BEFORE THE GREATER WELLINGTON REGIONAL COUNCIL AND HUTT CITY COUNCIL

EASTERN BAYS SHARED PATH PROJECT

Under	the Resource Management Act 1991
In the matter	of applications for resource consents by Hutt City Council under section 88 of the Act, to carry out the Eastern Bays Shared Path Project

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STATEMENT OF EVIDENCE OF RICHARD ANTHONY REINEN-HAMILL (BEACH NOURISHMENT) ON BEHALF OF THE APPLICANT

30 November 2020

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TABLE OF CONTENTS

QUALIFICATIONS AND EXPERIENCE

1. My full name is **Richard Anthony Reinen-Hamill**. I am a Technical Director – Coastal Engineering at Tonkin + Taylor.

2. My evidence is given on behalf of Hutt City Council ("**HCC**") in relation to its applications under section 88 of the Resource Management Act 1991 ("**RMA**") for resource consents for the Eastern Bays Shared Path Project (the "**Project**").

3. I have the following qualifications and experience relevant to the evidence I shall give:

    (a) I have a BE (Hons) and a ME from the University of Auckland, which included a thesis studying the coastal processes of Mission Bay, Auckland particularly on transport of sediments under tide and wave conditions and options to manage erosion including beach nourishment. I also have a certificate of competency in multi-hazard risk assessment from the University of Twente.

    (b) I have more than 30 years' experience as a coastal engineer. In my role as a consulting engineer, I have authored more than 800 coastal hazard assessments, design and review reports and I have 15 published papers.

    (c) From 1990 to 1993 I was a research and project engineer with the Specialist Coastal and Hydraulic Consultants, Delft Hydraulics Centre (now named Deltares) in the Netherlands. In this role I developed particular skills in evaluating sediment transport and coastal processes, including the use of physical and numerical models where appropriate. I also carried out the design and physical testing of coastal protection structures such as groynes, breakwaters and seawalls.

    (d) Since joining Tonkin + Taylor in 1994 I have been responsible for technical and management studies of coastal hazard identification and management, including erosion of soft (beach) and cliff shores, storm surge and tsunami processes for many of New Zealand's coastal developers, territorial authorities and regional councils.

    (e) I have carried out many designs for erosion protection works that have included beach nourishment, rock armour revetments, grouted rock seawall//s, stormwater outlet management, groynes, dune planting and protected planting. Award-winning projects I was involved in, in this area, include:

        A. Oriental Bay Beach enhancement (beach nourishment, offshore rock control structures, headland controls, ramps and accessways, stormwater diversion);

B. Torpedo Beach (beach nourishment, grouted rock seawalls and stair access, stormwater management and groynes);

C. Onehunga Foreshore Restoration Project (Taumanu Reserve). This included gravel and sand beach formation, naturalistic headlands and groynes, stormwater management, walkways and cycleways.

4. I have been involved in a significant number of other beach nourishment and coastal edge restoration projects, including Mission Bay, Kohimarama, St Heliers, Point Chevalier, Eastern Beach, Taylors Bay, Herne Bay, Sentinel Bay and Home Bay (all in Auckland). I also was the lead design engineer for the North Canterbury Transport Infrastructure Recovery Alliance and used gravel beach nourishment as part of the design solution to protect along parts of the SH1 corridor.

5. I am a member of a number of relevant associations including:

   (a) Engineering New Zealand (Fellow); and

   (b) New Zealand Coastal Society.

6. I confirm that I have read the 'Code of Conduct' for expert witnesses contained in the Environment Court Practice Note 2014. My evidence has been prepared in compliance with that Code. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

BACKGROUND AND ROLE

7. In preparing my evidence I have undertaken several site visits to inspect the shoreline during the design development both to familiarise myself with the setting and coastal drivers and to gain a deeper appreciation of the Project extent.

8. I prepared the technical report *Consent Level Beach Nourishment Design and Effects Assessment* (**"Beach Nourishment Assessment"**) for HCC dated March 2019 and included in Appendix F of the Assessment of Environmental Effects Report ("**AEE**").

9. I was initially involved in the review of the coastal process report and the preliminary beach nourishment designs prepared by **Dr Michael Allis** and then was engaged to prepare the consent level design for the beach nourishment and carried out the effect's assessment study relied on in the Beach Nourishment Assessment.

10. I have relied on the coastal physical process assessment prepared by **Dr Allis** (Appendix E of the AEE) to provide me with information on the existing

coastal environment and drivers of coastal change. I also reviewed reports prepared for earlier assessments for this Project.

SCOPE OF EVIDENCE

11. The purpose of my evidence is to outline the beach nourishment design which is proposed as mitigation for the recreation and associated amenity effects of the Project.

12. My evidence addresses:

    (a) an overview of the existing high tide beaches that will be affected by the Project;

    (b) the methodology used to develop the proposed beach nourishment design;

    (c) the beach nourishment construction process;

    (d) the potential effects of beach nourishment on the existing beaches and proposed monitoring included in the conditions; and

    (e) responses to submissions and the section 42A report.

EXECUTIVE SUMMARY

13. The beaches in the Project area are small pocket beaches confined within rocky headlands along this undulating coastline. The beaches comprise a combination of both sands and gravels, with the proportion of sand increasing from York Bay to Point Howard Beach. Waves are typically wind generated and, due to the generally windy climate within Wellington Harbour, there are frequent small wind generated waves acting on the beaches.

14. The main purposes of the beach nourishment is to mitigate the loss of beach area available for beach amenity, offsetting of beach loss due to the occupation of the shared path and restoration of ecosystems. Coastal protection benefits are a secondary consideration. The two key objectives that informed the beach nourishment design were:

    (a) to replace only the beach area that was expected to be occupied by the Shared Path; and,

    (b) to keep the nourishment within the existing beach areas to protect the sensitive ecological areas that were present seaward of the beach areas.

15. Retaining the existing beach material/sediment optimises the use of the existing material and reduces the quantity of sediment that needs to be imported. The process involves moving the existing sediment from the path footprint seaward and distributing down the beach face. Retaining the existing beach sediment will enable the Shared Path wall foundations to be

formed and to retain the material on the foreshore to provide a buffer against coastal processes during construction of the walls.

16. This process is likely to be done by a hydraulic excavator operating along the crest of the existing wall, although once the bench is formed, it could be carried out with machinery working along the upper part of the beach adjacent to the existing seawall during the low part of the tide cycle. The existing sediment will be pushed immediately seaward of the proposed wall, but will be within the existing beach footprint, creating a slightly over-steepened upper intertidal beach face within the existing footprint of the beach.

17. The Beach Nourishment Plan (**"BNP**") provided under conditions **EM.13** to **EM.14** of the proposed conditions will address these matters, together with conditions **EM.15** to **EM.18** which deal with beach monitoring, management and nourishment.

18. After the walls have been constructed within each particular bay, imported beach sediment would be placed along a central area of each beach to be distributed by natural wave and tide actions both down the beach face and along the shoreline.

19. The nourishment material would be placed on the foreshore on the formed high tide bench along the entire designated placement area. The sediment would then be transferred down the beach during low tides to form a beach berm, or crest, around 0.6 metres above the mean high water spring level ("**MHWS**") and a seaward slope of around 1 metre in the vertical direction and 4 metres horizontal.

20. Due to the shape of the bays it is not anticipated that there will be any alongshore loss from the bay where the sediment is placed and there is no need for additional control structures, such as groynes or offshore reefs to confine the placed sediment.

EXISTING HIGH TIDE BEACHES

General definitions

21. Beaches are made from alluvial sediments and shells. They have a backshore and swash area that stays dry except during extreme high tides and storms and a sloping beach face. The beach face extends from the beach crest to a point below low tide where wave induced sediment motion reduces. The foreshore slope between the high and low tide combines with the swash and backshore to provide areas of dry beach during lower tide levels. The beach face slope is a function of the wave climate, the size of the sediment on the beach and the tide range. The slopes can often vary between the swash zone, the foreshore and the subtidal beach slope. A

sketch of a typical beach profile with common terms to describe each part of the beach is included (see **Figure 1)**.

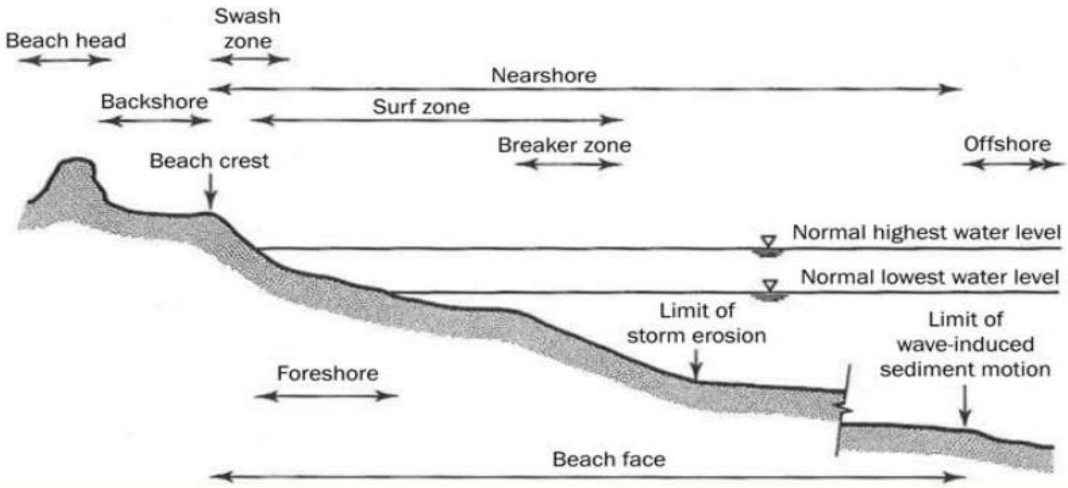

Figure 1 General beach profile (Source: CIRIA (2010) Beach nourishment management manual

22. The beaches in the Project area are small pocket beaches confined within rocky headlands along this undulating coastline. The beaches comprise a combination of both sands and gravels, with the proportion of sand increasing from York Bay to Point Howard Beach. Waves are typically wind generated and, due to the generally windy climate within Wellington Harbour, there are frequent small wind generated waves acting on the beaches. The nearshore wave breaking process keeps the finer sediment in suspension, to be transported to deeper water offshore and is why the beaches have low proportions of fine sediments. The sand and gravels tend to be a light colour, but browner than the darker grey sand and gravels that are migrating along the foreshore from entrance to Te Whanganui a Tara / Wellington Harbour along to Days Bay. This suggests that the gravels and sand are likely to originate largely from the local catchments within each embayment.

23. There are three beach areas where the proposed widening of the Shared Path will occupy an existing beach and where beach nourishment has been proposed to maintain the beach area; these are briefly described below. I note that more detailed descriptions are included in Section 3 of the Beach Nourishment Assessment.

Point Howard Beach

24. Point Howard Beach (see **Figure 2**) is a small narrow beach that extends along some 120 m of the shoreline and is a predominantly brown gravelly sand beach with traces of shell. The existing seawall intersects with the beach along the swash zone and there is no backshore area. Gravels are typically located along the relatively steep swash zone with finer sediments or mixed sediment gradings along the flatter intertidal beach area and finer sands on the sub-tidal area.

Figure 2 Point Howard Beach

Lowry Bay

25. Lowry Bay beach extends along some 450 m of Lowry Bay and comprises sandy fine to coarse gravel with minor broken shell (see **Figure 3**) with a more clearly defined beach crest and backshore area. There are fine gravels on the steeper swash and backshore with finer sediments or mixed sediment gradings along the intertidal beach area and finer sands on the sub-tidal area.

Figure 3 Lowry Beach upper beach area

York Bay

26. York Bay beach extends along some 150 m of York Bay and comprises steep sloping predominantly coarse gravel beach with minor broken shell on the swash zone and medium sands on the intertidal portion. The existing seawall interfaces with the swash zone and there is no significant dry beach area.

Figure 4 York Bay beach

METHODOLOGY

27. The main purpose of the beach nourishment is to mitigate the loss of beach area available for beach amenity, with coastal protection benefits only a

secondary consideration. The two key objectives that informed the beach nourishment design were:

(a) to replace only the beach area that was expected to be occupied by the Shared Path; and

(b) to keep the nourishment within the existing beach areas to protect the sensitive ecological areas that were present seaward of the beach areas.

28. No ongoing re-nourishment is proposed as part of this Project and there is no provision for the ongoing effect of sea level rise. However, there is provision, depending on monitoring, for a one off 'top up' and/or undertaking beach maintenance (condition EM 17). This approach provides a balance between mitigating the loss of beach area available for beach amenity on the one hand, and other values and concerns (such as potential risk to seagrass adjacent to the beach at Lowry Bay[1] and risk of blockages at the various outlets that discharge through the beach) on the other hand.[2] It also reflects the longer term loss of beach areas due to sea level rise as addressed in **Dr Allis'** evidence.

Beach area and volume

29. The area of occupation within the three existing high tide beaches was calculated to be around 1000 square metres along some 720 metres of coastline, meaning an average loss of beach width of around 1.4 metres. I note that this is not the total area of occupation of the coastal marine area ("**CMA**"), but the area within the three beaches that the Shared Path will occupy. The remaining areas of occupation are intertidal seabed and rock reef areas.

30. The area of occupation was then converted to a nourishment volume by taking the area of the foreshore occupied by the Shared Path over the effective length of the beach and the depth of the beach system assuming the proposed beach would have a similar slope to the in-situ beach. The proposed volume was then reduced by taking into account the retention of existing beach sediment from the footprint of the Shared Path on the beach seaward of the proposed shared path.

31. Finally the imported volume was determined by applying a bulking factor of 1.3, or an additional 30%, recognising that imported loose sediment will naturally consolidate and reduce in volume once placed on the foreshore through the process of rising and falling tides.

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[1] As discussed in the evidence of **Dr Fleur Matheson.**
[2] As discussed in the evidence of **Dr Alex James.**

Sediment properties

32. To comply with the second objective the imported beach nourishment sediment is required to be slightly coarser than the native sediment. This is to enable a slope steeper than the in-situ beach face to form. This slightly steeper beach face slope enables the nourished beach to better fit within the existing beach area and to avoid the placed material from extending seaward into ecologically sensitive areas. The imported sediment colour and the need to have a low proportion of fine sediment are also important. This is so that the imported sediment matches the existing sediment as well as to reduce risks of increased turbidity with fines washing out into the CMA. I note that these requirements are met with the samples obtained from the Hutt River and southern beach sources and were also met by the processed sand from Otago quarries, so there are a number of possible sources for the beach nourishment sediment.

BEACH NOURISHMENT CONSTRUCTION PROCESS

33. The beach nourishment construction process involves two key activities. The first is the retention of existing beach material seaward of the constructed walls and the second is the importing of beach sediment.

Retention of existing beach material

34. Retaining the existing beach material/sediment optimises the use of the existing material and reduces the quantity of sediment that needs to be imported. The process involves moving the existing sediment from the path footprint seaward and distributing down the beach face (see **Figure 5**). Retaining the existing beach sediment will enable the Shared Path wall foundations to be formed and to retain the material on the foreshore to provide a buffer against coastal processes during construction of the walls.

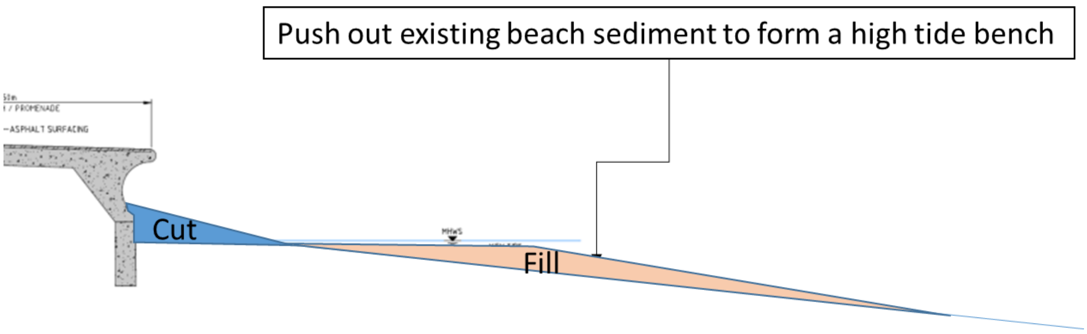

Figure 5 Sketch showing the initial high tide bench formation, moving the existing beach material from the upper beach to the lower beach

35. This process is likely to be done by a hydraulic excavator operating along the crest of the existing wall, although once the bench is formed, it could be carried out with machinery working along the upper part of the beach adjacent to the existing seawall during the low part of the tide cycle. The

existing sediment will be pushed immediately seaward of the proposed wall, but will be within the existing beach footprint, creating a slightly over-steepened upper intertidal beach face within the existing footprint of the beach. This may require works to retain the beach berm if the contractor needs to maintain the berm during construction. This maintenance activity may need to be done several times during the construction of the Shared Path. Some form of in-situ beach shaping may also be needed immediately prior to importing beach sediment to prepare the beach for the additional sediment placement. The Beach Nourishment Plan ("**BNP**") provided under conditions **EM.13** to **EM.14** of the proposed conditions will address these matters, together with conditions **EM.15** to **EM.18** which deal with beach monitoring, management and nourishment.

Imported beach nourishment

36. After the walls have been constructed within each particular bay, imported beach sediment will be placed along a central area of each beach to be distributed by natural wave and tide actions both down the beach face and along the shoreline. The initial placement areas are indicated in the sketches included in Appendix D of the Beach Nourishment Assessment. The placement areas were selected as they are situated in the widest area of the existing beach within the most substantial high tide area. The extents are designed not to extend across significant stormwater outlets, reducing the likelihood of blocking these outlets as well as being as distant as possible from areas of seagrass areas seaward of the existing beach.

37. Bringing the beach nourishment sediment to site could be done by trucks from the roadway or by shallow barges from the sea. For truck placement, sediment could either be unloaded from the truck to a discrete location and transferring along the beach seaward of the Shared Path by hydraulic excavator, or end tipped along the extent of the proposed beach. For barges, this would involve landing a shallow draft barge on the existing beach at high tide, unloading by hydraulic excavator and distributing the sediment along the nourished beach area during lower stages of the tide cycle. In all cases, the resulting post constructed beach form would be the same.

38. The nourishment material would be placed on the foreshore on the formed high tide bench along the entire designated placement area. The sediment would then be transferred down the beach during low tides to form a beach berm, or crest, around 0.6 metres above the mean high water spring level ("**MHWS**") and a seaward slope of around 1 metre in the vertical direction and 4 metres horizontal. Having a level of 0.6 metres means that the beach will be dry during most tides, but occasionally inundated during storms, so it will remain part of the beach environment. The solid yellow line in **Figure 6** shows the anticipated beach cross-section after the initial placement (the other lines are discussed in the following section where I discuss the anticipated movement of the placed sediment).

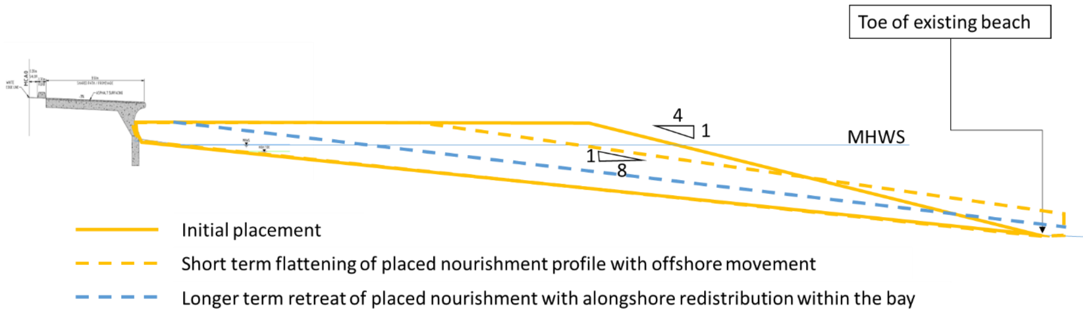

Figure 6 Illustration of sand nourishment placement and expected cross shore redistribution and landward retreat of the placed profile due to the alongshore processes

39. Where it is proposed to place at one location, the supply of sediment would be balanced with the rate of sediment able to be moved along the beach by hydraulic excavators working along the beach, to avoid placing too large a volume on the upper beach area which could result in over-steep slopes and the potential for slumping to occur onto the sensitive ecological areas seaward of the beach.

Anticipated movement of placed sediment

40. I expect that initially, cross-shore transport will be the main transport process for placed sediment, which means sediment will move up and down the beach face during periods where wave action is sufficient to generate waves during the upper stages of the tide (typically during mid tide and higher tide levels). This could result in the landward retreat of the beach crest and a seaward movement of the beach toe. This process is expected to result in a beach face slope like the existing beach profile slope and sorting will occur with sands and gravels moving to their preferred location on the beach profile. The resulting profile adjustment is shown as the yellow dashed line in **Figure 6** and the blue dashed and dotted lines on the plan view sketches in Appendix D of the Beach Nourishment Assessment.

41. There will also be alongshore transport that will act to distribute the placed sediment wider within each embayment. The movement along the shoreline will be dependent on the direction of waves during onshore storm and strong wind events. The speed of this process will depend on the persistency of waves that are generated that break at an angle to the shoreline. This creates alongshore velocity vectors and results in movement both to the south and north of the placed sediment confined to each embayment. The alongshore movement of sediment will result in a retreat of the placed sediment profile, with accretion along the adjacent beach profile. The resulting change in profile is indicated by the blue dashed line in **Figure 6.** In all instances of sediment transport, it will only be at the rate that the natural processes of waves, tide and wind allow.

42. Due to the shape of the bays it is not anticipated that there will be any alongshore loss from the bay where the sediment is placed and there is no need for additional control structures, such as groynes or offshore reefs to confine the placed sediment. I further note that **Dr Matheson's** evidence addressing the effects on seagrass says "*the risk to the seagrass within and adjoining the beach nourishment adjusted profile is considered to be temporary and small. As discussed below, steps will be taken to avoid adverse effects on seagrass arising from beach nourishment activities*".

POTENTIAL EFFECTS AND PROPOSED MONITORING

43. There are both positive and negative potential effects of the proposed beach nourishment on the beaches. In terms of potential positive effects, the proposed nourishment will retain the beach area seaward of the widened cycle way where beaches are currently present. The potential negative effects of the beach nourishment include the burial of adjacent seagrass features both during and after construction, blocking of stormwater outlets and increased turbidity within the CMA area during placement of the nourished material. These matters are discussed in the evidence of **Dr Matheson** (seagrass), **Dr James** (fish passage) and **Dr Allis** (coastal processes).

44. As I have described above, I have sought to minimise the potential adverse effects of the Project by careful design to:

    (a) limit the imported volume;

    (b) increase the grain size of the imported sediment to create slightly steeper beach face slopes;

    (c) limited the proportion of fines;

    (d) a placement approach that avoids encroachment onto the seagrass beds and minimises encroachment over stormwater outfalls; and

    (e) the placement to occur in winter months to avoid times of more vigorous sea grass growth.[3]

45. With these proposed actions the Project's potential effects on the beaches and the adjacent seabed areas are *low*, and the placed sediment will behave similarly to the existing beaches with the same wind, wave, and tide regime.

46. I have proposed recommendations on the detailed design as well as monitoring that will be required both during construction and post construction. The monitoring during construction is to ensure work is undertaken in a way that avoids, remedies or mitigates potential adverse

[3] As discussed effects assessment on coastal vegetation and avifauna (Appendix C-1 of the AEE).

effects during the construction period, while monitoring post-construction is proposed to confirm the behavior of the placed sediment.

47. The proposed conditions appended to the evidence of **Caroline van Halderen**, in particular conditions **EM.13** to **EM.18**, generally address my recommendations and are in my view appropriate. I note that EM.14(g)(ii) should be modified, changing 20m to 10m. The 10m requirement is as set out in my Beach Nourishment Report. Complying with these conditions will avoid the potential effects on the seagrass beds and will minimise the potential to block stream outlets.

RESPONSE TO SUBMISSIONS

48. I have reviewed the submissions that I consider relate to coastal processes and the proposed beach nourishment and wish to provide some comment and response to the submissions from the Department of Conservation (161), Royal Forest and Bird (170), East Harbour Environmental Association Incorporated (80) as well as submissions from Mr Butt (63), Mr Atkinson (168), Dr Lawrence (177) and Mr Rashbrooke (179).

Department of Conservation (168)

49. The key matter raised by the Department of Conservation submission in relation to the proposed beach nourishment is the potential for smothering of the adjacent seagrass by movement of the placed beach nourishment material and their requirement to specifically include this as a condition of consent.

50. I understand the importance of the seagrass beds and the need to protect these important habitats. Due to their location, seagrass beds will currently experience movement of sands and increased sediment suspension in the water column over the beds during periods of onshore strong winds and this is part of the natural character and setting of these areas. As discussed above, the proposed beach nourishment design has been carefully developed to prevent the encroachment of the beach nourishment by limiting the volume placed, slightly increasing the size of the placed sediment to more closely represent the steeply sloping upper beach areas and distributing the sediment along the placement area upon a formed beach berm of existing beach sediment. These requirements are also clearly set out in the BNP (Conditions **EM.13** to **EM.18**) and complying with these conditions will avoid the potential effects on the seagrass beds.

Royal Forest and Bird (170)

51. The Royal Forest and Bird submission also raises similar concerns to the Department of Conservation regarding the adverse effects to the seagrass beds. My response in the paragraph above addresses their concerns.

East Harbour Environmental Association Incorporated (80)

52. The East Harbour Environmental Association submission raises concerns with regard to the use of heavy machinery on the beaches which could cause significant damage to coastal formations and their flora and fauna. I do not agree that the use of heavy machinery on the upper beach area as part of the beach nourishment work will cause damage either to the coastal formation or to flora and fauna. This is due to the relatively sparce extent of flora and fauna on the upper beach area, the resilient nature of the sands and gravels to traffic loading, relatively infrequent traffic over the surface of the berm and the use of appropriately scaled equipment for the reasonably small amount of beach nourishment proposed.

53. Dr Overmars (Section 4.4.2 of the Avifauna and Vegetation Assessment in Appendix C of the AEE) identified that the gravels and sands on the upper part of the existing beaches are subject to accretion and erosion, have no top soil development and have only limited vegetation cover. There is limited flora and fauna on the upper beach area because they are dynamic areas and are subject to wave and tide action that causes frequent action and movement of these sediments.

54. The in-situ beach sediment is largely made up of rock and sands formed from erosion processes and shaped by wave and tide energy. As weathering occurs over time and with the movement of sand and gravels up and down the beach due to wave and tide action, only the more durable sediment fractions remain on the beach. Due to the design methodology of placing sediment in a central area and letting wave energy distribute the placed sediment, and the construction process of placing sediment along this area from the crest of the wall, traffic loading from hydraulic excavators is relatively low. Due to the durable nature of the beach sediment the traffic and use of construction plant is unlikely to result in damage to these sediments.

Mr Butt (63)

55. In his submission Mr Butt's preferred solution is larger-scale beach nourishment with sand sourced from deeper water offshore and pumped to shore. He refers to sand nourishment projects at Mission Bay and St Heliers in Auckland as examples of larger scale nourishment. I have been involved with both these projects with my work for Auckland Council, so am aware of their designs and ongoing performance. While I agree with Mr Butt that larger-scale beach nourishment is a potential solution, the preferred solution is a smaller-scale importing of coarser sediment. This preferred solution was developed based on a range of criteria including the ecologically sensitive seagrass areas adjacent to the beach. The preferred solution is also able to be implemented without additional control structures which would be required for larger scale nourishment and using the finer sand that is situated offshore.

Mr Atkinson (168)

56. Mr Atkinson is concerned that the widened Shared Path encroaches into the coastal area, decreasing the wave attenuation that existing beaches provide and reducing the beach amenity. He raises concern that the beach nourishment is a temporary and expensive solution that will not mitigate against future sea level rise changes that will occur in the future.

57. The proposed beach nourishment is specifically designed to maintain the existing level of beach amenity of the upper beach considering other constraints, such as the adjacent seagrass beds. In terms of the effects of sea level rises, this is dealt with in the evidence of **Dr Allis.**

Dr Lawrence (177)

58. Dr Lawrence provides her observations of the changes to Point Howard Beach over the last 40 years and the gradual occupation of the beach area through coastal edge development and encroachment. She is concerned that the proposed beach nourishment is done solely to offset the encroachment of the beach as it exists today and does not provide a long-term solution. Dr Lawrence recommends that the monitoring condition be modified to include a review after the two-year monitoring period to determine whether monitoring should continue and to link it to the longer-term adaptive pathways that will need to be considered to manage the effects of climate change.

59. Dr Lawrence is correct that the proposed design is intended to offset the encroachment of the beach of the proposed seawall and shared path. The beach nourishment design for the Project is a balance and consideration of a wider set of constraints and specific objectives. Dr Lawrence recommends a modification to the monitoring condition **EM.16** to include a review by a coastal professional to determine whether monitoring should continue and to link to the longer-term adaptive pathways. I note that the existing consent condition requires assessment of the results by a coastal scientist and would anticipate they would make an appropriate recommendation based on the results of the data (condition **EM.17**). Therefore, I do not support a modification of this consent condition. Further, beach nourishment as a longer-term response to managing the effects of climate change is a significantly bigger issue than what I have been asked to assess in relation to the Project.

Mr Rashbrooke (179)

60. Mr Rashbrooke provides some observations of the physical form of the beach, with Mahina and York Bays comprising steeper, coarser shingle at the upper part of the beach and finer and flatter sand through the intertidal and subtidal part of the beach. He raises concerns that the proposed beach nourishment will need to be continuous, citing his observations of what

occurs at Oriental Bay and that the proposed nourishment will sit on top of the sand, having an impact on the enjoyment of water activities.

61. The beach nourishment design both recognises and seeks to mimic the existing physical form by using coarser sediment placed on the upper part of the beach. Gravels tend to preferentially be located on the upper beach slope as breaking waves within the swash zone tend to push gravels shoreward, while sands can move both onshore and offshore. The coarser sediment will also move alongshore more slowly due to their increased mass, reducing the risk of sediment loss from the bays where the sediment is placed.

62. I was the designer for the beach nourishment at Oriental Bay and I have continued in that role since that project was completed in 2003. I have been involved in the review of beach monitoring and maintenance activities. The design criteria were strongly urban design focused and there was a requirement to continue waves and water to impact on the rotunda and for any protection works not to be visible. As part of the design solution, the annual transfer of sand from east to west was an accepted part of the design and management of the beach. This transfer of sand is not an indication of an unforeseen issue, but part of the design solution to meet the design criteria and objectives set by Council. Since construction only 1,500m^3, or around 9% of the capital volume, was added in 2015 to respond to the losses that were identified in the design and realized through monitoring.

63. Based on my understanding of the coastal processes operating along the proposed beach nourishment sites for the Project and the carefully developed proposed design, the beach nourishment design will be dynamically stable with little loss either offshore or alongshore. Therefore, beach nourishment will not need to be continuous to meet the Project objectives.

RESPONSE TO COUNCIL OFFICER'S SECTION 42A REPORT

64. I have reviewed the GWRC section 42A report, and in particular sections 12.2.4 and 12.3 that relate to public access and amenity and effects on coastal processes and sections 12.7.2 and 12.8, effects on seagrass. I have also reviewed the appendices from Dr Iain Dawe and Sharon Westlake.

65. I support the findings that beach nourishment is an appropriate form of mitigation for the loss of useable high-tide beach and the effects are no more than minor.

66. Dr Dawe suggests the potential for staging the placement of beach nourishment (Appendix G, conclusion point 3). The officers report (pg 87) also recommends a condition to place material in a staged manner placing smaller volumes across two or three treatments. I consider the potential to consider this is adequately included in the requirement to prevent damage to

the seagrass beds and is addressed in the requirements for the detailed design of the beach nourishment (**EM13**) and existing consent condition **EM.14** which requires a detailed construction methodology to limit potential adverse effects.

67. Dr Dawe identifies differences in the length of the proposed monitoring between Dr Allis and me. The proposed monitoring period is two years as included in **EM.15** with a requirement for reporting after this period by an experienced coastal scientist (or coastal engineer) is appropriate.

Richard Anthony Reinen-Hamill

30 November 2020