) until

such time as a Te Awanui Advisory Group is established (Condition 5)..

b) Take minutes of the ILG meetings, which shall be forwarded to members within 10 days of each meeting being held for those members to confirm they are true and correct record.

c) Give members at least three weeks' advance notice of the date, time and location of ILG meetings.

d) With the agreement of ILG members make minutes available on the Ports website (condition 6.5).

4.6 The Consent Holder shall provide $25,000 per year for the duration of this consent, or until the Te Awanui Advisory Group is established (condition 4.4), whichever is the soonest, so that the ILG can perform their functions under the consent.

4.7 Within 10 working days of the ILG being formed, or any changes being made to its membership, the Consent Holder shall provide details of its membership to the Regional Council.

5. **Te Awanui Advisory Group**

5.1 The Consent Holder will provide (in accordance with condition 5.1 h) for the ongoing involvement in these consents of a Te Awanui Advisory Group ("TAAG") (or alternative name as determined by the ILG) established by iwi and hapū in accordance with condition 4.3 (a). The Purpose of the TAAG is to provide an iwi and hapū-led forum that provides on-going advice to the Consent Holder in the implementation of these consents and is the main liaison point for the Consent Holder in regards to the requirements of this resource consent. In particular, the purpose of the TAAG is to:

a) Recognise the importance of Te Awanui as a taonga and to recognise and provide for the kaitiakitanga of iwi and hapū who have a relationship with Te Awanui;

b) Provide a means of liaison between iwi and hapū who have a kaitiaki relationship with Te Awanui and the Consent Holder through providing a forum for regular discussion about the implementation of this consent and consent [structures ref.], including details of the ongoing staging plans of the development;

c) Facilitate the development of a Mātauranga Monitoring Plan in accordance with Condition 13.1;

d) Evaluate the data obtained from any mātauranga monitoring undertaken in accordance with condition 13.3 insofar as they relate to the cultural values and the effects of the works authorised by these consents on Te Awanui and advise the Consent Holder and Regional Council of any unforeseen effects arising. In the case of any unforeseen adverse changes to effects on cultural values being identified as a result of the implementation of these consents, to advise and make recommendations to the Consent Holder and the Regional Council on the nature of the review (in accordance with condition 19.1) and appropriateness of any mitigation, response and/or contingency measures;

e) Be responsible for receiving requests for, and facilitating the provision of, any cultural ceremonies under condition 2.2;

f) Be a liaison point for the Consent Holder in the engagement over the Dredge Management Plan under the consent (condition 10.1); and

g) Administer the funds provided by the Consent Holder under condition 16.1 to be used for the functions of the TAAG under this consent and for restoration projects.

6. **Notification**

6.1 The consent holder shall notify (in writing) the following parties of its intention to commence dredging no less than 20 working days prior to each dredging operation:

a) Ngāti Ranginui;

b) Ngāi Te Rangi;

c) Ngāti Pūkenga;

d) Ngāi Tamarāwaho;

e) Ngāi Tukairangi;

f) Ngāti Kahu;

g) Ngāti Kuku and Whareroa Marae;

h) Ngāti Tapu;

i) Waitaha Iwi;

j) Tauranga Moana Iwi Customary Fisheries Trust ("TMICFT");

k) Ngāti Ranginui Fisheries Trust;

l) Ngāti He;

m) Ngā Hapū o Ngā Moutere o Matakana me Rangiwaea; and

n) Bay of Plenty Regional Council.

6.2 In addition to the above named parties, the Consent Holder shall provide notice on their website (in accordance with condition 6.5) of their intention to commence dredging at least 10 days prior to any capital dredging authorised by this consent or consents 65806 and 65807.

6.3 Notice under conditions 6.1 and 6.2 shall include as a minimum:

a) The area to be dredged;

b) The depths proposed to be achieved;

c) An assessment of dredging volumes and whether those volumes consist of capital or maintenance dredging;

d) An assessment of the material types expected to be dredged;

e) The expected duration of the dredging operation;

f) A plan for the disposal of dredged materials; and

g) The name and contact details of the person with responsibility for supervising the

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works.

6.4 At least 10 working days prior to the start of dredging the consent holder shall notify (in writing) the Coastguard, Tauranga Bridge Marina, Sulphur Point Marina and the Tauranga Harbourmaster and shall post notices in the Bay of Plenty Times and at the Whareroa Boat Ramp, Sulphur Point and Pilot Bay boat ramps advising the general public of the following:

a) The intention to start dredging;

b) The area to be dredged;

c) A contact number of the Consent Holder;

d) The period during which dredging is expected to occur; and

e) Any restrictions that will apply to navigation during the dredging operations.

6.5 The Consent Holder shall establish and maintain for the duration of this consent a dedicated page on its website for the purpose of ensuring all monitoring and reports required under these consent conditions is publicly available. The following documents or reports must be uploaded to the website as soon as practicable and no later than 20 working days after being received or prepared by the Consent Holder:

a) The final certified Dredge Management Plan, including any variations to that Plan if amended in accordance with condition 10.7;

b) The results of all monitoring and sampling undertaken pursuant to the consent;

c) Minutes of the meetings of the ILG and TAAG agreed by members as appropriate for public dissemination;

d) Copies of reports required in condition 17.1; and

e) Any other information reasonably related to the exercise of this consent.

WORKS

7. **Details of Works Authorised**

7.1 All excavation dredging works under this resource consent shall be undertaken in accordance with the resource consent application titled Stella Passage Development Resource Consent Application, Assessment of Environmental Effects and supporting materials dated May 2021 (except to the extent modified by these conditions), and in accordance with Stage 1 shown on the Port of Tauranga Plan titled 'Proposed Wharf / Reclamations / Dredging Resource Consent Drawings', Drawing No. 320-67 as appended to this consent.

7.2 The dredging works may be completed in one continuous work programme or by way of a staged programme in which portions of the excavation are completed at a time.

8. **Restrictions/Standards**

8.1 Trailer Suction Hopper dredging shall be undertaken with no overflow on the flood tide and a maximum of 15 minutes with overflow per load on the ebbing tide.

8.2 Trailer Suction Hopper Dredges shall have a Green Valve, or similar technology, installed

to limit suspension of particles in the discharge water.

8.3 The consent holder shall ensure that no contaminants, including fuel oils but excluding bed material and sediments, are permitted to enter the harbour waters as a result of these works.

8.4 Dredge equipment will be regularly maintained, including lubrication and repair of winches, generators, propulsion components and other potential noise sources to reduce underwater noise. Maintenance records shall be provided to the Bay of Plenty Regional Council upon request.

8.5 The consent holder shall submit a plan to the Harbourmaster for approval of any proposed changes to the navigational aids as a consequence of the dredging prior toaltering the existing navigational aids.

9. **Disposal of Dredged Material**

9.1 All dredged material shall be disposed of in accordance with the reclamation authorised by this resource consent, or in accordance with consents 65806 and 65807(or any variation made to them) or any deposition consent which replaces consents 65806 or 65807 and is subject to the conditions of those consents.

10. **Dredge Management Plan**

10.1 The Consent Holder shall prepare a Dredge Management Plan prior to dredging operations commencing. The Consent Holder shall invite the ILG or TAAG (whichever is established at the time) to provide feedback on the draft DMP.

10.2 The purpose of the Dredge Management Plan is to provide details of the planned dredging activities, detail the measures that will be in place to reduce the potential effects of dredging (particularly in relation to the risk of redistribution of invasive pest species that may be present and the effects of sediment plumes), outline the process for monitoring and the response framework. The Dredge Management Plan shall include as a minimum:

a) the area to be dredged.

b) identification of any dredging to be undertaken under resource consent 65806 and 65807 and, if so, how compliance with relevant conditions of those consents will be achieved.

c) methodology for undertaking the dredging activity.

d) controls for minimising sediment discharges.

e) results of the most recent invasive species survey undertaken through regular biosecurity monitoring by the Bay of Plenty Regional Council and measures taken to prevent the spread of any invasive species that may have been identified from that survey within the area to be dredged.

f) contingency measures proposed to manage discharge activities and methods for the avoidance of ecological effects from turbidity.

g) The feedback on the Dredge Management Plan provided by the ILG or TAAG, including details on recommendations not incorporated in the Plan and the reasons why.

h) Details of Water Quality Monitoring to be undertaken as required by condition 14.1.

i) In addition to Monitoring required by condition 14.1, ongoing background measurements from fixed turbidity monitors and a response framework using turbidity triggers and environmental limits as outlined in the table below:

Port/location	Trigger 1 (NTU)	Trigger 2 (NTU)	Environmental limit (NTU)	Term/Notes
Pilot Bay	15	20	35	6 hr Moving Avg.
No. 10	12	17	25	2 Week Moving Avg.
Butters	12	17	25	2 Week Moving Avg.
Otumoetai	15	20	35	6 hr Moving Avg.
Response framework				
Trigger 1	Investigation into the elevated turbidity. Assess impact of on-going operational dredge.			
Trigger 2	Modification to methodology of operational dredging. Including, but not limited to; • relocation of dredge • changing dredging equipment • operate dredge during certain tides times • modify frequency of dredging operation • a combination of methods			
Environmental limit	Upon reaching the environmental limit dredge operation should cease.			

Advice Note: The triggers in condition 10.2 (i) above relates to the fixed, continuous turbidity monitoring and is in addition to the triggers and response framework identified in conditions 14.2 to 14.4 of this consent.

10.3 The Consent Holder shall provide 15 working days for the ILG or TAAG to provide feedback on the draft DMP (in accordance with condition 10.1) before submitting a final version to the Bay of Plenty Regional Council.

10.4 The Consent Holder shall provide the Dredge Management Plan to the Bay of Plenty Regional Council for certification at least 15 working days prior to any dredging operations commencing. For the purposes of this condition, certification shall mean confirmation that the Dredge Management Plan has provided appropriate detail and methodology to address the above identified matters.

10.5 No works shall be undertaken until the Dredge Management Plan required by condition 10.1 has been certified by the Bay of Plenty Regional Council. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 10 working days of the date of submission under clause 10.3 (including a response that more time is needed for certification), the Dredge Management Plan will be deemed to be certified. If Bay of Plenty Regional Council's response is that it is unable to certify the management plan it must provide the Consent Holder with reasons and recommendations for changes needed to the Dredge Management Plan in writing. The Consent Holder must consider any reasons and recommendations of the Bay of Plenty Regional Council and submit an amended management plan for certification. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 5 working days of the date of

resubmission (including a response that more time is needed for certification), the management plan will be deemed to be certified.

10.6 All works shall be undertaken in accordance with the certified Dredge Management Plan.

10.7 At any time during the consent, or on advice of the ILG or TAAG, the Consent Holder may submit a request to amend the Dredge Management Plan to the Bay of Plenty Regional Council for re-certification. Where the Consent Holder provides an amended Monitoring Plan to the Bay of Plenty Regional Council for re-certification, if no response is received from the Bay of Plenty Regional Council within 20 working days then certification shall be deemed to have been given (unless the Bay of Plenty Regional Council provides an alternative timeframe for certification to the Consent Holder).

MONITORING AND MONITORING PLANS

11. **Te Paritaha Ongoing Monitoring**

11.1

The Consent Holder shall undertake annual monitoring of Te Paritaha in accordance with the Tauranga Harbour Marine Monitoring Methodologies Plan dated 27 September 2024 or any subsequent amended plan) for the duration of this consent.

Advice note: For the avoidance of doubt, the monitoring carried out pursuant to condition 11.1 is of the physical characteristics of the site and is separate to any mātauranga monitoring that may be undertaken in accordance with condition 13 of this consent).

12. **Cultural Monitoring of Dredge Operations**

12.1 Subject to condition 12.4, the Consent Holder shall provide an opportunity for a Cultural Monitor to be present during capital dredging works under this consent, provided that the Cultural Monitor can comply with all health and safety requirements.

12.2 The role of the cultural monitor includes:

a) Being present on the dredge (Trailer Suction Hopper Dredge or Back Hoe Dredge) to observe the dredge plume;

b) Observing that TSHD dredging is undertaken with no overflow on a flood tide (in accordance with condition 8.1);

c) Reporting back to the ILG and TAAG as may be required by those groups;

d) identification of any cultural artifacts that may be uncovered during dredging;

e) Checking that deposition of dredged material is occurring in the consented deposition site (in accordance with condition 9.1); and

f) Checking that any rubbish collected in the draghead is taken ashore and disposed of appropriately.

12.3 The Consent Holder shall pay the reasonable costs associated with the Cultural Monitoring carried out in accordance with clause 12.1.

12.4 Cultural monitoring shall be undertaken in accordance with consent 65806.

Advice Note: Consent 65806 has a requirement for cultural monitoring. Given that this consent is aligned with the duration of 65806 and the disposal of dredged material under this consent will be in accordance with consent 65806, this condition provides for monitoring to be integrated and occur under the framework of 65806 for the duration of both consents.

13. **Mātauranga Monitoring Plan**

13.1 Within two months of the TAAG being established (Condition 5.1), the Consent Holder will invite TAAG to facilitate the preparation of a Mātauranga Monitoring Plan (MMP).

13.2 The purpose of the MMP is to detail how the cultural health of Te Awanui, to the extent it overlaps with the Port Zone, is surveyed, monitored and reported upon to provide the state of the marine environment and kaimoana from a cultural perspective.

13.3 The MMP shall include:

a) A plan and description of the area subject to the MMP;

b) The cultural indicators to be surveyed and monitored, including appropriate baseline measures to monitor change against;

c) Methodologies for the cultural indicators to be surveyed and monitored;

d) A description of how the cultural indicators monitored will be integrated with the scientific monitoring carried out under this consent pursuant to conditions 11 and 14;

e) A description of how the monitoring obtained under the MMP will be integrated with any wider mātauranga monitoring undertaken for Te Awanui; and

f) Reporting requirements including the extent to which any information obtained is to be included on the consent holder's website in accordance with (condition 6.5).

13.4 Upon being provided with the final MMP, the Consent Holder shall forward the MMP to the consent authority for its records. If the Consent Holder becomes aware of any changes to the MMP, the Consent Holder shall notify the Bay of Plenty Regional Council within 5 days of being made aware of the changes (including a copy of the updated MMP if the Consent Holder has been provided with a copy by the TAAG).

13.5 The consent holder shall support the preparation and delivery of the MMP to the value of $25,000 per annum (jointly with consent [structures ref.]) from the time the TAAG is established (condition 5) until the expiry of this resource consent. The annual amount payable shall be adjusted annually for inflation in accordance with the CPI index.

14. **Water Quality Monitoring**

14.1 On every second day that excavations occur during dredging operations measurements using a back-scatter or nephelometric shall be taken at the following sites:

(a) To determine the natural background turbidity levels:

- 500m up current (away from the direction of the sediment plume) from the actively dredged area.

(b) To determine the turbidity within the water column during dredging operations for a Trailing Suction Hopper Dredger:

- 200m down current from the actively dredged area and/or at Aerodrome Bridge if the plume is going under Aerodrome Bridge.

(c) To determine the turbidity within the water column during dredging operations for a Backhoe Dredger:

- 500m down current from the actively dredged area and/or at Aerodrome Bridge if the plume is going under Aerodrome Bridge.

Advice Note: For the purpose of this consent the 'actively dredged area' means the area identified in the Dredge Management Plan required by condition 10.1 that is to be dredged.

14.2 The results from the measurements taken in accordance with condition 14.1 shall not be greater than 15 NTU above the natural background turbidity levels.

14.3 If three consecutive measurements are taken and found to comply with condition 14.2 monitoring may be suspended for 7 days.

14.4 If three consecutive measurements are taken and found to exceed the limits specifiedin condition 14.2 above, the Consent Holder shall:

(a) Cease the dredging operations that caused the exceedance.

(b) Notify the Bay of Plenty Regional Council and the ILG or TAAG (whichever is established at the time).

(c) Consult with the Chief Executive of the Bay of Plenty Regional Council or delegate and the ILG or TAAG (whichever is established at the time) over possible explanations for the exceedance and any proposed measures to rectify the non-compliance (including an amendment to the Dredge Management Plan, if required, under condition 10.7).

(d) Not recommence the dredging activities that caused the exceedance until any modification to the dredging operation receives the written certification of the Chief Executive of the Bay of Plenty Regional Council, or Delegate, that the amended methodology will ensure compliance with condition 14.2. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within 20 working days of the date of submission of the amended methodology the methodology will be deemed to be certified. If Bay of Plenty Regional Council's response is that it is unable to certify the methodology it must provide the Consent Holder with reasons and recommendations for changes needed to the methodology in writing. The Consent Holder must consider any reasons and recommendations of the Bay of Plenty Regional Council and submit an amended methodology for certification. If the Consent Holder has not received a response from the Bay of Plenty Regional Council within five working days of the date of resubmission, the methodology will be deemed to be certified.

14.5 The water sampling in Condition 14.1 shall be carried out as follows:

(a) Turbidity measurements shall be undertaken from a depth of 1m below the surface. A series of at least two readings shall be taken at each location and averaged to provide the measurement for that site.

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(b) At the time the samples are taken, the Consent Holder shall note:

(i) The time;

(ii) The stage of the tide;

(iii) The weather conditions;

(iv) The sea conditions, including prevailing wind direction, speed, wave or chop height.

15. **Bathymetric Survey**

15.1 The Consent Holder shall carry out bathymetric surveys at the dredge site both immediately prior to and immediately after the completion of the dredging works. The bathymetric survey should be sufficient to enable an assessment of the volume of material dredged. A copy of the results of the surveys shall be provided to the Bay ofPlenty Regional Council within 10 working days of the Consent Holder receiving the completed post dredge survey reports.

RESTORATION AND MITIGATION

16. Restoration

16.1 The Consent Holder shall provide a one off payment of $1,000,000 (when combined with resource consent [structures ref.]) for the TAAG to invest into projects of its choosing. The purpose of the fund is to provide support for administration of the TAAG and projects that:

(a) contribute to the restoration of the health of Te Awanui.

(b) abundance projects.

(c) projects that benefit iwi and hapu that have a relationship with Te Awanui.

16.2 An annual payment of $25,000 (when combined with resource consent [structures ref.] to the Whareroa Marae Reservation Trust towards Whareroa Marae Infrastructure projects, adjusted annually for inflation in accordance with the CPI index, from the time works commence pursuant to this consent until the expiry of this consent.

Advice note: the Consent Holder currently contributes $50,000 per annum (CPI adjusted) to the Ngā Mātarae Charitable Trust under the conditions of resource consent 65806. For the avoidance of doubt, the contributions specified in conditions 16.1 and 16.2 of this consent are additional to the contribution specified in resource consent 65806.

16.3 Should a TAAG not be established by the time of expiry of this consent, the Consent Holder shall provide the funds required in condition 16.1 in accordance with consent [structures ref.].

Advice Note: The Restoration and Mitigation offered in conditions 16.1 and 16.2 reflect an amount commensurate with Stage 1 of the wider development originally applied for. It is anticipated that further restoration and mitigation will form the conditions of any future consents associated with the wider development that may be authorised.

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Scholarships

16.4 The Consent Holder shall establish a fund of $250,000 to provide for research and education scholarships for iwi and hapū that have a relationship with Te Awanui for the duration of the consent. The fund is to be administered by the University of Waikato, and details of the scholarships awarded by the University of Waikato are to be made available by the Consent Holder on the project website (Condition 6.5).

16.5 The purpose of the scholarships is to provide for education and/or research that promotes a better understanding of Te Awanui, improvements to the health of Te Awanui and capacity enhancement within iwi/hapū. Research funded by the scholarships may include (but is not limited to):

(a) Kaimoana species / restoration of kaimoana.

(b) Ecological corridors within Te Awanui and how they may be enhanced.

(c) Mātauranga māori.

(d) Cultural health indicators.

(e) Living seawalls/living structures.

(f) Coastal erosion management.

(g) Climate change (such as impacts or blue carbon initiatives).

16.6 The Consent Holder shall arrange for the results of research funded under conditions 16.4 and 16.5 to be provided to the ILG or TAAG (whichever is established at the time) within 2 months of completion of the research.

RECORDING AND REPORTING

17. **Dredging Completion Report**

17.1 The consent holder shall forward a report to the Bay of Plenty Regional Council within 30 working days of completion of dredging under this consent describing:

a) The area excavated;

b) The quantity of sediment disposed and the areas to which the sediment has been disposed;

c) The quantity of sediment removed from the coastal marine area;

d) The results of the bathymetric survey taken over the dredged areas; and

e) An analysis of the results of the bathymetric surveys showing areas and extent of geomorphologic change.

18. **Sites of Archaeological, Historic or Cultural Significance**

18.1 In the event of any archaeological site or koiwi being uncovered during the exercise of this consent, activities in the vicinity of the discovery shall cease. The consent holder shall contact the Bay of Plenty Regional Council to obtain details of the relevant iwi authority.The consent holder shall then consult with the relevant Iwi authority and Heritage New Zealand and shall not recommence works in the area of the discovery until the relevant Heritage

New Zealand approvals or other approvals to damage, destroy or modify such sites have been obtained, where necessary. Advice Note: The Bay of Plenty RegionalCouncil is able to advise of contact details for the relevant iwi authority.

19. **Review**

19.1 The Bay of Plenty Regional Council may serve notice on the permit holder under s128(1)(a)(iii), and/or s128(1)(b) and/or s128(1)(ba) of the Resource Management Act 1991 of its intention to review the conditions of this resource consent on 1 November of each year.

The purpose of such a review is to:

a) give effect to any Act of Parliament, Regulation, National Policy Statement, Regional Policy Statement or relevant Operative Regional Plan, which controls or restricts activities in the coastal marine area in locations where works are authorised by this consent; and/ or;

b) address any effects on cultural values that are identified by the ILG or TAAG or parties involved in cultural monitoring undertaken in accordance with condition 13.1 to 13.5 and that:

i. have not yet been identified; and

ii. Result from the implementation of this resource consent.

19.2 The Bay of Plenty Regional Council may, within three months of the completion of any impact, environmental investigation or compliance report carried out by the Bay of Plenty Regional Council that shows there is an adverse effect on the environment as a result of any discharge or other activity, serve notice on the permit holder under s. 128(1)(a)(i) and/or (iii) of the Resource Management Act 1991 of its intention to review the conditions of this consent. The purpose of the review is to assess the need for monitoring or mitigation measures that may be necessary to address an effect that is appropriate to deal with at a later stage.

20. **Term of Consent**

20.1 This consent shall expire on 6 June 2027.

20.2 The Coastal Consent hereby authorised is granted under the Resource Management Act 1991 and does not constitute an authority under any other Act, Regulation or Bylaw.

Advice Notes:

1 This consent does not authorise the holder to modify or disturb any archaeological or historic sites within the area affected by this consent. Should any artefacts, bones orany other sites of archaeological or cultural significance be discovered within the areaaffected by this operation, written authorisation should be obtained from Heritage New Zealand before any damage, modification or destruction is undertaken.

2 The Bay of Plenty Regional Council is able to advise of contact details for the relevant iwi authority and hapu that has a recognised relationship with Te Awanui.

3 Reporting, notification and submission of plans required by conditions of this consentbe directed (in writing) to the Pollution Prevention Manager, Bay of Plenty Regional Council, PO Box 364, Whakatane or fax 0800 884 882 or email notify@boprc.govt.nz, this

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notification shall include the consent number RM21-0341.

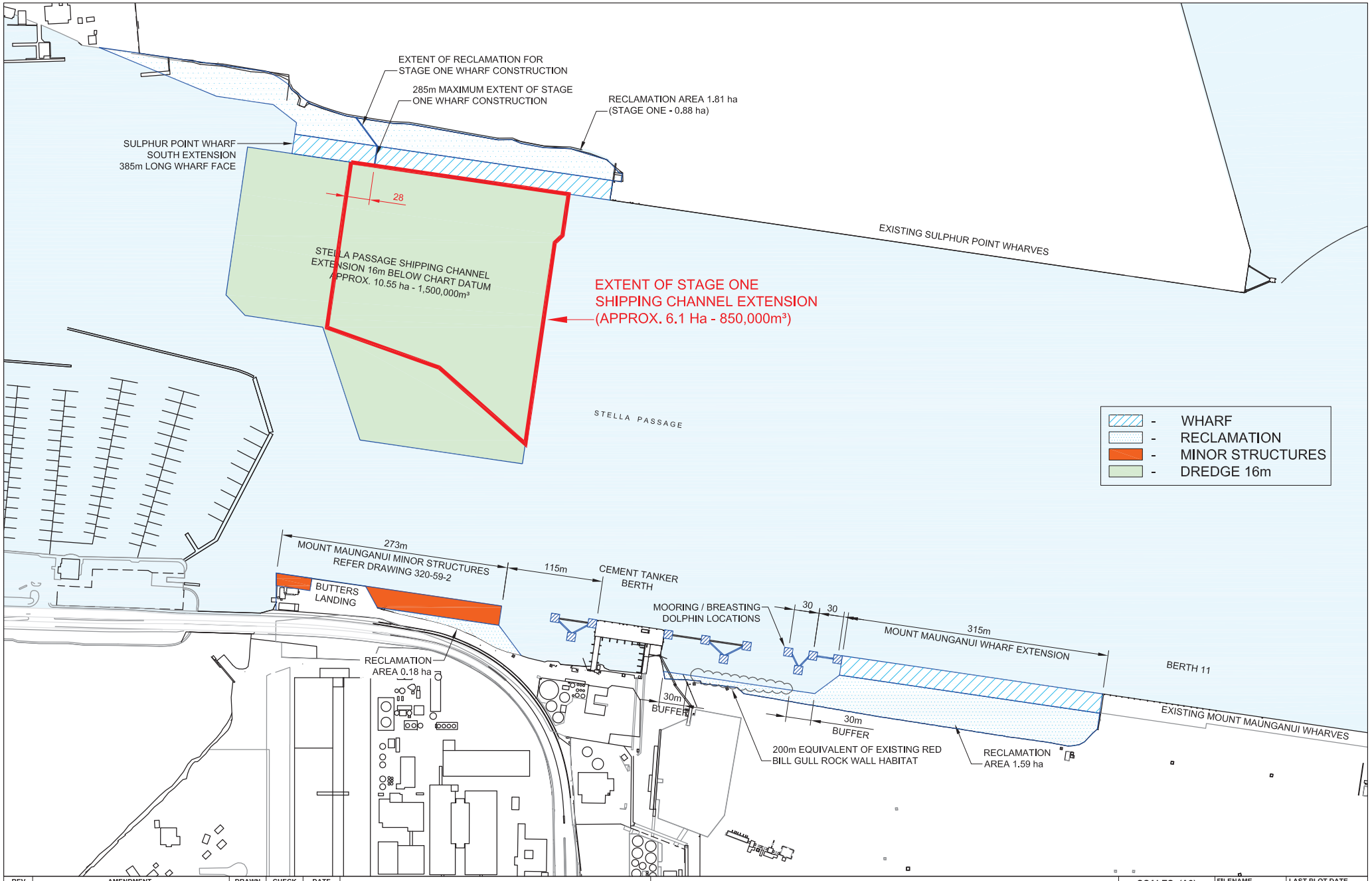
4 *The consent holder is responsible for ensuring that all contractors carrying out worksunder this consent are made aware of the relevant consent conditions, plans and associated documents.*

5 *The consent holder is advised that non-compliance with consent conditions may result in enforcement action against the consent holder and/or their contractors.*

6 *For the purposes of this consent Tauranga Moana Iwi means Ngāti Ranginui Iwi Society, Ngāi Te Rangi and Ngāti Pūkenga.*

7 *[Advice note to be added with iwi contact details for purposes of compliance with condition 6].*

8 *Disposal of material dredged under this consent is to occur under resource consent 65806. All conditions of that consent therefore apply to the disposal activity.*



REV.	AMENDMENT	DRAWN	CHECK	DATE
A	NOTES REVISED	D.B		22.05.24
0	FOR INFORMATION	D.B	-	13.12.23

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TELEPHONE 07 572 8899

PROPOSED WHARF / RECLAMATIONS / DREDGING RESOURCE CONSENT DRAWINGS

-

SCALES: (A3) 1:4000	
DESIGNED	-
DATE	-
DRAWN	D.B
DATE	13.12.23
CHECKED	-
DATE	-

FILENAME	LAST PLOT DATE
320-64.dwg	22.05.24
DRAWING No.	REV.
320-64	A

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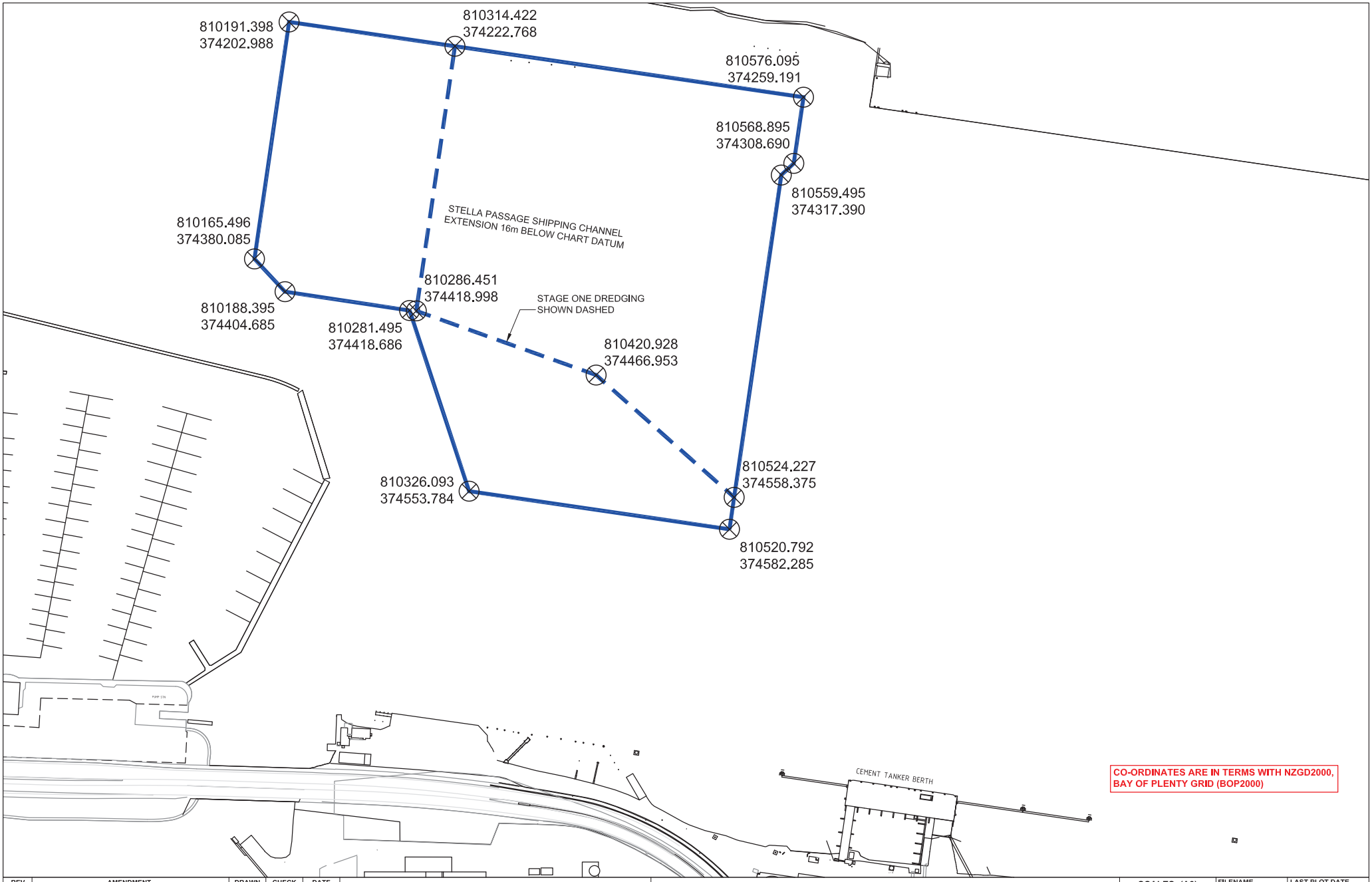

CO-ORDINATES ARE IN TERMS WITH NZGD2000, BAY OF PLENTY GRID (BOP2000)

REV.	AMENDMENT	DRAWN	CHECK	DATE
B	NOTES UPDATED	D.B		05.02.24
A	STAGE ONE DREDGING AREA ADDED	D.B		12.01.24
0	FOR INFORMATION	D.B	-	06.03.23

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CHANNEL DREDGING CO-ORDINATES
RESOURCE CONSENT DRAWINGS

SCALES: (A3)	1:2500
DESIGNED	-
DATE	-
DRAWN	D.B
DATE	06.03.23
CHECKED	-
DATE	-

FILENAME	LAST PLOT DATE
320-59.dwg	05.02.24
DRAWING No.	REV.
320-59-1	B

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