

Appendix G: Site specific assessments of the
Lyttelton and Akaroa Harbour
environments

1.1 Site inspections and assessment of aerial photographs

A site inspection of the Lyttelton and Akaroa Harbour environments was carried out on 20 February 2017. The site visit was conducted by Richard Reinen-Hamill and Patrick Knook (both of Tonkin + Taylor) and accompanied by Justin Cope and a coastal surveyor from Environment Canterbury. The following areas were visited:

1. Wainui (Akaroa Harbour, west side)
2. Duvauchelle (Akaroa Harbour, north side)
3. Takamatua Bay (Akaroa Harbour, east side)
4. Akaroa (Akaroa Harbour, east side)
5. Alandale (Lyttelton Harbour, west side)
6. Teddington (Lyttelton Harbour, southwest side)
7. Charteris (Lyttelton Harbour, south side)

During the site visit a location for a representative beach transect was established and a topographic survey was subsequently carried out by the ECan survey team to provide information on the upper beach and bank slopes. Purau was not surveyed as there is already a survey profile established as part of the Lyttelton Port monitoring programme and this profile was used.

1.1.1 Wainui

Wainui is located on the western shoreline of Akaroa Harbour and is oriented to the south-east facing the harbour entrance.

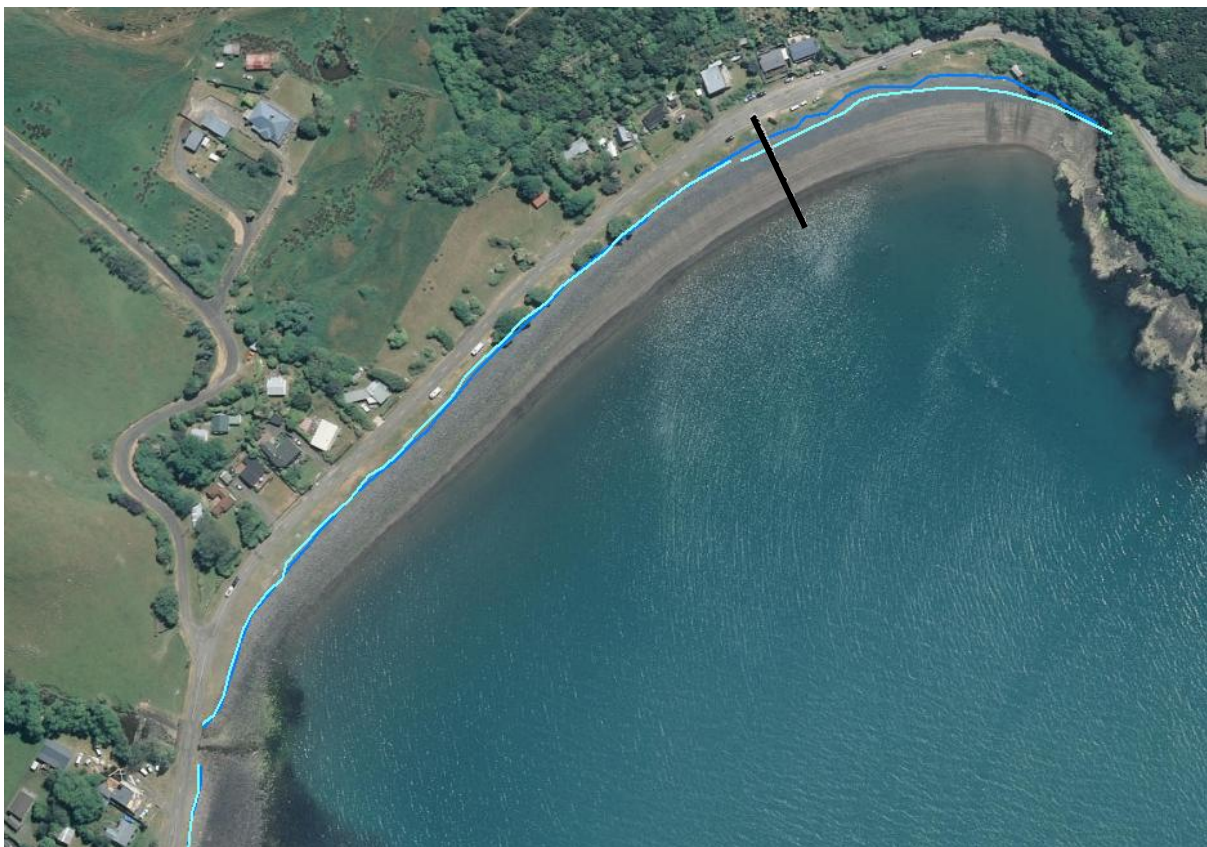


Figure G1 Aerial view of Wainui Beach from the stream at the southern end of the beach to the rocky headland to the east with the location of the survey transect (black line) indicated and the 1980-1984 (light blue line) and 2005-2017 shoreline (dark blue line) derived from aerial imagery (source: Canterburymaps.govt.nz)

It is a composite beach fronting a narrow grass road reserve. The upper intertidal and subaerial beach is gravel with a more sandy mid and lower intertidal area (refer Figure G2). A typical section through the beach is shown in Figure G3. Road levels vary from around 3 m RL in the vicinity of the stream outlet to around 4.5 m RL at the location of the beach profile. There is around an 0.5 m high steep bank down to the top of the gravel beach and the gravel beach zone is around 10 m wide with a slope of around 1(V):5(H) and the slope flattens to around 1(V):15(H) within the intertidal sand zone.

Based on the aerial photograph assessment there appears to have been around 4 m of retreat at the northern end of the bay from the early 1980's to the present, although the recent photograph shows this area is grassed over, so it may just indicate a fluctuating shoreline responding to shorter term fluctuations. The remainder of the shoreline appears reasonably stable.



Figure G2 Wainui Beach

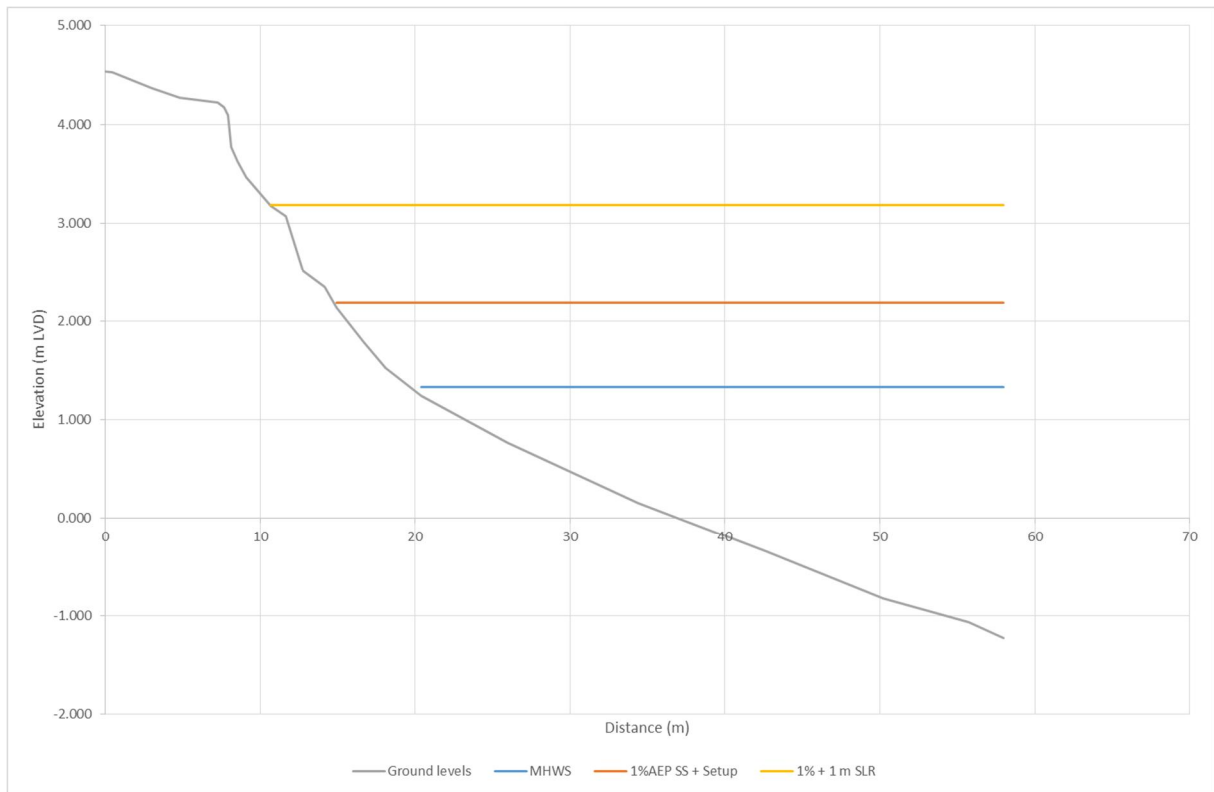


Figure G3 Section through beach at Wainui

1.1.2 Duvauchelle

Duvauchelle comprises two south-south-east facing bays situated at the northern extent of Akaroa Harbour. The bays are fronted by extensive intertidal flats (Figure G4).



Figure G4 Aerial view of Duvauchelle with the location of the survey transect (black line) indicated and the 1980-1984 (light blue line) and 2005-2017 shoreline (dark blue line) derived from aerial imagery (source: Canterburymaps.govt.nz)

It is a predominantly fine sand beach with a narrow shelly/gravel band fronting a low lying grass/road reserve. On the grass areas a raised area of the reserve acting as a low bund is evident (Figure G5). A typical section through the beach is shown in Figure G6. A low concrete seawall is evident along much of the coastline and in some locations accretion has occurred burying the seawall.

Reserve levels close to the beach are generally less than 2 m RL while road levels increase up to 3m RL. The narrow gravel/shell zone has a slope of around 1(V):6(H) and the slope flattens to around 1(V):30(H) on the fine sand and further flattens to 1(V):200(H) within the intertidal sand zone.

Based on the aerial photograph assessment there appears to have been no significant change in the vegetation line position from the early 1980's to the present.



Figure G5 Grass Reserve and beach at Duvauchelle

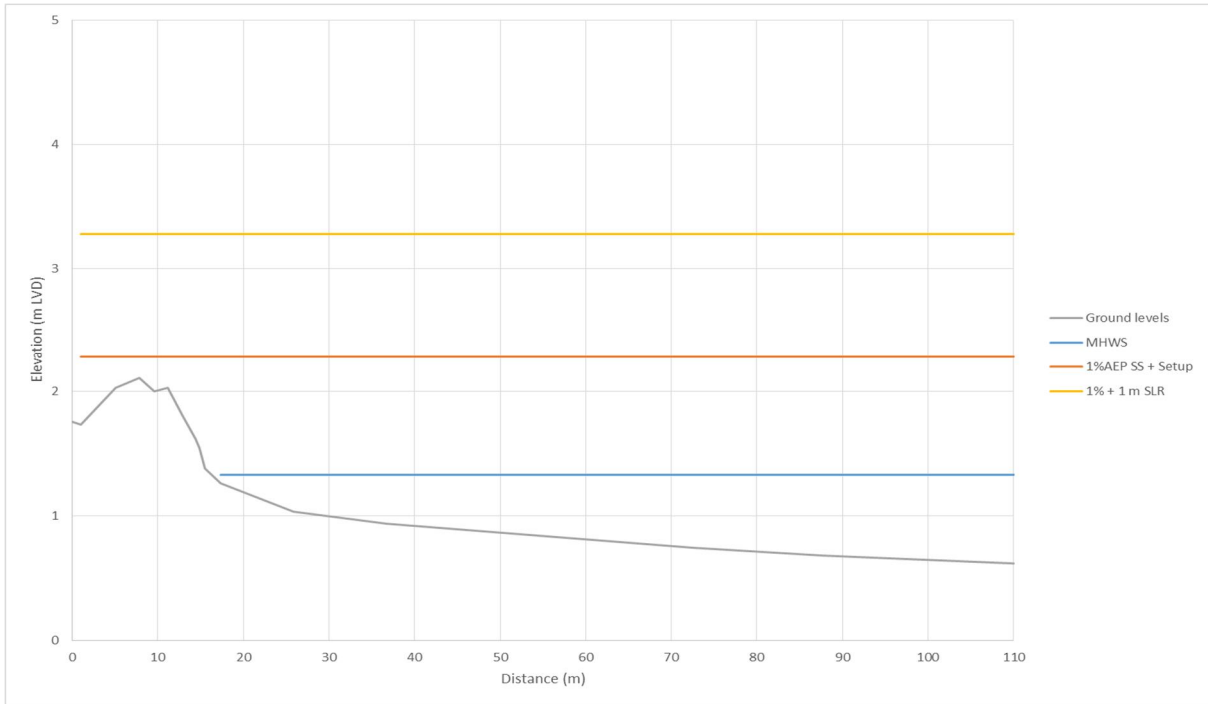


Figure G6 Section through beach at Duvauchelle

1.1.3 Takamatua Bay

Takamatua Bay is a west-north west facing alluvium shoreline bounded by cliff promontories.



Figure G7 Aerial view of Takamatua Bay with the location of the survey transect (black line) indicated and the 1980-1984 (light blue line) and 2005-2017 shoreline (dark blue line) derived from aerial imagery (source: Canterburymaps.govt.nz)

It is a predominantly fine sand beach with a narrow shelly/gravel band fronting a low lying grass/road reserve (Figure G8). A typical section through the beach is shown in Figure G9. A low concrete seawall with a level of around 1.5 m RL is evident along some of the coastline and in some locations accretion has occurred burying the seawall.

Reserve levels close to the beach are generally less: between 1.5 and 2 m RL. The narrow gravel/shell zone has a slope of around 1(V):8(H) and the slope flattens to around 1(V):27(H) on the fine sand and further flattens to 1(V):95(H) within the intertidal sand zone.

Based on the aerial photograph assessment there appears to have been no significant change in the vegetation line position from the early 1980s to the present.



Figure G8 Grass reserve and beach at Takamatua

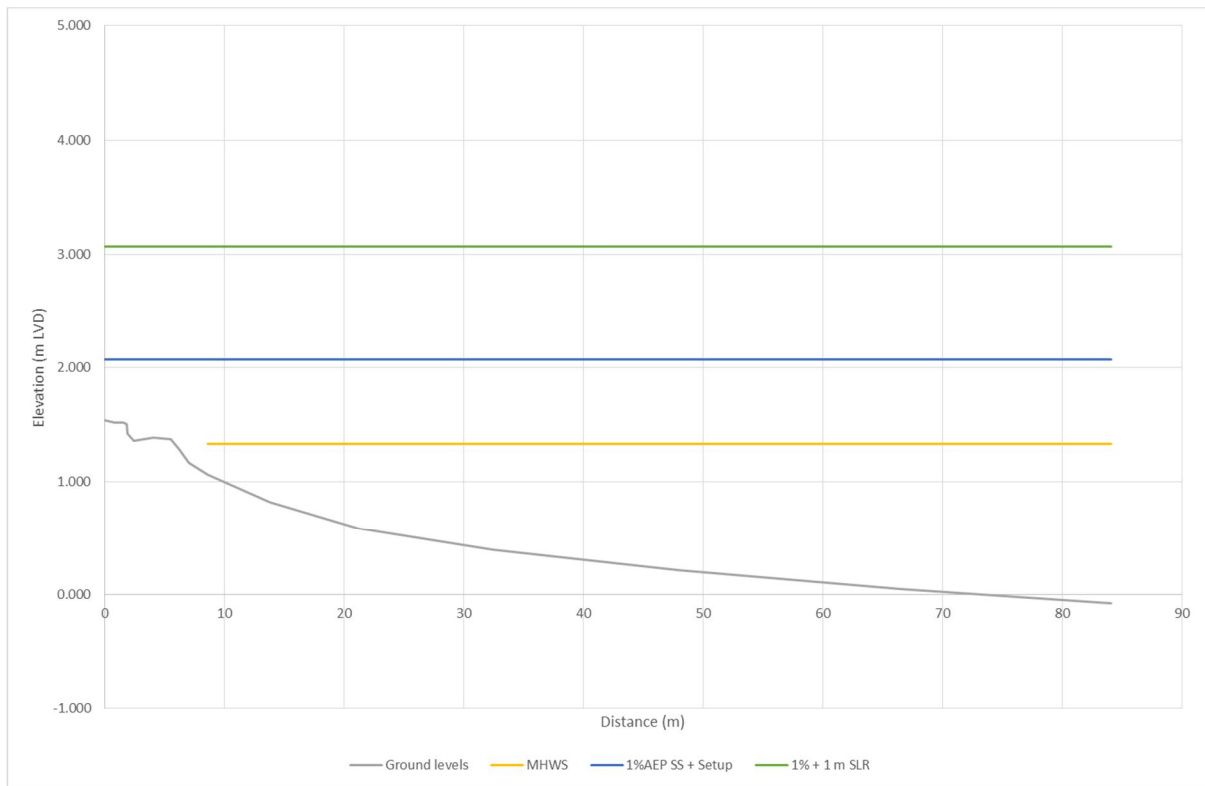


Figure G9 Section through beach at Takamatua

1.1.4 Akaroa

Akaroa is located along the eastern shores of French and Childrens Bay. There are natural beaches backed by cliffs at the northern end of the bay and seawalls along the main settlement comprising vertical seawalls (see Figure G10) with some rock armour revetments protecting a largely cliff coast. Due to the extensive seawalls extending along the coast at this location no survey or aerial photograph analysis was carried out.



Figure G10 Akaroa foreshore

1.1.5 Allandale

Allandale is a north-easterly facing foreshore in Governors Bay between two cliff promontories extending into upper reaches of Lyttelton Harbour with two small streams discharging to the coast. Part of the bay was historically used as a landfill and this can be seen by the seaward movement of the shoreline in Figure G11. The shoreline north of the northern stream outlet has been armoured with a sloping rock revetment. Erosion is evident between the two streams. Based on observations made during the site inspection, it is likely that landfill extended south of the stream outlet has adjusted to a more natural shoreline position over time. The remaining shoreline comprises a low bank (1(V):2(H)) to a flat foreshore (1(V):280(H)) and no significant evidence of change based on the historic aerial photograph assessment.



Figure G11 Aerial view of Allandale with the location of the survey transect (black line) indicated and the 1970-1974 (light blue line) and 2005-2017 shoreline (dark blue line) derived from aerial imagery (source: Canterburymaps.govt.nz)



Figure G12 Allandale foreshore between the two streams showing a steep bank with some evidence of erosion and a flat muddy/sandy intertidal area

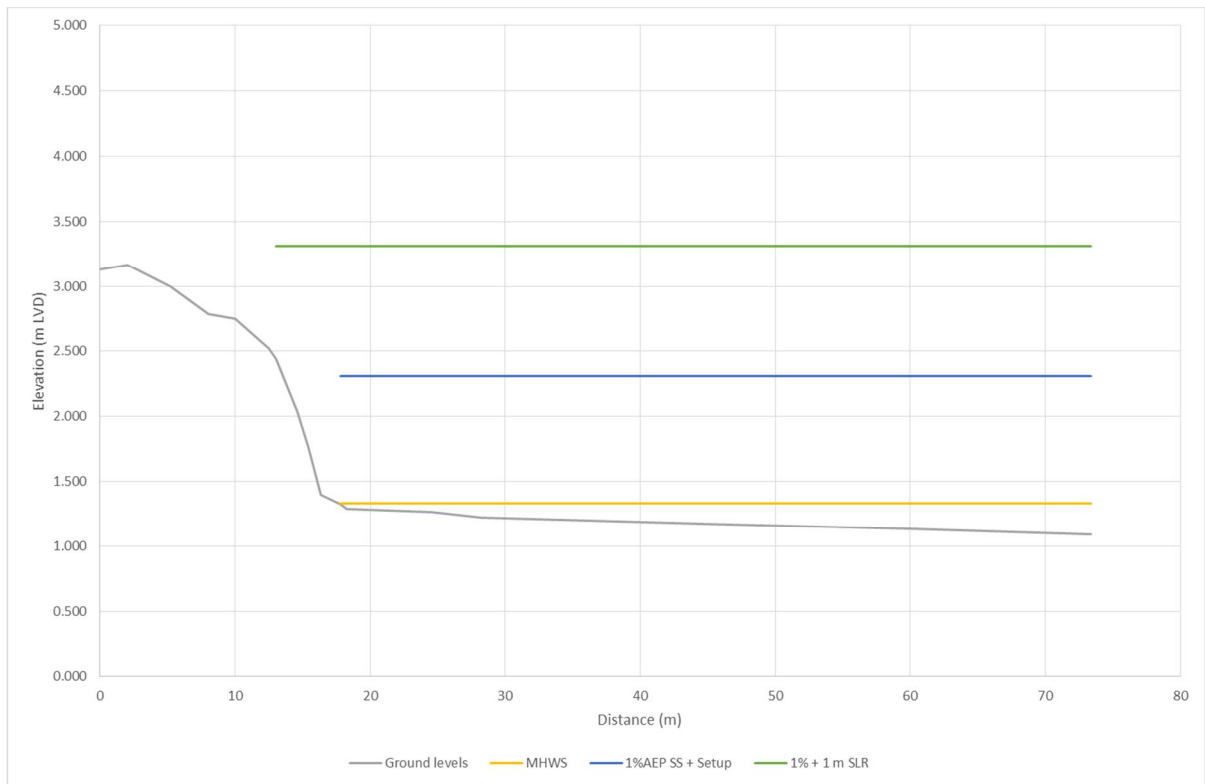


Figure G13 Typical foreshore section at Allandale

1.1.6 Teddington

Teddington has a northerly facing foreshore in Head of the Bay between two cliff promontories extending into the upper reaches of Lyttelton Harbour (Figure G14). The intertidal flats extend up to 1 m RL with the land area only marginally higher (1.2 to 1.5 m RL). The land area is predominantly comprised of extensive salt marshes and farm land with evidence of flood bunds around the farmed area. The aerial photograph analysis shows generally little shoreline change, although there are areas both of localised accretion and erosion. The bank along the edge of the coast is steep (around 1(V):2(H)) and low (refer Figure G15).



Figure G14 Satellite image of the Teddington shoreline with the 1970-1974 (light blue line) and 2005-2017 shoreline (dark blue line) derived from aerial imagery (source: Canterburymaps.govt.nz)



Figure G15 Foreshore adjacent to Teddington

1.1.7 Charteris Bay

The coastline along Charteris Bay is predominantly cliff coast with some small indented alluvial coastal areas between rocky outcrops and headlands. The main alluvial area adjacent to the road reserve is northerly facing towards the bottom of the bay (refer Site A, Figure G16), but there is also a shallow embayment with rock armour adjacent to the road in the centre of the bay (refer Site B, Figure G16).



Figure G16 Charteris Bay (Source: GoogleEarth)

The results of the analysis of historic aerial photographs is shown in Figure G17 for Area A. This shows that shorelines have eroded 5 to 10 m over 35 to 45 years (in the order of 0.1 m to 0.2m per year of erosion). Based on visual assessment, erosion is also evident along the cliff coast where rock platforms are evident in the intertidal area. However, some of the higher rates of erosion appear to be occurring in areas of fill and it is possible that these higher rates are occurring where there has been historic reclamations and ground raising. Based on the survey section in Area A (see Figure G20) the upper beach slope is around 1(V):8(H) and the foreshore slope is around 1(V):70(H). From visual inspection the beach slope in Area B was similar to that in Area A.



Figure G17 Southern embayment in Charteris Bay with the location of the survey transect (black line) indicated and the 1970-1974 (light blue line) and 2005-2017 shoreline (dark blue line) derived from aerial imagery (source: Canterburymaps.govt.nz)



Figure G18 Eroding bank in southern area of Charteris Bay (Area A of Figure G16)



Figure G19 Rock revetment protection along road reserve in Charteris Bay (Area B in Figure G16)

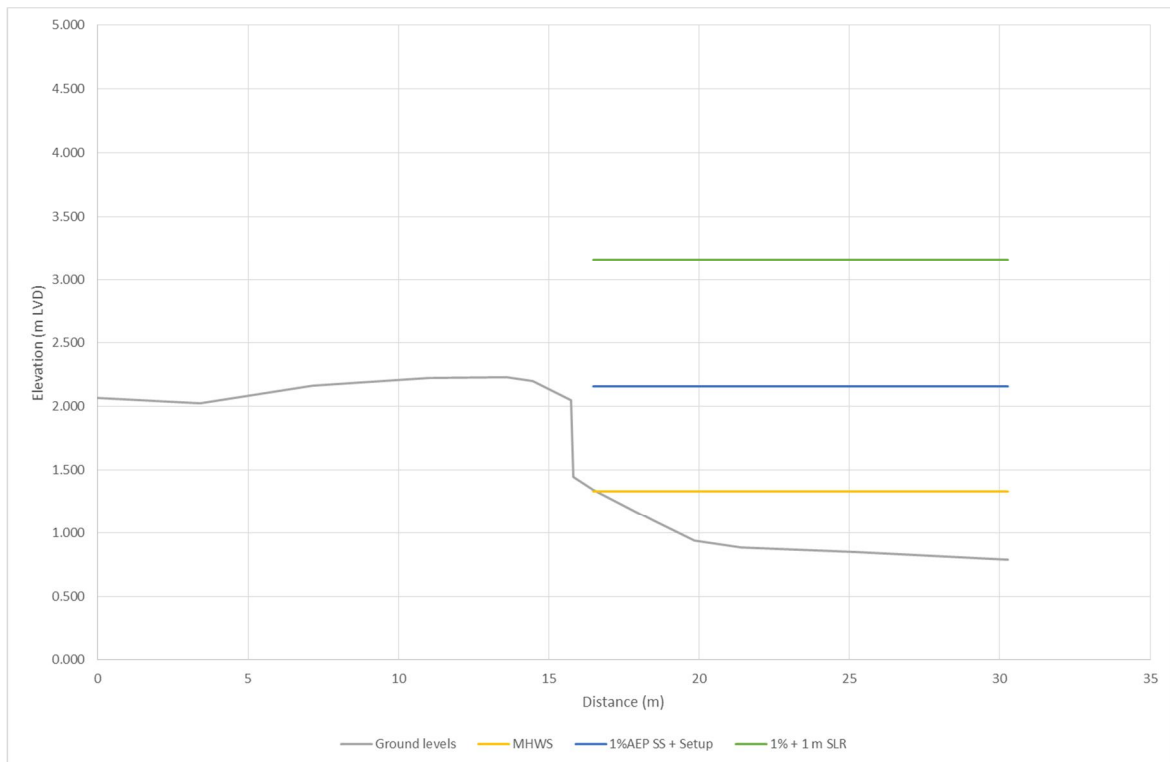


Figure G20 Foreshore transect in Charteris Bay (Area A in Figure G16)

1.1.8 Purau

Purau Bay is a north facing deeply indented embayment on the southern coast of Lyttelton Harbour. The coastline is predominantly cliff coast with some small indented alluvial areas between rocky outcrops and headlands and in the vicinity of stream outlets. The main alluvial area adjacent to the road reserve is at the southern end of the bay (refer Figure G21).

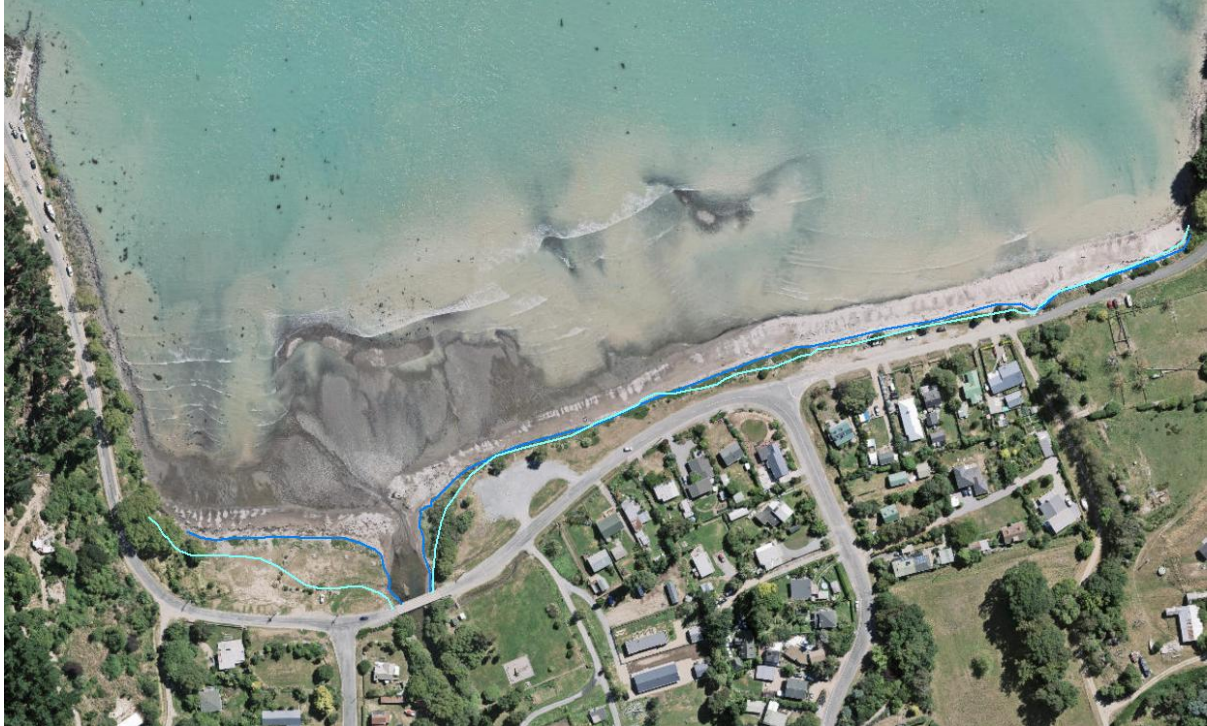


Figure G21 Purau Bay with the 1970-1974 (light blue line) and 2005-2017 shoreline (dark blue line) derived from aerial imagery (source: Canterburymaps.govt.nz)

The results of the analysis of historic aerial photographs is also shown in Figure G21. This shows that shoreline is stable, to slightly accretional, over the majority of the shoreline. There is evidence of greater accretion to the west of the stream outlet.

Based on the survey section situated along Camp Bay Road (see Figure G22 for the transect location and Figure G23 for the transect) the upper beach slope is around 1(V):9(H) and the foreshore slope is around 1(H):70(V). From visual inspection the beach slope in Area B was similar to that in Area A.



Figure G22 Purau Beach transect location

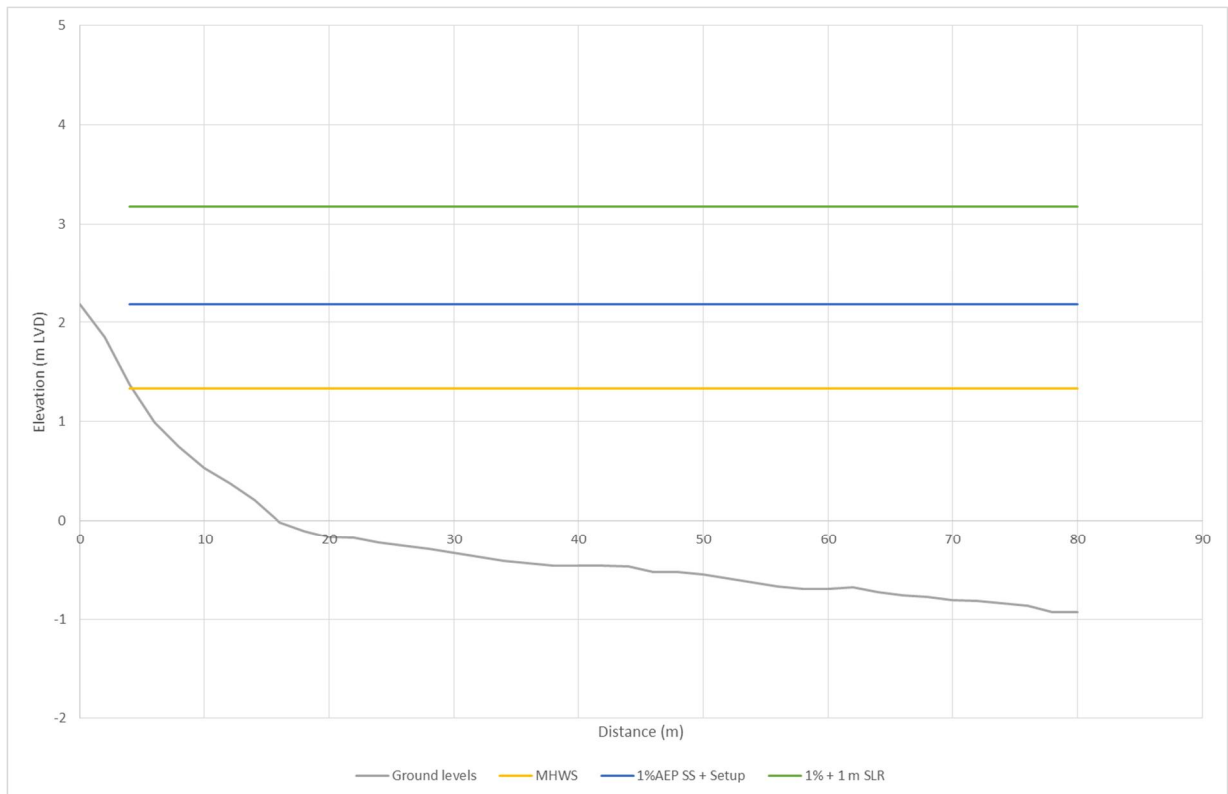


Figure G23 Foreshore transect in Purau Bay

1.2 Summary of key features of the foreshore areas to assess for coastal erosion hazard

Table G1 shows the key features of the various coastal environments that will be the basis for the coastal erosion hazard assessment. The blue shading shows the location where the height of the beach crest (vegetation line) is less than 0.5 m above MHWS (**darker blue**) and less than 1 m above MHWS (**lighter blue**).

Table G1 Summary of foreshore features to be used for erosion hazard assessment

Site	MHWS (m LVD)	Upper beach slope (1:n)	Beach crest (m LVD)	Height of beach crest above MHWS (m)	Long term retreat rate (m/yr) ³	Shoreline type
Allandale	1.33	2	3.2	1.87	0.05	Bank
Teddington	1.33	2	1.5	0.17	0	Bank
Charteris Bay	1.33	8	2.2	0.87	0.1	Coarse sand beach
Purau	1.33	9	2.2	0.87	0	Coarse sand beach
Wainui	1.33	5	3.8	2.47	0	Gravel Beach
Duvauchelle	1.33	30	1.8	0.47	0	Fine sand/shell
Takamatua	1.33	27	1.5	0.17	0	Fine sand/shell
Akaroa North	1.33	12	2	0.67	0 ¹	Medium sand

Notes:

1. Akaroa North long term retreat set to zero due to significant seawall along coastline
2. Dark blue locations are where the beach crest is less than 0.5 m above MHWS and Light blue locations are where the beach crest is less than 1 m above MHWS
3. Long term rate is based on averaged rate along each embayment shoreline