I hereby give notice that an ordinary meeting of the Franklin Local Board will be held on:

Date: Tuesday, 26 February 2019  
Time: 9.30am  
Meeting Room: Local Board Chambers  
Venue: Pukekohe Service Centre  
82 Manukau Road  
Pukekohe

Franklin Local Board
OPEN ADDENDUM AGENDA

MEMBERSHIP
Chairperson
Angela Fulljames
Deputy Chairperson
Andrew Baker
Members
Malcolm Bell
Alan Cole
Brendon Crompton
Sharlene Druyven
Amanda Hopkins
Murray Kay
Niko Kloeten

(Quorum 5 members)

Denise Gunn
Democracy Advisor - Franklin
25 February 2019

Contact Telephone: (09) 237 1310
Email: denise.gunn@aucklandcouncil.govt.nz
Website: www.aucklandcouncil.govt.nz

Note: The reports contained within this agenda are for consideration and should not be construed as Council policy unless and until adopted. Should Members require further information relating to any reports, please contact the relevant manager, Chairperson or Deputy Chairperson.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>TABLE OF CONTENTS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Sunkist Bay Seawall - Remedial Work Options</td>
<td>5</td>
</tr>
</tbody>
</table>
Sunkist Bay Seawall - Remedial Work Options

File No.: CP2019/00859

Te take mō te pūrongo
Purpose of the report

1. To seek approval from the Franklin Local Board for the recommended replacement solution for the eastern seawall at Sunkist Bay, Beachlands.

Whakarāpopototanga matua
Executive summary

2. In the January 2018 storms, wave action caused erosion of part of the reserve above the seawall at the eastern end of Sunkist Bay.

3. In response to storm damage seawall, staff prioritised the seawall for renewal and commenced investigation on how best to address the issue. Investigation was funded from the January 2018 regional storm damage budget.

4. Staff retained Tonkin and Taylor to assess the site and recommended best option for minimising future erosion, protecting existing assets and maintaining safe use of the beach for the community. Staff also requested that a grouted rock seawall was considered as part of this assessment at the request of the Franklin Local Board.

5. Tonkin and Taylor report (attachment A) clearly recommends that the existing seawall (a tipped rock seawall) is inadequate in terms of coastal protection and outlines the effects of two replacement options.

6. This report recommends that the existing tipped rock be replaced with a new rock armour revetment seawall and seeks approval from the board to proceed with this option as a renewal project.

Ngā tūtohunga
Recommendation/s

That the Franklin Local Board:

a) note the addition of Sunkist Bay tipped rock seawall renewal to the 2018/2019 Community Facilities renewal programme.

b) endorse the remediation solution, which is to replace the existing tipped rock seawall with an armoured rock revetment seawall.

Horopaki
Context

7. Beachlands is a fast-growing suburb of Auckland, and the beach at Sunkist Bay, including the boat ramp, boat club, coastal walkway and park at the eastern end is well used by locals and visitors to the area.

8. The Franklin Local Board developed a Sunkist Bay Concept Plan (Attachment B) in 2017/2018 to inform future development of the reserve including renewals. Within this concept plan, improvements to the seawall in terms of beach access and visual amenity were highlighted, and retention of the carpark endorsed.
9. The western end of Sunkist Bay is protected by a grouted rock seawall constructed in 1997 by Manukau City Council along the toe of the cliff that is the natural alignment of the coastline.

10. At the eastern end of Sunkist Bay is reclamed reserve and approximately 200 metres of tipped rock was constructed by Manukau City Council in 1972 to protect the reclamtion. The reclamed low-lying area has been developed to contain a carpark, ramp and reserve area.

11. Sunkist Bay is exposed to major storm-generated northerly and north easterly storm surges, and wind generated waves that form in the Tamaki Strait. Waves that reached higher than the seawall (wave overtopping) in the January 2018 storms resulted in scour and erosion of the unprotected ground above the low crest of the existing tipped rock structure. The storm damage triggered the need for the coastal protection to be renewed.

12. Tonkin and Taylor Limited were engaged to assess coastal erosion damage to the structure and adjacent reserve, and to provide detailed design information to effect replacement of the tipped rock protection. This investigation was funded from the January 2018 Storm Damage budget.

13. The investigation report also provides information on the relative benefits and disadvantages of rock armour revetment, and at the request of the Franklin Local Board (on behalf of the local community) also considers a grouted rock seawall alternative.

Tātaritanga me ngā tohutohu
Analysis and advice

14. Repair to the existing tipped rock seawall is not a viable option due to the absence of any geotextile and under layer material, the low crest and over-steepened profile of the existing slope, and poor connectivity for access to the foreshore via existing steps. The placement of additional rock material over the existing tipped rock would not prevent migration of fines through the existing rocks and ongoing settlement and undermining of the structure would still occur, and it is recommended that the existing tipped rock be completely rebuilt.

15. Two replacement options have been considered for the renewal of the existing tipped rock seawall that armours the coastal edge of the reclamned reserve at the eastern end of Sunkist Bay. Comparison of the rock armour revetment option with the grouted rock seawall option is provided in the summary table below.

<table>
<thead>
<tr>
<th>Effects</th>
<th>Armoured Rock Revetment</th>
<th>Grouted Rock Seawall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beach character and visual</td>
<td>Similar to existing rock character, with improved visual appearance as engineered armour rock revetment is constructed from interlocking rocks at a uniform slope.</td>
<td>Change in visual character at eastern end of beach, but similar to existing western seawall. Likely to require hand rail/balustrade due to height above beach which may impede views from the reserve.</td>
</tr>
<tr>
<td>Beach levels</td>
<td>The slope, permeability and surface roughness of stacked interlocking rock dissipates wave energy and reduces wave reflection. Scouring of beach (loss of sand) is less likely.</td>
<td>Solid seawalls have higher incidence of wave energy reflection. Grouted rock seawall would create more turbulence, particularly from wave reflection in the eastern corner Scouring of beach (loss of sand) likely.</td>
</tr>
<tr>
<td>Beach access (from road to sand)</td>
<td>Similar for either option – steps can be incorporated into both types of structure</td>
<td></td>
</tr>
</tbody>
</table>
**Beach access (alongshore)**

- Similar footprint to existing structure, no extension over foreshore and no change in beach width.
- Potential increase in beach width if alignment of new seawall is pulled landward and rock removed from foreshore.

**Effects on beach sand (and founding depth)**

- More dissipative structures have less wave reflection, which means less potential for beach lowering along toe of structure. Shallow founding possible.
- Deeper founding is required to account for wave reflection and potential scour effects that can lower beach sand levels along the toe of the structure.

**Planning implications**

- Repair of existing lawful reclamation either a Permitted Activity i.e. can proceed without a resource consenting process or Restricted Discretionary activity.
- New hard protection structure discretionary activity. New Resource consent required, delaying remediation and adding cost to project delivery.

**Adaptive management potential**

- Easier to reuse materials for future variations of protection.
- Expensive to adapt for future sea level rise.

**Wave overtopping**

- More dissipative structure due to slope, permeability and surface roughness so more wave energy is absorbed and there is less wave overtopping.
- Less dissipative structure due to solid face and generally steeper slope that reflects more wave energy and has generally higher wave overtopping rates.

**Design life**

- Similar, 50 years

**Maintenance**

- Similar

**Indicative Cost (Physical Works Only)**

- $3,000 per lin. m
- $8,000 per lin. m

16. Replacement with a rock armour revetment option is recommended to remediate the storm damage and scour above the existing tipped rock. The proposed rock armour revetment option will:

i. dissipate more wave energy, be less reflective and have lower wave overtopping rates than the alternative grouted rock wall option. Minimising the risk of beach/sand loss.

ii. be more readily adapted for future sea level rise.

iii. enable improved public access with steps through the rock armour revetment to provide safe connection to the foreshore from the reserve.

iv. accommodate improved public access and amenity landward of the revetment crest should the local board chose to invest in this enhancement in the future.

v. be able to progress as repair to the existing lawful reclamation meaning that remediation can commence with minimal delay and risk to further erosion and public safety is minimised.
Ngā whakaaweawe me ngā tirohanga a te rōpū Kaunihera
Council group impacts and views
17. This recommendation has been informed with input from the following council departments: Engineering Technical Services; Community Services; Community Facilities, and Regulatory Services.

Ngā whakaaweawe ā-rohe me ngā tirohanga a te poari ā-rohe
Local impacts and local board views
18. The remediation of the tipped rock seawall at Sunkist Bay is of high interest to the local community. Community feedback on the Sunkist Bay concept plan (Attachment B) highlighted the importance of safe public access to the foreshore and along the reserve, and a community desire to enhance connectivity with beach area. The visual character of Sunkist Bay is also recognised as an important aspect of the amenity of the area.

19. The strength of community feeling is further demonstrated through a petition received by Council on 12 December 2018 (Resolution number FR/2017/213) that requested funding allocated to be "firstly invested in the building of a permanent seawall along the eroding boulder edge foreshore in Sunkist Bay." (Refer to Attachment C)

20. The Tonkin and Taylor options report was worked up with the Franklin Local Board on 4 September 2018. Some members of the board reiterated the community interest in an alternative grouted seawall option. The board also expressed interest in opportunities to enhance recreational and visual amenity values as part of the project.

Tauākī whakaaweawe Māori
Māori impact statement
21. The coastal environment of Sunkist Bay is of interest to a number of mana whenua groups. The appropriate mana whenua groups will be consulted in relation to the proposed remediation option should the board approve the addition of the project to the Franklin Local Board work programme.

Ngā ritenga ā-pūtea
Financial implications
22. The indicative cost estimate for the rock armour revetment is $970,000, which includes professional services, physical works for coastal erosion protection, internal charges and contingency.

23. The cost estimate includes consenting; however does not include any unforeseen consent conditions that may have to be met before being granted. Should this risk materialise, a funding variation will need to be sought from within the renewal programme budget.

24. The estimate does not include additional features to enhance public access along the reserve, landscape design features or delineation of parking and vehicle access on the adjacent reserve. Should the board wish to broaden the scope of the project to engage specialist landscape designers to provide options for enhanced public access and visual amenity in Sunkist Bay reserve, additional funding would be required.

25. The allocation for this project from within renewals programme is as below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018/2019 – Coastal Renewals</td>
<td>$100,000</td>
</tr>
<tr>
<td>2019/2020 – Coastal Renewals</td>
<td>$870,000 (provision will be allocated to the board in the 2019/2020 Annual Plan to fund the balance).</td>
</tr>
</tbody>
</table>
26. Additional Discretionary Works – Walkway improvements and/or landscape design features is out of scope for this project. These may be funded using LDI Capex or alternative sources of funding.

Ngā raru tūpono me ngā whakamaurutanga

Risks and mitigations

27. Temporary safety fencing has been erected above the scoured reserve edge to mitigate potential risks to pedestrians from existing damage and to avoid vehicles parking close to the top of the bank and worsening damage from existing erosion; however this temporary solution does not eliminate risk.

28. If no works are undertaken there is a risk that, in the event of any future storm events, there may be additional wave overtopping induced scour of reserve and damage to the carpark area at Sunkist Bay.

29. If the Franklin Local Board does not approve the recommended option and instructs staff to proceed with a grouted seawall option the following risks have been identified:
   i. Increased wave overtopping rates experienced for the grouted rock seawall because it is more reflective and less dissipative than rock armour revetment.
   ii. Increased time and cost associated with consent application for grouted rock seawall, and risk that consent application may be declined.
   iii. Unforeseen consent conditions could impact on scope and budget, and may trigger future budget variation.
   iv. The rock armour revetment structure is more adaptable to future management options to address wave overtopping and sea level rise than a grouted rock seawall that would be more expensive to adapt in the future.

Ngā koringa ā-muri

Next steps

29. Following a decision by the Franklin Local Board on the staff recommendation to replace the tipped rock seawall with a armoured rock revetment seawall, the next steps will be:
   1. Tonkin + Taylor Ltd to commence stakeholder consultation, and proceed with detailed design and tender documents.
   2. Tender release on a competitive basis
   3. Tender negotiation and award
   4. Physical works
   5. Practical completion and handover.

30. The Franklin Local Board may wish to extend the project to include development of additional landscaping features above the rock armour revetment to enhance public access along the reserve, any parks amenity structures or delineation of parking and vehicle access on the adjacent reserve. In this instance, the board would need to request a report seeking additional funding to engage specialist landscape designers to provide options for enhanced public access and visual amenity in Sunkist Bay reserve.

Ngā tāpirihanga

Attachments

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A²</td>
<td>Remedial Works, Sunkist Bay - Tonkin + Taylor Ltd Report dated August 2018</td>
<td>11</td>
</tr>
</tbody>
</table>
Item 24

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Sunkist Bay Concept Plan December 2017</td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td>Sunkist Bay Petition</td>
<td>69</td>
</tr>
</tbody>
</table>

Ngā kaihaina Signatories

<table>
<thead>
<tr>
<th>Author</th>
<th>Rodrigo Pizarro - Senior Property Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorisers</td>
<td>Rod Sheridan - General Manager Community Facilities</td>
</tr>
<tr>
<td></td>
<td>Nina Siers - Relationship Manager</td>
</tr>
</tbody>
</table>

Sunkist Bay Seawall - Remedial Work Options
 Remedial Works, Sunkist Bay
Coastal Erosion Assessment and
Detailed Design of a Rock Revetment

Prepared for
Auckland Council
Prepared by
Tonkin & Taylor Ltd
Date
August 2018
Job Number
1006734

Exceptional thinking together
www.tonkintaylor.co.nz
Document Control

<table>
<thead>
<tr>
<th>Title</th>
<th>Remedial Works, Sunkist Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>10/08/18</td>
</tr>
<tr>
<td>Version</td>
<td>DRAFT</td>
</tr>
<tr>
<td>Description</td>
<td>Remedial Works</td>
</tr>
<tr>
<td>Prepared by</td>
<td>LWHI</td>
</tr>
<tr>
<td>Reviewed by</td>
<td>PW/Q</td>
</tr>
<tr>
<td>Authorised by</td>
<td>GWP</td>
</tr>
</tbody>
</table>

Distribution:

- Auckland Council: PDF copy
- Tonkin & Taylor Ltd (FILE): 1 copy
Table of contents

1 Introduction 1
2 Site information 1
  2.1 Location 1
  2.2 Datum 2
  2.3 Existing modifications and structures 2
    2.3.1 Grouted rock seawall 3
    2.3.2 Boat ramp with grouted gabion baskets 3
    2.3.3 Rock revetment 4
    2.3.4 Northeast boat ramp and wharf 6
3 Environmental conditions 6
  3.1 Geology and beach sediment 6
  3.2 Ground conditions 6
  3.3 Topography and bathymetry 7
  3.4 Water levels 8
    3.4.1 Astronomic tide 9
    3.4.2 Storm surge 9
    3.4.3 Medium-term sea level fluctuations 10
    3.4.4 Long-term sea level rise 10
  3.5 Wind 11
  3.6 Wave climate 11
  3.7 Shoreline change 12
  3.8 Coastal inundation 13
4 Protection options 14
5 Detailed design of rock revetment option 15
  5.1 Option selection 15
  5.2 Scope of renewal 15
  5.3 Design life 15
  5.4 Design scour and beach lowering 15
  5.5 Design water level and wave heights 16
  5.6 Armour sizing 16
  5.7 Wave overtopping 16
  5.8 Services 17
  5.9 Beach access 17
  5.10 Vegetation 17
6 Conclusions 17
7 References 1
8 Applicability 1

Appendix A: Historic aerials
Appendix B: Geotechnical investigation logs
Appendix C: Site survey
Appendix D: Design drawings
Executive summary

Purpose
Auckland Council was engaged by Tonkin + Taylor (T+T) to assess coastal erosion damage along a section of damaged rock revetment, and provide detailed design information to effect renewal upgrades of this structure. Additionally, this report considers the relative benefits and disadvantages of a grouted rock structure.

Issues
Located on the north-facing coastline of Beachlands, Sunkist bay is exposed to major storm-generated northerly and north easterly storm swells that penetrate between Motutapu, Motuihe and Waiheke Islands, and wind generated waves from the north-west to the east that form in the Tamaki Strait. Overtopping of an existing rock revetment in this bay by waves has resulted in scour and erosion of the unprotected ground above the crest of this structure.

Design
Drawings of the rock revetment renewal are included in Appendix D, which show comprehensive replacement of the existing rock revetment structure within the same alignment.

Limitations
While the renewed structure proposed will address ongoing scour at crest level, overtopping will still occur.

Future sea level rise and potential beach lowering from storm waves are likely to increase future water depths at the toe of this structure which will in-turn increase the height of waves and resulting overtopping. The crest level of the rock revetment cannot be easily raised above the road. Overtopping discharge could be reduced in the future by installing a wave barrier behind the revetment crest, or installing more durable surfacing to minimise maintenance in exposed areas.
1 Introduction

Tonkin + Taylor (T+T) has been engaged by Auckland Council to assess coastal erosion along a section of damaged rock revetment indicated in Figure 1-1 and provide detailed design information to effect renewal upgrades of this structure. Additionally, this report considers the relative benefits and disadvantages of a grouted rock structure, similar to that which presently extends along the western end of this beach.

![Figure 1-1 Scour of the grassed bank behind existing rock revetment](image)

2 Site Information

2.1 Location

Sunkist Bay is located in the Tamaki Strait (see Figure 2-1) on the north-facing coastline of Beachlands. A sandy beach approximately 400 m in length is protected at each end by steep cliffed headlands.

The project area is situated at the eastern end of the bay, accessed via a sealed road from the northern end of Wakelin Road. An existing rock revetment protects a low lying area of land up to 40 m in width containing a carpark, boat ramp and reserve areas. Land surrounding this area becomes moderately steep, rising to the south.
2.2 Datum

The project datum is the Land Information New Zealand (LINZ) Auckland Vertical Datum that was set in 1946 (AVD-46). In this report AVD-46 is defined as the Reduced Level (RL). According to the Ports of Auckland datum sheets, RL 0 m is Chart Datum (CD) +1.743m. The coordinate systems used is the New Zealand Transverse Mercator 2000 (NZTM2000).

2.3 Existing modifications and structures

There are several existing coastal structures located in Sunkist Bay, as noted in Figure 2-2. These structures are discussed below based on our site observations made on 28 May 2018, historical aerial images in Appendix A and background information provided by Auckland Council.
2.3.1 Grouted rock seawall

Along its western end, a grouted rock seawall protects the approximately half of the bay. Consented in 1996 (application number H10842 by Manukau City Council), this seawall extends for roughly 250m. The profile of the wall consists of a 1(H):1(V) sloping face that rises to 2.5m RL with a vertical section to the wall crest at approximately 3.2m RL. Atop the wall’s crest is a 1.7m wide walkway backed by a low timber wall. The length of the seawall is punctuated by several concrete staircases providing access to the beach.

![Figure 2-3 Existing grouted rock seawall](image)

2.3.2 Boat ramp with grouted gabion baskets

Adjacent to the eastern end of the existing grouted rock seawall is a vertical wall comprised of grouted gabion baskets. This wall serves to protect a small concrete boat ramp that runs west off the vehicle access way onto the upper foreshore. At the time of our inspection we noted grout delaminating from this structure and wire broken open in places and fine gravels are spilling out (see Figure 2-4). These defects have resulted in exposed voids and thus the structure appears to be nearing the end of its design life. Furthermore, the boat ramp itself also contains voids as it appears the top surface has simply been poured over a former ramp (see Figure 2-5). The gradient of the boat ramp varies from approximately 4 degrees to 10 degrees.
2.3.3 Rock revetment

The existing rock revetment was consented and constructed as part of authorised reclamation works (approved MD plan 11819) in 1972. At approximately 200m long, the revetment 'protects' the bay's eastern end – primarily the reclaimed area Figure 2-6.
The slope of the revetment behind the beach face is typically 1:2.5 (V:H) making up approximately two-thirds of the revetment length. At the eastern end of the bay fronting the headland, this slope is steeper and typically 1:1.5 (H:V), although locally over steepened in some areas. The crest of the rock revetment is variable with elevation ranging from 2 m RL to 3.5m RL. The crest is known to have been overtopped by waves in the past, the action of which has caused erosion and scour of the unprotected ground above the existing rock (Figure 1-1). Scour damage behind the crest of this wall is visibly worse in more exposed areas where the rock armour crest level is lower. Beach levels at the toe of the structure range between -0.5m RL and 1 m RL. Site observations did not identify under-layer material or geotextile beneath rock armour of this structure. Concrete stairs cross the existing revetment (Figure 2-7) in the eastern end of the bay.
2.3.4 Northeast boat ramp and wharf

A boat ramp at the north-eastern end of the bay extends from the headland, adjacent to a narrow wharf structure. The wharf appears to have been extended as part of the 1972 reclamation, although present in one form or another since at least 1955 (Figure 2-6). The boat ramp appears to have been constructed after the reclamation sometime before 1988 (Appendix A).

3 Environmental conditions

3.1 Geology and beach sediment

Review of the 1:250,000 scale geological map of the Auckland area by Edbrooke S.W (2001) indicates Puketoka Formation overlying East Coast Bays Formation (ECBF). ECBF is described as muddy sandstone and mudstone of Middle Miocene flysch. Overlying Puketoka Formation in the backshore is described as mud, sand, gravel, muddy peat and lignite of Late Pliocene to Middle Pleistocene pumiceous river deposits.

3.2 Ground conditions

A geotechnical investigation was carried out on site in May 2018. Testing comprised a total of eight hand-augured boreholes along the foreshore and backshore of the existing rock revetment (see Figure 3-1). All investigation records are included in Appendix B. Eight hand-augured boreholes were completed to a target depth of approximately 5m.
Moving west to east, the series of four backshore hand augers landward of the rock revetment encountered fill material extending down to between 0.2 m RL to 0.7 m RL, similar to existing beach levels at the toe of the rock revetment. The fill material appears to be a combination of stiff to very stiff silt and clayey silt with occasional intrusions of sand, gravels and topsoil.

Puketoka Formation material was encountered below fill material comprising layers of stiff to very stiff silt, sandy silt, organic silt and clayey silt. Only one hand auger (HA1) encountered minor inclusions of peat.

The two foreshore hand augers encountered roughly 0.5m of gravelly medium to coarse beach sand with shell and cobbles before reaching Puketoka Formation comprising firm to very stiff clayey silts and sandy silts of the Puketoka Formation at remaining depths. In both of these hand augers, material became considerably stiffer, approaching hard (>200kPa).

Rocky exposures in the eastern end of the bay are thought to be of the East Coast Bays Formation. A shallow hand-augured borehole on the foreshore in this area (HA8) recovered approximately 100mm of grey sandy silt – thought to be of the East Coast Bays Formation – before refusal onto the rocky reef.

3.3 Topography and bathymetry

A topographic survey was undertaken by Madsen Lawrie Consultants on 28 May 2018. A drone (UAV) survey of the project area was also carried out by T+T at the same time.

Survey information indicates ground levels behind the rock revetment adjacent to the road are variable ranging between 2.8 m RL and 4.8 m RL. The crest of the existing rock revetment is variable with elevation ranging between 2 m RL to 3.5m RL.

In a cross shore direction the beach may be broadly characterised as having an upper beach face from approximately 0.7 m RL to -0.9m RL sloping at approximately 6 degrees and typically between
10 and 20 m wide. The upper beach transitions to a lower beach profile at approximately -0.9m RL, sloping seaward at less than 1 degree (see Figure 3-2).

Shallow intertidal reefs then extend from both the western and eastern ends of the bay at the base of headlands.

![Beach profile diagram](image)

Figure 3-2 Characterisation of cross shore profile

### 3.4 Water levels

The potential coastal flood levels at any location vary across a range of time scales. Key components that determine water level are shown in Figure 3-3 and include:

- Astronomical tides.
- Barometric and wind effects, generally referred to as storm surge.
- Medium-term sea level fluctuations, including the effects of ENSO and IPO.
- Long-term changes in sea level.
- Wave breaking (through wave set-up and run-up).
3.4.1 Astronomic tide

NIWA (2012) provides the following water levels in Table 3-1, approximately 4 km west of Sunkist Bay which are considered appropriate for this detailed design.

Table 3-1 Astronomical tidal levels near Sunkist Bay (NIWA, 2012)

<table>
<thead>
<tr>
<th>Tidal state</th>
<th>Tidal level (m RL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Astronomical Tide (HAT)</td>
<td>1.82</td>
</tr>
<tr>
<td>Mean High Water Springs 10% (MHWS10)(^1)</td>
<td>1.57</td>
</tr>
<tr>
<td>Mean Low Water Springs 50% (MLWSS0)(^2)</td>
<td>-1.02</td>
</tr>
</tbody>
</table>

\(^1\) MHWS10 calculated by the level exceeded by the highest 10% of all high tides.

\(^2\) MLWSS0 taken as the mean (50th percentile) low tide level.

3.4.2 Storm surge

Storm surge results from the combination of barometric set-up from low atmospheric pressure and wind stress from winds blowing along or onshore. This process, described in Figure 3-4, elevates the water level above the predicted tide. The combined elevation of the predicted tide and storm surge is known as the storm tide.

Stephens et al. (2013) derived storm tide estimates for the Hauraki Gulf and Waitemata Harbours by probabilistically combining the astronomical tide with storm surge and the monthly mean sea level anomaly. For eastern coasts such as the Beachlands area, joint probability analysis of both storm tides and wave conditions were carried out using coinciding significant wave heights, wave periods and storm tide elevations sampled at each high tide. Joint probability analysis described above relates to the combined likelihood of events, i.e. the probability of high storm tides and large wave events occurring simultaneously. The storm tide elevation results presented by Stephens et al. in 2013 therefore includes the effects of wave setup.
Results offshore of Sunkist Bay for a range of Annual Exceedance Probabilities (AEP) and Average Recurrence Intervals (ARI) are shown in Table 3-2. The 1% AEP storm tide elevation offshore of Sunkist Bay is 2.39 m RL. This means that, based on the information available, we can say with a reasonably certain (63%) confidence that a storm tide elevation will reach the level within the next 100 years. The majority of these high water level events occur with the combination of tropical cyclones or extra-tropical depressions and high tide levels with winds and waves predominantly from the north to east.

Table 3-2 Storm tide elevations including wave setup offshore of Sunkist Bay (Stephens et al., 2013)

<table>
<thead>
<tr>
<th>Annual exceedance probability (AEP)</th>
<th>50%</th>
<th>20%</th>
<th>10%</th>
<th>5%</th>
<th>2%</th>
<th>1%</th>
<th>0.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average recurrence interval (ARI) (years)</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Elevation (RL m)</td>
<td>2.07</td>
<td>2.16</td>
<td>2.22</td>
<td>2.29</td>
<td>2.35</td>
<td>2.39</td>
<td>2.43</td>
</tr>
</tbody>
</table>

3.4.3 Medium-term sea level fluctuations

Atmospheric factors such as season, ENSO and IPO can all affect the mean level of the sea (MLOS) at a specific time. The combined effect of these fluctuations is up to 0.25 m (Hannah & Bell, 2012).

3.4.4 Long-term sea level rise

The Ministry for the Environment (MfE, 2017) guidelines on climate change use four sea level rise scenarios based on the Intergovernmental national Panel on Climate Change (IPCC, 2014) projections of three Representative Concentration Pathway (RCP) emission scenarios. These are the
median projections of the RCP 2.6, RCP 4.5 and RCP 8.5, and RCP 8.5+ the upper end of the ‘likely range’ (i.e. 83rd percentile) of the RCP 8.5 projection.

Table 3-3 MFE (2017) Sea level rise projections from the 1986-2005 baseline for the four RCP emission scenarios

<table>
<thead>
<tr>
<th>Year</th>
<th>RCP 2.6 M¹</th>
<th>RCP 4.5 M</th>
<th>RCP 8.5M</th>
<th>RCP 83”+ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2070</td>
<td>0.32 m</td>
<td>0.36 m</td>
<td>0.45 m</td>
<td>0.61 m</td>
</tr>
<tr>
<td>2120</td>
<td>0.55 m</td>
<td>0.67 m</td>
<td>1.06 m</td>
<td>1.36 m</td>
</tr>
</tbody>
</table>

¹ - M = median

The values presented in Table 3-3 are relative to a baseline based on the average sea level between 1986 and 2005. For the purposes of our calculations we have associated the baseline (0 m) mid-way within this baseline range in 1995. Although not specifically provided in the MFE guidance, 2018 values have been interpolated between the baseline (taken as 1995) and 2020. Relative to interpolated values for 2018 these projections for SLR range from 0.25 m to 0.51 m for the 50 year time frame (i.e. by 2070) and 0.48m to 1.26m for the 100 year time frame (i.e. by 2120).

3.5 Wind

The Musick Point weather station provides the closest long term wind dataset for the site. The station is located approximately 9 km to the northwest and is considered to be representative of the wind climate at the site. Figure 3-5 shows the wind rose plot for Musick Point EWS for data from January 2000 to January 2010 (Agent number 18195, operated by ARC and accessed via NIWA Ciflo).

Figure 3-5 shows there are two principal wind directions; from the west to south west sectors approximately 50% of the time, and from north east to east sectors approximately 25% of the time. Maximum wind speeds at Musick Point typically occur from the north east to east sector.

![Wind rose plot](image)

Figure 3-5 Location and wind rose for Musick Point EWS 2000-2010 data (source: NIWA Ciflo database)

3.6 Wave climate

Waves are typically fetch and depth limited events. Sunkist Bay is located in the Tamaki Strait (see Figure 2-1), on the north-facing coastline of Beachlands. From this position, the bay is exposed to major storm-generated northerly and north easterly swells that penetrate between Motutapu, Motuhi and Waiheke Islands, and wind generated waves from the north-west to the east that form in the Tamaki Strait.
Stephens (2013) calculated 100 yr ARI and 50 yr ARI wave heights of 1.8 m and 1.75 m (ref location 20) off the Beachlands Peninsula in deeper water. From an existing SWAN model of the Hauraki Gulf (T+T, 2018), significant wave heights were extracted for wave fronts approaching the Sunkist Bay shoreline. The SWAN model employed a 250m by 250m grid of the Hauraki Gulf and a 50m by 50m nested grid of the Tamaki Strait. With these grids, wave conditions were modelled for a 1% AEP storm tide plus a 50 year allowance for SLR (i.e. 0.5m) and north-westerly wind speeds for 1, 50 and 500 year average recurrence intervals. Significant wave heights approximately 3km offshore of Sunkist bay are presented below in Table 3-4.

<table>
<thead>
<tr>
<th>ARI (years)</th>
<th>Wind Speed (m/s)</th>
<th>Significant Wave Height (m)</th>
<th>Peak Wave Period (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>1.7</td>
<td>5.1 (Tm=4.6)</td>
</tr>
<tr>
<td>50</td>
<td>26</td>
<td>2.1</td>
<td>5.5 (Tm=5.0)</td>
</tr>
<tr>
<td>500</td>
<td>30</td>
<td>2.3</td>
<td>5.7 (Tm=5.2)</td>
</tr>
</tbody>
</table>

Closer to the nearshore in shallower water, waves frequently become depth limited, often when significant wave heights approach 60% of the water depth. The depth of water becomes critical when assessing wave heights for revetment design. This water depth is likely to increase as a result of storm induced beach scour and separately future sea level rise.

Extreme wave heights frequently coincide with storm surge conditions and accordingly design of coastal protection in this area (discussed in more detail later in this report) requires consideration of depth limited waves in storm surge conditions as oppose to astronomical tide.

### 3.7 Shoreline change

Historic aerial photographs and the recent T+T UAV survey have been reviewed to better understand historic shoreline change. The following datasets have been rectified and reviewed:

- 1961 aerial photograph (sourced from Retrolens.nz and licensed by LINZ CC-BY 3.0)
• 1972 aerial photograph (sourced from Retrolens.nz and licensed by LINZ CC-BY 3.0)
• 1998 aerial photograph (sourced from Retrolens.nz and licensed by LINZ CC-BY 3.0)
• 2018 T+T UAV survey

The historic aerial photographs have been georeferenced using distinct land features (e.g. houses, roads, vegetation or other topographic features) as a reference that are present in multiple aerial photographs.

In these photographs a distinct colour change occurs at the transition between the upper beach and lower beach profiles in the intertidal area. From the recent survey this transition occurs at approximately -0.9 m RL. This transition has been digitised in the photographs above as a proxy for relative beach width.

This review shows:

• Prior to land reclamation, beach widths increased by 4 to 9 m between 1961 and 1972, possibly reflecting the magnitude of short –term fluctuations in beach width experienced in this area, estimated in a coastal erosion regional study by Tonkin + Taylor in 2006 (Reinen-Hamill et al., 2006) to be 5 m for Maraetai Beach.
• After the reclamation was undertaken the orientation of the upper beach profile toe rotated slightly anti-clockwise resulting in a relatively wider beach at the eastern end, and corresponding beach narrowing at the western end. The beach reclamation is likely to have contributed to this change.
• Since the reclamation was undertaken, negligible change in sandy beach width is observed in the photographs. This is consistent with geotechnical investigations behind the wall showing that fill material extending to depths very similar to existing beach levels surveyed at the toe of the revetment.

3.8 Coastal inundation

Coastal inundation in this area has implications for maintenance of the reserve areas from scour damage and health and safety for people in these areas during severe weather events.

Presently, review of extreme sea levels (still water level) in Table 3-2 indicates that coastal inundation of the road and reserve is occurring as a result of wave overtopping which is discussed further in Section 5.7.

In the future, sea level rise will progressively reduce the freeboard height between still water level and road level, increasing wave overtopping volumes and flooding. Allowing for sea level rise of 1.26 m over a 100 year timeframe (Section 3.4.4) results in an extreme still water level of 3.65 m RL. This means that localised areas of the road are likely to become inundated at the western end of the car park area from still water levels (even without overtopping).

This assessment ignores contributions from overland rainfall or storm water reticulation.
4 Protection options

Two protection options considered are:

- Renewal of the existing rock revetment with (Figure 4-1 right), or
- Replacement of the existing rock revetment with a grouted rock seawall (Figure 4-1 left) similar to that which protects the bay’s eastern end.

![Figure 4-1 Preliminary options, grouted wall left and rock revetment on right (drawings not to scale and indicative only)]

Table 4-1 below qualitatively compares these two options against a variety of design criteria.

Table 4-1 Design comparison, rock revetment versus grouted rock seawall

<table>
<thead>
<tr>
<th>Effects</th>
<th>Rock Revetment</th>
<th>Grouted Rock Seawall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character</td>
<td>Similar to existing</td>
<td>Change in beach character, but similar to seawall. Likely to require hand rail/balustrade.</td>
</tr>
<tr>
<td>Beach levels</td>
<td>Less wave reflection.</td>
<td>More wave reflection particularly in eastern corner, therefore more turbulence and potential localised scour and lowering of beach levels.</td>
</tr>
<tr>
<td>Beach access (from road to sand)</td>
<td>Similar for either option – steps can be incorporated into the structure</td>
<td></td>
</tr>
<tr>
<td>Beach access (alongshore)</td>
<td>No change in beach width</td>
<td>Potential increase in sandy beach width depending on new alignment</td>
</tr>
<tr>
<td>Effects on beach sand (and founding depth)</td>
<td>More dissipative and less wave reflection means less potential for beach lowering. Shallower founding.</td>
<td>Deeper founding required to account for wave reflection scour effects.</td>
</tr>
<tr>
<td>Planning implications</td>
<td>Repair of existing lawful reclamation either a Permitted Activity or Restricted Discretionary activity under AUP(OIP) Rules A2 or A3; A122 or A123^2</td>
<td>New hard protection structure discretionary activity under AUP(OIP) Rule A142^3</td>
</tr>
<tr>
<td>Adaptive management potential</td>
<td>Easier to reuse materials for future variations of protection.</td>
<td>Expensive to adapt.</td>
</tr>
</tbody>
</table>

^1 Pers. Comm. Quilter/Morris 29/08/2018
5 Detailed design of rock revetment option

5.1 Option selection

We understand that in the near term repair of the existing rock revetment is the preferred option to minimise ongoing scour damage in this area.

5.2 Scope of renewal

Due to the absence of geotextile and underlayer material and low crest level among other issues (Section 2.3.3), we recommend that the existing structure be completely rebuilt as indicated in Design drawings included in Appendix D.

The placement of more rock material over the existing structure will not prevent migration of fines through the existing structure and ongoing settlement and undermining of this structure. It would also significantly increase the footprint of the revetment seawall with consequent loss of beach space. As the section of revetment behind the seawall is at a flat grade (approximately 2.5H:1.0V) the new seawall can be constructed to a steeper grade or smaller and occupy a similar footprint to the existing structure.

5.3 Design life

The design life of the sections of rock revetment renewal is considered to be 50 years. Maintenance should be carried out as required to achieve the design life.

5.4 Design scour and beach lowering

Further to Section 3.7, scour and beach lowering could result from short term horizontal fluctuations of between 5 and 10 m, considering timescales from months to a few years and accounting for storm cutback caused by singular or clusters of storms events. Allowing for an upper beach grade of 1:10, a short term fluctuation of between 5 and 10m could amount to beach lowering of as much as 1 m in loose unconsolidated sediment.

In areas of more competent exposed ECBF, less beach lowering is expected, and we have allowed for up to 300 mm of down cutting within the 50 year design life.

Beach levels at the toe of the structure range between -0.5 m RL at the eastern end overlying exposed ECBF rock, to 0.8 m RL along the rear of the upper beach profile over unconsolidated beach sediment.

Allowing for different scour and beach lowering in these areas, a future design beach toe level of -0.8 m RL has been used in design throughout. The base of the rock revetment is to be buried a further 500 mm below this level.

Based on site observations and refusal in ground investigations, the buried toe of the existing structure generally extends approximately 1.5 m seaward of its visible extent (approx. -0.3m RL). Accordingly the buried toe of the proposed revetment is unlikely to extend more than 1.5 m seaward of the existing revetment toe.

<table>
<thead>
<tr>
<th>Overtopping</th>
<th>More dissipative with less overtopping</th>
<th>Less dissipative with higher overtopping rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design life</td>
<td>Similar, 50 years</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>Similar</td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>$3,000 per lin. m</td>
<td>$8,000 per lin. m</td>
</tr>
</tbody>
</table>

Tennink & Taylor Ltd
Remedial Works, Sunkist Bay - Coastal Erosion Assessment and Detailed Design of a Rock Revetment
Auckland Council
5.5 Design water level and wave heights

As discussed in Section 3.6, the depth of water becomes critical when assessing wave heights for revetment design.

Extreme wave heights in this area frequently coincide with storm surge conditions and accordingly design of this coastal protection requires storm surge conditions for the estimation of depth limited waves, rather than astronomical tide. A 1% AEP storm tide level of 2.39 m RL is presented in Table 3-2 which includes allowance for wave setup.

Allowing for a design life of 50 years and sea level rise of 0.35 m (RCP 8.5M) in addition to this 1% AEP level gives a design still water level of 2.74 m RL.

Allowing for future storm scour and beach lowering to -0.8 m RL (Section 5.4 above) gives a water depth of 3.54 m. Maximum depth limited wave heights (significant wave height) under such conditions (0.6 x water depth) are approximately 2.12 m. This wave height is closest to that generated by a 50 year ARI wind speed in Table 3-4 and has been used as the design wave height in Section 5.6 below.

5.6 Armour sizing

The armour rock and underlayer for revetment renewal were assessed using the method of Van der Meer as set out in the Rock Manual (CIRA, 2007). The armour layer has been sized to withstand depth-limited wave height of 2.12 m as discussed above in Section 5.5 and allowing for minor damage ("start of damage"). The mass density of the rock was assumed to be at least 2650 kg/m³ and the storm duration assessed was 3 hours. Rock sizes below are preliminary and may be adjusted upon confirmation of rock density.

Table 5-1 shows the resulting rock armour sizing required for a stable 1(V):1.5(H) slope structure. The resultant rock would have a median diameter, D50 = 1.17 m (diameter range of 0.86 to 1.6 m) and median weight, W50 = 3000 kg (weight range of 952 kg to 6,500 kg). This would need to be placed in two layers approximately 1.8 m thick with a 0.8 m thick underlayer of smaller rock (0.35 to 0.65 m diameter) overlying a geotextile filter fabric.

<table>
<thead>
<tr>
<th>Grading class (%)</th>
<th>Rock armour</th>
<th>Underlayer material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D (m)²</td>
<td>W (kg)²</td>
</tr>
<tr>
<td>Max</td>
<td>1.6</td>
<td>6000</td>
</tr>
<tr>
<td>50%</td>
<td>1.17</td>
<td>3000</td>
</tr>
<tr>
<td>Min</td>
<td>0.86</td>
<td>1000</td>
</tr>
<tr>
<td>Layer thickness</td>
<td>1.8 m</td>
<td></td>
</tr>
</tbody>
</table>

Note: Nominal diameter (cube equivalent)² Rock diameter (average of three rock dimensions)² Rock mass

5.7 Wave overtopping

It is understood that the crest level of the rock revetment is to be similar to existing levels of the adjacent access way. As such an overtopping assessment has been undertaken to establish potential damage rather than to optimise crest levels.

To assess the wave overtopping the Neural Network tool officially adopted by EuvrOttop (Formentin et al., 2017) was employed. This tool serves to predict the hydraulic performance of coastal structures in terms of wave overtopping, wave transmission coefficient and wave reflection coefficient.
At a level of 4m RL (representative level of the road) and allowing for present day 1% AEP extreme water level and 50 yr AR wave height the mean overtopping is estimated to be less than 1 L/s per m length. This rate is within safe limits suggested by Eurotop (2016) as being safe for people standing in the vicinity of the wall crest (>1 l/s/m). The effects of this overtopping will decrease with distance from the crest. Grass appears to be well established directly adjacent to the road above the crest of the slope and we recommend that top soiling and re-grassing be undertaken in these areas at completion of these works landward of the concrete kerb.

Allowing for 50 years of sea level rise and beach lowering this rate increases to 23 l/s/m which exceeds safe limits for people standing nearby, and nearby vehicles (>20 l/s/m). These rates will likely cause visible scour damage to grassed areas behind the revetment in the future. The installation of pervious paving (e.g. Gobi block) in grassed areas may be considered in this instance separating the rear of the rock revetment and the existing pavement edge.

In lower areas such as the western and northern extents of the carpark areas and close to the boat ramps overtopping rates will be much larger exceeding 100 l/s/m, even without sea level rise. These areas are effectively manoeuvring areas for the boat ramp which are not expected to be utilised during storm events.

As a general rule, grouted rock structures are less porous than rock revetments and result in comparatively higher wave overtopping.

5.8 Services

Buried services that will need to be considered during construction include two storm water outlets passing through the wall and exiting onto the beach. Refer to drawings for further details.

5.9 Beach access

Several options to provide beach access in the location of the existing concrete steps include, building new concrete steps through the renewed structure, or building a suspended timber structure over. Final details regarding this structure will be confirmed in due course by Auckland Council.

5.10 Vegetation

Two medium sized Pohutukawa trees are located within the footprint of the rock revetment renewal close the crest of this structure. Excavation within the dripline of these trees is to be undertaken under the supervision of an Auckland Council appointed arborist.

6 Conclusions

Auckland Council was engaged by Tonkin + Taylor (T+T) to assess coastal erosion damage along a section of damaged rock revetment, and provide detailed design information to effect renewal upgrades of this structure. Additionally, this report considers the relative benefits and disadvantages of a grouted rock structure.

Located on the north-facing coastline of Beachlands, Sunkist bay is exposed to major storm-generated northerly and north easterly swells that penetrate between Motutapu, Motuihe and Waheke Islands, and wind generated waves from the north-west to the east that form in the Tamaki Strait. Overtopping of an existing rock revetment in this bay by waves has resulted in scour and erosion of the unprotected ground above the crest of this structure.

Drawings of the seawall renewal are included in Appendix D, which show comprehensive replacement of the existing rock revetment structure within the same alignment.
7 References


NIWA (2012). *Development of an updated Coastal Marine Area boundary for the Auckland Region.*


8 Applicability

This report has been prepared for the exclusive use of our client Auckland Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by: Authorised for Tonkin & Taylor Ltd by:

.................................................. ..................................................
Lucy Whitelock-Bell Grant Pearce
Water Resources Engineer Project Director

and

Peter Quilter
Coastal Engineer

LWHI
C:\users\grw\downloads\20180605_design_report_v3jm_notes.docx
Appendix A: Historic aerials
1972 Manually rectified aerial
Sourced from Retrolens.nz and licensed by LINZ CC-BY 3.0
- Reclaimed eastern end
- Extended wharf in place at north eastern headland
- Rock revetment and boat ramp in place
- Natural coastline at western end
1988 Manually rectified aerial
Sourced from Retro lens.nz and licensed by LINZ CC BY 3.0
- Reclaimed eastern end
- Small wharf in place at north eastern headland
- Boat ramp at north eastern headland in place
- Rock revetment and boat ramp in place
- Natural coastline at western end
Appendix B: Geotechnical investigation logs

- [Text here]
Sunkist Bay Seawall - Remedial Work Options
### Sunkist Bay - Remedial Work Options

**Hand Auger Log**

**HOLE**: HA02  
**DATE**: 26 February 2019

**PROJECT**: Sunkist Bay  
**LOCATION**: Sunkist Bay, Beachlands  
**JOB**: J006734

**CO-ORDINATES**  
**DRILL TYPE**: 64mm hand auger  
**R.L.**: —  
**DATE**: 26/02/2019

**GEOLOGICAL DESCRIPTION**

<table>
<thead>
<tr>
<th>DEPTH (M)</th>
<th>DESCRIPTION AND ADDITIONAL OBSERVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 M</td>
<td>Silt, non-plastic, abundant gravel, moist, dark brown; brown from 0.2 m</td>
</tr>
<tr>
<td>0.5 M</td>
<td>Clayey silt, low plasticity, moist, yellowish brown; mottled light grey</td>
</tr>
<tr>
<td>1.0 M</td>
<td>1.0 m: light grey, mottled brown, occasional fine</td>
</tr>
<tr>
<td>2.6 M</td>
<td>Silt, non-plastic, moist, greenish grey</td>
</tr>
<tr>
<td>3.0 M</td>
<td>Clayey silt, low plasticity, moist, light greenish grey</td>
</tr>
<tr>
<td>3.6 M</td>
<td>Organic silt, non-plastic, moist, brown and black</td>
</tr>
<tr>
<td>5.15 M</td>
<td>Silt, non-plastic, moist, light grey</td>
</tr>
</tbody>
</table>

**Comments**

---

**Drilling Partially Completed**

---

**Do Not Bore**
Beach Deposits

- *Casing Water*: 0.5 m
- *Drill Type*: 65/8 kPa
- *Mud Log*: M-04

Silty clayey, medium plasticity, moist, light greyish brown

- 0.6 m: light/greenish grey to brown, minor organics

Pukaki Formation

- *Casing Water*: 2.0 m
- *Drill Type*: 75/11 kPa
- *Mud Log*: M-05

- 2.3 m: Light/greenish grey
- 3.3 m: Light grey mottled black

- 3.6 m: Target depth

- *Casing Water*: 3.6 m
- *Drill Type*: 104/12 kPa
- *Mud Log*: M-06

- 5.6 m: Target depth

**Description and Additional Observations**

- Gravelly medium to coarse SAND with cobbles, loose, saturated (hand dug). Hole cased off to clay and continued
**Hand Auger Log**

**Project:** Sunkist Bay  
**Location:** Sunkist Bay, Beachlands  
**Job No.:** 1006734

**Co-ordinates (NZTRMS):**  
**Drill Type:** S80mm Hand auger  
**Drill Method:** HA  
**Hole Started:** 28/09/2018  
**Hole Finished:** 28/09/2018  
**Drilled by:** Geotechnics  
**Logged by:** RE

**Geological Description:**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
<th>Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beach Deposits</td>
<td>Gravelly medium to coarse sand, with shell, loose, collapsing, hand dug and cased off to clay</td>
<td></td>
</tr>
</tbody>
</table>
| Pulabtoba Formation | clayey silt, medium plasticity, moist, light grey  
1.0m: light brown  
sandy silt, non-plastic, moist, grey  
delayed silt, medium plasticity, moist, light grey  
mottled dark brown  
1.8m: light grey  
2.3m: light brown and light grey  
sandy silt, non-plastic, moist, grey  
3.8m: organic layer, dark brown |

**3.9m: Target depth**
**Franklin Local Board**
26 February 2019

**HAND AUGER LOG**

**PROJECT:** Sunkist Bay  
**LOCATION:** Sunkist Bay, Beachlands  
**JOB No.:** 1006734

**COORDINATES:** (NGDC)  
**DRILL TYPE:** Soils hand auger  
**DRILL METHOD:** HA  
**HOLE STARTED:** 28/02/2018  
**HOLE FINISHED:** 28/02/2018  
**DRILLED BY:** GOTECHNICS  
**LOGGED BY:** RSE  

**GEOLOGICAL**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description and Additional Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>SILT, non-plastic, moist, dark brown (topsoil)</td>
</tr>
<tr>
<td>0.5</td>
<td>Angular line to medium GRAVEL, angular cobbles at 0.2m. Hand dug</td>
</tr>
<tr>
<td>1.0</td>
<td>Clayey SILT, low plasticity, moist, yellowish brown with dark brown silt and minor fine gravel</td>
</tr>
<tr>
<td>2.0</td>
<td>1.0m: moist to wet</td>
</tr>
<tr>
<td>4.0</td>
<td>Clayey SILT, medium plasticity, wet, light grey and brown</td>
</tr>
<tr>
<td>7.0</td>
<td>Clayey SILT, low plasticity, moist, light grey with minor yellowish brown mottles</td>
</tr>
<tr>
<td>9.0</td>
<td>2.1m layer of orange gravel, penetrated with</td>
</tr>
<tr>
<td>9.5</td>
<td>Clayey SILT, medium plasticity, moist, light grey and light brown with minor topsoil inclusions</td>
</tr>
<tr>
<td>11.0</td>
<td>Clayey SILT, medium plasticity, moist, light brown speckled black</td>
</tr>
<tr>
<td>11.5</td>
<td>Sandy SILT, non-plastic, moist to wet, grey</td>
</tr>
<tr>
<td>12.0</td>
<td>Clayey SILT, low plasticity, moist, grey</td>
</tr>
</tbody>
</table>

**Puketaka Formation**

**HOLE ID:** HA07  
**SHEET:** 1 OF 1

** Comments**

**Attachment A**

Item 24
Appendix C: Site survey
Appendix D: Design drawings

- [Text here]
NOTE:
1. ALL LEVELS ARE IN METERS AND RELATIVE TO AUCKLAND VERTICAL OR
   DATUM (VA = 0.0), REFERRED TO AS SEA LEVEL. Level (RL) is
   referred to as sea level.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
3. ROCK SIZE TO BE CONFIRMED AT DETAILING STAGE.
4. ROCK SIZE BASED ON A UNIT WEIGHT OF D3000 = 1.93.

SECTION 1 TYPICAL ROCK REVETMENT

FIRSTE ISSUE

Firkin Local Board
26 February 2019

Attachment A

Item 24
Item 24

www.tonkintaylor.co.nz
1. Street parking - additional angled
2. Open space - drainage improvements + walkway circulation
3. Log Cabin - potential for facilities + dehitching
4. Boat + trailer parking - potential to extend footprint
5. Youth area - parabola basketball court
6. Primary boat ramp - general improvements + launching pontoon
7. Walkways - consistent theme and highly legible for safe pedestrian flow
8. Gentle terracing - subtle design, gentle terraces to support casual gathering
9. War memorial area - small scale and contemporary design incorporated into terracing
10. Viewing platform + beach access - concrete steps into tidal water
11. Open space + picnic areas - mounded grass area for aspect, picnic tables and shade trees
12. Road terminus + short term parking - no public vehicles past this point, uniformed access to secondary boat ramps for Boat Club and emergency vehicles via removable boards and permeable paving surface
13. Walkway + promenade - contiguous pedestrian access to open space areas, beach + seating
14. Playground - all ages play space - utilize natural surroundings (bank) for play value
15. Existing walkway to First View Ave - general maintenance + enhancement
16. Existing coastal walkway - general maintenance + enhancement

SUNKIST RESERVE - PRELIMINARY CONCEPT PLAN
OVERALL PLAN | REVISION 3 | DECEMBER 2017
26 June 2017

Re: Sunkist Reserve, Beachlands, review.

To whom it may concern,

In response to the current survey we have been invited to take part in regarding -

the allocation of Franklyn Local Board funding towards the master planning of the ‘Sunkist Reserve’ to guide future developments

we the undersigned request that serious consideration be given to:-

• All funding allocated to be spent in and around this Reserve be, firstly invested in the building of a permanent sea wall along the eroding boulder edge foreshore in Sunkist Bay - as marked on your Existing Features Plan LP.01.

At the current rate of erosion what has bought people to this warm, sheltered, safe beach over many years is at great risk of disappearing all together. We ask that you start at the beginning by addressing that major issue and in turn preserving what we consider to be the real asset of the Reserve - the Beach and foreshore – before that of any future plans by the Board to ‘make the reserve a more enjoyable place to visit’.

Thank you.