

**IN CONFIDENCE**  
**By email**

3 March 2020

File Ref:

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Dear Shannon,

This letter is in response to your email dated 21 January 2020 requesting a formal response to matters arising from submissions to the Eastern Bays Shared Pathway consent application.

In particular you have asked me to comment on:

- The suitability of the seawall design to:
  - resist scour at the base/toe;
  - allow for further adaptation in future (i.e. add-ons and building up), and requirements for such adaptation to be successful;
  - be successfully upgraded in future.
- Whether raising of the road level is likely to be required.

The points I have responded to specifically are contained within submissions from the following parties, and are additional to the responses by Dr Iain Dawe:

- |    |                   |   |
|----|-------------------|---|
| 1. | Submitter No. 63  | John Arnold Butt                                |
| 2. | Submitter No. 159 | Te Aranui O Pōneke, The Great Harbour Way Trust |
| 3. | Submitter No. 168 | Richmond Esmond Atkinson                        |
| 4. | Submitter No. 177 | Judith Lawrence                                 |
| 5. | Submitter No. 190 | Gertrud (Trudi) Bruhlmann                       |



My responses are set out in response to the points listed above and include a summary of the main points raised in the submissions that I comment directly on.

## **1. Suitability of the seawall design**

### **1.1 Submission points summary**

A submitter expressed concern about erosion occurring beneath the wall and at the base or toe of the revetment.

Submitters also believe that sea level rise may render the path useless in the long-term, and that the sea wall infrastructure should be adaptable for sea incursions and southerly storms to be moderated/rebuffered in the future.

### **1.2 Response**

#### **1.2.1 Erosion beneath the wall**

Appropriate design of the proposed seawalls are important for structural stability, durability and also performance. Any erosion beneath the proposed seawalls, if not designed for or able to be remedied in a timely manner through the Hutt City Council maintenance programme, could lead to failure of the protection works and also the shared path which the walls support.

In assessing foundation depths for the proposed seawalls, investigations were carried out to evaluate the likely excavations required for the proposed seawalls to be structurally sound and also to allow for coastal processes to occur without these processes compromising the walls' stability and strength. The outcomes of the seawall embedment investigations are given in the NIWA Coastal Physical Processes Report, page 29-30 (Appendix E of the Assessment of Environmental Effects), which states: "Whilst excavations will generally be shallow (<1 m, see Figure 2-7) for the majority of the Project, in some beach locations the site investigations (Stantec 2017) have indicated seawall foundations may need to extend down up to 5 m below current beach level in order to reach material of acceptable bearing capacity, whilst ensuring the design is not compromised (undermined) by the long-term effects of coastal erosion or short-term scour during prolonged storms. These areas of deep excavation include Sorrento Bay (50 m), Lowry Bay (585 m), York Bay (450 m), Mahina Bay (220 m), Sunshine Bay (250 m). These deeper foundations will utilise traditional deep foundation techniques such as reinforced concrete cut-off walls, sheet-piling, or bored or driven reinforced concrete piles as required, depending on depth and loading on the foundation. Details will be provided in the CEMP for the specific sections of seawall."

Final embedment depths for the proposed seawall will be part of the detailed design for the project and will be determined at this stage. I would also expect that structural design of the seawalls would be finalised as part of the detailed design, and that the final seawall design would be peer reviewed by an appropriately qualified and experienced engineer.

Timely monitoring and maintenance of the seawalls is required, and these would be part of Hutt City Councils asset management plans following practical completion and handover of the works.

### 1.2.2 Erosion at the toe of the revetment

The toe of a revetment is a special type of transition from the revetment slope to the nearly horizontal beach. The primary function of the revetment toe is to support the revetment. When the friction holding the revetment toe in place becomes too little, either to a drop in the water level, waves to erosion of the beach material, the toe has to deliver the resisting force to prevent lateral spread and collapse of the revetment. If the founding substrate for the revetment toe is sufficiently hard and not able to be eroded (i.e. rock/dense gravel) then minimal keying in of the revetment toe is required, although I would expect some keying in of the toe for revetment stability and to withstand lateral forces.

The NIWA Coastal Physical Processes Report, page 27 (Appendix E of the Assessment of Environmental Effects) states “No excavation is anticipated for placement of the rock layers of revetment (outside of the toe) due to rock/gravel substrate.” As the final revetment design will be part of the detailed design for the project, I would expect this premise to be confirmed, and also that the revetment design would be peer reviewed by and appropriately qualified and experienced engineer. Also, as above, monitoring and maintenance of the revetment will be required as part of Hutt City Councils asset management programme.

### 1.2.3 Adaptability of the proposed seawalls and revetments

The overall design of the current project has been decided to satisfy the requirement under the RMA to consider the effects of climate change over a period of at least 100 years as stipulated in the NZCPS-2010 (Policy 24) (NIWA Coastal Physical Processes Report, (Appendix E of the Assessment of Environmental Effects)). The seawalls have been structurally designed to be able to be raised in the future. Where a revetment structure is proposed, the carriageway and path facility will be supported by a reinforced concrete cantilever wall which will be designed as a standalone element and so these too may be raised in the future. The rock revetment profile can also be raised, and further beach nourishment can also be carried out as sea levels rise, however these works would encroach further into the CMA, with consequent potential effects, including on the seagrass meadows. These would need to be evaluated as part of the consenting process for any future works.

## 2. Future raising of the road level

### 2.1 Submission points summary

A submitter raised the point that HCC will almost certainly have to raise the road level via infill behind a seawall add on. They believe the wider path will require more infill and that this will allow for additional carriageway width on the landward side of the road.

A submitter also notes that shared path will be flooded more frequently and might not be usable in 35 years.

## **2.2 Response**

The project is an interim response to the current conditions of road closure and the requirement for a shared path along the route. It will provide protection from storm events for Marine Drive and other infrastructure along the road corridor. With sea level rise, the level of protection to the road will reduce. If the seawall is raised without raising the level of the road behind it, there will be some limited protection from wave action and debris provided by the seawall, however flooding of the road is highly likely from elevated sea water levels during storms and from stormwater flooding.

HCC will be developing a Climate Change and Resilience Strategy with the community, and future levels of service and access requirements would be expected to be part of this strategy. This project will not preclude any outcomes of the strategy and will “buy” time for it to be developed, agreed and implemented.

## **3. Suggested conditions**

### **3.1 Monitoring**

The proposal states that “Monitoring of the beach nourishment should be carried out every 6 months for a period of 2 years with a report completed after the 2 year period to assess the changes and make recommendations on the requirement for ongoing monitoring, or if the monitoring could cease.”

Performance of the beaches is likely to be a reflection of the storminess, weather, waves and tidal conditions the storms occurred over. Monitoring should include connection with these elements and also their return period, to evaluate whether it has been sufficiently ‘tested’ over the duration of the monitoring. The NIWA Coastal Physical Processes report suggests that the monitoring period should be 5 years, and I concur that a monitoring period of 5 years should be enough time to allow the new seawalls and beach nourishments to obtain a new equilibrium with the wave and current climate in each bay. My suggested monitoring is:

- 6 monthly for 5 years at the end of summer and the end of winter
- Following storms of greater than 5 year return period.

Consent conditions should allow something to be done with the monitoring results i.e. ‘topping up’ of the beach nourishment and maintenance/topping up of the revetments if design conditions are exceeded during the monitoring period and this is deemed to be required by the experienced coastal scientist/engineer.

Longer term monitoring of the effectiveness of the whole project, including the performance of the revetments and the impacts of sea level rise and climate change, would be part of standard asset management processes within Hutt City Council.

### **3.2 Reclamation**

The proposal states that “All imported fill/rock material to be used in the reclamations, revetments and associated toe aprons and wave/tide bunds shall be in accordance with the Ministry for the Environment ‘cleanfill’ definition, as detailed in Publication ME418 ‘A Guide to the Management of Cleanfills, 2002’ or subsequent updates.”

This MfE cleanfill definition is that the material “will typically be from construction and demolition activities, and will generally comprise soil, rock, concrete, bricks and similar inert material.” Construction and demolition materials are clearly unsuitable for placement on the beaches and the condition should be modified to restrict suitable materials to natural sand, gravel or rock.

### **3.3 Peer review**

Final design of the seawalls, revetments and structural works should include peer review by a suitably qualified and experienced engineer.

I am happy to discuss further.

Kind regards

**Sharyn Westlake**  
Senior Engineer, Strategy and Advisory Specialist  
Flood Protection Department

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