

28 Rangaiwaea North

28.1 Site description

The Rangaiwaea North shoreline is located on the northern side of Rangaiwaea Island. The site consists of approximately 6.3 km of low-lying estuarine area, 0.8 km of consolidated cliff and 0.3 km of unconsolidated shoreline. The site is split into 5 cells based on differences in morphology, exposure and shoreline elevation (Figure 28-1). The Rangaiwaea North shoreline is a relatively low energy environment with limited fetch and shallow intertidal flats.



Figure 28-1 Location and cell extent of the Rangaiwaea North shoreline within Tauranga Harbour.

At the south-western extent of the shoreline there is small section approximately 100 m long of west-facing cliffs which range in elevation from RL 12 to 15 m (Cell 28A) (Figure 28-2). Towards north the shoreline elevation drops to a low-lying estuarine shoreline which is fronted by shallow intertidal flats (Cell 28B). The low-lying estuarine shoreline continues around to the eastern side of Rangaiwaea Island.

There is a section of east-facing cliffs that range in elevation from RL 4 to 6 m (Cell 28C). The cliff toe is approximately 20 m from Hunters Creek. South from the cliffs the shoreline elevation drops to another low-lying estuarine area which is fronted with mangroves and salt marsh vegetation (Cell 28D). Cell 28E is characterised by an unconsolidated shoreline which has a high tide beach approximately 5 m wide.



Figure 28-2 Site photo of Rangaiwaea North. Consolidated shoreline with sandy high tide beach within Cell 28A.

28.2 Geology

The geological map of the area²⁹ indicates that the site comprises:

- Holocene stable dune deposits: Loose to poorly consolidated dune sands.
- Matua Subgroup: Poorly to moderately sorted gravel with minor sand and silt underlying terraces; includes minor fan deposits and loess.

The existing slope angles in this area are between 5° to 25° along the unconsolidated shoreline, and between 30° to 50° in areas of banks or cliffs. The range of stable slope angles for Rangaiwaea North shown in Table 28-1 below.

The failure types observed around Rangaiwaea Island were typically shallow surface failures. The likelihood of deep seated movement is low to moderate.

28.3 Coastal processes

Due to extensive intertidal flats and small fetch exposure, most of the Rangaiwaea North shoreline is relatively sheltered from coastal processes. The small section of cliff within Cell 28A is exposed to an average fetch of 4.5 km from west, however the shallow intertidal flats and sandy beach fronting the cliff toe are likely to reduce the wave energy reaching the shoreline. Field observations indicate the cliff is relatively stable. Due to tree coverage it is difficult to determine the long term erosion rate, however based on cells of similar exposure it is estimated to range from -0.02 to -0.1 m/yr.

The orientation of the sandspits, both south and north, from Cell 28A suggests that there is some northwards sediment transport.

The presence of mangroves and salt marsh in Cell 28B indicates it is a relatively low energy environment. On the eastern side of Rangaiwaea Island the fetch exposure is limited to less than 1 km and therefore there is likely to be minimal wave energy. Hunter's Creek channel runs approximately 20 m offshore from the shoreline within Cell 28C which may result in some stronger tidal currents and cliff toe erosion. Based on regression analysis the long term erosion rates are estimated to range from -0.02 to -0.08 m/yr.

²⁹ Leonard, G.S.; Begg, J.G.; Wilson, C.J.N. (compilers) 2010: *Geology of the Rotorua area*. Institute of Geological & Nuclear Sciences 1:250,000 geological map 5. 1 sheet + 102 p. Lower Hutt, New Zealand. GNS Science.

Further south, Hunter's Creek shifts further east towards Matakana Island. The shallow intertidal flats fronting the Rangaiwaea shoreline create a relatively low energy environment where mangroves and salt marsh have gradually expanded since at least 1992.

The unconsolidated shoreline within Cell 28E is exposed to slightly larger fetches and offshore water depths. Regression analysis indicates the long term erosion rate ranges from -0.05 to -0.19 m/yr. Based on a 2 km fetch from southeast, theoretical significant wave height is estimated to be 0.4 m. Based on model results the short term storm cut is estimated to range from 1 to 3 m.

Due to the low fetch exposure within Cell 28C the SLR response factor for the consolidated shoreline is estimated to range from 0.1 to 0.3. The range of potential SLR factors for Cell 28A are higher due to the large fetch exposure which may result in larger waves reaching the shoreline if offshore water depths increase.

28.4 Adopted component values

Adopted component values are presented within Table 28-1. The short term values are equal to zero for the consolidated cells as short term erosion is not applicable for consolidated shorelines (see section 4.6.2 in main report).

Table 28-1 Component values for cells around Rangaiwaea North.

Site		28. Rangaiwaea North				
Cell		28A	28B	28C	28D	28E
Cell centre (NZTM)	E	1873929	1873374	1874135	1875058	1875550
	N	5830727	5832385	5832154	5831409	5830788
Morphology		Consolidated	Low-lying estuarine	Consolidated	Low-lying estuarine	Unconsolidated
Geology		Matua Subgroup	Holocene dune deposit	Matua Subgroup	Holocene dune deposit	Holocene dune deposit
Exposure (average fetch/direction)		4.5 km (W)	1 km (SW-NE)	0.8 km (NE)	1 km (NE)	5 km (SE)
State		Natural	Natural	Natural	Natural	Natural
Short-term (m)	Min	0	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>	0	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>	1
	Mode	0		0		2
	Max	0		0		3
Dune/Cliff elevation (m above toe or scarp)	Min	12.5		4		0.5
	Mode	13		4.5		1
	Max	15		6		2
Stable angle (deg)	Min	24		24		30
	Mode	26		26		32
	Max	50		40		34
Long-term (m)	Min	-0.1		-0.08		-0.19
	Mode	-0.05	-0.05	-0.1		
	Max	-0.02	-0.02	-0.05		
Closure slope (beaches)/SLR response factor (cliffs)	Min	0.2	0.1	0.05		
	Mode	0.3	0.2	0.1		
	Max	0.4	0.3	0.2		

28.5 Coastal erosion hazard assessment

Coastal erosion hazard distances for Rangaiwaea North are presented within Table 28-2 and an overview map in Figure 28-4. Histograms of individual components and resultant erosion hazard distances using a Monte Carlo technique are shown in Appendix B. For the purpose of this assessment all coastal erosion protection structures have been ignored (refer to main report Section 4.5.4).

The current P_{66%} erosion hazard ranges from -4 m along the unconsolidated shoreline to -18 m along the consolidated shoreline. For the future erosion hazard, the P_{5%} for 1.6 m SLR in 2130, ranges from -28 m along the consolidated shoreline to -42m along the unconsolidated shoreline.

Due to the presence of salt marsh vegetation and the very sheltered environment, there is no current erosion hazard along cells 28B and 28D. Inundation as a consequence of SLR is likely to be a greater hazard for the low-lying shoreline in the future.

Table 28-2 Coastal erosion hazard widths (m) for current, 2080 and 2130 timeframes.

Site	Cell	Timeframe	SLR (m)	Probability of Exceedance											
				Min	P _{66%}	P _{50%}	P _{5%}	P _{1%}	Max						
Rangaiwaea North	28A	Current	0.03	-11	-18	-21	-29	-31	-33						
		50yr (2080)	0.12	-13	-21	-24	-32	-34	-37						
			0.2	-13	-22	-24	-33	-35	-38						
			0.4	-13	-23	-25	-34	-36	-40						
			0.6	-14	-23	-26	-35	-37	-41						
		100yr (2130)	0.22	-14	-24	-26	-35	-38	-42						
			0.6	-15	-26	-29	-38	-41	-46						
			0.8	-16	-27	-30	-39	-42	-47						
			1.25	-16	-28	-31	-41	-45	-49						
				1.6	-17	-29	-32	-42	-46	-51					
		28B	Current	0.03	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>										
			50yr (2080)	0.12											
	0.2														
	0.4														
	0.6														
	100yr (2130)		0.22												
			0.6												
			0.8												
			1.25												
				1.6											
28C	Current		0.03	-6							-8	-9	-12	-12	-14
	50yr (2080)		0.12	-7							-11	-12	-14	-15	-17
		0.2	-7	-11	-12	-15	-16	-18							
		0.4	-7	-12	-12	-15	-17	-19							
		0.6	-7	-12	-13	-16	-17	-19							

Site	Cell	Timeframe	SLR (m)	Probability of Exceedance					
				Min	P _{66%}	P _{50%}	P _{5%}	P _{1%}	Max
		100yr (2130)	0.22	-8	-13	-14	-17	-19	-21
			0.6	-9	-14	-15	-19	-21	-23
			0.8	-9	-15	-16	-20	-21	-24
			1.25	-9	-15	-16	-21	-22	-25
			1.6	-9	-16	-17	-21	-23	-26
	28D	Current	0.03	<i>No CEIHA (Refer to future MHWS layer in Stephens, 2019)</i>					
		50yr (2080)	0.12						
			0.2						
			0.4						
			0.6						
		100yr (2130)	0.22						
			0.6						
			0.8						
			1.25						
			1.6						
	28E	Current	0.03	-3	-4	-5	-6	-6	-7
		50yr (2080)	0.12	-5	-9	-10	-14	-15	-16
			0.2	-6	-10	-11	-14	-15	-17
			0.4	-7	-12	-13	-16	-18	-20
			0.6	-9	-14	-15	-19	-20	-23
100yr (2130)		0.22	-8	-14	-16	-22	-24	-25	
		0.6	-11	-18	-19	-26	-27	-30	
		0.8	-12	-20	-21	-28	-30	-34	
		1.25	-15	-23	-25	-33	-36	-42	
		1.6	-17	-26	-28	-38	-41	-48	

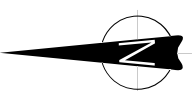
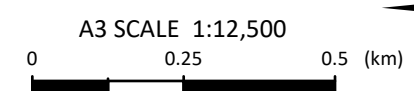


LEGEND

- ↔ Cell Extent
- Baseline (2014-2017)
- - - No current erosion (refer to future MHWS)
- Critical structures
- 2030 (current) - P66%
- 2030 (current) - P5%
- 2080 - 0.4m SLR - P66%
- 2080 - 0.6m SLR - P66%
- 2080 - 0.6m SLR - P5%
- 2130 - 0.8m SLR - P66%
- 2130 - 1.25m SLR - P66%
- 2130 - 1.25m SLR - P5%
- 2130 - 1.6m SLR - P5%
- Future MHWS7 - 1.6m SLR

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Notes: Aerial photograph sourced from the LINZ Data Service (dated 2015)



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Tauranga Harbour Coastal Erosion Assessment
 Erosion Hazard Overview
 Site 28: Rangaiwaea North

FIGURE No. Figure 28-4

Rev. 0

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