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Jeremy G. Gibb

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## Rates of coastal erosion and accretion in New Zealand

JEREMY G. GIBB\*

Department of Geology, Victoria University of Wellington,  
Private Bag, Wellington, New Zealand

### ABSTRACT

Rates of coastal erosion and accretion for New Zealand are calculated for the period since early European colonisation. Methods used for calculating rates from cadastral plans, vertical aerial photographs and field measurements are described, evaluated, and illustrated with examples. The most natural reference line for measurements of shoreline changes and for defining the seaward boundary of land is the seaward limit of land vegetation. Measurements made from air photographs and plans at scales larger than 1:4000 have errors less than  $\pm 1$  m. As scales become small, errors increase proportionately. Along depositional shorelines, erosion and accretion generally occur at  $0.5-4.0 \text{ m.y}^{-1}$ . Maximum erosion and accretion rates are  $25.4 \text{ m.y}^{-1}$  at North Kaipara Head and  $68.9 \text{ m.y}^{-1}$  at Farewell Spit respectively. Cliff recession generally occurs at  $0.25-1.0 \text{ m.y}^{-1}$  with maximum rates of  $2.25 \text{ m.y}^{-1}$  for mudstone cliffs at Cape Turnagain and  $3.46 \text{ m.y}^{-1}$  for conglomerate cliffs at Ngapotiki.

### INTRODUCTION

Coastal erosion is the process of removal of material at the shoreline which leads to loss of land as the shoreline retreats landward. Accretion is the product of deposition of material at the shoreline which leads to gain of land as the coast advances seaward.

In this study, basic information collected by the author has been resolved into rates of coastal erosion and accretion (Appendix 1). Calculated rates cover the period since early European colonisation of New Zealand. Useful sources of information available for this type of study are listed in the references at the end of the text. Information was gathered between 20 March 1975 and 16 October 1977 from around New Zealand. Except for Fiordland and parts of the Marlborough Sounds, a systematic reconnaissance was completed of all accessible parts of the coast of the two main islands of New Zealand.

Objectives of this paper are to make available existing New Zealand data on rates of coastal erosion and accretion (Appendix 1), to list sources of basic information, and to briefly illustrate, with examples, methods used for calculating rates. Patterns of coastal erosion and accretion around New Zealand will be dealt with elsewhere.

### THE SHORELINE

By definition, the shoreline, or seaward boundary of any land, is the intersection of a specified plane of water with the beach (Allen 1972). In New Zealand the seaward boundary of any land is defined in Section 35 of the Crown Grants Act, 1908 as "... the line of high-water mark at ordinary tides". This line is interpreted as the mean of all high tides occurring "in the ordinary course of nature throughout the year", and is generally termed "mean high-water mark" (MHWM) (Kelly 1971). The shoreline shown on hydrographic charts, cadastral and topographic maps of New Zealand is MHWM (Mr W. Watson, Cartographic Branch, Department of Lands and Survey, Wellington pers. comm.).

By law, the land surveyor is required to make tidal observations every day for 365 days when fixing the seaward boundary of any land (Adams 1971). It is impractical, however, to determine MHWM by this method and then to trace that level along the coast by spirit levelling (Mr N. C. Gardiner, Chief Surveyor (rtd), Department of Lands and Survey, Wellington, pers. comm.). In practice, therefore, MHWM is usually estimated from the position of natural markers such as the seaward limit of land vegetation, a line of driftwood, or a "wetted" line along the beach. Over the past century land surveyors in New Zealand have adopted seven different "shorelines" to represent the seaward boundary of any land (Fig. 1). The seaward limit of land vegetation has been the most commonly preferred 'shoreline' (Figs 1 & 2).

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\*Present address: Water and Soil Division, Ministry of Works and Development, P.O. Box 12041, Wellington North.

METHODS

In this study, changes in the position of the coast over the past century were determined from cadastral plans, hydrographic charts, vertical aerial photographs, field measurements, and information supplied by people living near the coast. Rates were calculated by dividing the amount of horizontal shoreline displacement by the time interval between each successive survey; negative values (-) are erosion and positive (+) are accretion.

Aerial photographs were studied at Head Office, Department of Lands and Survey, Wellington, which holds copies of all aerial photographs of New Zealand dating from about 1934 to the present day. Cadastral plans dating from mid 19th century were studied in district offices of the Department of Lands and Survey around New Zealand, each of which holds a complete set of plans for its respective Land District. Hydrographic charts dating from 1842 were studied at the Hydrographic Branch of the Royal New Zealand Navy in Auckland. Rates have been

summarised from relevant publications and from unpublished sources of information including New Zealand Government Reports, consultant's reports, and theses on coastal processes. For Appendix 1, 72% of the observations listed were gathered directly by the author, and 28% are from published and unpublished material.

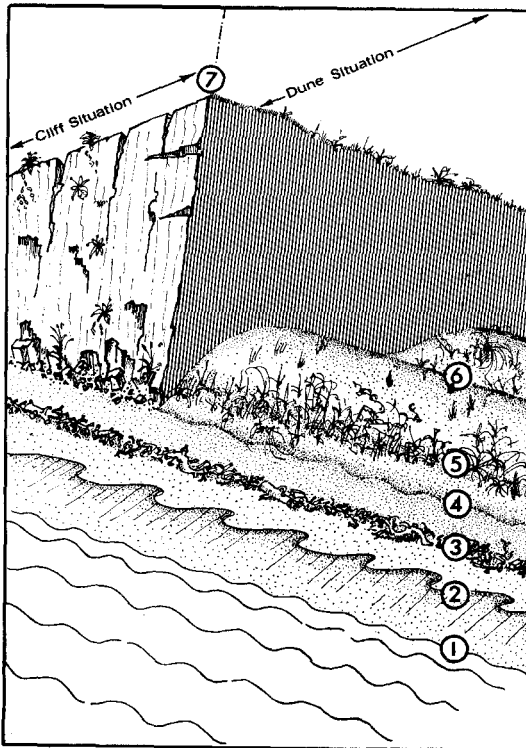


FIG. 1—Seven reference lines used by New Zealand land surveyors to define the shoreline (MHW) on cadastral plans over the century 1870-1970: 1 - Geodetic MHW (average height of the high tides over an 18.6 y period); 2 - "Wetted" line; 3 - Driftwood line; 4 - Toe of foredune or cliff; 5 - Vegetation line; 6 - Crest of beach ridge or foredune; and 7 - Top edge of cliff.

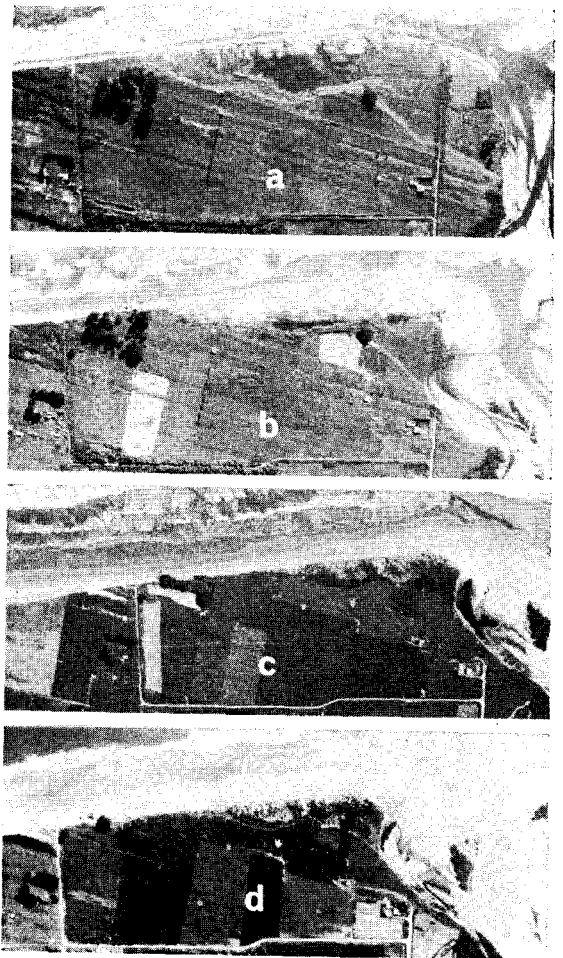


FIG. 2—Waimangaroa River mouth (west coast, South Island) and associated southern coast, 1943-1976. Coastal erosion is occurring along 10 km of coast either side of the mouth.

- a - Run 796, photo 4, 25 May 1943.
- b - Run 858, photo 13, 12 April 1955.
- c - Run SN 3777, Photo G/1, 25 November 1974.
- d - Run SN 2983, Photo L/1, 5 October 1976.

The left hand road leading to the coast in each photograph was used for measurements (see Table 2). The proximity of the group of macrocarpa trees to the coast reflects the amount of erosion with time. Note the truncation of the right hand road leading to the coast by river erosion. (Aerial photographs published by permission of Department of Lands and Survey, N.Z.).

## ERRORS

Three possible sources of error may affect the accuracy of rate calculations from plans or aerial photographs. Firstly, successive cadastral plans of the same locality may adopt different criteria for seaward boundaries (Fig. 1). Secondly, errors inherent in aerial photographs, such as relief displacements and distortion away from the photo-centre, may falsify measurements (Kirk 1975). Thirdly, measurement errors may be made by the individual.

The first possibility is dealt with by referring to the surveyor's field book or traverse book and clarifying his definition of MHW, and then by consistently using the same reference shoreline (Fig. 1) at each locality for all measurements. In the present study the reference shoreline was taken as the vegetation line along depositional coasts and the top edge of cliffs along steeply cliffed coasts. The second possibility of error may be controlled by establishing a base line of known length on each successive aerial photograph as near to the photo-centre as possible.

The third possibility may be calculated if the accuracy of measurements is known; it is generally the most significant source of error. All measurements made in this study on aerial photographs and survey plans have an estimated accuracy of  $\pm 0.25$  mm. Based on this, errors have been calculated for various scales (Table 1). As scale decreases, errors increase and measurement error becomes highly significant with shoreline displacements of only a few metres. The most accurate measurements are achieved from plans and photographs at scales greater than 1:4000. Small shoreline displacements of 2–5 m become insignificant in terms of error at scales between 1:8000 and 1:16 000.

## EXAMPLES

Methods used in this study for the calculation and evaluation of rates are illustrated by four examples.

## AERIAL PHOTOGRAPHS

Figure 2 shows the Waimangaroa River mouth, 15 km northeast of Westport, west coast, South Island (see Fig. 6). A baseline was established for 620 m along the section of road sub-parallel to the coast from the northern road junction to the right-angled corner to the south. The scale of each photograph was calculated using the baseline length established on cadastral plans. Distances were measured along the southern beach road from the south end of the baseline to the seaward limit of land vegetation. Results were converted to metres using the scale for each photograph. Rates were calculated by dividing these values by the time interval in years and decimals between successive survey flights. Errors based on an order of accuracy of measurements on each aerial photograph of  $\pm 0.25$  mm were then calculated. The results show that between 1945 and 1976 (33 y) about 74 m of coast has been lost by erosion at Waimangaroa at a net rate of  $2.2 \pm 0.1 \text{ m.y}^{-1}$  (Table 2).

Changes in position of the shoreline at Waimangaroa since 1876 are summarised in Fig. 3. There has been a net retreat of 235 m over the past 100 y (Item 027, Appendix 1). Past shoreline positions were plotted from cadastral plans made in 1876 and 1925 and from vertical aerial photographs shown in Fig. 2.

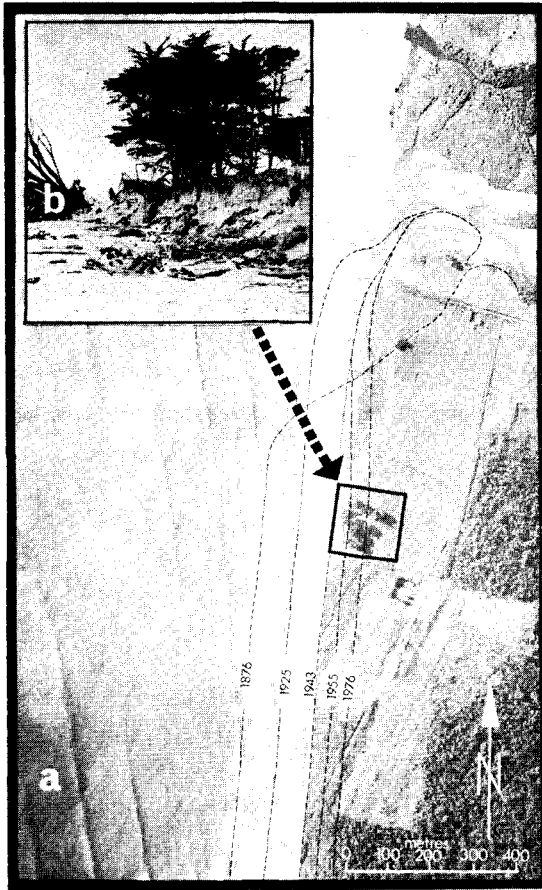


FIG. 3—*a*—Shoreline changes along the Waimangaroa coast (west coast, South Island) 1876–1976, plotted on aerial photographs taken in 1943. The oblique strike of Holocene dune belts to the present coastline is evidence that this coast is in the process of realigning. *b*—Ground photograph taken 12 February 1977 looking north towards the group of macrocarpa trees (Fig. 2; fallen trees in the background are evident on Fig. 2d). The erosion scarp shown is characteristic of actively eroding depositional coasts. (Aerial photographs published by permission of Department of Lands and Survey, N.Z.).

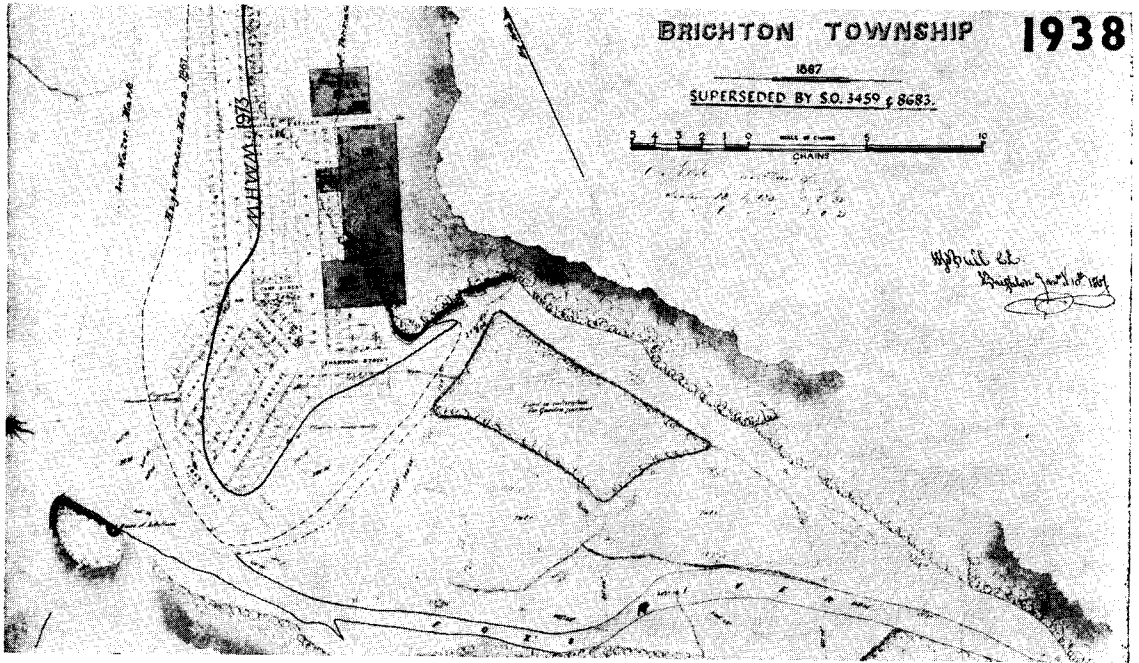


FIG. 4—Survey Office plan 1938 of Brighton, west coast, South Island. The 1973 position of MHW (vegetation line) was plotted by the author from aerial photographs. Coastal erosion has resulted in a retreat of the shoreline along 7 km of this coast. The amount of erosion from 1867 to 1973 was measured directly from the line scale on the original plan. (Plan published by permission of the Department of Lands and Survey, N.Z.).

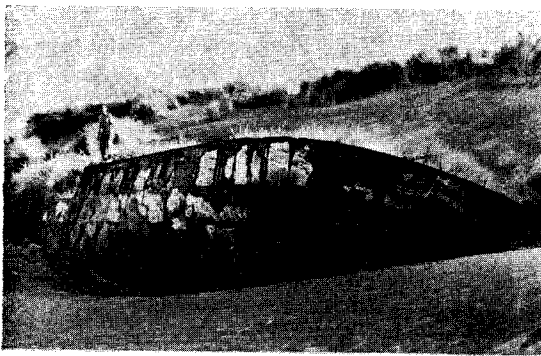


FIG. 5—Two examples of field measurements from reference points dating past shorelines. (Upper) — Stern view of *Fusilier* on Santoft beach (Fig. 6) 20 March 1975, landward of recently constructed foredune. The wreck dates the approximate position of MHW in 1884. Amount of accretion was measured from the wreck to present-day MHW. (Lower) — Concrete gun-emplacement at Kaitoke beach (Fig. 6) 21 March 1975, outflanked by coastal erosion exposed on the beach during low-water spring tides. It marks the 1940 position of the second dune in from the sea. The amount of erosion was measured from the gun-emplacement to the position of the present-day secondary dune.

CADASTRAL PLANS

Cadastral plans show surveyed land boundaries, including MHWM, for describing and recording ownership. Those held by the Department of Lands and Survey are of three kinds: transfers of Crown Land are recorded on Survey Office plans (S.O.s), Public Land on Deposited Plans (D.P.s), and Maori Land on Maori Land plans (M.L.s).

The 1867 survey office plan (S.O. 1938) shown in Fig. 4 is of the gold mining town of Brighton at the mouth of the Fox River between Westport and Grey-mouth, west coast, South Island (see Fig. 6). In the 1870s, Brighton boasted a casino, billiard saloons, and 53 pubs (Nolan 1975). Today no trace of this town of several thousand people is left. A combination of coastal erosion and the passing of the gold rush have led to its destruction.

TABLE 1—Measurement errors on plans of various scales based on a plan measurement accuracy of ±0.25 mm.

Scale	Measurement Error (m)
1:100 000	±25
1:63 360	±16
1:31 680	± 8
1:15 840	± 4
1:7920	± 2
1:6000	± 1.5
1:3960	± 1.0
1:2000	± 0.5
1:1000	± 0.25
1:792	± 0.2

The 1867 position of MHWM shown on the plan represents the vegetation line. Aerial photographs taken in 1973 were used to plot this same line on the old plan using proportional dividers and geographic fixed points common to both plan and aerial photographs. Shoreline changes indicate 50–76 m of coastal erosion over a period of 106 y (Items 021 & 022, Appendix 1).

FIELD MEASUREMENTS

Field measurements were made from a known reference point or line dating a past shoreline to the present day shoreline. Two examples are shown in Fig. 5. Figure 5 (upper) shows the wreck of *Fusilier* on Santoft beach, Wellington west coast (Fig. 6). This steel barque of 404 tons was wrecked in 1884, settling between low- and high-water marks. Over the 97 y since the wreck the coast has built out about 100 m at a net rate of 1 m.y<sup>-1</sup> (Item 113, Appendix 1). A foredune has been constructed and is engulfing the wreck.

Fig. 5b shows a World War II concrete gun-emplacement at Kaitoke Beach, Wanganui (Fig. 6) that has been outflanked by coastal erosion. In 1940, it was constructed on the second dune in from the sea and is now well seaward of the foredune. The coast has retreated by 70 m at a net rate of 2 m.y<sup>-1</sup> over the past 37 y (Item 114, Appendix 1).

TABLE 2—Calculation of rates of coastal erosion from measurements made from aerial photos of the Waimangaroa coast (Fig. 2) with two examples of calculation of errors (*R* = rate; *D* = horizontal distance; *T* = survey interval).

Flight Date	Photo-scale	Horizontal Distance ( <i>D</i> , m)	Measure-ment Error (m)	Survey Interval ( <i>T</i> , y)	Net Erosion (m)	Rate ( <i>R</i> , m.y <sup>-1</sup> )	Net Rate (m.y <sup>-1</sup> )
25/ 5 /43	1:6630	285.1	±1.66				
12/ 4 /55	1:6460	248.1	±1.62	11.90	-37.0	-3.1 ± 0.3	
25/11/75	1:6810	218.6	±1.70				
5/10/76	1:6710	211.4	±1.68	1.89	- 7.2	-3.8 ± 1.8	2.2 ± 0.1

EXAMPLES

(a)  $D = (285.1 \pm 1.66) - (248.1 \pm 1.62) \text{ m}$

$= -37 \pm 3.28 \text{ m}$

$$R = \frac{D}{T} = \frac{-37 \text{ m} \pm 8.9\%}{11.9 \text{ y}}$$

$= -3.11 \text{ m} \pm 8.9\%$

$\therefore R = -3.1 \pm 0.3 \text{ m.y}^{-1}$

(b)  $D = (285.1 \pm 1.66) - (211.4 \pm 1.68) \text{ m}$

$= -73.7 \pm 3.34 \text{ m}$

$$R = \frac{-73.7 \text{ m} \pm 4.5\%}{33.34 \text{ y}}$$

$= -2.21 \text{ m} \pm 4.5\%$

$\therefore R = -2.2 \pm 0.1 \text{ m.y}^{-1}$

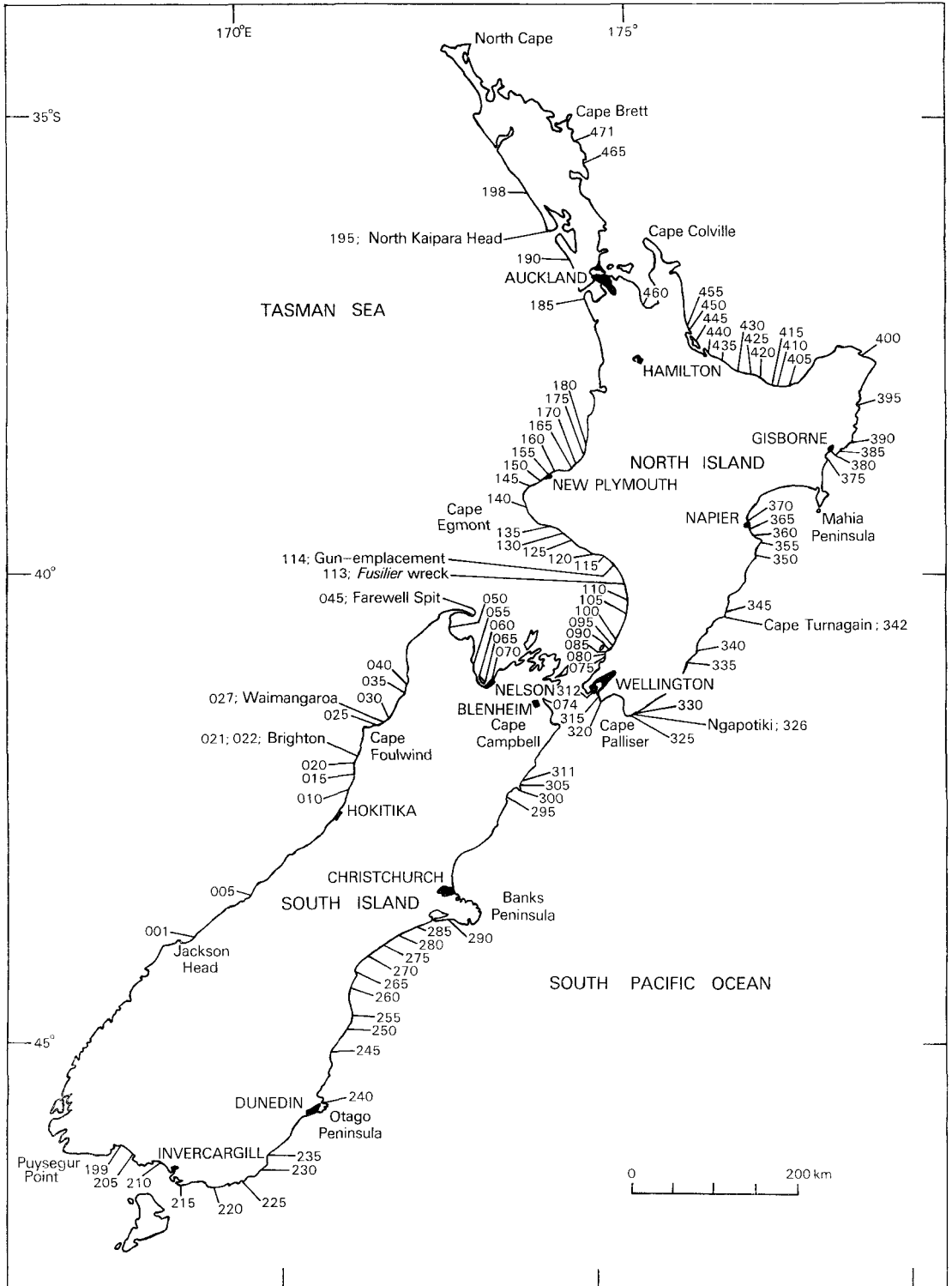


FIG. 6—General location of every fifth item in Column A of Appendix 1. Aerial photographs, survey plans, and field books for determining rates of coastal movement are held in Lands and Survey district offices in the cities and towns named.

## CONCLUSIONS

Rates of erosion or accretion may be determined for any locality around the New Zealand coast from either cadastral plans or vertical aerial photographs held in offices of the Department of Lands and Survey.

The seaward limit of land vegetation is the most natural reference line to use for defining the seaward boundary of land on the open coast.

Measurements of shoreline changes made from aerial photographs and plans at scales larger than 1:4000 generally have errors less than  $\pm 1$  m. Errors increase proportionately as scales become small so that small shoreline displacements of 2–5 m become insignificant at scales between 1:8000 and 1:16 000.

Along depositional shorelines in New Zealand erosion and accretion has generally occurred at rates of 0.5–4.0 m.y<sup>-1</sup>. The highest accretion rate recorded was 68.9 m.y<sup>-1</sup> at Farewell Spit (Item 045, Appendix 1), whereas the maximum erosion rate recorded was 25.4 m.y<sup>-1</sup> at North Kaipara Head (Item 195, Appendix 1).

Cliff recession has generally occurred at 0.25–1.0 m.y<sup>-1</sup> with maximum rates recorded of 2.25 m.y<sup>-1</sup> for mudstone cliffs at Cape Turnagain (Item 342, Appendix 1) and 3.46 m.y<sup>-1</sup> for conglomerate cliffs at Ngapotiki (Item 326, Appendix 1).

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APPENDIX 1—(Overleaf) Rates of coastal erosion and accretion around the New Zealand coast tabulated for 471 localities. Key to columns: (A) = localities numbered consecutively as shown on Fig. 6; (B) = locality names; (C) = NZMS 1 grid reference; (D) = land forms, their age of formation, and lithology of material forming the coast at each locality and (E) = texture of beach sediments (for abbreviation in (D) and (E) see Appendix 2)

Column (F) = survey years, information on significant erosion events, tectonic movements, establishment of coastal subdivisions, and aggregate mining of beaches; (G) = land gained from accretion (+) or lost from erosion (–) is tabulated as a horizontal distance in metres for each locality; (Items 312, 313, 314, and 324 record land gained by tectonic uplift from the 1855 Wellington earthquake); (H) = rates of erosion/accretion ( $\text{m.y}^{-1}$ ) for each survey interval; (I) = net rate ( $\text{m.y}^{-1}$ ) for entire survey period; and (J) = references (numbers listed correspond with those in reference list at the end of the text, and addresses of local informants are held by the author).

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
ITEM	LOCALITY	N Z M S 1 GRID REF.	LITHOLOGY AND AGE	BEACH	SURVEY INTERVAL (y)	ACCRETION(+) OR EROSION(-)(cm)	RATES (m.y <sup>-1</sup> )	NET RATE (m.y <sup>-1</sup> )	DATA SOURCE
001	JACKSON'S BAY	S86/680035	H <sub>3</sub> d	S	1904-1920	-50	-3.13		71
					1920-1962	-200	-4.76	3	
					1962-1974	-100	-8.34	71	
002	JACKSON'S BAY	S87/807137	H <sub>3</sub> d	S/G	1962-1975	+10	+0.77	+0.77	19
003	BRUCE BAY	S78/300463	H <sub>3</sub> d	S/G	1935-1975	-30	-0.75	-0.75	3
004	BRUCE BAY	S78/335482	H <sub>3</sub> d	S/G	1884-1928	-120	-2.73		71
					1925-1950	-100	-4.0	-3.33	71
005	HUNTS BEACH	S78/350525	H <sub>3</sub> r/s	G/S	1930-1975	-300	-6.67	-6.67	3
006	GILLESPIES BEACH	S70/507690	H <sub>3</sub> r	G	1945-1975	-20	-0.67	-0.67	61
007	WAITAHIA	S57/263270	H <sub>3</sub> r/d	S/G	1945-1975	-250	-8.3	-8.3	3
008	MOKITIKA	S50/519559	H <sub>3</sub> r/d	S/G	1867-1914	-20	-0.43		71
					1914-1953	+61	+1.39	71	
					1958-1975	+25	+1.47	+0.61	71
009	GREYMOOUTH	S44/723890	H <sub>3</sub> r	G	1930-1944	+88	+6.29		71
					1944-1968	0	0	+2.32	71
010	GREYMOOUTH	S44/734906	H <sub>3</sub> r	G	1888-1910	-20	-0.91		71
					1910-1971	-50	-0.82	-0.83	71
011	GREYMOOUTH	S44/743942	Ld	G	1910-1935	-14	-0.56		71
					1935-1971	-24	-0.67	-0.62	71
012	GREYMOOUTH	S44/745958	Ld	G	1888-1936	-30	-0.63	-0.63	71
013	RAPAHOE TRIG D	S44/766974	H <sub>3</sub> r	G	1882-1901	0	0		71
					1901-1929	-50	-1.79		71
					1929-1975	-60	-1.30	-1.18	71
014	RAPAHOE	S44/772985	H <sub>3</sub> r & Ak S7ST.-M/ST.	G	1950-1975	-60	-2.4	-2.4	71
015	BARRYTOWN	S44/823098	H <sub>3</sub> r/s	G	1930-1975	-100	-2.22	-2.22	71
016	BARRYTOWN	S37/825112	H <sub>3</sub> r/s	G	1930-1975	-160	-3.56	-3.56	71
017	BARRYTOWN	S37/826121	H <sub>3</sub> r/s	G	1930-1975	-140	-3.11	-3.11	71
018	BARRYTOWN	S37/827130	H <sub>3</sub> r/s	G	1930-1975	-90	-2.0	-2.0	71
019	BARRYTOWN	S37/831177	H <sub>3</sub> r	G	1930-1975	-140	-3.11	-3.11	71
020	BARRYTOWN	S37/832187	H <sub>3</sub> r	G	1930-1975	+110	+2.44	+2.44	71
021	TIROMDANA	S37/896393	H <sub>3</sub> r/d	S/G	1867-1973	-76	-0.72	-0.72	46
022	TIROMDANA	S37/897395	H <sub>3</sub> r/d	S/G	1867-1973	-50	-0.47	-0.47	46
023	NINE MILE BEACH	S30/963593	H <sub>3</sub> d	S	1950-1975	-60	-2.4	-2.4	3
024	CARTERS BEACH	S24/078753	H <sub>3</sub> d	S	1880-1919	+853	+21.88		29
025	NORTH BEACH	S24/087753	H <sub>3</sub> d	S	1919-1968	+160	+3.26	+11.51	46
					1880-1919	+954	+24.46		29
026	FAIRDOWN	S24/175757	H <sub>3</sub> d	S	1867-1884	0	0		46
					1884-1905	-128	-6.09		46
					1905-1921	-88	-5.49		46
					1921-1955	-104	-3.06		46
					1955-1968	+76	+5.83	-2.42	46
027	WAIMANGARDA	S24/217790	H <sub>3</sub> d	S/G	1876-1925	-79	-1.61		46
					1925-1943	-82	-4.56		46
					1943-1955	-37	-3.11		18
					1955-1974	-29.5	-1.51		18
					1974-1976	-7.2	-3.81	-2.35	18

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
028	NTH WAIMANGARA	S24/228800	H <sub>3</sub> d	G/S	1890-1905	-125	-8.33		16
					1905-1921	-99	-6.19		16
					1921-1943	-51	-2.32		16
					1943-1973	-35	-1.17	-3.73	36
029	JONES CREEK	S24/245815	H <sub>3</sub> d	S/G	1904-1968	-170	-2.66	-2.66	46
030	NGAKAWAU	S24/338901	H <sub>3</sub> r	G	1899-1931	+40	+1.25		46
					1931-1968	-19	-0.51	+0.30	46
031	HECTOR	S24/344908	H <sub>3</sub> r	G	1873-1894	0	0		46
					1894-1968	+61	+0.82	+0.64	46
032	NIKAU	S24/385978	H <sub>3</sub> θ/r	G	1897-1975	-40	-0.51	-0.51	46
033	NIKAU	S24/391992	H <sub>3</sub> θ/r	G	1902-1975	-32	-0.44	-0.44	46
034	MOKIHIAUI TRIG AP. S17/394002		H <sub>3</sub> θ	G	1875-1888	-11	-0.85		46
					1888-1947	-11	-0.19		46
					1947-1975	-9	-0.32		46
					1975-1977	-8	-6.67	-0.38	19
035	LITTLE WANGANUI	S18/512165	H <sub>3</sub> d	S	1879-1891	-6	-0.5		46
					1891-1901	-4	-0.36		46
					1901-1968	-80	-1.19	-1.01	46
036	LITTLE WANGANUI	S18/516175	H <sub>3</sub> d	S	1879-1891	+68	+6.18		46
					1891-1901	-94	-8.55		46
					1901-1968	-57	-0.85	-0.53	46
037	TE NAMU	S18/522187	H <sub>3</sub> d	S	1879-1891	+3	+0.25		46
					1891-1926	-50	-1.43		46
					1926-1955	-81	-2.79		46
					1955-1963	-8.6	-1.06		18
					1963-1968	-6.4	-1.39		18
					1968-1974	-2.8	-0.41		18
038	TE NAMU	S18/527214	H <sub>3</sub> d	S	1879-1891	0	0		46
					1891-1926	-18	-0.51		46
					1926-1936	-30	-3.0		46
					1936-1968	-75	-2.34	-1.38	46
039	TE NAMU	S18/530225	H <sub>3</sub> d	S	1879-1891	0	0		46
					1891-1926	-32	-0.91		46
					1926-1936	-24	-2.4		46
					1936-1972	-65	-1.81	-1.30	46
040	KONGAHU SCHOOL	S18/535253	H <sub>3</sub> d	S	1891-1926	-12	-0.34		46
					1926-1936	-28	-2.8		46
					1936-1968	-67	-2.09	-1.39	46
					1937	SCHOOL MOVED INLAND			
041	KARAMEA	S12/549367	H <sub>3</sub> d	S	1867-1968	+90	+0.89	+0.89	46
042	KARAMEA	S12/552398	H <sub>3</sub> d	S	1938-1968	+100	+3.33	+3.33	46
043	KARAMEA	S12/553419	H <sub>3</sub> d	S	1938-1968	+140	+4.67	+4.67	46
044	FAREWELL SPIT	S1/398182	H <sub>3</sub> d	S	1851-1938	0	0		16
					1938-1964	+2471	+95.04		46
					1964-1970	+92	+15.33		18
					1970-1975	0	0	+20.5	18
045	FAREWELL SPIT	S1/398182	H <sub>3</sub> m	S	1851-1938	+6993	+80.38		16
					1938-1964	+792	+30.46	+68.89	46
					WIDENING OF SPIT OVER ENTIRE LENGTH				
					1851-1938	+72.5	+0.88		16
					WIDENING OF SPIT OVER LAST 2/3 LENGTH				
1938-1964	+270	+10.38	+3.03	46					
EROSION OF INSIDE OF SPIT OVER FIRST 1/3 LENGTH									
1938-1964	-64	-2.46	-2.46	46					

Continued on next page.

## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(i)	(j)
046	TRIG H	S1/159231	H <sub>3</sub> d	S	1870-1923	-19	-0.36		45
					1923-1938	+10	+0.67		46
					1938-1964	+37	+2.19	+0.51	46
047	PAKAWAI	83/099135	H <sub>3</sub> d	S/G	1895-1914	-400	-21.0		3
					1914-1975	-150	-2.45	-6.88	19
048	PAKAWAI	S3/102125	H <sub>3</sub> d	S	1940-1975	-10	-0.3	-0.3	3
049	WAIKATO	S3/094097	H <sub>3</sub> d	S	1925-1975	-20	-0.4	-0.4	3
050	WAIKATO	S3/092080	H <sub>3</sub> d	S	1940-1975	-100	-2.88	-2.88	3
051	AWAROA BAY	S9/416801	H <sub>3</sub> r/d	S	1850-1963	+100	+0.88	+0.88	33
052	ONETAHUTI BAY	S9/426770	H <sub>3</sub> r/d	S	1850-1890	+80	+2.0		30
					1890-1954	+100	+1.55		38
					1954-1963	+20	+2.22	+1.77	38
053	SANDY BAY	S9/389626	H <sub>3</sub> d	S	1842-1888	+40	+0.87		33
					1888-1942	+40	+0.74		38
					1944-1954	+30	+3.0	+0.96	33
054	HAITERITERI	S9/397587	H <sub>3</sub> r	S	1842-1930	+50	+0.57		33
					1930-1944	0	0	+0.49	33
055	KINA	S14/433411	H <sub>3</sub> r	G	1961-1975	-6	-0.43	-0.43	3
056	KINA	S14/435408	H <sub>3</sub> r	G	1961-1975	-3	-0.21	-0.21	3
057	RUBY BAY	S14/454347	H <sub>3</sub> r	G	1912-1945	0	0		43
					1945-1964	-22	-1.16	-0.42	46
058	RUBY BAY	S14/456343	H <sub>3</sub> r	G	1912-1964	-26.2	-0.5	-0.5	45
059	RUBY BAY	S14/461338	H <sub>3</sub> r	G	1912-1964	-45.5	-0.87	-0.87	45
060	RUBY BAY	S14/466333	H <sub>3</sub> r	G	1970-1975	-10	-2.0	-2.0	43
061	MAPUA	S14/467334	H <sub>3</sub> r	G/S	1912-1961	-37.7	-0.77	-0.77	46
062	MAPUA	S14/472329	H <sub>3</sub> d/r	G/S	1912-1961	+81.7	+1.67	+1.67	45
063	RABBIT ISLAND	S14/473321	H <sub>3</sub> r/d	S	1923-1967	-50	-1.14	-1.14	45
064	RABBIT ISLAND	S14/479322	H <sub>3</sub> d	S	1923-1967	+37	+0.84	+0.84	46
065	RABBIT ISLAND	S14/493316	H <sub>3</sub> d	S	1923-1967	0	0	0	45
066	RABBIT ISLAND	S14/505310	H <sub>3</sub> d	S	1923-1967	+50	+1.14	+1.14	45
067	RABBIT ISLAND	S14/514307	H <sub>3</sub> d	S	1923-1967	+10	+0.23	+0.23	46
068	RABBIT ISLAND	S14/527303	H <sub>3</sub> d	S	1923-1967	-50	-1.14	-1.14	45
069	RABBIT ISLAND	S20/545293	H <sub>3</sub> d	S	1923-1967	-84	-1.91		46
					1967-1975	-25	-3.13	-2.1	19
070	RABBIT ISLAND	S20/554283	H <sub>3</sub> d	S	1923-1967	-380	-8.64	-8.64	45
071	TAHUNANUI BEACH	S20/597287	H <sub>3</sub> d	S	1850-1969	+445	+3.74	+3.74	31
072	TAHUNANUI BEACH	S20/588287	H <sub>3</sub> d	S	1948-1971	-73	-3.17		18
					1971-1975	-10	-2.5		18
					1975-1977	-32	-13.33	-3.93	18
073	BOULDER BANK	S14/613310	H <sub>3</sub> r	G	1850-1943	+658	+7.08		47
					1943-1944	+43	+35.83		47
					1944-1950	+84	+13.33		47
					1950-1954	+21	+5.25		47
					1954-1956	+36	+18.0		47
					1956-1957	+26	+26.0		47
074	CLOUDY BAY	S22/320100	H <sub>3</sub> r	G/S	1957-1958	+7	+7.0		47
					1958-1960	+23	+11.5	+8.16	47
075	CENTENNIAL INN - PAREKAKARIKI	N160/485570	H <sub>3</sub> d	G	1894-1940	-12	-0.26		70
					1940-1977	-6	-0.16	-0.22	19
					(STORM SURGE SEPTEMBER 11-13, 1976)	-1			19

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
076	PAEKAKARIKI	N160/489576	H <sub>3</sub> d	G	1894-1897	-7	-2.3		70
					1897-1906	-6	-0.67		70
					1906-1926	-18	-0.9		70
					1926-1940	+21	+1.5		70
					1940-1958	-56	-2.78		70
					1958-1977	0	0	-0.72	19
077	PAEKAKARIKI	N160/491579	H <sub>3</sub> d	G	1926-1941	-9	-0.6		70
					1941-1963	0	0		70
					1963-1977	0	0	-0.18	19
					1907 FIRST SUBDIVISION OF PAEKAKARIKI COAST				
078	PAEKAKARIKI PARADE	N160/495587	ROAD FILL		1907-1976	0	0		70
					1976-1977	-2	-2	-0.03	19
079	PROFILE 3	N160/500596	H <sub>3</sub> d	S/G	1874-1968	+48	+0.51		70
					1968-1977	-1	-0.14	+0.46	19
					(STORM SURGE SEPTEMBER 11-13, 1976 -1) 19				
080	TRIG BEACH	N156/506613	H <sub>3</sub> d	G/S	1874-1968	+32	+0.34	+0.34	70
081	TRIG D	N156/512624	H <sub>3</sub> d	G/S	1874-1968	+17	+0.18	+0.18	70
082	PROFILE 4	N156/508618	H <sub>3</sub> d	G/S	1874-1943	+26	+0.38		70
					1943-1948	-13.8	-2.76		18
					1948-1952	+1.2	+0.3		18
					1952-1966	+4.4	+0.31		18
					1966-1973	-2.9	-0.41		18
					1973-1977	+3.0	+0.75	+0.17	18
					(STORM SURGE SEPTEMBER 11-13, 1976 0) 19				
083	PROFILE	N156/513633	H <sub>3</sub> d		1874-1943	-5	-0.07		70
					1943-1948	-9.7	-1.94		18
					1948-1952	+3.9	+0.98		18
					1952-1966	-4.4	-0.31		18
					1966-1973	-10.2	-1.46		18
					1973-1977	-3.0	-0.75	-0.28	18
					(STORM SURGE SEPTEMBER 11-13, 1976 -2.5) 19				
1906 FIRST SUBDIVISION OF RAUMATI COAST									
084	PROFILE 6	N156/516649	H <sub>3</sub> d	S	1874-1880	-50	-8.33		70
					1880-1920	+29	+0.73		70
					1920-1968	-5	-0.10		70
					1968-1977	-11	-1.22	-0.36	19
					(STORM SURGE SEPTEMBER 11-13, 1976 -11) 19				
085	PROFILE 7	N156/518666	H <sub>3</sub> d	S	1874-1880	-40	-6.67		70
					1880-1943	+35	+0.56		70
					1943-1952	+12.4	+1.38		18
					1952-1958	-25	-4.17		18
					1958-1977	-6	-0.32	-0.23	18
(STORM SURGE SEPTEMBER 11-13, 1976 -6) 19									
086	PROFILE 8	N156/518682	H <sub>3</sub> d	S	1874-1880	+40	+6.67		70
					1880-1905	+20	+0.8		70
					1905-1952	-24	-0.51		70
					1952-1958	+2.2	+0.37		18
					1958-1966	+4.4	+0.55		18
					1966-1973	+5.2	+0.74		18
					1973-1977	+5.3	+1.33	+0.52	18
(STORM SURGE SEPTEMBER 11-13, 1976 -4) 19									

Continued on next page.

## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
087	PROFILE 9	N156/519694	H <sub>3</sub> d	S	1880-1905	+143	+5.72		70
					1905-1968	+52	+0.83	+2.22	70
					(STORM SURGE SEPTEMBER 11-13, 1976	-4)			19
088	PROFILE 10	N156/523708	H <sub>3</sub> d	S	1880-1905	+119	+4.76		70
					1905-1968	+52	+0.83	+1.94	70
					(STORM SURGE SEPTEMBER 11-13, 1976	-1)			19
1920 FIRST SUBDIVISION OF PARAPARAUU COAST									
089	KENAKENA TRIG	N156/527714	H <sub>3</sub> d	S	1880-1892	+22	+1.83		70
					1892-1905	+73	+5.62		70
					1905-1968	+96	+1.51	+2.16	70
090	KENAKENA POINT	N156/527714	H <sub>3</sub> d	S	1877-1892	+60	+4.0		12
					1892-1914	+60	+2.73		12
					1914-1940	+40	+1.54	+2.54	12
091	PROFILE 11	N156/532717	H <sub>3</sub> d	S	1880-1968	+171	+1.94	+1.94	70
					(STORM SURGE SEPTEMBER 11-13, 1976	-1)			19
092	PROFILE 12	N156/548727	H <sub>3</sub> d	S	1880-1898	+26	+1.44		70
					1898-1923	-40	-1.6		70
					1923-1968	+71	+1.58		70
					1968-1977	-8	-0.89	+0.51	19
					(STORM SURGE SEPTEMBER 11-13, 1976	-2)			19
093	PROFILE 13	N157/556733	H <sub>3</sub> d	S	1880-1898	+121	+6.72		70
					1898-1923	+32	+1.28		70
					1923-1948	+4	+0.16		70
					1948-1968	+24	+1.2		70
					1968-1976	-8	-1.0		19
					1976-1977	-2	-2.0	+1.76	19
					(STORM SURGE SEPTEMBER 11-13, 1976	-3)			19
1923-1924 FIRST SUBDIVISION OF WAIKANAE COAST									
094	WAIKANAE	N157/563739	H <sub>3</sub> d	S	1880-1924	+116	+2.64		70
					1924-1948	+13	+0.54		70
					1948-1968	+45	+2.25		70
					1968-1977	-8	-0.89	+1.71	19
095	PROFILE 14	N157/569745	H <sub>3</sub> d	S	1880-1898	+120	+6.67		70
					1898-1957	+18	+0.31		70
					1957-1968	+18	+1.64		70
					1968-1977	-8	-0.89	+1.53	19
					(STORM SURGE SEPTEMBER 11-13, 1976	-4)			19
096	PROFILE 15	N157/578757	H <sub>3</sub> d	S	1880-1908	+80	+2.85		70
					1908-1957	+38	+0.77		70
					1957-1968	+51	+4.64		70
					1968-1976	-6	-0.75		19
					1976-1977	-2	-2.0	+1.66	19
					(STORM SURGE SEPTEMBER 11-13, 1976	-6)			19
097	TRIG M	N157/584765	H <sub>3</sub> d	S	1880-1908	+14	+0.5		70
					1908-1964	+34	+0.61		70
					1964-1968	+33	+8.25		70
					1968-1977	-8	-0.89	+0.75	19
098	PROFILE 16	N157/589772	H <sub>3</sub> d	S	1914-1964	+17	+0.34		70
					1964-1968	+17	+4.25		70
					1968-1976	-6	-0.75		19
					1976-1977	-2	-2.0	+0.41	19
					(STORM SURGE SEPTEMBER 11-13, 1976	-6)			19

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
099	TRIG T	N157/608808	H <sub>3</sub> d	S	1879-1918	+19	+0.66		70
					1918-1968	+100	+2.0	+1.34	70
100	TE HORO	N157/615823	H <sub>3</sub> d/r	G/S	1879-1918	0			70
					1918-1968	+60	+1.2	+0.67	70
					1918 FIRST SUBDIVISION OF TE HORO COAST				70
101	SIMS ROAD	N157/623840	H <sub>3</sub> r	G	1880-1968	+67	+0.76	+0.67	70
102	SWAMP ROAD	N157/629855	H <sub>3</sub> r	G	1880-1968	+67	+0.76	+0.76	70
103	OTAKI BEACH	N157/637873	H <sub>3</sub> r/d	S/G	1870-1930	+60	+1.0	+1.0	12
104	'HYDERABAD' WRECK	N152/712092	H <sub>3</sub> d	S	1878-1975	+20	+0.26	+0.26	19
105	WAITAREE BEACH	N152/730180	H <sub>3</sub> d	S	1842-1972	+350	+2.69	+2.69	70
106	WAITAREE BEACH	N152/732198	H <sub>3</sub> d	S	1842-1972	+460	+3.54	+3.54	70
107	MANAWATU MOUTH NTH	N148/736208	H <sub>3</sub> d	S	1842-1889	+1720N	36.6		31
					1889-1962	-3200S	-43.84	-12.33S	70
					MOUTH MIGRATION N(+) AND S(-)				
108	FOXTON BEACH	N148/737238	H <sub>3</sub> d	S	1842-1952	+70	+0.58	+0.58	31
109	FOXTON BEACH	N148/739253	H <sub>3</sub> d	S	1889-1953	0	0	0	42
110	HIMATANGI	N148/742290	H <sub>3</sub> d	S	1889-1962	+300	+4.11	+4.11	42
111	HIMATANGI	N148/747320	H <sub>3</sub> d	S	1889-1971	+50	+0.61	+0.61	42
112	TANGIMODANA	N148/748347	H <sub>3</sub> d	S	1889-1943	+20	+0.37	+0.37	42
113	'FUSILLIER' WRECK	N143/702615	H <sub>3</sub> d	S	1884-1975	+90	+1.0	+1.0	19
114	KAITOKE BEACH	N138/566809	H <sub>3</sub> d	S	1940-1975	-70	-2.0	-2.0	19
115	KAITOKE BEACH	N138/559816	H <sub>3</sub> d	S	1940-1975	-56	-1.6	-1.6	19
116	WANGANUI AIRPORT	N138/500823	H <sub>3</sub> d	S	1940-1975	-50	-1.43	-1.43	19
117	STH WANGANUI	N137/530840	H <sub>3</sub> d	S	1879-1894	-60	-4.0		41
					1894-1921	-60	-2.22		41
					1921-1942	-120	-5.45		41
					1942-1962	+90	+4.5	-1.81	41
118	CASTLECLIFF	N137/514847	H <sub>3</sub> d	S	1879-1894	+50	+3.33		7
					1894-1921	+100	+3.70		7
					1921-1942	+200	+9.09		7
					1942-1962	+100	+5.00		7
					1962-1970	+10	+1.25	+5.05	7
119	KAI IWI BEACH	N137/440917	lm	S	1876-1893	-25.5	-1.5		14
					1893-1916	-9.9	-0.43		14
					1942-1953	-7.6	-0.69		7
					1953-1963	-4.6	-0.46		7
					1963-1969	-4.	-0.69	-0.56	7
120	OKEHU	N137/414931	lm	S	1904-1954	-16	-0.32	-0.32	70
121	MAXWELL	N137/395938	lm	S	1904-1954	-20	-0.4	-0.4	70
122	TRIG T	N137/379942	lm	S	1904-1954	-36	-0.72	-0.72	70
123	PATEA	N136/053053	H <sub>3</sub> d	S	1872-1905	+60	+1.82		67
					1905-1976	-60	-0.85	0	19
124	PATEA	N136/050053	H <sub>3</sub> d	S	1872-1905	-32	-1.0		67
					1905-1939	+59	+1.74		67
					1939-1976	+76	+2.05	+0.99	19
125	POWER HOUSE ROAD	N129/985105	lm	S	1901-1976	-4	-0.05	-0.05	67
126	MANUTAHU ROAD	N129/953148	lm	S	1874-1927	-22	-0.42	-0.42	67
127	MANAWAPOU	N129/930180	lm	S/G	1874-1953	-48	-0.61		67
					1953-1976	-20	-0.87	-0.67	19
					1940 EXTRACTION OF 14,000m GRAVEL				66
128	MANAWAPOU	N129/922192	lm	S/G	1874-1953	-42	-0.53		67
					1953-1976	-23	-1.0	-0.64	19

Continued on next page.



## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
129	SIGGS TRIG	N129/864234	Wm	G/S	1908-1958	-30	-0.6	-0.60	67
130	HAUROTO ROAD	N129/796267	Wm	G/S	1902-1930	-9	-0.32	-0.32	67
131	OHAWE BEACH	N129/778275	Wm	G/S	1871-1966	-60	-0.63	-0.63	67
132	OHAWE BEACH	N129/773277	H <sub>3</sub> m	G/S	1871-1959	-51	-0.58		67
					1959-1966	-9	-1.29	-0.63	25
133	RAINE ROAD	N129/764277	Wm	G/S	1940-1976	-40	-1.11	-1.11	39
					1945-1960 EXTRACTION OF 36,600m <sup>3</sup> GRAVEL				39
134	WINKS TRIG	N129/723284	H <sub>2</sub> J	G/S	1872-1976	35	-0.34	-0.34	67
135	NORMANBY ROAD	N129/678288	H <sub>2</sub> J	G/S	1879-1930	-8	-0.16	-0.16	67
136	GLEN ROAD	N129/655294	H <sub>2</sub> J	G/S	1912-1947	0	0	0	67
137	PIHAMA	N128/498372	H <sub>3</sub> J	S/G	1920-1976	0	0	0	67
138	PUNEHU	N120/493377	H <sub>3</sub> J	S/G	1920-1976	-5	-0.09	-0.09	67
139	DANUJI	N118/382505	H <sub>3</sub> d	S	1881-1950	0	0	0	67
140	WAITAHA	N118/360597	H <sub>3</sub> d	S	1880-1937	+40	+0.70		67
					1937-1959	+50	+2.27	+1.14	67
141	TIPOKA	N118/358604	H <sub>3</sub> d	S/G	1880-1937	+42	+0.74		67
					1937-1959	-20	-0.91	+0.28	67
142	TIPOKA TRIG V	N118/356610	H <sub>3</sub> d	S	1880-1937	+22	+0.39		67
					1937-1959	-12	-0.55	+0.13	67
143	WAREA RIVER	N118/698372	H <sub>3</sub> r	G	1881-1953	+14	+0.19	+0.19	67
144	STENT ROAD	N108/370703	H <sub>3</sub> r	G	1881-1953	+20	+0.28	+0.28	67
145	STENT ROAD	N108/372710	H <sub>3</sub> r	G	1881-1953	+10	+0.14	+0.14	67
146	LEITH ROAD	N108/463813	H <sub>2</sub> J	G	1892-1976	0	0	0	67
147	AHU AHU ROAD	N108/516842	H <sub>3</sub> d	S	1865-1961	+20	+0.21	+0.21	67
148	DAHURA	N108/525843	H <sub>3</sub> d	S	1865-1961	+64	+0.67	+0.67	67
149	QAWURA	N108/531845	H <sub>3</sub> d	S	1865-1961	+32	+0.33	+0.33	67
150	HAREHAWE STREAM	N108/598905	H <sub>2</sub> J	S	1925-1976	0	0	0	67
151	NEW PLYMOUTH	N109/658927	H <sub>2</sub> J	S	1842-1901	-10	-0.17		67
					1901-1921	-10	-0.5		67
					1921-1944	-9	-0.39	-0.28	67
					1944 SEAWALL BUILT, CLIFFS STABILISED				30
152	NEW PLYMOUTH	N109/664926	H <sub>3</sub> d	S	1842-1921	-86	-1.09	-1.09	67
153	FITZROY BEACH	N109/668929	H <sub>3</sub> d	S	1842-1958	-68	-0.59	-0.59	67
154	FITZROY BEACH	N109/672933	H <sub>3</sub> d	S	1842-1958	-67	-0.58	-0.58	67
155	FITZROY BEACH	N109/675937	H <sub>3</sub> d	S	1842-1958	-100	-0.86	-0.86	67
156	FITZROY BEACH	N109/679942	H <sub>3</sub> d	S	1842-1958	+9	+0.08	+0.08	67
					1881-1887 NEW PLYMOUTH HARBOUR BREAKWATER BUILT				30
157	BELL BLOCK	N109/710966	H <sub>3</sub> d	S/G	1907-1974	-28	-0.42	-0.42	67
158	WILLS ROAD	N109/724967	H <sub>2</sub> J	G/S	1852-1945	-23.5	-0.25		67
					1945-1950	-11.9	-2.38		18
					1950-1957	0	0		18
					1957-1970	-9.02	-0.69		18
					1970-1976	-0.92	-0.15	-0.37	18
159	PUKETAPU TRIG	N109/730972	H <sub>2</sub> J	G/S	1917-1945	-20.0	-0.71		67
					1945-1950	-12.3	-2.5		18
					1950-1957	0	0		18
					1957-1964	-9.6	-1.37		67
					1964-1970	-2.7	-0.41		18
					1970-1976	-0.44	-0.07	-0.76	18
					1937-1948 GRAVEL EXTRACTION WILLS ROAD TO PUKETAPU				3
160	AIRPORT	N109/742982	H <sub>2</sub> J	G/S	1917-1964	-45	-0.96	-0.96	67
161	AIRPORT	N109/747990	H <sub>2</sub> J	G/S	1917-1964	-15	-0.32	-0.32	67

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
162	WAITARA	N99/800006	H <sub>3</sub> d	S/G	1913-1958	-130	-2.89	-2.89	67
163	OTARARA ROAD	N99/835005	H <sub>3</sub> d	S/G	1919-1975	-24	-0.43	-0.43	67
164	STH ONAERO	N109/910000	Tt M/ST.-S/ST.	S	1882-1937	-30	-0.55	-0.55	67
165	STH ONAERO	N99/921003	Tt M/ST.-S/ST.	S	1882-1931	-6	-0.12	-0.12	67
166	NTH ONAERO	N99/927003	Tt M/ST.-S/ST.	S	1883-1958	-40	-0.53	-0.53	67
167	NTH ONAERO	N99/934004	Tt M/ST.-S/ST.	S	1883-1958	-80	-1.07	-1.07	67
168	URENUI	N99/951006	H <sub>3</sub> e	S/G	1970-1975	-30	-6.0	-6.0	19
169	BROWN TRIG	N99/968017	Tt M/ST.-S/ST.	S	1883-1958	0	0	0	67
170	OLD NTH ROAD	N99/976026	Tt M/ST.-S/ST.	S	1883-1960	-17.5	-0.23	-0.23	67
171	OLD NTH ROAD	N99/983030	Tt M/ST.-S/ST.	S	1883-1980	-12.5	-0.16	-0.16	67
172	CARRS ROAD	N99/987033	Tt M/ST.-S/ST.	S	1883-1975	-24.0	-0.26	-0.26	67
173	CARRS ROAD	N99/990037	Tt M/ST.-S/ST.	S	1883-1975	-30.0	-0.33	-0.33	67
174	MIMI TRIG	N99/999047	Tt M/ST.-S/ST.	S	1880-1975	-36	-0.38	-0.38	67
175	PUKEARUHE ROAD	N99/045110	Tt M/ST.-S/ST.	S	1866-1980	-30	-0.29	-0.29	67
176	PARIKARIWA POINT	N99/061123	Tt M/ST.-S/ST.	S	1955-1975	-10	-0.5	-0.5	3
177	MONUMENT	N99/070126	Tt M/ST.-S/ST.	S	1937-1969	-12	-0.38	-0.38	67
178	PARININIHI TRIG	N99/095151	Tt M/ST.-S/ST.	S	1880-1975	-180	-1.89	-1.89	67
179	WHITE CLIFFS	N100/118191	Tt M/ST.-S/ST.	S	1955-1975	-40	-2.0	-2.0	3
180	RAPANUI STREAM	N100/135238	Tt M/ST.-S/ST.	S	1896-1966	-8	-0.11	-0.11	67
181	MOHAKATINO	N91/150305	Tt M/ST.-S/ST.	S	1888-1974	-43	-0.5	-0.5	67
182	MOHAKATINO	N91/151313	Tt M/ST.-S/ST.	S	1888-1974	-8	-0.09	-0.09	67
183	MANUKAU BARRIER	N46.098258	H <sub>3</sub> d	S	1853-1919 1919-1969	+115 -240	+1.74 -4.8	-1.08	31 31
184	MANUKAU BARRIER	N46/082291	H <sub>3</sub> d	S	1853-1919 1919-1969	+110 -408	+1.67 -8.16	-2.57	31 31
185	MANUKAU BARRIER	N46/077300	H <sub>3</sub> d	S	1853-1919 1919-1969	+120 -384	+1.82 -7.68	-2.28	31 31
186	MANUKAU BARRIER	N46/065330	H <sub>3</sub> d	S	1853-1919 1919-1969	+336 -614	+5.09 -12.28	-2.40	31 31
187	MANUKAU BARRIER	N46/064354	H <sub>3</sub> d	S	1853-1919 1919-1969	+672 -960	+10.18 -19.2	-2.48	31 31
188	WHATIPI	N41/024375	H <sub>3</sub> d	S	1844-1853 1953-1890 1890-1910 1910-1919 1919-1930 1930-1940 1940-1954 1954-1960 1960-1968 1968-1974	0 +280 0 -180 -100 +500 +710 +20 +10 +80	0 +7.57 0 -20.0 -9.09 +50.0 +50.71 +3.33 +1.25 +13.33	0 +10.15	42 42 42 31 42 42 42 42 42 42

Continued on next page.

## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
189	TRIG X	N41/018399	H <sub>3</sub> d	S	1844-1890	+380	+8.26		42
					1890-1910	0	0		42
					1910-1919	-20	-2.22		31
					1919-1940	+90	+4.29		42
					1940-1960	+60	+3.0		42
					1960-1968	+320	+40.0		42
190	MURIWAI BEACH	N41/951616	H <sub>3</sub> d	S	1968-1974	0	0	+6.38	42
					1971-1975	-50	-12.5	-12.5	3
					1971-1975	-20	-5.0	-5.0	3
					1852-1926	-772	-10.43		72
					1926-1966	+1235	+30.68	+4.06	72
191	MURIWAI BEACH	N41/943648	H <sub>3</sub> d	S	1926-1942	+875	+54.69		72
					1942-1952	+663	+66.3		72
					1952-1966	+160	+11.43	+17.61	72
					1926-1960	-250	-7.35	-7.35	72
192	STH KAIPARA HEAD	N33/688042	H <sub>3</sub> d	S	1852-1879	-772	-28.59		72
					1879-1926	-1111	-23.64		72
					1926-1943	-617	-36.29		72
					1943-1960	-347	-14.53	-25.44	72
193	PAPAKANUI SPIT	N33/744110	H <sub>3</sub> d	S	1852-1926	+586	+7.92		72
					1926-1942	+926	+54.45		72
					1942-1952	+123	+7.24	+15.14	72
					1952-1966	+15	+1.5	+1.5	57
194	KAIPARA HEAD LIGHTHOUSE	N33/657158	H <sub>1</sub> d	S	1962-1972	+15	+1.5	+1.5	57
					1915-1976	-60	-0.98	-0.98	3
					1889-1963	0	0	0	64
					1889-1901	+24	+2.0		64
195	NTH KAIPARA HEAD	N32/583146	H <sub>3</sub> d	S	1901-1926	+70	+2.8		64
					1926-1963	+24	+0.65		64
					1963-1976	0	0	+1.36	18
					1946-1963	-17	-1.0		18
201	TE WAEWAE BAY	S175/736237	H <sub>3</sub> b	G	1963-1976	-35	-2.69	-1.73	18
					1946-1963	-20	-1.18		18
					1963-1976	-40	-3.08	-2.0	18
202	TE WAEWAE BAY	S175/752224	H <sub>3</sub> b	G	1946-1963	-5	-0.29		18
					1963-1976	+5	+0.38		18
					1976-1977	-10	-10.0	-0.32	19
203	TE WAEWAE BAY	S175/757212	H <sub>3</sub> F	G	1884-1928	0	0		64
					1928-1977	0	0	0	19
					1909-1969	0	0	0	64
204	DREPUKI	S175/824147	lim M/ST.	G/S	1884-1963	+20	+0.25	+0.25	64
					1881-1963	+55	+0.67	+0.67	64
205	KAWAKAPUTA BAY	S176/920047	H <sub>3</sub> d	S	1858-1966	+30	+0.28	+0.28	64
					1858-1966	0	0	0	64
206	COLLAC BAY	S176/996065	H <sub>3</sub> d	S	1863-1963	+80	+0.8	+0.8	64
					1926-1963	+50	+1.35	+1.35	64
207	RIVERTON	S176/076071	H <sub>3</sub> F/d	S/G	1907-1963	+200	+3.57	+3.57	64
					1907-1963	+250	+4.46	+4.46	64
208	RIVERTON	S176/100089	H <sub>3</sub> F/d	S/G	1888-1969	+5	+0.06	+0.06	64
					1888-1947	-30	-0.51	-0.51	64
209	FERRY ROAD	S176/223033	H <sub>3</sub> d	S	1888-1947	-30	-0.51	-0.51	64
					1888-1947	-30	-0.51	-0.51	64
210	DRETI BEACH	S181/249988	H <sub>3</sub> d	S	1888-1947	-30	-0.51	-0.51	64
					1888-1947	-30	-0.51	-0.51	64
211	DRETI BEACH	S181/270938	H <sub>3</sub> d	S	1888-1947	-30	-0.51	-0.51	64
					1888-1947	-30	-0.51	-0.51	64
212	DRETI BEACH	S182/280916	H <sub>3</sub> d	S	1888-1947	-30	-0.51	-0.51	64
					1888-1947	-30	-0.51	-0.51	64
213	DRETI BEACH	S182/280916	H <sub>3</sub> d	S	1888-1947	-30	-0.51	-0.51	64
					1888-1947	-30	-0.51	-0.51	64
214	TOETDES BAY	S182/483777	H <sub>3</sub> F	G	1888-1947	-30	-0.51	-0.51	64
					1888-1947	-30	-0.51	-0.51	64
215	TRIG A	S182/507785	H <sub>3</sub> F	G	1888-1947	-30	-0.51	-0.51	64
					1888-1947	-30	-0.51	-0.51	64

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
216	WHITUNA TRIG	S182/632831	H <sub>3</sub> r	G/S	1889-1906	-10	-0.59		64
					1906-1966	-24	-0.4	-2.26	64
217	TOETOES BAY	S182/703830	H <sub>3</sub> d	S	1875-1928	-28	-0.53		64
					1928-1965	+68	+1.64	+0.44	64
218	TOETOES BAY	S182/733821	H <sub>3</sub> d	S	1928-1952	+40	+1.67		64
					1952-1969	+40	+2.35	+0.51	18
219	WAIPAPA	S183/813734	H <sub>3</sub> d	S	1888-1935	-38	-0.81		64
					1935-1948	+65	+5.0		64
					1948-1967	-30	-1.58	-0.04	18
220	WAIPAPA	S183/858734	H <sub>3</sub> d	S	1888-1935	-66	-1.40		64
					1935-1948	+170	+13.08		64
					1948-1967	-30	-1.58	+0.94	18
221	HALDANE BAY	S183/950732	H <sub>3</sub> d	S	1894-1967	+50	+0.68	+0.68	64
222	PORPOISE BAY	S183/995734	H <sub>3</sub> d	S	1894-1948	+60	+1.11	+1.11	64
223	PORPOISE BAY	S183/994745	H <sub>3</sub> d	S	1894-1958	+24	+0.38		64
					1958-1977	+16	+0.84	+0.48	19
224	PORPOISE BAY	S183/001754	H <sub>3</sub> d	S	1894-1948	+60	+1.11		64
					1948-1977	0	0	+0.72	19
225	WAIPATI BEACH	S184/203789	H <sub>3</sub> d	S	1897-1967	+50	+0.71	+0.71	51
226	WAIPATI BEACH	S184/215801	H <sub>3</sub> d	S	1897-1967	-70	-1.0	-1.0	51
227	TAHAKOPA BAY	S184/309862	H <sub>3</sub> d	S	1894-1967	+357	+3.84	+3.84	51
228	TAHAKOPA BAY	S184/323867	H <sub>3</sub> d	S	1894-1967	+153	+1.64	+1.64	51
					1889-1933	-60	-1.36		51
229	CATLINS	S184/494977	H <sub>3</sub> d	S	1933-1967	0	0	-0.77	51
					1865-1891	0	0		51
230	CATLINS	S184/500967	H <sub>3</sub> d	S	1891-1948	-360	-6.32		51
					1948-1951	+109	+36.33		18
					1951-1975	-134	-5.58		18
					1975-1977	-85	-42.5	-4.20	19
231	SURAT BAY	S184/518972	H <sub>3</sub> d	S	1891-1948	+119	+2.09		51
					1948-1951	-13	-4.33		18
					1951-1975	+6	+0.25	+1.33	18
232	MOLYNEUX BAY	S179/557100	H <sub>3</sub> r	S	1847-1962	0	0		51
					1962-1977	-80	-5.33	-0.62	19
233	MOLYNEUX BAY	S179/572122	H <sub>3</sub> b	S/G	1847-1962	+380	+3.30	+3.30	51
234	MOLYNEUX BAY	S179/590142	H <sub>3</sub> r/d	S/G	1847-1962	+290	+2.52	+2.52	51
235	MOLYNEUX BAY	S179/611155	H <sub>3</sub> r/d	S/G	1847-1962	+145	+1.26	+1.26	51
236	MOLYNEUX BAY	S179/630165	H <sub>3</sub> r/d	S/G	1847-1962	+70	+0.61	+0.61	51
237	ALLANS BEACH	S164/315714	H <sub>3</sub> d	S	1939-1969	+300	+10.0	+10.0	42
238	WICKLIFFE BAY	S164/346775	H <sub>3</sub> d	S	1867-1888	-166	-7.9		51
					1888-1952	-3	-0.05		51
					1952-1972	+63	+3.15	-1.01	51
239	PIPIKARETU BEACH	S164/357804	H <sub>3</sub> d	S	1876-1972	+239	+2.28	+2.28	51
240	PENGUIN BEACH	S164/354820	H <sub>3</sub> d	S	1867-1972	+133	+1.27	+1.27	51
241	PURAKAWI BAY	S164/252878	H <sub>3</sub> d	S	1891-1975	+435	+5.18	+5.18	51
242	WARRINGTON	S155/232906	H <sub>3</sub> d	S	1862-1968	+30	+0.28	+0.28	51
243	WAIKUAITI	S155/295033	H <sub>3</sub> d	S	1861-1968	+20	+0.19	+0.19	51
244	WAIKUAITI	S155/302037	H <sub>3</sub> d	S	1861-1968	+14	+0.13	+0.13	51
245	KAKAWI	S136/485554	H <sub>3</sub> r	S	1957-1977	-100	-5.0	-5.0	19
246	DAMARU	S136/544653	H <sub>3</sub> r	G	1860-1971	+63	+0.56	+0.56	51

Continued on next page.

## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
247	DAMARU	S137/565687	H <sub>2</sub> a	G	1861-1939	-50.9	-0.65		51
					1939-1945	-8.5	-1.42		44
					1945-1954	-2.1	-0.23		44
					1954-1959	-2.1	-0.42		44
					1959-1964	-0.3	-0.06		44
					1964-1967	-0.3	-0.10		44
					1967-1970	-0.3	-0.10		44
					1970-1971	-0.3	-0.18		44
					1871-1973	-0.4	-0.29		44
					1973-1974	-0.7	-0.47		44
					1974-1976	-1.5	-1.07	-0.58	44
248	DAMARU	S137/566688	H <sub>2</sub> a	G	1861-1939	-35.7	-0.46		51
					1939-1945	-8.2	-1.37		51
					1945-1954	-8.2	-0.91		44
					1954-1959	-3.4	-0.68		44
					1959-1964	-0.6	-0.12		44
					1964-1967	-0.3	-0.10		44
					1967-1970	-0.6	-0.20		44
					1970-1971	-0.3	-0.18		44
					1971-1973	-0.2	-0.14		44
					1973-1974	-1.4	-0.93		44
					1974-1976	-0.6	-0.43	-0.50	44
249	STH WAITAKI FAN	S137/615732	H <sub>2</sub> a	G	1955-1972	-9.8	-0.59	-0.59	18
250	STH WAITAKI FAN	S137/650775	H <sub>2</sub> a	G	1955-1972	-32.5	-1.97	-1.97	18
251	STH WAITAKI FAN	S128/671803	H <sub>2</sub> a	G	1943-1969	-39.9	-1.55	-1.55	18
252	STH WAITAKI FAN	S128/683828	H <sub>2</sub> a	G	1943-1969	-20.8	-0.81	-0.81	18
253	NTH WAITAKI FAN	S128/706900	H <sub>2</sub> a	G	1943-1969	-37.9	-1.47	-1.47	18
					(STORMS JUNE 18, AUGUST 2, 1974	-6.0)			10
254	NTH WAITAKI FAN	S128/714939	H <sub>2</sub> a	G	1943-1969	-45.5	-1.76	-1.76	18
255	NTH WAITAKI FAN	S128/717975	H <sub>2</sub> a	G	1943-1969	-34.6	-1.34		18
					1974-1977	-7.3	-2.59	-1.24	13
256	NTH WAITAKI FAN	S128/718005	H <sub>2</sub> a	G	1943-1969	-9.7	-0.38	-0.38	18
257	WAIHAO RIVER	S128/717059	H <sub>3</sub> r	G	1899-1958	-27.1	-0.46		13
					1958-1963	-18.3	-3.66	-0.68	13
258	WAINONO	S119/709189	H <sub>3</sub> b	G	1953-1977	-8.8	-0.38	-0.38	18
259	MAKIKIHI	S119/706231	H <sub>3</sub> r	G	1953-1977	-4.6	-0.20	-0.20	18
260	ST ANDREWS	S119/734354	H <sub>2</sub> a	G	1877-1957	-20.1	-0.25		3
					1957-1968	-5.5	-0.5	-0.28	13
					(STORMS JUNE 18, AUGUST 2, 1974	-6.0)			10
261	PATITI POINT	S111/796495	H <sub>3</sub> r	G/S	1879-1967	-80	-0.91	-0.91	42
262	TIMARU	S111/792503	H <sub>3</sub> r	G/S	1879-1967	+150	+1.70	+1.70	42
263	TIMARU	S111/793518	H <sub>3</sub> r	G/S	1879-1967	+500	+5.68	+5.68	42
264	CAROLINE BAY	S111/782524	H <sub>3</sub> d	S	1879-1967	+300	+3.41	+3.41	42
265	BENVENUE	S111/778534	H <sub>3</sub> r	G/S	1879-1967	-375	-4.26	-4.26	42
266	WASHDYKE	S111/793563	H <sub>3</sub> b	G/S	1865-1934	-170	-2.46		13
					1934-1956	-126.6	-5.75		18
					1956-1967	-33.3	-3.03		18
					1967-1973	-12.6	-2.10	-3.17	18
267	SEAFORTH	S111/816595	H <sub>3</sub> r/w	G/S	1865-1932	-100	-1.49		13
					1932-1967	-140	-4.0		13
					1967-1977	-80	-8.0	-3.21	13
268	STH OPIHI	S111/850635	H <sub>3</sub> r/b	G/S	1870-1958	-121	-1.37		40
					1967-1977	-40	-4.0	-1.62	13

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
269	BROWNS BEACH	S111/905688	H <sub>3</sub> r/e	G/S	1870-1958	-60	-0.60		40
					1967-1977	-40	-4.0	-0.99	13
270	NTH ORARI	S102/947726	H <sub>2</sub> a	G/S	1900-1958	-50	-0.86		40
					1939-1967	-9.7	-0.35	-0.65	18
271	NTH ORARI	S102/975747	H <sub>2</sub> a	G/S	1939-1967	-8.6	-0.31	-0.31	18
272	NTH RANGITATA	S103/045798	H <sub>2</sub> a	G/S	1939-1961	-6.0	-0.27		18
					1961-1977	-7.0	-0.44	-0.34	19
273	BEACH ROAD	S103/077822	H <sub>2</sub> a	G/S	1939-1965	-19.1	-0.73	-0.73	18
274	TWENTYONE ROAD	S103/110844	H <sub>2</sub> a	G/S	1939-1965	-23.7	-0.51	-0.91	18
275	NTH HINDS	S103/145865	H <sub>2</sub> a	G/S	1939-1965	-6.0	-0.23	-0.23	18
276	TANSEY'S ROAD	S103/198895	H <sub>2</sub> a	G/S	1941-1965	-13.1	-0.55	-0.55	18
277	STH ASHBURTON	S103/259925	H <sub>2</sub> a	G/S	1941-1965	-9.1	-0.38	-0.38	18
278	NTH ASHBURTON	S103/285943	H <sub>2</sub> a	G/S	1941-1976	-23.8	-0.68	-0.68	18
279	WAKANUI	S103/327968	H <sub>2</sub> a	G/S	1942-1976	-28.6	-0.84	-0.84	18
280	SEAVIEW	S103/363989	H <sub>2</sub> a	G/S	1942-1976	-23.3	-0.69	-0.69	18
281	SEAFIELD ROAD	S92/44020	H <sub>2</sub> a	G/S	1942-1976	-46.2	-1.36	-1.36	18
282	CORBETTS ROAD	S92/443035	H <sub>2</sub> a	G/S	1942-1976	-11.4	-0.34	-0.34	18
283	KYLE ROAD	S93/472052	H <sub>2</sub> a	G/S	1942-1976	-14.6	-0.43	-0.43	18
284	MAINWARING'S ROAD	S93/537083	H <sub>2</sub> a	G/S	1942-1976	-21.2	-0.62	-0.62	18
285	STH RAKAIA	S93/603110	H <sub>3</sub> r	G/S	1942-1976	+12.1	+0.36	+0.36	18
286	RAKAIA ROAD	S93/665134	H <sub>3</sub> r	G	1943-1975	-21.0	-0.66	-0.66	18
287	McEVEDYS ROAD	S93/703151	H <sub>3</sub> r	G	1943-1975	-66.6	-2.08	-2.08	18
288	McEVEDYS ROAD	S93/703151	H <sub>3</sub> r	G	1931-1945	-0.64	-0.05		33
					1945-1962	-15.5	-0.91		33
					1962-1965	-1.5	-0.51		33
					1965-1967	-3.1	-1.53	-0.58	33
289	TAUMUTU	S93/752163	H <sub>3</sub> r	G	1943-1975	-98.3	-3.07	-3.07	18
290	BIRDLINGS FLAT	S94/067201	H <sub>3</sub> r/d	G/S	1862-1952	+50	+0.56		4
					1952-1966	0	0	+0.48	4
291	OKAINS BAY	S85/375356	H <sub>3</sub> d	S	1870-1970	+230	+2.3	+2.3	11
292	SUMNER	S84/114514	H <sub>3</sub> d	S	1928-1930	+18	+9.0		52
					1930-1950	+20	+1.0		52
					1950-1977	-40	-1.48	-0.04	49
293	CLIFTON	S84/108518	H <sub>3</sub> d	S	1849-1928	0	0		52
					1928-1930	+110	+55.0		52
					1930-1936	+12	+2.0		52
					1936-1950	+152	+10.86		52
294	SOUTHSHORE	S84/105535	H <sub>3</sub> d	S	1920-1963	+120	+2.79	+2.79	6
295	DARD BEACH	S56/805786	H <sub>3</sub> d	S	1942-1974	+18.3	+0.59	+0.59	34
296	DARD BEACH	S56/806793	H <sub>3</sub> d	S	1942-1974	+3.7	+0.12	+0.12	34
297	STH KAIKOURA	S49/890885	H <sub>3</sub> d/r	G/S	1942-1974	+25.0	+0.81	+0.81	34
298	STH KAIKOURA	S49/902890	H <sub>3</sub> d/r	G/S	1942-1974	+15.2	+0.49	+0.49	34
299	STH KAIKOURA	S49/927898	H <sub>3</sub> d/r	G/S	1942-1974	2.4	+0.08	+0.08	34
300	STH KAIKOURA	S49/950902	H <sub>3</sub> d/r	G/S	1942-1974	13.8	+0.45	+0.45	34
301	STH KAIKOURA	S49/963890	H <sub>3</sub> d/r	G/S	1942-1974	15.2	+0.48	+0.48	34
302	KAIKOURA PENINSULA	S49/972875	L S/ST.-M/ST.	G	1942-1974	-10.7	-0.33	-0.33	34
303	KAIKOURA PENINSULA	S49/988883	H <sub>3</sub> r	G	1942-1974	-3.1	-0.10	-0.10	34
304	KAIKOURA PENINSULA	S49/985883	H <sub>3</sub> r	G	1942-1974	-15.2	-0.47	-0.47	34
305	NTH KAIKOURA	S49/972902	H <sub>3</sub> r	S/G	1942-1974	-11.3	-0.35	-0.35	34
306	NTH KAIKOURA	S49/969950	H <sub>3</sub> r	G/S	1942-1974	+27.5	+0.89	+0.89	34
307	NTH KAIKOURA	S49/987980	H <sub>3</sub> r	G/S	1942-1974	+11.3	+0.35	+0.35	34

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## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
308	NTH KAIKOURA	S49/005995	H <sub>3</sub> r	G/S	1942-1974	+40.9	+1.32	+1.32	34
309	HAPUKU	S49/027013	H <sub>3</sub> r	G	1942-1974	+30.5	+0.98	+0.98	34
310	HAPUKU	S49/031024	H <sub>3</sub> r	G	1942-1974	+18.3	+0.59	+0.59	34
311	MANGAMAUNU	S49/029041	H <sub>3</sub> r	G	1942-1974	-5.2	-0.17	-0.17	34
312	HUE-TE-TAKA PENINSULA	N164/369148	H <sub>3</sub> r	G	1855-1947	+15	+0.16	+0.16	65
313	PALMER HEAD	N164/378148	H <sub>3</sub> r	G	1855-1947	+100	+1.09	+1.09	65
314	PETONE BEACH	N164/434287	H <sub>3</sub> d	S/G	1840-1956	+270	+2.33	+2.33	65
					1855	EARTHQUAKE ADVANCED SHORELINE 30-100m			65
315	PENCARROW	N164/407138	H <sub>3</sub> r	G/S	1855-1941	+13	+0.15		21
					1941-1974	+6	+0.18	+0.16	21
316	PENCARROW	N164/405129	H <sub>3</sub> r	G/S	1855-1941	+9	+0.10		21
					1941-1974	+39	+1.18	+0.40	21
317	KOHANGAPIRIPIRI	N164/412122	H <sub>3</sub> r	G	1855-1941	+5	+0.06		21
					1941-1974	+77	+2.33	+0.69	21
318	KOHANGATERA	N164/418110	H <sub>3</sub> r	G	1855-1956	+15	+0.15	+0.15	65
319	FITZROY BAY	N164/424106	H <sub>3</sub> r/d	G	1855-1941	+18.5	+0.22		21
					1941-1974	+4	+0.12	+0.19	21
320	BARING HEAD	N164/426068	H <sub>3</sub> r	G	1855-1941	+52	+0.60		21
					1941-1974	-30	-0.91	+0.18	21
321	WAINUIOMATA	N164/438064	H <sub>3</sub> r	G	1941-1974	-15	-0.45	-0.45	21
322	ORONGORONGO	N164/446061	H <sub>3</sub> r	G	1855-1941	+28	+0.32		21
					1941-1974	+25	+0.77	+0.45	21
323	ORONGORONGO	N164/459055	H <sub>3</sub> r	G/S	1855-1941	+12	+0.14		21
					1941-1974	0	0	+0.10	21
324	TURAKIRAE HEAD	N164/464038	K-D GULKE	G	1855-1975	+37	+0.31	+0.31	21
					1855	EARTHQUAKE UPLIFT 2.45m ABOVE M.H.W.			65
325	NGAPOTIKI	N168/871859	H <sub>3</sub> r	G	1944-1973	-269.3	-9.45	-9.45	18
326	NGAPOTIKI	N168/867858	H <sub>3</sub> e	G	1944-1973	-98.7	-3.46	-3.46	18
327	NGAPOTIKI	N168/863853	H <sub>3</sub> e/r	G	1944-1973	-22.3	-0.79	-0.79	18
328	WHITE ROCK	N168/915880	H <sub>3</sub> r	G/S	1944-1973	-20.1	-0.71	-0.71	18
329	WHITE ROCK	N168/925880	H <sub>3</sub> r	G/S	1944-1973	-20.7	-0.73	-0.73	18
330	TE KAUKAU POINT	N168/939874	Mh-Dt S/ST.-M/ST.	G	1944-1973	-12.2	-0.43	-0.43	18
331	TE KAUKAU POINT	N168/940877	Mh-Dt S/ST.-M/ST.	G	1944-1973	-6.9	-0.24	-0.24	18
332	TE KAUKAU POINT	N168/943878	Mh-Dt S/ST.-M/ST.	G	1944-1973	-7.5	-0.26	-0.26	18
333	GLENBURN	N166/336207	H <sub>3</sub> r/d	S	1974-1977	-10	-3.33	-3.33	3
334	FLAT POINT	N166/424270	H <sub>3</sub> d	S	1927-1967	-100	-2.5		3
335	KAIWHATA RIVER	N163/451330	H <sub>3</sub> e	G	1962-1977	-40	-2.67	-2.67	3
336	HOMEWOOD	N163/463361	S M/ST.	G/S	1957-1977	-20	-2.0	-2.0	3
337	HOMEWOOD	N163/486383	S M/ST.	G/S	1957-1977	-2	-0.1	-0.1	3
338	RIVERSDALE BEACH	N168/525455	H <sub>3</sub> d	S	1903-1953	+52	+1.06		69
					1953-1972	-35	-1.84		69
					1972-1974	-17	-8.5	0	69
339	ORUI	N163/549515	H <sub>3</sub> e/r	S/G	1970-1977	-40	-5.7	5.7	3
340	CASTLEPOINT	N159/667687	P M/ST.	S	1962-1977	-1.6	-0.31	-0.31	3
341	CAPE TURNAGAIN	N155/028178	H <sub>3</sub> d	S	1943-1975	-60	-1.88	-1.88	18
342	CAPE TURNAGAIN	N155/035181	Wo M/ST.	G	1943-1975	-72	-2.25	-2.25	18
343	CAPE TURNAGAIN	N155/043187	Wo M/ST.	G	1943-1975	-24	-0.75	-0.75	18
344	CAPE TURNAGAIN	N151/045216	Wo M/ST.	G	1943-1975	-52	-1.63	-1.63	18

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
345	CAPE TURNAGAIN	N151/049230	W <sub>0</sub> M/ST.	G	1943-1975	-60	-1.88	-1.88	18
346	CAPE TURNAGAIN	N151/041243	W <sub>0</sub> M/ST.	G	1943-1975	-36	-1.13	-1.13	18
347	WHANGAEHU	N151/041256	T M/ST.	G/S	1943-1975	-36	-1.13	-1.13	18
348	WHANGAEHU	N151/048272	T M/ST.	G/S	1943-1975	-12	-0.38	-0.38	18
349	WAIMARAMA	N142/405981	Mt(I) M/ST.	G	1937-1952	-13.5	-0.9		26
					1952-1972	-12.8	-0.64		26
					1972-1976	-7.5	-1.5	-0.85	26
350	WAIMARAMA	N142/403983	H <sub>3</sub> d	G/S	1937-1952	-3.3	-0.22		26
					1952-1972	-6.7	-0.34		26
					1972-1976	-2.2	-0.55		26
					1976-1977	-9.7	-13.86	-0.55	26
					1965	COASTAL SUBDIVISION ESTABLISHED			3
351	WAIMARAMA	N142/402987	H <sub>3</sub> d	G/S	1937-1952	-28.2	-1.88		26
					1952-1972	+3.0	+0.15		26
					1972-1976	-5.4	-1.35		26
					1976-1977	-2.4	-3.43	-0.79	26
352	WAIMARAMA	N142/400991	H <sub>3</sub> d	S	1972-1976	-6.8	-1.7	-1.7	26
353	WAIMARAMA	N142/406977	Mh+Mt(I) M/ST.-S/ST.-CONGL.	G	1964-1977	-3.4	-0.26	-0.26	43
354	WAIMARAMA	N142/400020	H <sub>3</sub> d	S	1904-1977	+5.1	+0.07	+0.07	43
355	HAUPOJURI	N135/467159	Pm M/ST.	-	1930-1977	-10	-0.21	-0.21	24
356	KIDNAPPERS	N135/455205	W <sub>2</sub> m CONGL.	G/S	1950-1976	-5.0	-0.19	-0.19	18
357	KIDNAPPERS	N135/438199	W <sub>2</sub> m CONGL.	G/S	1937-1976	-16.0	-0.41	-0.41	18
358	KIDNAPPERS	N135/419208	W <sub>2</sub> m CONGL.	G/S	1937-1976	-8.0	-0.21	-0.21	18
359	CLIFTON	N135/410210	H <sub>3</sub> r	G	1936-1948	-0.6	-0.05		20
					1948-1963	-14.0	-0.93		20
					1963-1974	-50.1	-4.55	-1.7	18
360	CLIFTON ROAD	N135/411210	H <sub>3</sub> r	G	1931-1933	-6.72	-3.36		43
					1933-1937	-8.4	-2.1		43
					1937-1949	-41.16	-20.58		43
					1949-1957	-17.64	-2.26		43
					1957-1974	-9.24	-0.54	-1.93	43
361	TE AWANGA	N135/388221	H <sub>3</sub> r	G	1948-1963	-16.0	-1.07		20
					1963-1969	-6.8	-1.13		20
					1969-1976	-18.0	-2.57	-1.46	28
362	EAST ROAD	N135/369240	H <sub>3</sub> r	G	1936-1948	+2.0	+0.17		20
					1948-1963	-24.0	-1.6		20
					1963-1969	-2.0	-0.33		18
					1969-1974	-7.4	-2.4		18
					1974-1976	-10.6	-5.3	-1.05	19
363	HAUMDNA	N135/361256	H <sub>3</sub> r	G	1936-1948	-4.0	-0.33		20
					1948-1963	-14.6	-0.97		20
					1963-1964	+21.2	+21.2		20
					1964-1969	-15.9	-3.18		18
					1969-1974	-13.3	-2.66		18
					1974-1976	-4.6	-2.3	-0.78	19
364	OUTFALL	N135/353276	H <sub>3</sub> r	G	1936-1948	-18.0	-1.5		20
					1948-1963	-30.0	-2.0		20
					1963-1969	+108.2	+18.03		18
					1969-1974	-166.7	-33.34	-2.79	18

Continued on next page.



## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
365	AMATOTO	N134/338312	H <sub>3</sub> r	G	1936-1948	+4.0	+0.33		20
					1948-1962	+6.0	+0.43		20
					1962-1964	+2.6	+1.3		20
					1964-1969	+10.6	+2.12		20
					1969-1972	+6.8	+2.27		20
366	AMATOTO	N134/335336	H <sub>3</sub> r	G	1936-1948	+3.0	+0.25		20
					1948-1962	+4.0	+0.29		20
					1962-1969	+8.3	+1.19		20
					1969-1972	+1.7	+0.52		18
					1972-1974	-19.3	-9.65	+0.28	18
367	SOUTHERN HAMME BAY	N134/335336	H <sub>3</sub> r	G	1939-1940	+19.05	+33.42		43
					1940-1941	-42.29	-34.38		43
					1941-1942	+17.72	+15.41		43
					1942-1943	+11.43	+13.45		43
					1943.75-1943.96	+8.57	+40.81		43
					1943-1946	+16.19	+6.11		43
					1946-1948	+4.38	+2.67		43
					1948-1950	+8.57	+4.49		43
					1950-1952	-21.72	-7.78		43
					1952-1954	+4.76	+3.75	-1.88	43
368	NAPIER	N134/335378	H <sub>3</sub> r	G/S	1936-1969	+13.0	+0.39		18
					1969-1974	-23.7	-4.74	-0.28	18
369	NAPIER	N134/337394	H <sub>3</sub> r	G/S	1882-1906	+50.0	+2.08		45
					1906-1936	+20.0	+0.67		37
					1936-1969	+18.5	+0.56		18
					1969-1974	-16.5	-3.3	+0.78	18
370	WEST SHORE	N124/303407	H <sub>3</sub> r/d	S/G	1936-1974	-29.1	-0.77	-0.77	18
371	BAY VIEW	N124/298473	H <sub>3</sub> r	G	1936-1974	-28.7	-0.76	-0.76	18
372	WHIRINAKI	N124/312523	H <sub>3</sub> r	G	1934-1972	-29.1	-0.77	-0.77	18
373	TANGIOIO	N124/342577	H <sub>3</sub> r	G	1931-1934	+20.0	+6.67		19
					1934-1972	-28.7	-0.76	-0.21	18
374	MURIMAI BEACH	N107/320294	H <sub>3</sub> d	S	1886-1975	+290	+3.26	+3.26	42
375	WAIKANAĒ BEACH	N98/330330	H <sub>3</sub> d	S	1886-1910	+19	+0.79		42
					1910-1942	+44	+1.38		42
					1942-1975	+20	+0.61	+1.07	42
376	WAIKANAĒ BEACH	N98/346347	H <sub>3</sub> d	S	1886-1910	+18	+0.75		42
					1910-1942	+15	+0.47		42
					1942-1975	+47	+1.42	+0.90	42
					1886-1910	+16	+0.67		42
377	ABATTOIRS	N98/370362	H <sub>3</sub> d	S	1910-1942	+22	+0.69		42
					1942-1975	+27	+0.67	+0.67	42
					1886-1910	+35	+0.88		42
378	TITIRANGI	N98/405353	H <sub>3</sub> d	S	1926-1975	+10	+0.20	+0.51	42
					1886-1975	-62	-0.70	-0.70	42
379	TUAMOTU	N98/425327	Du-Lwh M/ST.	G	1886-1975	-62	-0.70	-0.70	42
380	SPONGE BAY	N98/440326	S8-c S/ST.-M/ST.	G	1887-1976	-49.8	-0.56	-0.56	23
381	TUAHINE POINT	N98/444323	S8-c S/ST.-M/ST.	G	1887-1976	-20.5	-0.23	-0.23	23
382	WAINUI BEACH	N98/447335	H <sub>3</sub> d	S	1887-1976	-17.8	-0.20	-0.20	23
383	WAINUI BEACH	N98/452347	H <sub>3</sub> d	S	1889-1976	0	0	0	23
384	WAINUI BEACH	N98/460356	H <sub>3</sub> d	S	1914-1976	+8.1	+0.13	+0.13	23
385	WAINUI BEACH	N98/470364	H <sub>3</sub> d	S	1921-1976	-1.1	-0.02	-0.02	23
386	MAKARORI BEACH	N98/503386	H <sub>3</sub> d	S	1891-1976	+11.1	+0.13	+0.13	62

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
387	TATAFOURI BEACH	N98/521395	H <sub>3</sub> d	S	1896-1976	0	0	0	62
388	TURIHALA BEACH	N98/532412	H <sub>3</sub> d	S	1920-1976	+22.4	+0.40	+0.40	62
389	POUAWA BEACH	N98/570436	H <sub>3</sub> d	S	1915-1955	-7.6	-0.19		62
					1955-1975	-11.8	-0.59	-0.32	62
390	WHANGARA BEACH	N98/607492	H <sub>3</sub> d	S	1896-1975	+1.6	+0.02	+0.02	62
391	TOLAGA BAY	N89/688710	H <sub>3</sub> d	S	1896-1976	+68.0	+0.85	+0.85	62
392	TOLAGA BAY	N89/682726	H <sub>3</sub> d	S	1896-1976	+27.2	+0.34	+0.34	62
393	KAIHUA BAY	N90/705802	H <sub>3</sub> d	S	1906-1976	+4.2	+0.06	+0.06	62
394	ANAUHA BAY	N89/691883	H <sub>3</sub> d	S	1910-1976	-1.32	-0.02	-0.02	62
395	TKOMARU BAY	N81/701010	H <sub>3</sub> d	S	1896-1976	+64.0	+0.80	+0.80	62
396	HAUTAI BEACH	N63/908570	H <sub>3</sub> d	S	1912-1976	+30.1	+0.47	+0.47	62
397	HAUTAI BEACH	N63/885590	H <sub>3</sub> d	S	1912-1976	+39	+0.61	+0.61	62
398	KAWA KAWA BAY	N63/767617	H <sub>3</sub> r	G	1900-1975	+75	+1.0	+1.0	42
399	KAWA KAWA BAY	N63/747628	H <sub>3</sub> r	G/S	1900-1975	+130	+1.73	+1.73	42
400	KAWA KAWA BAY	N63/732643	H <sub>3</sub> r	S/G	1900-1975	+84	+1.12	+1.12	42
401	HICKS BAY	N62/698677	H <sub>3</sub> d	S	1916-1976	+48	+0.80	+0.80	62
402	OPAPE	N70/838218	H <sub>3</sub> d	S	1945-1964	+25	+1.32		27
					1964-1971	-68	-9.71	-1.65	27
403	OMARUMUTU	N70/820215	H <sub>3</sub> d	S	1945-1964	+32	+1.68		27
					1964-1971	-50	-7.14	-0.69	27
404	LOWER WAIHUA	N70/800212	H <sub>3</sub> d	S	1945-1964	-8	-0.42		27
					1964-1971	+15	+2.14	+0.27	27
405	TIRIHANGA	N69/780209	H <sub>3</sub> d	S	1945-1964	-15	-0.80		27
					1964-1971	+25	+3.57	+0.38	27
406	HIKUAHAI BEACH	N69/750207	H <sub>3</sub> d	S	1945-1964	-30	-1.58		27
					1964-1971	+22	+3.14	-0.31	27
407	HIKUAHAI BEACH	N69/722206	H <sub>3</sub> d	S	1886-1976	+50	+0.56	+0.56	19
408	OPOTIKI	N69/720206	H <sub>3</sub> d	S	1945-1964	-20	-1.05		27
					1964-1971	+14	+2.0	+0.32	27
409	WAIOTAHAI BEACH	N69/680206	H <sub>3</sub> d	S	1945-1971	+8	+0.31	+0.31	27
410	WAIOTAHAI BEACH	N69/655207	H <sub>3</sub> d	S	1945-1971	+15	+0.58	+0.58	27
411	WAIOTAHAI SPIT	N69/630208	H <sub>3</sub> d	S	1945-1971	-47	-1.81	-1.81	27
412	OHUWA	N69/610211	H <sub>3</sub> d	S	1945-1971	-30	-1.15	-1.15	27
413	OHUWA	N69/601212	H <sub>3</sub> d	S	1890-1908	+100	+5.56		55
					1908-1938	-100	-3.33		55
					1938-1945	+20	+2.86		22
					1945-1948	-20	-6.67		8
					1948-1959	+95	+8.64		22
					1959-1970	-80	-7.27		22
					1970-1976	-15	-2.5	0	22
414	OHUWA SPIT	N69/588209	H <sub>3</sub> d	S	1867-1878	-61	-5.43		22
					1878-1909	-5	-0.16		22
					1909-1945	-120	-3.29		22
					1945-1959	-25	-1.29		22
					1959-1965	-35	-6.09		22
					1965-1970	-40	-8.60		22
					1970-1971	-12	-7.59		22
					1971-1976	-48	-10.7	-3.15	22
415	OHUWA SPIT	N69/563218	H <sub>3</sub> d	S	1886-1945	+50	+0.85		22
					1945-1976	+70	+2.26	+1.33	22
416	OCEAN ROAD	N69/540223	H <sub>3</sub> d	S	1944-1977	+30	+0.91	+0.91	27
417	OHUWA BEACH	N69/500234	H <sub>3</sub> d	S	1944-1977	+23	+0.70	+0.70	27
418	OHUWA BEACH	N69/470247	H <sub>3</sub> d	S	1953-1976	+80	+3.48	+3.48	19

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## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
419	WHAKATANE	N69/440272	H <sub>3</sub> d	S	1944-1961	+15	+0.88		27
					1961-1974	-30	-2.31	-0.5	27
420	WHAKATANE	N69/425278	H <sub>3</sub> d	S	1886-1962	+20	+0.26	+0.26	56
421	ORINI	N69/400292	H <sub>3</sub> d	S	1944-1961	+15	+0.88		27
					1961-1974	+26	+2.0	+1.37	27
422	GOLF COURSE	N69/386297	H <sub>3</sub> d	S	1886-1968	+100	+1.22		56
					1968-1976	+60	+7.5	+1.78	19
423	AIRPORT	N69/360306	H <sub>3</sub> d	S	1944-1961	+20	+1.18		27
					1961-1974	+14	+1.08	+1.13	27
424	RANGITAIKI	N68/320314	H <sub>3</sub> d	S	1944-1963	+43	+2.26		27
					1963-1974	+22	+2.0	+2.17	27
425	RANGITAIKI	N68/302319	H <sub>3</sub> d	S	1886-1962	+101	+1.33	+1.33	56
426	TARAWERA	N68/270331	H <sub>3</sub> d	S	1944-1963	+30	+1.58		27
					1963-1974	+20	+1.82	+1.67	27
427	TARAWERA	N68/232338	H <sub>3</sub> d	S	1886-1962	+101	+1.33	+1.33	56
428	MATATA	N68/200347	H <sub>3</sub> d	S	1943-1963	+12	+0.6		27
					1963-1973	0	0	+0.4	27
429	HERERU ROAD	N68/170359	H <sub>3</sub> d	S	1943-1963	+14	+0.7		27
					1963-1974	+8	+0.73	+0.71	27
430	PIKOWAI	N68/130376	H <sub>3</sub> d	S	1943-1963	-34	-1.7		27
					1963-1974	-8	-0.73	-1.35	27
431	OTAMARAKAU	N68/080402	H <sub>3</sub> d	S	1943-1963	+10	+0.5		27
					1963-1974	0	0	+0.32	27
432	RODGERS ROAD	N68/030433	H <sub>3</sub> d	S	1943-1963	+28	+1.4		27
					1963-1977	-28	-2.0	0	27
433	PUKEHINA BEACH	N68/990463	H <sub>3</sub> d	S	1943-1963	+19	+0.95		27
					1963-1977	-19	-1.36	0	27
434	LITTLE WAIHI	N68/945500	H <sub>3</sub> d	S	1943-1977	-13	-0.39	-0.38	27
435	MARKETU	N59/915505	H <sub>3</sub> d	S	1948-1960	-90	-7.5		27
					1960-1974	-22	-1.57	-4.31	27
436	KAITUNA	N58/870520	H <sub>3</sub> d	S	1948-1960	+20	+1.67		27
					1960-1974	+5	+0.36	+0.96	27
437	PAPAMOA BEACH	N58/820550	H <sub>3</sub> d	S	1948-1960	+28	+2.33		27
					1960-1974	+15	+1.07	+1.65	27
438	DOMAIN ROAD	N58/760577	H <sub>3</sub> d	S	1943-1960	-8	-0.47		27
					1960-1974	+14	+1.0	+0.19	27
439	TE MAUNGA	N58/710607	H <sub>3</sub> d	S	1943-1959	-15	-0.94		27
					1959-1974	-15	-1.0	-0.97	27
440	OMANU	N58/680634	H <sub>3</sub> d	S	1943-1959	-18	-1.13		27
					1959-1974	+8	+0.53	-0.32	27
441	MAUNGAMUI	N58/655657	H <sub>3</sub> d	S	1943-1959	-18	-1.13		27
					1959-1974	-8	-0.53	-0.84	27
442	MOUNT MAUNGAMUI	N58/654653	H <sub>3</sub> d	S	1852-1954	-70.1	-0.69	-0.69	42
443	MATAKANA ISLAND	N58/635650	H <sub>3</sub> d	S	1852-1901	-24.4	-0.41		42
					1901-1927	+158.5	+6.1		42
					1927-1948	+61.0	+2.9		42
					1948-1954	+292.6	+48.77		42
					1954-1970	-70.1	-4.38	+3.54	31
444	MATAKANA ISLAND	N58/625667	H <sub>3</sub> d	S	1852-1901	+167.6	+3.42		42
					1901-1927	-128.0	-4.92		42
					1927-1948	+61.0	+2.9		42
					1948-1954	+61.0	+10.17		42
					1954-1970	-57.9	-3.62	+0.88	31
445	MATAKANA ISLAND	N58/600692	H <sub>3</sub> d	S	1943-1977	+62	+1.82	+1.82	27

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
446	MATAKANA ISLAND	N58/550752	H <sub>3</sub> d	S	1948-1960	+35	+2.92		27
					1960-1974	+8	+0.57	+1.65	27
447	MATAKANA ISLAND	N58/516800	H <sub>3</sub> d	S	1948-1960	-14	-1.17		27
					1960-1974	+55	+3.93	+1.58	27
448	KATIKATI	N54/483844	H <sub>3</sub> d	S	1902-1966	+127.9	+2.0	+2.0	31
449	BOWENTOWN	N53/472862	H <sub>3</sub> d	S	1948-1969	+10	+0.48		27
					1969-1977	-54	-6.75	-1.52	27
450	ATHENREE	N53/459880	H <sub>3</sub> d	S	1948-1969	-73	-3.48		27
					1969-1977	-12	-1.5	-2.93	27
451	WAIHI BEACH	N53/448899	H <sub>3</sub> d	S	1948-1969	-28	-1.33		27
					1969-1977	0	0	-0.97	27
452	WAIHI BEACH	N53/448899	H <sub>3</sub> d	S	1957-1961	-43.5	-10.88		63
					1961-1964	+24.0	+8.0	-2.79	63
453	WAIHI BEACH	N53/448899	H <sub>3</sub> d	S	1942-1963	-46.1	-2.25		18
					1963-1964	+66.0	+68.75		18
		(MHWM)			1964-1969	-53.0	-10.29		18
					1969-1975	+9.5	+1.71	-0.73	18
		(VEGETATION LINE)			1963-1964	-6.5	-6.77		18
					1964-1969	-7.9	-1.53		18
					1969-1975	-1.6	-0.29	-1.37	18
454	WAIHI BEACH	N53/440912	H <sub>3</sub> d	S	1929-1939	+34.5	+3.45		63
					1939-1957	0	0		63
					1957-1965	-24.0	-3.0	+0.29	63
455	WAIHI BEACH	N53/440912	H <sub>3</sub> d	S	1942-1963	+15.7	+0.77		18
					1963-1964	+42.4	+44.17		18
					1964-1969	-55.8	-10.83		18
					1969-1975	+9.2	+1.65	+0.36	18
456	WAIHI BEACH	N53/428933	H <sub>3</sub> d	S	1929-1948	+33.0	+1.74	+1.74	63
					1942-1963	-1.3	-0.06		18
					1963-1964	+6.6	+6.88		18
					1964-1969	-13.0	-2.52		18
					1969-1975	+3.5	+0.63	-0.13	18
457	WAIHI BEACH	N53/426936	H <sub>3</sub> d	S	1919-1929	+72.0	+7.2	+7.2	63
					1942-1963	-12.2	-0.56		18
					1963-1964	+34.2	+35.63		18
					1964-1969	-30.5	-5.92		18
					1969-1975	+2.0	+0.36	-0.20	18
					10. APRIL 1968 WAIHINE STORM ERODED 14-15m DUNE				35
					1961 ERODED 13m FOREDUNE				35
458	BUFFALO BEACH	N44/200633	H <sub>3</sub> d	S	1930-1969	-40	-1.03	-1.03	3
459	KUAOTUNU	N40/215761	H <sub>3</sub> d	S/G	1974-1977	-3.7	-1.23	-1.23	53
460	MIRANDA	N48/810248	H <sub>3</sub> r	G/S	1934-1957	-80.5	-3.5	-3.5	59
461	MANGATAWHIRI SPIT	N34/300213	H <sub>3</sub> d	S	1871-1934	+60	+0.95		60
					1934-1953	+32	+3.56	+1.28	60
462	MANGATAWHIRI SPIT	N34/294225	H <sub>3</sub> d	S	1871-1934	+40	+0.63		60
					1934-1953	+15	+1.67		60
					1953-1973	-5	-0.5		5
					1973-1976	-7	-2.33	+0.41	5

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## APPENDIX 1 — (Continued)

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
463	MANGATAWHIRI SPIT	N34/292238	H <sub>3</sub> d	S	1871-1934	+40	+0.63		60
					1934-1950	-76	-12.67		60
					1950-1953	+18	+6.0		60
					1953-1961	+15	+1.88		60
					1961-1963	+33	+16.5		60
					1963-1973	-53	-5.3		5
464	MANGATAWHIRI SPIT	N34/293250	H <sub>3</sub> d	S	1871-1934	0	0		60
					1934-1942	0	0		60
					1942-1950	0	0		60
					1950-1953	-40	-13.33		60
					1953-1961	-65	-8.13		60
					1961-1963	+20	+10.0		60
465	NGUNGURU SPIT	N20/023080	H <sub>3</sub> d	S	1942-1959	-20	-1.18		60
					1959-1963	0	0	-0.95	60
					1963-1966	-45	-15.0		5
					1966-1968	-45	-27.5		5
					1968-1973	-60	-15.0		5
					1973-1976	-30	-10.0	-2.52	5
466	WHANAKI SPIT	N16/973218	H <sub>3</sub> d	S	1942-1951	+20	+2.22		60
					1951-1961	-20	-2.0		60
					1961-1963	0	0	0	60
467	OKUPE BEACH	N16/935300	H <sub>3</sub> d	S	1880-1970	+20	+0.22	+0.22	9
468	OKUPE BEACH	N16/935307	H <sub>3</sub> d	S	1880-1970	+150	+1.67	+1.67	9
469	OKUPE BEACH	N16/936314	H <sub>3</sub> d	S	1880-1970	+20	+0.22	+0.22	9
470	MIMIWHANGATA BAY	N16/923314	H <sub>3</sub> d	S	1880-1970	+6	+0.07	+0.07	9
471	MIMIWHANGATA BAY	N16/927325	H <sub>3</sub> d	S	1880-1970	-4	-0.04	-0.04	9

APPENDIX 2—Standard abbreviations for Quaternary and older lithologies. Abbreviations marked with an asterisk are adopted from observations during field work and are not recorded on N.Z. Geological Survey geological maps. Others are adopted from N.Z. Geological Survey Quaternary geological maps of N.Z. (1973a, b) and from Folk (1968).

PLEISTOCENE			HOLOCENE	LANDFORM	LITHOLOGY
Lower	Middle	Upper			
..	H <sub>1</sub> d	H <sub>2</sub> d	H <sub>3</sub> d	Dune	Sand
..		..	*H <sub>3</sub> r	Beach ridge	Gravel
..		..	*H <sub>3</sub> b	Barrier ridge	Gravel and sand
..		..	*H <sub>3</sub> r/d	Beach ridge and dune	Gravel and sand
Wm		H <sub>2</sub> m	H <sub>3</sub> m	Cliff	Marine and estuarine deposits
W <sub>1</sub> f		H <sub>2</sub> a	H <sub>3</sub> a	Cliff	Alluvial and glacial outwash fans
..		H <sub>2</sub> j	H <sub>3</sub> j	Cliff	Lahar deposits A
..		..	H <sub>3</sub> s	Cliff	Swamp and lacustrine deposits
..		..	H <sub>3</sub> t	Cliff	Till
Lithologies older than Quaternary				{ M/ST. Mudstone S/ST. Sandstone CONGL. Conglomerate	Consolidated mud Consolidated sand Consolidated gravel
Present day beaches				{ G. (> -1.0 φ) S. (< -1.0 φ)	Unconsolidated gravel Unconsolidated sand