

BEFORE AN INDEPENDENT HEARINGS COMMISSIONER

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER a resource consent application and an objection to a decision of the Gisborne District Council by Simon Cave concerning a revetment wall at the toe of the cliff below 4, 6 and 8 Tuahine Crescent, Wainui Beach

**STATEMENT OF EVIDENCE OF SAMUEL CASEY MORGAN
FOR SIMON CAVE**

COASTAL PROCESSES

Dated: 5 October 2022

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1. EXECUTIVE SUMMARY

- 1.1** The application relates to proposed maintenance works to a seawall at the cliff toe below 4, 6, and 8 Tuahine Crescent, Wainui Beach.
- 1.2** I have undertaken a detailed assessment of the local coastal processes operating at the southern end of Wainui Beach and the subject site.
- 1.3** The site without adequate coastal protection measures would be subject to a progressive erosion hazard, as it the nature of coastal cliff features.
- 1.4** The existing structure has deteriorated in form and cannot be relied upon long term.
- 1.5** The proposed maintenance works seek to remedy these issues, whilst providing for modern engineering standards and future climate change. I have carefully considered both of these issues and applied current and appropriate methodology in the course of my assessment.
- 1.6** As the overall footprint of the structure is not increasing, in my opinion the effects of the proposal on local coastal processes will be similar in character, scale and intensity to that which has applied since the structure was established.
- 1.7** The structure is expected to perform in a similar manner to the performance of the existing structure over time although the application of modern engineering standards is expected to enhance that performance and the management of any potential end effects.

2. INTRODUCTION

- 2.1** My name is Samuel Casey Morgan. I hold a Master of Science degree (Hons) in Marine Science, specialising in coastal geosciences, from the University of Auckland. I have approximately fifteen years' experience in the field of Coastal Science and Management and am a Certified Environmental Practitioner through the Environment Institute of Australia and New Zealand.
- 2.2** I am currently employed as a Principal Coastal Consultant at 4Sight Consulting, part of SLR (*4Sight*) and I have been in this role since March 2018.
- 2.3** Much of my academic focus was on the relationship between coastal geomorphology and longer-term habitat trends. My master's thesis involved an investigation into the late Holocene development and habitat changes in the Matapouri Estuarine system.
- 2.4** In 2008 I started at the Rodney District Council in an operational role undertaking the maintenance and development of coastal assets within the district. Previous to this I was involved in research and teaching at the University of Auckland and the University of

Wollongong, as well as research at the Elkhorn Slough Estuarine Research Centre in California.

- 2.5 From 2009 to 2011 I worked at Davis Coastal Consultants on a range of coastal management and engineering projects. Subsequent, to this I was employed by Auckland Council as a Senior Coastal Scientist until January 2016, providing advice across Auckland Council in coastal science, engineering and management issues.
- 2.6 Following my role at Auckland Council I was employed by AR & Associates as an Associate Coastal Scientist for a period of 2 years. In this role I was involved in leading several coastal management projects including overseeing the engineering design and resource consenting components.
- 2.7 Through my professional career I have applied these expertise and experience to the interpretation of beach monitoring data sets with respect to beach management strategies. This has been drawn upon an experience in coastal science, beach management and coastal engineering.
- 2.8 I am often asked to review the coastal processes and engineering aspects of resource consent applications on behalf of Auckland Council and Otago Regional Council.

3. CODE OF CONDUCT

- 3.1 I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2014 and that I have complied with it when preparing my evidence. Other than when I state that I am relying on the advice of another person, this evidence is entirely within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

4. SCOPE OF EVIDENCE

- 4.1 In preparing this evidence I have reviewed all documents relating to the applications including the submissions and Council's s.42A hearing report including the coastal processes review contained within the respective Appendices.
- 4.2 As a part of both the Resource Consent Application and the Existing Use Rights application I prepared detailed coastal processes assessments in support. I have been reliant upon these in the preparation of this evidence. I confirm that the contents of those reports remain consistent with my views and opinions as expressed within my areas of expertise. On any issue arising related or relevant to the planning analysis, I defer to the evidence of Georgina McPherson.
- 4.3 This evidence addresses the application and in doing so, it will cover the following matters:

- (a) Maintenance works description;
- (b) Requirement of maintenance work;
- (c) Local coastal processes regime;
- (d) Coastal processes impact assessment; and
- (e) Points of clarification.

5. DESCRIPTION OF MAINTENANCE WORKS AND CONSTRUCTION METHODOLOGY

- 5.1** The existing structure is a hybrid solution utilising railway irons as a toe control to retain a rip-rap rock wall established against the toe of the cliff. The rip-rap rock serves to dissipate the incoming wave energy. However, this existing structure has now deteriorated to a stage where the railway irons can no longer be relied upon to maintain the stability of the rip-rap rock wall.
- 5.2** Two different designs have been presented within the respective applications, with the newer design contained in the existing use rights application extending slightly to the north but on a much gentler slope. This was proposed in response to concerns around potential end effects raised by Katherine Cave in particular. The original resource consent application contemplated a structure of this scale and scope to ensure end effects can be addressed to the satisfaction of all concerned.
- 5.3** The proposed works maintain this hybrid solution, timber posts replace the railway irons serving to restrict the seaward extent of the wall toe and allow for the rock rip-rap to be built up to desired design heights. The timber piles are prescribed at Ø300mm spaced at 900mm centres to avoid loss of rock between individual piles. The larger rock will be placed along the seaward face and along the top of the rock rip-rap wall to create a stable platform to repair the remainder of the wall. While the work is comprehensive, having regard to the planning analysis prepared by Georgina McPherson, in my opinion the work is properly characterised as repair rather than removal.
- 5.4** The most significant difference between the existing and repaired structures is an increased crest height in the repaired structure at RL4m to allow for future sea-level rise (rather than the RL4.8m proposed in an earlier consenting process). When incorporating a future sea-level rise of 1m, the new crest height provides 0.7m of freeboard above the 100-year storm surge event (RL1.43m) and wave setup (+0.9m) water level.
- 5.5** This also provides adequate allowance for the projected -0.73mm/yr of subsidence as recently highlighted in the recent NZ SeaRise project. This equates to 0.073m over 100yrs which is considered to be inconsequential in the context of the potential uncertainty associated with future sea-level rise and climate change.

- 5.6** The freeboard and additional allowance for sea-level rise (beyond 50yrs) is considered to be an important component of the design to compensate for factors such as wave run-up. This approach was undertaken (as opposed to wave run-up calcs) due to the complex nature of coastal processes operating at the site and hybrid wall solution.
- 5.7** Due to the uncertainty associated with projected sea-level rise and climate change, an indication of the structures life expectancy beyond 50 years is unrealistic due to the increasingly divergent modelling results.
- 5.8** Works will be undertaken from the beach side of the site and staged in a manner to minimise the degree of exposure and disturbance. The nature and extent of that work is set out in the application documents. A detailed site management plan will be provided by the appointed contractor prior to construction commencing.
- 5.9** The works are proposed to be undertaken in early autumn or late spring so as to avoid both increased pedestrian traffic and the likelihood of large weather events. This will also need to avoid and accommodate penguin management at the site. It is noted that the appointed contractor will still be required to work within tidal cycles and weather events over the course of construction.

6. REQUIREMENT FOR MAINTENANCE WORKS

- 6.1** The structure currently is considered to have deteriorated from what was initially constructed and documented in prior consenting processes. Figure 1 below shows the present state of the structure with only the lower logs acting to retain the rocks remaining. Displaced rocks and deformed railway irons are also noted. Based on discussions with the applicant a number of logs have been displaced and the rock material weathered and settled from its original condition.
- 6.2** Despite the structure's deterioration, I am of the opinion that it continues to perform in a similar manner both in terms of its coastal protection function and impact on the local coastal receiving environment as when originally constructed, in 1997 when the current planning framework was notified, and when otherwise subsequently considered.
- 6.3** However, continued deterioration of the structure can be expected, and should the existing structure fail it is anticipated that the existing rock contained behind the railway irons would migrate on to and eventually cover the beach away from the toe of the cliff.
- 6.4** As the toe of the cliff becomes exposed an increase in erosion of the toe will likely occur, eventually leading to further slope instability issues. As the toe erodes and the slope fails, additional erosion risk to adjoining properties may increase by means of outflanking of adjoining structures potentially leading to their failure.

- 6.5** It is intended to reuse as much of the existing material from the site as possible during the maintenance works. The maintenance works will be staged and undertaken in a manner to ensure that it continues to perform a coastal protection function as best as practicable throughout the course of the work.



Figure 1: The existing structure in 2018.

7. LOCAL COASTAL PROCESSES REGIME

- 7.1** A full description of the coastal setting and processes is detailed in the coastal processes memo included in the application documents. The key points from that memo are summarised below.
- 7.2** Wainui Beach is a high energy system open to large swell from the south through to the north-east with waves in excess of 8m during extreme events.
- 7.3** The site itself is considered to be the northern extent of the Tuahine Cliffs and is essentially the starting point of the of the true Wainui Beach system. This is indicated by the bedrock exposure and slip scarp characterising the backshore of the site.

- 7.4 As is the nature of cliff features, this site is subject to an ongoing progressive erosion process.
- 7.5 Geotechnical testing at the site indicates that bedrock occurs relatively shallow below the beach sands and is supported by the proximity of the shore-platform features seaward of the site.
- 7.6 Sand deposits in front of the existing seawall structure are known to fluctuate depending on changing weather conditions and are influenced by the presence of various structures at the site.
- 7.7 The groyne adjoining the southern terminus of the existing seawall will act as a “catch” for sand in weather events originating from the northeast. During southerly weather events the structure provides some degree of shelter from waves approaching the shore.
- 7.8 The seawalls characterising the toe of the cliff are considered to have a reflective impact, influencing the retention of sand directly in front of them during periods of high wave activity. During periods of calmer wave activity sand returns to the area.

8. COASTAL PROCESSES IMPACT ASSESSMENT

- 8.1 In general, given the proposed maintenance works will occupy the same footprint as the existing authorised structure which has been in place for approximately 50 years, in my opinion the potential effects on the local coastal processes will be the same or similar to the existing situation. I note that Dr. Willem De Lange and I are largely in agreement on these matters. Significantly, there is no material difference between us in our analyses of the primary issues; if anything, I discern that Dr De Lange considers my analysis to be a little more conservative than his own.
- 8.2 As noted above the degree of uncertainty associated with climate change and sea-level rise beyond the next 50 years makes it problematic to assign a design life beyond this. Accordingly, a similar rationale is applicable to the assessment of potential effects beyond 50 years.
- 8.3 It is recognised that during periods of low sand levels, the seaward face of the structure is vertical in nature which can increase the amount of energy reflection because the approaching wave is not able to dissipate up a sloped surface. However the degree and amount of reflection will be reduced as the face will be semi- permeable in nature allowing water movement through the structure to dissipate some of the wave energy. For this reason, the proposed structure will act at least in a similar manner to the existing structure in terms of reflection and potentially lessen the impacts of reflection at the site.
- 8.4 I observe that in the original design south, to address the potential for end effects the northern slope has been reduced to 2(h) and 1(v), terminating the structure in-line with

an outcrop of exposed rock material and tie-ins to the existing structure. At the southern terminus the structure will tie into the existing groyne and seawall. I am still of the opinion that this will adequately minimise the potential for end effects.

8.5 However, for the reasons discussed above, the revised design optimises the purpose of the work having regard to the desirability of repair and maintenance of the existing structure within number 4 Tuahine Crescent generally while further reducing the potential for end effects and the ongoing management of public access over the adjoining public accessway. The revised design proposes that this be managed by reducing the northern slope to 5(h) to 1(v) to create a smoother transition into the adjoining structures. I accept this will further reduce the available area of turbulence which the initial design manages, but this revised design improves upon this feature thereby reducing likely future repair and maintenance considerations which in a dynamic environment can be a point of vulnerability if not well managed.

8.6 As noted above the proposed maintenance works will tie into the adjoining structures to the south. It is understood that these structures have an existing coastal consent which was issued in 2008 for the maximum term available of 35 years. This consent is due to expire in 2042. In my opinion, even if this consented work were to be de-commissioned, there are obvious methods available to tie off the Cave structure within number 8 Tuahine Crescent to ensure the Cave structure is not compromised. It is noted that the owner of 8 Tuahine crescent (Annabel Reynolds) supports both the resource consent and existing use rights applications.

9. POINTS OF CLARIFICATION

9.1 The consent term limit contained within Condition 5 in my understanding relates terms limits of adjoining coastal structures. From a coastal processes perspective and for the reasons noted in the previous paragraph, I cannot identify a reason for this consent term.

9.2 Further, I note current coastal management practices are moving toward the development of triggers based on observed changes in a particular system for management responses. Consent terms and conditions such as these have proven to be largely ineffective and difficult to enforce. For this reason I consider the review condition proposed in the evidence of Georgina McPherson to be appropriate to these circumstances while also having regard to the anticipated ongoing performance of the structure as generally agreed with Dr De Lange over (in my opinion) the next 50 years.

9.3 In my opinion, Condition 7 requiring final design and certification be supplied to GDC 1 month prior to be largely ineffective. In my opinion, the best means of avoiding or mitigating potential end effects is by establishing effective tie-in points to the existing structures and local ground conditions. These will be best observed and understood as

the existing structure is dismantled and sub-surface conditions become apparent. Therefore, I consider it more effective to have a condition requiring the works be supervised by a suitably qualified and experienced professional. Then following completion of the physical works as-built plans and certification of the works be supplied 1 month following. I suggest a condition as below:

Physical works shall be supervised by a suitably qualified and experienced professional to determine an appropriate tie off for the structure with the intent of minimising potential end effects. One month following the completion as-built plans and documentation confirming the nature of this work shall be provided to the consent authority.

9.4 Condition 18 reference the works shall not cause erosion of the dune face. As noted above the subject area is characterised by cliff toe and exposed bedrock material and it is unclear which dune (if any) this condition might be referencing. Further, the condition is open to interpretation. Potentially, the erosion of any dune could leave the consent holder in breach of this condition. Given the potential controls contained in Condition 7, I consider this condition to be uncertain and unnecessary.

9.5 I consider that the Finished Site Works and Planting Plan contained within Condition 23 will be more effective if submitted after completion. This will allow the full extent of land remediation required to be better understood and refinement of the planting required. Accordingly, I suggest the wording below:

At least 1 month following completion of the works, the Consent Holder shall submit to the Consents Manager, Gisborne District Council, for certification, a Finished Site Works and Planting Plan which shall;

(i) Be in general accordance with the 4Sight Visual and Landscape Assessment dated April 2019,

(ii) Provide details of landscape and stabilisation planting/works to be completed along the top of the rock armour and the proposed work areas and the timeframe for when the works shall be completed,

(ii) Provide any additional measures to rehabilitate any areas within the CMA which have been affected by the construction works including all access routes to and along the CMA,

(ii) Provide details of ongoing maintenance of any landscape and stabilisation planting/works which shall be undertaken during the term of the consent.

9.6 This will require an additional item(s) within the Construction Management Plan contained within Condition 10 to address immediate disturbance to and from accessing the beach environment. Accordingly, I suggest the wording below:

- *Identify access areas and pathways to and along the CMA. This shall include any remedial works required to reinstate these areas following the completion of physical works.*

10. SUMMARY

- 10.1** The site has been identified to be subject to an ongoing erosion issue and the existing seawall structure has been providing adequate protection to the site for the past 50+ years.
- 10.2** With time the existing structure has deteriorated and cannot be relied upon in the medium to long term. The proposed maintenance works are of a similar form to the existing and will occupy the same footprint.
- 10.3** As the proposed maintenance works will not extend further into the coastal environment and able to be tied into existing structures and nature features at either end the potential effects on local coastal processes are considered to be insignificant in the context of the receiving environment and, in my opinion, will be the same or similar in character, scale and intensity to that which has been experienced over time (including when the planning framework was established in 1997).