6 One Tree Point

Description and geomorphology

One Tree Point is located at the entrance to Whangarei Harbour, approximately 15 km south of Whangarei.

The site is approximately 4 km long and extends from Marsden Cove in the east around One Tree Point down to the western tip of the sand spit located in Takahiwai Estuary. The majority of the site is cliff shoreline and approximately 600 m of the site shoreline forms the barrier spit.

The cliff shoreline is a coastal barrier plain formed from Pleistocene coastal sand deposits. The Pleistocene deposits comprise cemented dune sands overlying sandy beach and nearshore seabed deposits. The crest elevation of the ridges at One Tree Point ranges from RL 4 to 10.5 m. This stratigraphy was formed as the shoreline advanced under falling sea level during the last interglacial period approximately 125,000 years ago.

Areas of slumping and landslides are apparent along the site, where coastal processes are undercutting the cliff toe causing instability over time. A sandy beach comprising fine to medium sand exists along the cliff toe from One Tree Point to Marsden Cove. There is a minimal berm above high tide and no dune system has developed.

The barrier spit located at the western end of the site has a relatively low backshore elevation and is experiencing erosion over the southern half of its extent. A sandy beach comprising fine sand exists along the spit shoreline, which transitions to intertidal mud flats approximately 10 m offshore.

Local considerations

Erosion protection structures exist along the majority of the toe of the cliff. The structures range from loose rock revetments to timber seawalls. There are also a number of stormwater outlets located at the base on the cliff. These type of structures can lower the adjacent foreshore level resulting in more wave induced erosion at the toe of the cliff. A boat ramp is situated at One Tree Point.

Site Photograph A (east facing shoreline)

Site Photograph B (west facing shoreline)

Site Photograph C (western spit shoreline)

Coastal Erosion Hazard Assessment

The site is split into five cells based on differences in geomorphology, exposure and dune/cliff height. All coastal cells are weakly cemented dune in fixed transverse dune ridges except at the western end where the shoreline is non-consolidated.

Adopted component values are presented within Table 6-1. The cliffed coastline has stable angles of 18 to 27°, heights of 4 to 10.5 m and long-term erosion rates of up to -0.1 m/year. The non-consolidated shoreline has long-term trends ranging from slightly accretional to erosional.

Histograms of individual components and resultant CEHZ distances using a Monte Carlo technique are shown in Figure 6-1. Coastal Erosion Hazard Zone widths are presented within Table 6-2 to 6-4 and Figure 6-6. CEHZ1 for cell A is 13 m, CEHZ2 is 44 m and CEHZ3 is 47 m. CEHZs have been mapped in agreement with the calculated values.

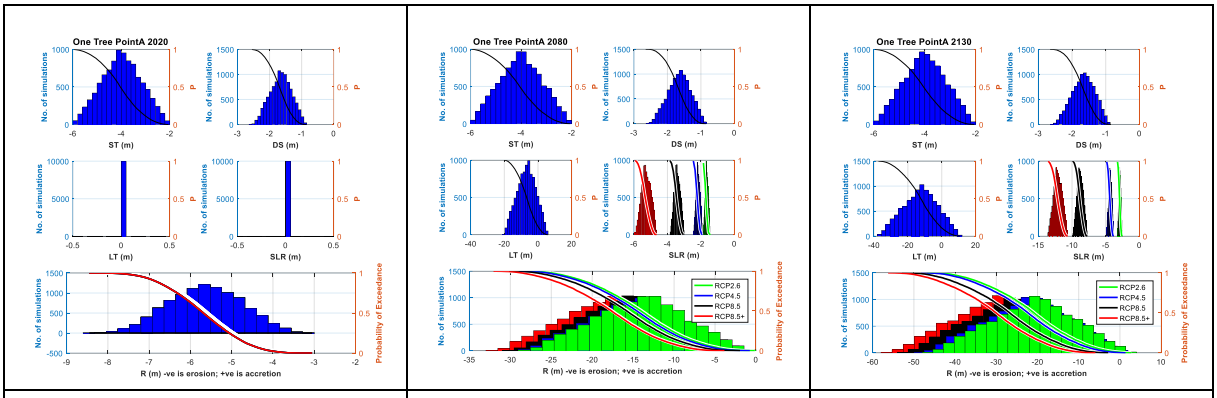
For cell 6B to cell 6D the cliff projection method has been adopted with future shoreline distances shown in Figure 6-2 to Figure 6-5 and Table 6-2 instead of CEHZ distances. The future shoreline (cliff toe) distances range from 4 to 8 m to 2080 and 13 to 23 m to 2130.

Figure 6-7 shows the available historic shorelines for One Tree Point.

Table 6-1 Component values for Erosion Hazard Assessment

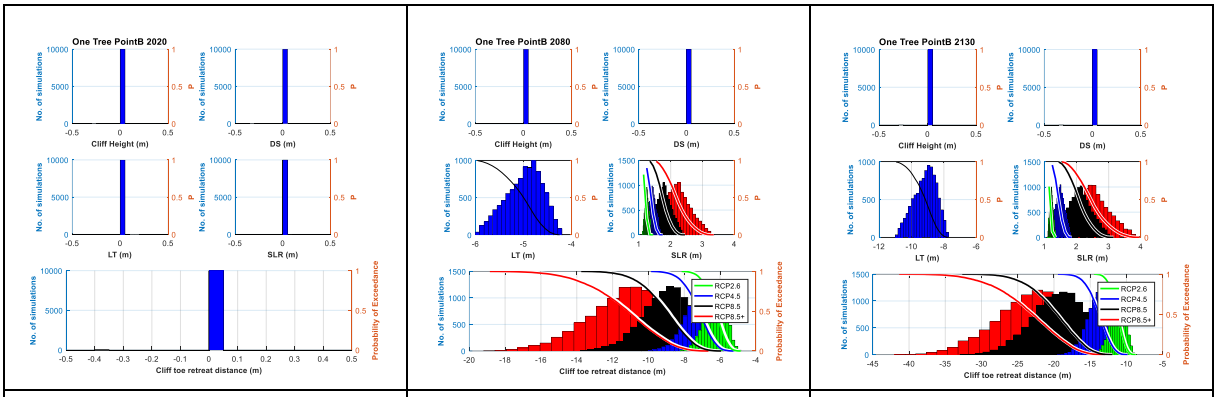
Site		**6. One Tree Point**				
Cell		6A	6B[1,2]	6BB[1,2]	6C[1,2]	6D[1,2]
Cell centre (NZTM)	E	1730299	1730968	1730968	1731838	1732603
	N	6034249	6034921	6034921	6034670	6033913
Chainage, m (from N/W)		0-680	680-1420	1420-1882	1890-3500	3500-3800
Morphology		Estuary Bank	Weakly cemented dune in fixed transverse dune ridges			
Short-term (m)	Min	2	0	0	0	0
	Mode	4	0	0	0	0
	Max	6	0	0	0	0
Dune/Cliff elevation (m above toe or scarp)	Min	1.1	6.1	4.0	5.6	4.2
	Mode	2.0	8.5	6.2	7.7	5.7
	Max	3.1	10.4	8.5	10.0	7.9
Stable angle (deg)	Min	30	18.4	18.4	18.4	18.4
	Mode	32	22.5	22.5	22.5	22.5
	Max	34	26.6	26.6	26.6	26.6
Long-term (m) -ve erosion +ve accretion	Min	0.1	-0.07	-0.02	-0.02	-0.06
	Mode	-0.1	-0.08	-0.04	-0.06	-0.08
	Max	-0.34	-0.1	-0.07	-0.1	-0.1
Closure slope (beaches)	Min	0.11	0.75	0.75	0.75	0.75
	Mode	0.095	0.5	0.5	0.5	0.5
	Max	0.086	0.25	0.25	0.25	0.25
SLR 2080 (m)	RCP 2.6	0.16	0.16	0.16	0.16	0.16
	RCP 4.5	0.21	0.21	0.21	0.21	0.21
	RCP 8.5M	0.33	0.33	0.33	0.33	0.33
	RCP 8.5H+	0.51	0.51	0.51	0.51	0.51
SLR 2130 (m)	RCP 2.6	0.28	0.28	0.28	0.28	0.28
	RCP 4.5	0.42	0.42	0.42	0.42	0.42
	RCP 8.5M	0.85	0.85	0.85	0.85	0.85
	RCP 8.5H+	1.17	1.17	1.17	1.17	1.17

[1]Cliff projection method has been used, so distance to future cliff toe position has been tabulated. Actual CEHZ width will be greater depending on cliff height and stable slope angle.
[2]CEHZ0 included behind coastal protection structure.



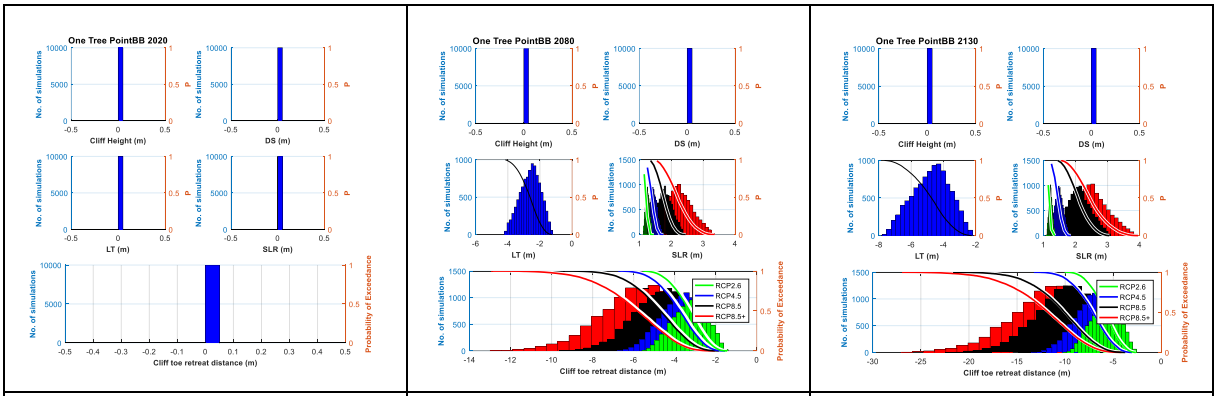
2020	2080	2130

Figure 6-1 Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 6A



2020	2080	2130

Figure 6-2 Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 6B



2020	2080	2130

Figure 6-3 Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 6BB

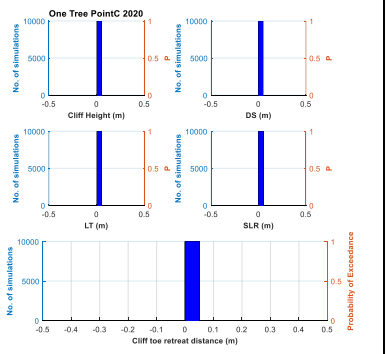
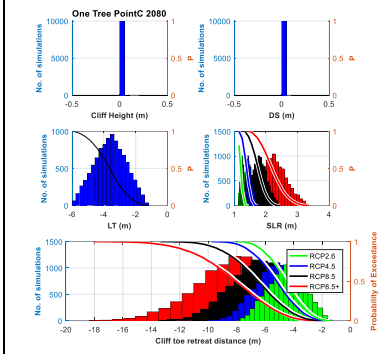
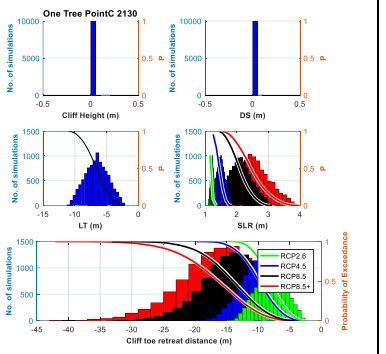
		
2020	*2080*	*2130*

Figure 6-4 Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 6C

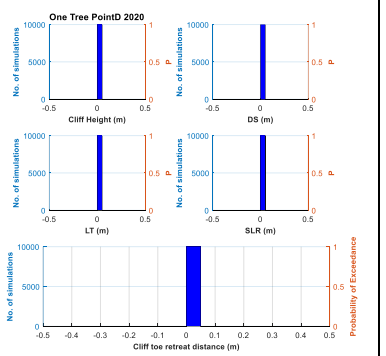
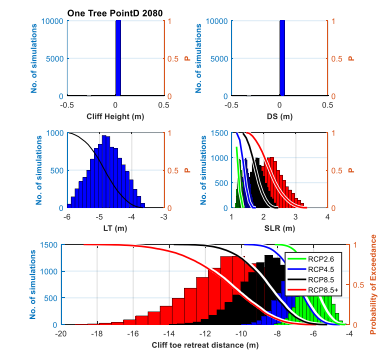
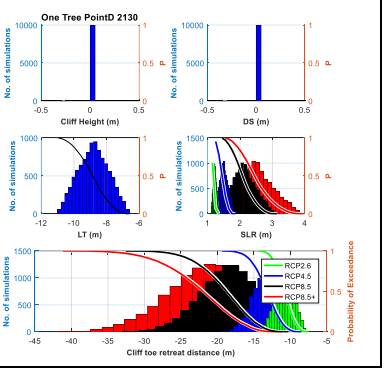
		
2020	*2080*	*2130*

Figure 6-5 Histograms of parameter samples and the resultant shoreline distances for 2020, 2080 and 2130 timeframes for cell 6D

Table 6-2 Coastal Erosion Hazard Zone Widths for 2020

Site		6. One Tree Point				
Probability of CEHZ (m) Exceedance		A	B*	BB*	C*	D*
	Min	-3	0	0	0	0
	99%	-4	0	0	0	0
	95%	-4	0	0	0	0
	90%	-4	0	0	0	0
	80%	-5	0	0	0	0
	70%	-5	0	0	0	0
	66%	-5	0	0	0	0
	60%	-5	0	0	0	0
	50%	-6	0	0	0	0
	40%	-6	0	0	0	0
	33%	-6	0	0	0	0
	30%	-6	0	0	0	0
	20%	-6	0	0	0	0
	10%	-7	0	0	0	0
	5%	-7	0	0	0	0
	1%	-8	0	0	0	0
	Max	-8	0	0	0	0

*Cliff projection method has been used, so cliff toe position has been tabulated, which has been assumed to be unchanged from the adopted 2019 baseline. Actual CEHZ width will be greater depending on cliff height and stable slope angle.

Table 6-3 Coastal Erosion Hazard Zone Widths Projected for 2080

Site		6. One Tree Point																			
Cell		6A				6B				6BB				6C				6D			
RCP scenario		2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+
Probability of CEHZ (m) Exceedance	Min	0	-1	-2	-4	-5	-5	-6	-7	-1	-2	-2	-2	-1	-2	-2	-2	-4	-5	-5	-6
	99%	-3	-3	-5	-6	-5	-6	-7	-8	-2	-2	-2	-3	-2	-2	-2	-3	-5	-5	-6	-7
	95%	-5	-6	-7	-9	-5	-6	-7	-8	-2	-2	-3	-3	-2	-3	-3	-4	-5	-5	-6	-7
	90%	-7	-7	-9	-11	-5	-6	-7	-8	-2	-2	-3	-3	-3	-3	-4	-4	-5	-5	-7	-8
	80%	-9	-10	-11	-13	-6	-6	-7	-9	-2	-3	-3	-4	-3	-4	-4	-5	-5	-6	-7	-8
	70%	-11	-12	-13	-15	-6	-6	-8	-9	-3	-3	-4	-4	-4	-4	-5	-6	-5	-6	-7	-8
	66%	-12	-12	-13	-15	-6	-6	-8	-9	-3	-3	-4	-4	-4	-4	-5	-6	-5	-6	-7	-9
	60%	-13	-13	-14	-16	-6	-6	-8	-9	-3	-3	-4	-5	-4	-4	-5	-6	-6	-6	-7	-9
	50%	-14	-14	-16	-18	-6	-7	-8	-9	-3	-3	-4	-5	-4	-5	-6	-7	-6	-6	-8	-9
	40%	-15	-16	-17	-19	-6	-7	-8	-10	-3	-4	-4	-5	-5	-5	-6	-7	-6	-7	-8	-9
	33%	-17	-17	-18	-20	-6	-7	-8	-10	-3	-4	-5	-6	-5	-5	-6	-8	-6	-7	-8	-10
	30%	-17	-18	-19	-21	-6	-7	-8	-10	-4	-4	-5	-6	-5	-6	-7	-8	-6	-7	-8	-10
	20%	-19	-20	-21	-23	-6	-7	-9	-10	-4	-4	-5	-6	-5	-6	-7	-9	-6	-7	-8	-10
	10%	-22	-22	-23	-25	-7	-7	-9	-11	-4	-5	-6	-7	-6	-7	-8	-9	-7	-7	-9	-11
	5%	-24	-24	-25	-27	-7	-8	-9	-11	-4	-5	-6	-7	-6	-7	-8	-10	-7	-8	-9	-11
	1%	-26	-26	-28	-29	-7	-8	-10	-12	-5	-5	-6	-8	-7	-8	-9	-11	-7	-8	-10	-12
	Max	-28	-29	-30	-32	-7	-8	-11	-13	-5	-6	-7	-9	-7	-8	-10	-13	-7	-8	-10	-13
	CEHZ1	-13				-8*				-4*				-5*				-7*			

*Cliff projection method has been used, so distance to future cliff toe position has been tabulated. Actual CEHZ width will be greater depending on cliff height and stable slope angle.

Table 6-4 Coastal Erosion Hazard Zone Widths Projected for 2130

Site		6. One Tree Point																			
Cell		6A				6B				6BB				6C				6D			
RCP scenario		2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+	2.6	4.6	8.5	8.5+
Probability of CEHZ (m) Exceedance	Min	3	1	-3	-6	-9	-10	-13	-14	-3	-3	-4	-4	-3	-3	-4	-4	-8	-9	-11	-12
	99%	-1	-2	-6	-10	-9	-11	-14	-15	-3	-4	-5	-5	-3	-4	-5	-6	-8	-9	-12	-14
	95%	-5	-6	-11	-14	-10	-11	-14	-16	-4	-4	-5	-6	-4	-5	-7	-7	-9	-10	-13	-15
	90%	-8	-9	-14	-17	-10	-11	-15	-17	-4	-5	-6	-7	-5	-6	-8	-9	-9	-10	-14	-15
	80%	-12	-14	-18	-21	-10	-12	-15	-17	-4	-5	-7	-8	-6	-7	-9	-10	-9	-11	-14	-16
	70%	-16	-17	-21	-25	-10	-12	-16	-18	-5	-6	-8	-9	-7	-8	-10	-12	-10	-11	-15	-17
	66%	-17	-18	-23	-26	-10	-12	-16	-18	-5	-6	-8	-9	-7	-8	-11	-12	-10	-12	-15	-17
	60%	-18	-20	-24	-28	-10	-12	-16	-19	-5	-6	-8	-9	-7	-8	-11	-13	-10	-12	-16	-18
	50%	-21	-22	-27	-30	-11	-13	-17	-19	-6	-6	-9	-10	-8	-9	-12	-14	-10	-12	-16	-18
	40%	-23	-25	-29	-33	-11	-13	-17	-20	-6	-7	-9	-10	-8	-10	-13	-15	-11	-13	-17	-19
	33%	-26	-27	-31	-35	-11	-13	-18	-20	-6	-7	-10	-11	-9	-10	-14	-16	-11	-13	-17	-19
	30%	-26	-28	-32	-36	-11	-13	-18	-20	-6	-7	-10	-11	-9	-11	-14	-16	-11	-13	-17	-20
	20%	-30	-32	-36	-39	-12	-14	-18	-21	-7	-8	-11	-12	-10	-11	-15	-17	-11	-13	-18	-20
	10%	-35	-36	-41	-44	-12	-14	-19	-22	-8	-9	-12	-13	-11	-12	-17	-19	-12	-14	-19	-21
	5%	-38	-40	-44	-47	-12	-14	-20	-23	-8	-9	-13	-14	-11	-13	-18	-20	-12	-14	-19	-22
	1%	-42	-44	-48	-52	-13	-15	-21	-24	-9	-10	-14	-16	-12	-14	-19	-22	-13	-15	-21	-24
	Max	-47	-48	-53	-56	-13	-16	-23	-27	-9	-11	-15	-18	-13	-16	-23	-27	-13	-16	-23	-27
	CEHZ2	-44				-20*				-13*				-18*				-19*			
	CEHZ3	-47				-23*				-14*				-20*				-22*			

Notes: Dashed CEHZ indicates greater uncertainty around stream mouths and backshore topography.
Northland 0.4m Rural Aerial Photos (2014-2016).

A4 SCALE 1:15,000

0 0.1 0.2 0.3 0.4 0.5 (km)

N

Tonkin+Taylor
105 Carlton Gore Rd, Newmarket, Auckland
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PROJECT No.	1012360	

NORTHLAND REGIONAL COUNCIL

Coastal Erosion Hazard Assessment
One Tree Point
Site: 6

FIGURE No. Figure 6-6

Rev. 1

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Notes: Dashed CEHZ indicates greater uncertainty around stream mouths and backshore topography.
Northland 0.4m Rural Aerial Photos (2014-2016).

A4 SCALE 1:15,000

0 0.1 0.2 0.3 0.4 0.5 (km)

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ARCFILE	1012360_Historicv2.mxd	
SCALE (AT A4 SIZE)	1:15,000	
PROJECT No.	1012360	

NORTHLAND REGIONAL COUNCIL

Historic Shorelines
One Tree Point
Site: 6

FIGURE No. Figure 6-7

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