

From: Parsons, Tom <Tom.Parsons@ccc.govt.nz>
Sent: Wednesday, September 18, 2024 5:07 PM
To: Little, Dave <David.Little@ccc.govt.nz>
Cc: McDonnell, Kevin <Kevin.McDonnell@ccc.govt.nz>
Subject: Southshore Sea Level Rise Assessment

Hi Dave,

Following on from our meeting with ECan please find below a suggested response regarding sea level rise regarding potential sea level rise impacts on the bund. I have not attempted to identify the change in performance of the coastal erosion protection as this would be best undertaken by Jesse or a coastal engineer. I suggest that Jesse look over the response prior to circulating to ECan.

The bund crest height is set to a level of 11.4m CDD. This equates to a present day 50 year event with approximately 300mm of freeboard or a 100 year event with 200mm of freeboard, with the later being the design condition. The tide levels are based upon a 2020 assessment undertaken by GHD and HKV, which is available on Councils website with the relevant portion of Table 5 extracted below:

[GHD Report \(ccc.govt.nz\)](#)

	Bridge St
Location parameter	10.721m
Scale parameter	0.1026
ARI	Tide level
1	10.721
2	10.792
5	10.886
10	10.957
20	11.028
50	11.122
100	11.194
200	11.265
500	11.359
1000	11.430

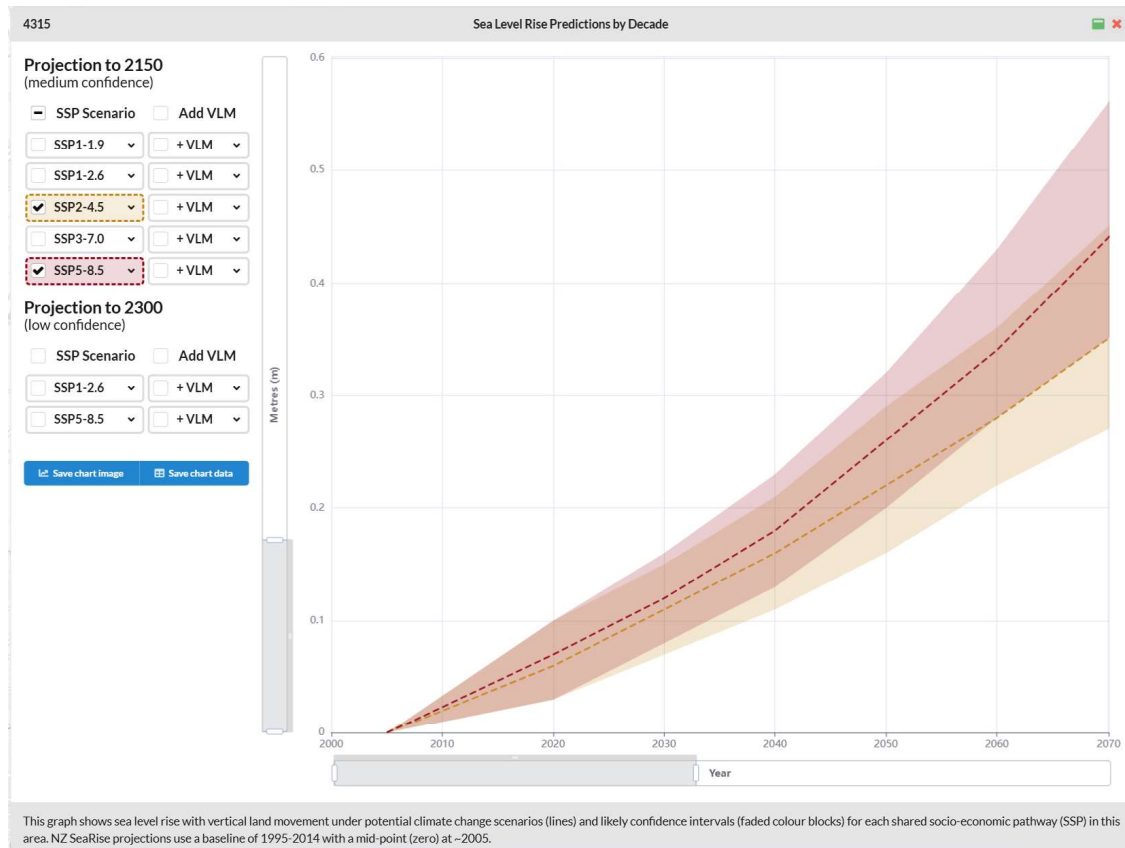
As set out in the consent application the intent of the design is to restore pre-earthquake flood risk and resolve the earthquake legacy issues for the community. This has the aim to enable community consultation on long term coastal hazards adaptation planning.

The proposed works do not seek address climate change as it could be viewed as predetermination of the planned consultation. However, we can consider the potential conditions at the end of the 20-year consent, as requested by ECan. The NZ Sea Rise website provides future sea level scenarios:

[Takiwa - Map Page](#)

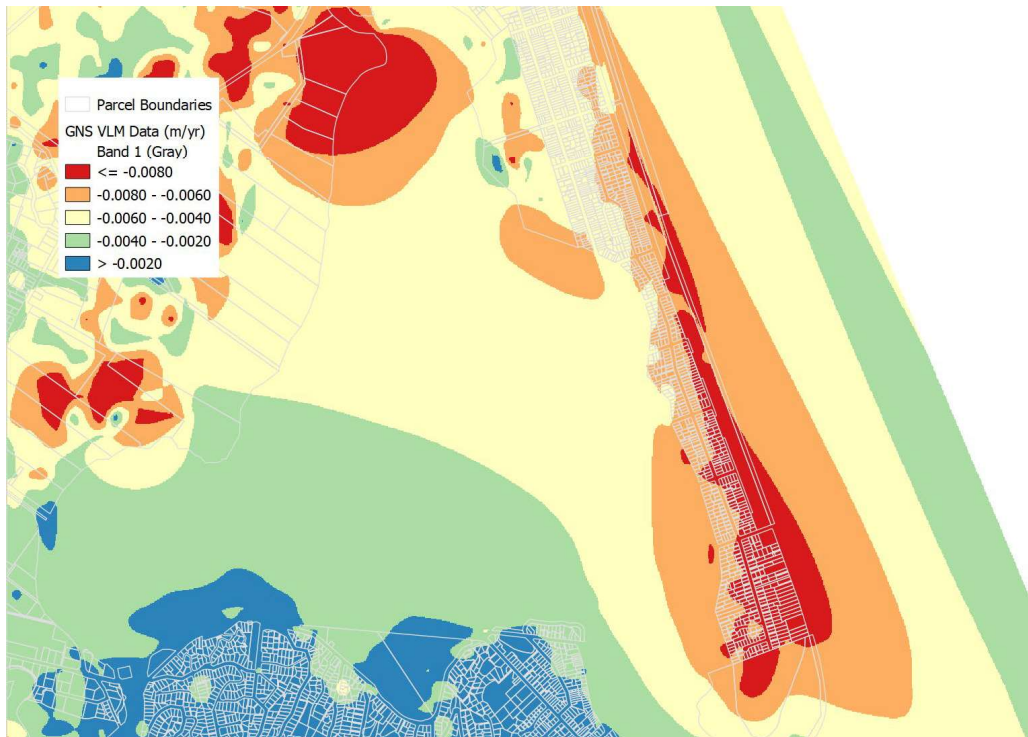
There is a node on the map at Bridge St, which is used as reference as it is the location at which the tidal statistics are calculated. The projections use a baseline of ~2005 so the quantum of sea rise between that date and the date the tidal statistics were calculated in 2020 need to be removed from the ~2045 projection. This figure is approximately 0.065m. There are a range of projections for 2040 and 2050 provided (as tabulated further below), averaging 0.19m for SSP2-4.5

and 0.22m for SSP5-8.5 for the medium p50 scenarios. For comparison, the p83 low confidence SSP-8.5 figure for 2024 is approximately 0.35m, representing a low likelihood scenario. Re-baselining to 2020 give projections of between 0.125m and 0.155m for the p50 scenarios, respectively.



scenario	year	p17	p50	p83
SSP2-4.5 (medium confidence)	2005	0	0	0
SSP2-4.5 (medium confidence)	2020	0.03	0.06	0.1
SSP2-4.5 (medium confidence)	2030	0.07	0.11	0.15
SSP2-4.5 (medium confidence)	2040	0.11	0.16	0.21
SSP2-4.5 (medium confidence)	2050	0.16	0.22	0.29
SSP2-4.5 (medium confidence)	2060	0.22	0.28	0.36
SSP5-8.5 (medium confidence)	2005	0	0	0
SSP5-8.5 (medium confidence)	2020	0.03	0.07	0.1
SSP5-8.5 (medium confidence)	2030	0.08	0.12	0.16
SSP5-8.5 (medium confidence)	2040	0.13	0.18	0.23
SSP5-8.5 (medium confidence)	2050	0.2	0.26	0.32
SSP5-8.5 (medium confidence)	2060	0.28	0.34	0.43

If sea levels were to rise by 0.16m over the next 25 or so years then we would expect that the 11.4m CDD bund would contain about a 20 year event with the original 200mm freeboard. However, there is vertical land movement currently being observed across the city at post-seismic rates high than pre-seismic (see image below from GNS data). Brighton spit is currently esitimated to be dropping at approximatley 7.5mm/yr ([Sea-level-rise-factsheet-UPDATED.pdf \(ccc.govt.nz\)](#)). If this rate were to continue for the next 20 years then approximately 150mm of VLM might be reaslised, effectivly utilising all the freeboard available.



In a 20 year future storm event, there is risk of some wave action overtopping the bund. The Jacobs assessment estimated wave heights to be in the range of 0.8m for a 50 year, present day storm (see table 3-1 below as extracted from the preliminary desing report). Without the erosion protection dissipating this wave energy the bund would easily be overtopped to a depth that could cause landward flooding. As an aside, wind set up across the estuary should be inherent in the recorded data and consquently tidal statistics.

Southshore Preliminary Design Report

The structures are designed such that wave run-up may overtop them in the design event but would not result in significant damage to the structure. Back scour behind the structure will be minimised by the establishment of salt tolerant vegetation plantings between the revetment and inundation bund. Table 3-1 provides a summary of the damage and overtopping criteria adopted for the rock revetment design.

Table 3-1. Damage and overtopping criteria for the rock revetment

Return Period (years)	Water level (m CDD)	Significant wave height, Hs (m)	Significant wave period, Ts (s)	Armour unit damage criteria	Overtopping damage criteria
50	11.12	0.8	3.2	No damage	< 20 l/s/m at the revetment (no significant erosion behind the structure)

Over the same period there could be changes in 'storminess' which could alter the conincidence of wave action and extreme water levels, but this has not been accounted for in the above.

In summary, the system is design to address present day concerns however, it will need to be in service for the duration of the consent. In looking out 20 years, the current design will not offer the same level of service as will be enjoyed immediately after construction. At the end of the 20 year consent period the bund will contain only about a 20 year storm with minimal freeboard, but only if the erosion protection is installed to dissipate wave energy to less than the residual freeboard allowance. If the erosion protection were not installed it is likely that the bund would be overtopped by waves in a much more frequent event, and could be subject to erosion.

Tom Parsons

Stormwater & Waterways Engineer

Asset Planning - Stormwater & Waterways Team



[027 4777 828](tel:0274777828)



Tom.Parsons@ccc.govt.nz



Te Hononga Civic Offices, 53 Hereford Street, Christchurch



PO Box 73014, Christchurch 8154



ccc.govt.nz



This electronic email and any files transmitted with it are intended solely for the use of the individual or entity to whom they are addressed.
The views expressed in this message are those of the individual sender and may not necessarily reflect the views of the Christchurch City Council.
If you are not the correct recipient of this email please advise the sender and delete the email.



Disclaimer

The information contained in this communication from the sender is confidential. It is intended solely for use by the recipient and others authorised to receive it. If you are not the recipient, you are hereby notified that any disclosure, copying, distribution or taking action in relation of the contents of this information is strictly prohibited and may be unlawful.

This email has been scanned for viruses and malware.

This electronic email and any files transmitted with it are intended solely for the use of the individual or entity to whom they are addressed.
The views expressed in this message are those of the individual sender and may not necessarily reflect the views of the Christchurch City Council.
If you are not the correct recipient of this email please advise the sender and delete the email.

