

APPENDIX I

Tables 1-4: Geologic Data (from Appendix II, Gibb 1998)

Table 1 (Appendix I) lists 15 radiocarbon dated shoreline features from the study area. Nine of the samples dated are the estuarine intertidal dwelling cockle, *Austrovenus stutchburyi*, which although occupying the entire tidal flat, extending to about -2 m water depth, is most abundant between Mean Sea Level (MSL) and Mean Low Water Springs (MLWS). Although living in estuarine sediments ranging from coarse sand to mud, the cockle feeds within 2 to 3 mm of the tidal flat surface, does not burrow, and tends to remain within a few centimetres of the same position for its entire 10 to 15-year life. It may be killed by either a rapid influx of fresh water or pure seawater, or by rapid sedimentation (Gibb 1986b). The samples dated were all whole bivalves in "life" position in estuarine silts and are excellent indicators of palaeosea-levels.

Four of the 15 dated samples are from wood of which two were from "submerged" forests north of Hamanatua stream and opposite Tuahine Crescent and two were from twigs and logs exposed in the eroding seacliff at Sponge Bay. Both submerged forests revealed by seasonal erosion of beach sands comprised different sized stumps in growth position on relict gravelly soils overlying the Late Tertiary sedimentary rocks. At Lysnar Domain the ancient stumps ranged in elevation from +1.73 to -1.37 m above MSL and at Tuahine Crescent the stumps occur at about -0.5 to -1.5 m below MSL.

The final two dates (NZ 4433, NZ 7998) are from shell fragments sampled from emerged rounded beach gravels. These deposits represent a high-energy open exposed coastal environment and were probably deposited on the upper foreshore at the time. The Okitu date (NZ 4433) came from beach deposits exposed in a swale between ancient dune belts. The Tuahine date (NZ 7998) came from similar deposits unconformably overlying estuarine silts exposed by sea erosion in the eroding seacliff just south of the Wainui Stream outlet. Both dated beach deposits are conformably overlain by beach and dune sands. Adopted from Gibb (1998 Appendix II, table 1).

TABLE 1: Fifteen radiocarbon dated shoreline features from the Wainui Beach-Sponge Bay area. Radiocarbon ages have been calibrated from data obtained in this study or published in Gibb (1981), Ota *et al.* (1992) or supplied by Len Brown (pers. comm. 1993). Formation heights have been field checked and corrected in this study with respect to MSL datum. All radiocarbon ages were determined and calibrated by the New Zealand Radiocarbon Dating Laboratory, Institute of Geological & Nuclear Sciences. Depositional environments were determined in this study from radiocarbon dating forms and field checks. Adopted from Gibb (1998).

LOCALITY	NZ ¹⁴ C NUMBER	DATED SAMPLE	FORMATION HEIGHT (m. above M.S.L.)	RADIOCARBON AGE		DEPOSITIONAL ENVIRONMENT	DATA SOURCE
				Conventional Radiocarbon Age	Calibrated Age Range (95% Confidence interval in years BP 1950)		
Okitu	4433	broken shell	8.3	4798 ± 57	5281 - 4927	Beach ridge	Gibb 1981
Murphy Road	7998	broken shell	3.2	4190 ± 56	4445 - 4147	Beach ridge	This study
Radio Mast	6145	shell (A.S.)*	7.6	6588 ± 83	7271 - 6919	tidal flat	Ota <i>et al.</i> 1992
Tuahine Cres.	6143	shell (A.S.)*	3.6	7517 ± 136	8289 - 7683	up. tidal flat	Ota <i>et al.</i> 1992
Hamanatua Strm.	5440	shell (A.S.)*	3.0	7703 ± 377	8637 - 7126	tidal channel	Ota <i>et al.</i> 1992
Hamanatua Strm	7992	shell (A.S.)*	-14.0	11,423 ± 210	13,574 - 11,807	tidal flat	Brown <i>pers.comm.</i> 1993
Tuahine Cres.	1881	shell (A.S.)*	3.6	7908 ± 65	8501 - 8192	up. tidal flat	Gibb 1981
Tuahine Cres.	7999	tree stump*	- 1.0	7346 ± 79	8250 - 7938	coastal forest	This study
Lysnar Dom.	5099	tree stump*	1.0	8407 ± 103	9494 - 9033	coastal forest	Gibb 1981
Sponge Bay	5576	twigs	4.8	7252 ± 91	8181 - 7787	coastal lagoon	Ota <i>et al.</i> 1992
Sponge Bay	5573	shell (A.S.)*	2.1	7668 ± 171	8442 - 7775	tidal channel	Ota <i>et al.</i> 1992
Sponge Bay	6144	shell (A.S.)*	2.0	7812 ± 77	8404 - 8069	tidal channel	Ota <i>et al.</i> 1992
Sponge Bay	6306	shell (A.S.)*	1.7	7863 ± 94	8503 - 8090	tidal channel	Ota <i>et al.</i> 1992
Sponge Bay	5574	shell (A.S.)*	2.9	8013 ± 158	8910 - 8126	tidal channel	Ota <i>et al.</i> 1992
Sponge Bay	5575	log	2.1	7972 ± 97	9083 - 8512	tidal channel	Ota <i>et al.</i> 1992

(1)A.S. = shell species *Austrovenus stutchburyi*

(2)Asterisk indicates samples in life position

TABLE 2: Textural properties of nearshore sediments off Wainui Beach. Samples were taken by the East Coast Conservancy SCUBA dive team on 6 May 1993 and Stations are shown on Figure 5. All statistical parameters are in phi (ϕ) classes ($\phi = -\log_2$ diameter in mm). Analyses were performed by the Research School of Earth Sciences, Victoria University of Wellington. Adopted from Gibb (1998).

Station	Depth (m)	Mean Grain Size M_z	Sorting σ_G	Skewness Sk_G	Kurtosis K_G	CaCO ₃ %	Wentworth Size Class Description
5.1	-8	2.69	0.56	-0.70	5.90	31	Moderately well sorted fine shelly sand
5.2	-10	2.31	0.70	-1.49	6.55	47	Moderately well sorted fine shelly sand
5.3	-12	1.13	1.51	-0.83	2.92	53	Poorly sorted very coarse shelly sand
5.4	-15	-1.81	2.65	1.77	10.17	46	Very poorly sorted shelly granules
7.7	-5	2.26	0.67	-1.47	5.99	37	Moderately well sorted fine shelly sand
7.1	-10	2.34	0.52	-1.15	6.18	47	Moderately well sorted fine shelly sand
7.5	-12	-1.53	2.37	0.88	3.84	38	Very poorly sorted shelly granules
7.2	-15	3.19	0.49	-0.02	5.76	30	Well sorted very fine shelly sand
7.3	-20	0.56	1.27	-0.46	3.69	36	Poorly sorted coarse shelly sand
7.4	-25	3.12	0.80	-0.62	4.68	13	Moderately sorted very fine shelly sand
9.1	-5	2.12	0.57	-0.96	4.84	51	Moderately well sorted fine shelly sand
9.2	-10	2.37	0.69	-0.51	4.68	43	Moderately well sorted fine shelly sand
9.4	-12	2.63	0.65	-0.51	5.01	32	Moderately well sorted fine shelly sand
9.3	-15	2.71	0.70	-1.23	7.25	32	Moderately well sorted fine shelly sand
12.5	-8	2.53	0.60	-0.57	5.26	42	Moderately well sorted fine shelly sand
12.1	-10	2.74	0.58	-1.24	9.35	22	Moderately well sorted fine shelly sand
12.2	-12	2.75	0.66	-1.49	8.28	26	Moderately well sorted fine shelly sand
12.3	-15	2.72	0.67	-0.97	7.34	23	Moderately well sorted fine shelly sand
12.4	-20	-0.57	0.97	1.13	6.32	90	Moderately well sorted shelly granules

TABLE 3: Textural properties of beach, dune, and Late Tertiary sandstone sediments along the Wainui - Makorori coastline. Stations WB and MB were sampled on 23-24 October 1981 and Stations 5.5, 7.6, 9.5 and 12.6 on 28 April and 7 May 1993. All statistical parameters are in phi (ϕ) classes (phi = $-\log_2$ diameter in mm). N/A is not analysed. Stations are located on Figures 5 and 6. The 1981 samples were analysed by Central Laboratories, Ministry of Works and Development, Gracefield, and the 1993 samples by the Research School of Earth Sciences, Victoria University of Wellington. Adopted from Gibb (1998).

Station	Grid Ref. NZMS 260/Y18	Distance North from WB-1	Mean Grain Size	Sorting	Skewness	Kurtosis	CaCO ₃	Environment	Wentworth Size Class Description
		(km)	M _Z	σ_G	Sk _G	K _G	%		
WB-1	511661	0.0	4.04	0.56	0.30	0.82	N/A	Tuahine sandstone	Moderately well sorted coarse silt
WB-2	512664	0.30	1.88	0.50	0.06	0.90	58	Beach sand	Well sorted shelly medium sand
5.5	512664	0.30	2.02	0.52	-0.24	1.15	43	Beach sand	Well sorted shelly fine sand
WB-3	515673	1.30	2.24	0.42	-0.14	1.08	29	Dune sand	Well sorted shelly fine sand
WB-4	515673	1.30	1.75	0.47	0.07	0.95	51	Beach sand	Well sorted shelly medium sand
7.6	515673	1.30	1.31	0.81	-0.27	0.93	60	Beach sand	Well sorted shelly medium sand
WB-5	522682	2.30	1.99	0.40	0.10	0.90	50	Beach sand	Well sorted shelly medium sand
9.5	522682	2.30	1.86	0.39	0.14	1.18	44	Beach sand	Well sorted shelly fine sand
WB-6	528687	3.30	2.14	0.42	-0.09	0.86	36	Dune sand	Well sorted shelly fine sand
WB-7	528687	3.30	1.70	0.42	0.13	0.87	46	Beach sand	Well sorted shelly medium sand
12.6	528687	3.20	2.12	0.34	-0.04	0.95	38	Beach sand	Well sorted shelly fine sand
WB-8	537693	4.30	1.64	0.57	0.04	0.96	63	Beach sand	Moderately well sorted shelly medium sand
WB-9	542694	4.70	3.92	0.70	0.17	0.82	N/A	Makorori sandstone	Moderately well sorted very fine sand
MB-1	545700	5.70	2.28	0.45	-0.16	1.08	55	Beach sand	Well sorted shelly fine sand
MB-2	553705	6.50	2.63	0.27	0.05	1.17	32	Beach sand	Very well sorted shelly fine sand
MB-3	562709	7.30	2.63	0.24	0.09	1.24	29	Beach sand	Very well sorted shelly fine sand
MB-4	577706	9.00	3.83	0.94	-0.01	1.58	N/A	Tatapouri sandstone	Moderately sorted very fine sand

TABLE 4: Percentages of Wentworth size classes for sediment samples from the beach and nearshore seabed at Wainui Beach. The 4 transects and stations are located on Figure 7 in Gibb (1998). Adopted from Gibb (1998).

STATION	GRAVEL	SAND					MUD	DEPTH
		Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	
	>10	-1 to 0 Ø	0 to 1Ø	1 to 2Ø	2 to 3Ø	3 to 4Ø	4 to 5Ø	(m)
5.5	0.0	0.0	1.8	42.7	51.7	0.8	3.0	beach
5.1	0.0	0.0	0.7	4.6	68.7	21.7	4.7	-8
5.2	0.2	0.3	2.2	14.5	72.7	9.9	0.2	-10
5.3	2.3	5.2	11.5	23.0	36.2	8.5	13.8	-12
5.4	4.8	8.9	11.7	5.7	8.2	9.3	51.4	-15
7.6	0.1	0.9	11.8	63.0	17.8	1.0	5.4	beach
7.7	0.0	0.3	1.3	13.0	77.4	5.2	2.8	-5
7.1	0.0	0.3	2.7	18.3	69.8	4.9	3.9	-10
7.5	7.5	3.8	6.8	7.0	9.0	12.4	53.5	-12
7.2	0.0	0.0	0.1	0.9	29.3	63.8	5.9	-15
7.3	4.5	3.1	45.5	30.9	10.3	4.8	4.9	-20
7.4	0.0	0.1	1.7	5.5	37.3	50.9	8.5	-25
9.5	0.0	0.0	0.8	71.4	22.7	0.9	4.2	beach
9.1	0.0	0.2	1.1	32.7	60.5	2.1	3.5	-5
9.2	0.0	0.0	0.7	18.3	61.5	14.6	4.9	-10
9.4	0.0	0.0	0.1	9.0	59.3	23.1	5.5	-12
9.3	0.0	0.0	0.6	3.8	57.6	29.8	8.2	-15
12.6	0.0	0.0	0.1	49.2	46.3	0.7	3.7	beach
12.5	0.0	0.0	0.3	9.3	65.4	19.5	5.5	-8
12.1	0.0	0.0	0.3	2.4	60.7	34.4	2.2	-10
12.2	0.0	0.0	0.2	3.9	58.7	32.8	4.4	-12
12.3	0.0	0.0	0.4	3.5	66.3	24.0	5.8	-15
12.4	0.0	3.1	2.6	14.0	52.3	27.5	0.5	-20