APPENDICES

Appendix I. Moutere Inlet field survey information, December - March 1991. L, M and H refer to low, moderate and high densities of visible macrofauna.

Site S1 (Plates 1, 2)	
General location	North side of Port Motueka channel ca 50m NE (seaward) of boat ramp.
Tidal elevation	> MLW (1.0-1.5m).
Substrate	Large, rounded cobble with sand base; little silt.
Depth of soft sediment	None.
Profile	Anoxic beneath primary cobble layer; light brown to 90mm depth then gradually darker; uniform texture.
Vegetation	Occasional drift *Ulva*.
Visible macrofauna	*Elminius modestus* (barnacles) L-M; *Isactinea divacea* (anemone) M.

Site S2 (Plate 3)	
General location	North side of Port Motueka channel ca 50 m southwest (landward) of boat ramp.
Tidal elevation	> MLW (1.0-1.5 m).
Substrate	Cobble with sand/gravel base; some small boulder and concrete debris; patches of silt/sand overlying cobble.
Depth of soft sediment	32± 13 mm within patches and between cobbles.
Profile	Light brown silty sand to a depth of 30 to 40 mm grading to a grey/black anoxic zone of a sandy texture.
Vegetation	Occasional drift *Ulva*.
Visible macrofauna	*Elminius modestus* (barnacles) L; *Pomatoceros* sp. (tubeworm) L.

Site S3 (Plate 4)	
General location	North side of Port Motueka channel ca 10 m northeast of wharf.
Tidal elevation	> MLW (1.0-1.5 m).
Substrate	Blocks of concrete and concrete rubble on shingle/cobble and fine sand in patches and between rocks.
Depth of soft sediment	30 ± 15 mm within patches and between rocks.
Profile	Light brown silty sand to a depth of 10-20 mm grading to black anoxic zone of a fine sand texture.
Vegetation	None.
Visible macrofauna	*Pomatoceros* sp. (tubeworm) L.
Additional comments	A slight H_2S odour was detectable. Plastic and metal debris were scattered sparsely across the site and fish scales were abundant.

Site S4 (Plates 5,6)	
General location	North side of Port Motueka channel ca 100m west of wharf.
Tidal elevation	>MLW (1.0-1.5m).
Substrate	Scattered small cobble/gravel overlying a shingle/sand base; large amount of dead shell.
Depth of soft sediment	70 ± 10 mm between cobbles.
Profile	Light grey medium sand to a depth of 40-50 mm grading to mottled dark grey with similar texture
Vegetation	Occasional drift *Ulva*.
Visible macrofauna	*Xenostrobus pulex* (black mussel) M; *Elminius modestus* (barnacles) on cobbles; *Microlenchus* sp. (topshell) M-H; *Pomatoceros* sp. (tubeworm) in patches and isolated colonies; *Austrovenus stutchburyi* (cockle) H.
Additional comments	Very dense bed of large size cockles.

Site S5 (Plate 7)	
General location	Junction of main channel from Port Motueka with side channel from marina area; ca 150m west of wharf.
Tidal elevation	> MLW (1.0-1.5 m).
Substrate	Densely packed small cobble mixed with sand.
Depth of soft sediment	None.
Profile	Not done.
Vegetation	50-80% cover of *Ulva* and some *Gracilaria* attached to rock and shell.
Visible macrofauna	*Xenostrobus pulex* (black mussel) H; *Austrovenus stutchburyi* (cockle) M; *Pomatoceros* sp. (tubeworm) M; *Elminius modestus* (barnacle) L-M.

Site S5A (Plates 8,9)	
General location	Approximately 20 m west of Site 5 along the secondary channel
Tidal elevation	> MLW (1.0-1.5 m).
Substrate	Soft mud.
Depth of soft sediment	508 ± 34 mm.
Profile	Top 20 mm light grey grading into dark grey (Plate ??).
Vegetation	Yellow-green microalgal mat; occasional drift *Ulva*.
Visible macrofauna	*Amphibola crenata* (mud snail) M; *Helice crassa* (mud crab) L.
Additional comments	This alternate site was selected for measurement of sediment variables other than macrofauna because of the lack of fine sediments at Site 5.

Site S6 (Plates 10, 11)	
General location	Northeast Inlet across secondary channel from Site 5 (i.e. 50 m West of Site 5).
Tidal elevation	> MLW (1.0 - 1.5 m).
Substrate	Fine sand littered with dead shell.
Depth of soft sediment	308 ± 65 mm.
Profile	Light grey throughout top 20 mm gradually grading to dark grey, however during the March 1991 sampling the anoxic layer was a more pronounced black (Plate ??).
Vegetation	Patchy (20-60%) cover of *Ulva*, some attached to shell and some drift.
Visible macrofauna	*Diloma* spp. (top shell) M; *Cominella glandiformis* (whelk) L-M; *Austrovenus stutchburyi* (cockle) M-H.

Site S6A (Plates 13, 14)	
General location	Approximately 50 m west of site M6 along a small channel draining the upper sandflat.
Tidal elevation	>MLW (1.0-1.5 m).
Substrate	Fine sand littered with some shell.
Depth of soft sediment	336 ± 45 mm.
Profile	Similar to Site 6.
Vegetation	Similar to Site 6.
Visible macrofauna	Similar to Site 6.
Additional comments	This alternate site was selected for measurement of sediment variables because it contained less dead shell making coring and sediment collection easier.

Site S7 (Plates 14, 15)	
General location	Upper Inlet along main channel extending from Thorpe Drain; ca 80 m north of Wharf Road.
Tidal elevation	Estimated > 1.5 m, however because of the flow restriction through the wharf road culvert, the site remains flooded for longer periods than normal for that elevation.
Substrate	Soft mud.
Depth of soft sediment	272 ± 19 mm.
Profile	Light grey mud to 10 mm and dark grey below, fine sand layer from 50 to 120 mm with mud above and below (Plate ??).
Vegetation	December 1990: 95-100% cover of *Enteromorpha* with traces of *Gracilaria* and *Ulva* (52.8 ± 25.6 $g.m^{-2}$). September 1991: 70-80% cover of *Ulva* (35.2 ± 28.8 $g.m^{-2}$), *Gracilaria* (43.2 ± 37.2 g m^{-2}) with traces of *Enteromorpha*.
Visible macrofauna	*Austrovenus stutchburyi* (cockle) H; *Zeacumantus* (spire shell) M.

Site S8 (Plates 16, 17)	
General location	North central (high tidal) flats ca. 500 m south of Wharf Road and 300 m East of State Highway 60.
Tidal elevation	> neap HW (3.0 - 3.5 m).
Substrate	Fine sand/silt.
Depth of soft sediment	272 ± 19 mm.
Profile	Uniform fine sand texture, mottled brown and grey with some red/brown patches especially below 70 mm (Plate ??).
Vegetation	None.
Visible macrofauna	*Helice crassa* (mud crab) M; *Amphibola crenata* (mud snail) O.

Site S9 (Plates 18-22)	
General location	Northwest Inlet on west side of main LW channel, ca 500m east of junction of State Highway 60 with Robinson Road.
Tidal elevation	> MLW (1.0 - 1.5 m).
Substrate	Sand/gravel/shell.
Depth of soft sediment	55 ± 26.5 mm.
Profile	Light grey sand beneath gravel to a depth of 20-30 mm, dark band 30-40 mm then orange brown sand/clay with mottling (Plate ??).
Vegetation	December 1990: 50-60% *Ulva* cover with an abundance of small *Gracilaria* plants, <5% cover (total biomass 100 ± 118 $g.m^{-2}$). September 1991: (Plate ??) Overall 50% coverage of *Ulva and Gelidium* but up to 100% in patches; <10% *Gracilaria* cover in patches near L tide line (specific biomass values; *Ulva* 70.4 ± 44.8 $g.m^{-2}$; *Gelidium* 64.0 ± 70.4 $g.m^{-2}$; *Gracilaria* 1.6 ± 3.2 $g.m^{-2}$; total 136 ± 101 $g.m^{-2}$).
Visible macrofauna	*Anthopleura aureoradiata* (mudflat anemone) H; *Zeacumantus* sp. M-H; *Diloma* spp. (top shell) M; *Austrovenus stutchburyi* (cockle) M.

Site S10 (Plates 23, 24)	
General location	Central Inlet inside SE end of Jacketts Island on island side of channel.
Tidal elevation	> MLW (1.0 - 1.5 m).
Substrate	Fine silt over sand/gravel base with shell debris.
Depth of soft sediment	44 ± 11 mm.
Profile	Light brown silt layer grading to black sand between 20 and 30 mm; variable colouration in deeper layers with orange and light brown mottling.
Vegetation	*Ulva* cover from 5 to 20%; December 1990 (18.4 ± 17.9 $g.m^{-2}$; September 1991 (15.3 ± 23 g m^{-2}).
Visible macrofauna	*Anthopleura aureoradiata* (mudflat anemone) M-H; *Pomatoceros* sp (tubeworm) M.
Additional comments	Little visual differences between December 1990 and September 1991 observations.

Site S11 (Plates 25, 26)	
General location	Central Inlet inside SE end of Jacketts Island ca 30m NE of site M10.
Tidal elevation	> MLW (1.2 - 1.7 m).
Substrate	Soft, deep mud.
Depth of soft sediment	220-240 mm (uniform).
Profile	Light brown down to 15-20 mm then grading to dark grey mottled with brown/grey (Plate ??).
Vegetation	Up to 10% *Ulva* cover (26.4 ± 19.7 $g.m^{-2}$) measured December 1990.
Visible macrofauna	*Anthopleura aureoradiata* (mudflat anemone) H; *Diloma* spp. (topshell) L-O; *A. stutchburyi* (cockle) M.

Site S12 (Plate 27)	
General location	Kina outlet on Jacketts Island side of the main channel.
Tidal elevation	> MLW (1.0 - 1.5 m).
Substrate	Medium cobble with shingle and hard packed sand gravel base.
Depth of soft sediment	None.
Profile	Cores not obtainable.
Vegetation	Sparse *Ulva* cover with occasional tufts of *Gracilaria* (9.3 ± 5.5 g.m^{-2}) as measured in December 1990.
Visible macrofauna	*Elminius modestus* (barnacle) H; *Actinia tenebrosa* (red anemone) H; *Pomatoceros* sp (tubeworm) M.

Site S12A (Plates 28, 29)	
General location	Kina outlet on Jacketts Island side of main channel; ca 20 m NE of Site 12 beside a small side channel draining the SE end of Jacketts Island.
Tidal elevation	> MLW (1.5 - 2.0 m).
Substrate	Fine sand littered with terrestrial debris.
Depth of soft sediment	167 ± 59 mm on west side of drainage stream and 315 ± 78 mm on east side.
Profile	Variable due to patchy distribution of organic (terrestrial) debris both on the sediment surface and deeper within the profile (Plate). Where surface litter was present the core was anoxic throughout with the black layer extending to the surface. Where a subsurface organic layer was present, it was surrounded by black colouration grading to light brown at the surface. Where no organic layer existed, the core was uniform in texture (fine sand) and colour (light brown).
Vegetation	Small amount of drift *Ulva*.
Visible macrofauna	None.
Additional comments	This appears to be a localised area affected by activities on Jacketts Island such as logging, roading, etc.

Site S13 (Plate 30)	
General location	Opposite Kina outlet (South end of Jacketts Island) where the main channel divides, ca 300m SSW (40°) of Site 10.
Tidal elevation	> MLW (1.0 - 1.5m).
Substrate	Medium cobble on a shingle/sand base.
Depth of soft sediment	None.
Profile	No cores taken.
Vegetation	Drift accumulation of *Ulva* with lesser amounts of red algae; 5-10% cover over all with patches up to 70%.
Visible macrofauna	*Elminius modestus* (barnacle) M; *Pomatoceros* sp. (tubeworm) M; *Notoacmea helmsi* (limpet) M.

Site S13A (Plate 31)	
General location	Opposite Kina outlet ca 75 m North of Site M13 marker on a small island (channel centre) exposed at low tide only.
Tidal elevation	~MLW (0.8 - 1.3m).
Substrate	Fine sand.
Depth of soft sediment	840 ± 181 mm.
Profile	Uniform texture, brown at sediment surface grading to brown-grey (40-60 mm) and dark grey > 60 mm (Plate).
Vegetation	Traces only of drift *Ulva*.
Visible macrofauna	*Diloma* spp. (top shell) L; *Cominella* spp. (whelk) L.

Site S14 (Plates 32, 33)	
General location	Central Inlet flats opposite the SE end of Eden Road; ca midway between Highway 60 and the Kina channel.
Tidal elevation	> MLW (1.5 - 2.5m).
Substrate	Fine silty sand with some shell debris.
Depth of soft sediment	597 ± 6 mm.
Profile	Grey with yellow/brown mottling throughout.
Vegetation	None.
Visible macrofauna	*Helice crassa* (mud crab) M.

Site S15 (Plates 34, 35)	
General location	Southwest Inlet; midway between Kina Peninsula and State Highway 60.
Tidal elevation	> Neap HW (3.0 - 3.5 m).
Substrate	Mud.
Depth of soft sediment	> 1m.
Profile	Uniform texture; light brown layer 0-30 mm turning dark grey below (Plate).
Vegetation	Scattered small *Gracilaria* fragments attached to cockles.
Visible macrofauna	*Amphibola crenata* (mud snail) M; *Austrovenus stutchburyi* (cockle) L-M.; *H. crassa* (mud crab) L.

Site S16 (Plates 36, 37)	
General location	Eden Road embayment, central, ca 100m from east side.
Tidal elevation	Mid-tidal range, (1.5 - 2.5 m).
Substrate	Soft mud over a firm base.
Depth of soft sediment	Variable due to scattered subsurface shingle layer; 487 ± 173 mm.
Profile	Soft brown mud 0-20 mm; silty sand mixed with some coarse sand and gravel (yellow-brown mottling) 20-60 mm; orange-brown sand below 60 mm; aerobic throughout.
Vegetation	None.
Visible macrofauna	*Amphibola crenata* (mudsnail) L-M; *Helice crassa* (mud crab) L-M.

Site S17 (Plates 38, 39)	
General location	Moutere River arm, South side, ca 20m from Robinson Road.
Tidal elevation	Mid to high tidal range (2.5 - 3.0 m).
Substrate	Silty sand.
Depth of soft sediment	436 ± 47 mm.
Profile	Light brown silty sand, 0-40 mm; grading to dark grey with orange mottling below.
Vegetation	None.
Visible macrofauna	*Amphibola crenata* (mud snail) L-M; *Helice crassa* (mud crab) M.

Site S18 (Plates 40, 41)	
General location	Moutere River arm, south side *Juncus* marsh opposite rubbish tip.
Tidal elevation	Neap HW (3.0 - 3.5 m).
Substrate	Firm clay/mud with some sand.
Depth of soft sediment	202 ± 14 mm.
Profile	Soft, light brown mud 0-20 mm; firm clay medium brown with dark grey mottling and orange root zones below 20 mm.
Vegetation	*Juncus maritimus* (sea rush), bases (40-50% cover), tops (90-100% cover).
Visible macrofauna	*Potamopyrgus estuarinus* (small mud snail) H; *Amphibola crenata* (mud snail) L; *Helice crassa* (mud crab) L-M.

Appendix II. Physico-chemical and microbial characteristics of sediments at 18 sights in the Moutere Inlet (March 1991)

Site	AFDW %	Silt %	MinPot µg/g/h	Chla µg/g	Tot-N m mol/kg	Tot-P m mol/kg	PO4-P m mol/kg	NO3-N m mol/kg	NH4-N m mol/kg	DIN m mol/kg
1a	1.1	7.4	0.17	3.0	20.7	10.6	0.025	0.048	1.71	1.76
1b	1.3	7.8	0.20		26.4	11.6	0.031	0.061	2.86	2.92
1c	-	-	-	-	-	-	-	-	-	-
2a	2	14.8	0.25	-	41.4	12.5	0.013	0.009	3.64	3.65
2b	1.6	14.1	0.23	11.0	37.1	13.4	0.013	0.017	3.07	3.09
2c	-	-	-	-	-	-	-	-	-	-
3a	2.5	23.7	0.22	-	41.4	15.3	0.009	0.017	4.64	4.66
3b	2.8	19.3	0.43	-	45.0	16.9	0.031	0.004	4.00	4.00
3c	-	-	-	1.6	-	-	-	-	-	-
4a	1.5	10.9	0.21	2.6	25.7	13.8	0.025	0.004	2.57	2.58
4b	1.2	4.3	0.40	0.4	14.3	10.0	0.031	0.004	1.79	1.79
4c	-	-	-	2.6	-	-	-	-	-	-
5Aa	6.1	74.7	1.10	8.3	107.1	24.7	0.006	0.009	4.29	4.29
5Ab	5.6	73.2	0.86	5.9	121.4	22.2	0.003	0.004	4.14	4.15
5Ac	-	-	-	8.7	-	-	-	-	-	-
6Aa	3.1	31.6	0.58	5.6	63.6	16.9	0.009	0.010	4.79	4.80
6Ab	3.4	32.3	0.69	8.5	57.1	18.1	0.009	0.009	5.14	5.15
6Ac	-	-	-	9.1	-	-	-	-	-	-
7a	4.1	46.1	1.65	23.0	107.1	18.1	0.009	0.006	7.00	7.01
7b	4.1	47.9	2.68	15.0	114.3	20.0	0.016	0.006	8.57	8.58
7c	-	-	-	15.0	-	-	-	-	-	-
8a	1.9	35.8	0.09	1.4	15.0	13.8	0.003	0.007	0.29	0.29
8b	2.1	42.2	0.07	2.0	20.7	13.8	0.006	0.006	0.29	0.29
8c	-	-	-	1.3	-	-	-	-	-	-

Appendix II (cont.). Physico-chemical and microbial characteristics of sediments at 18 sights in the Moutere Inlet (March 1991)

Site	AFDW %	Silt %	MinPot µg/g/h	Chla µg/g	Tot-N m mol/kg	Tot-P m mol/kg	PO4-P m mol/kg	NO3-N m mol/kg	NH4-N m mol/kg	DIN m mol/kg
9a	2.5	14.6	0.26	2.1	49.3	10.3	0.013	0.010	3.36	3.37
9b	2	16	0.29	1.1	32.1	12.2	0.019	0.004	3.00	3.00
9c	-	-	-	3.2	-	-	-	-	-	-
10a	4.8	42.9	0.28	3.9	60.7	19.7	0.016	0.004	5.29	5.29
10b	5.2	51.8	0.21	11.0	92.9	19.1	0.009	0.009	4.29	4.30
10c	-	-	-	3.9	-	-	-	-	-	-
11a	6.2	79.6	0.32	2.0	100.0	21.9	0.003	0.004	3.07	3.08
11b	6.6	76.8	0.41	2.8	107.1	23.8	0.006	0.004	4.93	4.93
11c	-	-	-	1.2	-	-	-	-	-	-
12Aa	5	34.4	0.24	4.9	71.4	14.1	0.006	0.006	4.14	4.15
12Ab	4	30	0.18	5.1	62.1	14.7	0.006	0.004	3.93	3.93
12Ac	-	-	-	3.8	-	-	-	-	-	-
13Aa	0.8	8.4	0.09	4.2	14.3	10.0	0.038	0.004	1.86	1.86
13Ab	0.7	4.8	0.08	3.0	15.0	10.3	0.028	0.005	1.57	1.58
13Ac	-	-	-	5.3	-	-	-	-	-	-
14a	1.5	41	0.16	1.4	15.0	15.3	0.006	0.006	1.21	1.22
14b	1.9	42.3	0.14	0.8	15.7	15.3	0.009	0.004	1.14	1.15
14c	-	-	-	1.2	-	-	-	-	-	-
15a	5.3	78.7	0.29	1.9	85.7	21.9	0.016	0.004	3.57	3.58
15b	5.2	72.8	0.25	2.2	78.6	23.8	0.009	0.006	3.64	3.65
15c	-	-	-	0.4	-	-	-	-	-	-
16a	2.1	40	0.27	2.8	27.9	13.1	0.006	0.004	1.71	1.72
16b	2.3	43.5	0.25	2.6	30.0	14.4	0.025	0.008	2.07	2.08
16c	-	-	-	2.1	-	-	-	-	-	-
17a	2.9	39.6	0.08	3.0	26.4	8.8	0.006	0.004	0.93	0.93
17b	2.5	34.6	0.07	2.0	24.3	7.8	0.006	0.004	0.56	0.57
17c	-	-	-	2.2	-	-	-	-	-	-
18a	5.5	70.5	0.51	2.5	92.9	17.2	0.003	0.004	3.21	3.22
18b	5.2	70.2	0.60	2.9	85.7	14.7	0.003	0.004	2.50	2.50
18c	-	-	-	2.8	-	-	-	-	-	-

Appendix III. Surface quadrat counts of benthic invertebrates from 18 sites in Moutere Inlet (December 1990)

Numbers are counts in 1/16m² quadrats

		Site 1								Site 2					Site 3					Site 4			Site 5		Site 6								
Scientific Name	Common Name	a	b	c	d	e	f	g	h	a	b	c	d	e	a	b	c	d	e	a	b	c	a	b	a	b	c	d	e	f	g	h	i	j
ANTHOZOA	(sea anemones)																																	
Actinia tenebrosa	(red anemone)																																	
Anthopleura aureoradiata	(mudflat anemone)																			1									1	1				2	
Isactina olivacea	(olive green anemone)	14	15	16	23	11	20	12	30																									
MOLLUSCA	(molluscs)																																	
AMPHINEURA	(chitons)																																	
Amaurochiton glaucus	(green chiton)	1	4	3	2	3	4			3	2	2	1	2					2			1												
Chiton pelliserpentis	(snakeskin chiton)						1																											
GASTROPODA	(univalve molluscs)																																	
Amphibola crenata	(mudflat snail)																																	
Cominella glandiformis	(mudflat whelk)		1							1								1		1	4	8		1	2			1	10	1		3	1	
Diloma subrostrata	(mudflat topshell)	1																		1			5		1		3			2	1	1	2
Diloma zelandica	(topshell)							1				2			1				2	4		10	10		2	1	3	2	4	5	6	4	1	6
Melagraphia aethiops	(spotted top shell)			1																														
Micrelenchus tenebrosus	(topshell)										1		3		3			1	4	14	2	40	24			3		2	1	1		2	1	1
Notoacmea helmsi	(estuarine limpet)		2	1		9		5		2		3	4	1						2	1	20	10		1	2	4	2	6	2		2	18	15
Potamopyrgus estuarinus	(small snail)																																	
Turbo smaragdus	(cats eye)																																	
Zeacumantus sp.	(spire shell)																																	
PELECYPODA	(bivalves)																																	
Austrovenus stutchbury	(cockle)									11			15							50	55	76			12	3	12	6	11	13	12	20	23	20
Crassostrea gigas	(pacific oyster)		1		1		1	6						1			1			2	1	1		3									
Mytilus edulis aoteanus	(blue mussel)	1	1														4	1	1														
Paphies australis	(pipi)												1					1			1	1								1			
Paphies subtriangulata	(tuatua)																																	
Xenostrobus pulex	(little black mussel)																1			17	2	26	60	100	3								
POLYCHAETA	(marine bristle worms)																																	
Phyllodocidae	(paddle worms)																																	
Eulalia microphylla																	1					1		1									
Polynoidae	(scale worm)																																	
Serpulidae	(fan worm)																																	
Pomatoceros sp.			15	2		2				30	40	15	40	10		60	18	2	10	10		3	4	1						1			
CRUSTACEA	(crustaceans)																																	
Elminius modestus	(estuarine barnacle)	200	70	80	200	150	600	100	60	2	16	50	40	65	10	800	999	100	100	400	200	400	50											
Isopoda																1																		
Decapoda																																		
Crab Holes																																		
Halicarcinus whitei	(spider crab)				1																	1					2							
Helice crassa	(mud crab)																			1		2												
Hemigrapsus crenulatus	(hairy handed crab)													2			15	2					6	4								1	1	
Macrophthalmus hirtipes	(stalk-eyed mud crab)																																	
Petrolisthes elongatus	(hall crab)												1				2																	
ECHINODERMATA																																		
Asterina regularis	(cushion star)			2	2					1									4															
Total individuals		217	109	105	229	175	626	124	90	50	59	72	105	81	10	865	1041	108	123	503	266	590	169	110	21	9	22	16	33	24	21	33	48	44
Number of taxa		5	8	7	6	5	5	5	2	7	4	5	8	6	1	5	8	7	7	12	8	14	8	8	6	4	4	7	6	6	5	7	8	5

Appendix III. Surface quadrat counts of benthic invertebrates from 18 sites in Moutere Inlet (December 1990)

Continued Numbers are counts in 1/16m² quadrats

Scientific Name	Common Name	Site 7										Site 8										Site 9		Site 10						Site 11									
		a	b	c	d	e	f	g	h	i	j	a	b	c	d	e	f	g	h	i	j	a	b	a	b	c	d	e	f	a	b	c	d	e	f	g	h	i	j
ANTHOZOA	(sea anemones)																																						
Actinia tenebrosa	(red anemone)																																						
Anthopleura aureoradiata	(mudflat anemone)	1	1				4	5														36	40	20	5	12	60	40	40	55	70	50	30	30	50	60	40	60	20
Isactina olivacea	(olive green anemone)																																						
MOLLUSCA	(molluscs)																																						
AMPHINEURA	(chitons)																																						
Amaurochiton glaucus	(green chiton)																																						
Chiton pelliserpentis	(snakeskin chiton)																																						
GASTROPODA	(univalve molluscs)																																						
Amphibola crenata	(mudflat snail)																																						
Cominella glandiformis	(mudflat whelk)			1		1				5	2											1																	
Diloma subrostrata	(mudflat topshell)				1	1																		3				2	2	1	1	6	2		1	2			
Diloma zelandica	(topshell)			1	1	3		1														9	8	3		1			3	8	8	1	4		4	2			
Melagraphia aethiops	(spotted top shell)																																						
Micrelenchus tenebrosus	(topshell)																					3	8							2	1								
Notoacmea helmsi	(estuarine limpet)				2					2												12	10																
Potamopyrgus estuarinus	(small snail)																																						
Turbo smaragdus	(cats eye)																																						
Zeacumantus sp.	(spire shell)	3	2	1	5		5		1	3												1	68																
PELECYPODA	(bivalves)																																						
Austrovenus stutchburyi	(cockle)	60	88	59	56	26	78	68	33	60	55											7	31																
Crassostrea gigas	(pacific oyster)				1	1				1																				8	20	24	28	30	12	23	15	24	9
Mytilus edulis aoteanus	(blue mussel)																																						
Paphies australis	(pipi)																																						
Paphies subtriangulata	(tuatua)																							1															
Xenostrobus pulex	(little black mussel)				1																									1			1						
POLYCHAETA	(marine bristle worms)																																						
Phyllodocidae	(paddle worms)																																						
Eulalia microphylla																																							
Polynoidae	(scale worm)																																						
Sorpulidae	(fan worm)																																						
Pomatoceros sp.																																							
CRUSTACEA	(crustaceans)																					6	8	50	60	20	15	5											
Elminius modestus	(estuarine barnacle)																																						
Isopoda																																							
Decapoda																																							
Crab Holes		2		6	3	3	2	2	3		3	10	18	17	21	9	18	15	14	12	24				2			2		1	2	3	2	2	3	4		2	5
Halicarcinus whitei	(spider crab)							1			3												1																
Helice crassa	(mud crab)																						2		1					5									
Hemigrapsus crenulatus	(hairy handed crab)																																						
Macrophthalmus hirtipes	(stalk-eyed mud crab)																																						
Petrolisthes elongatus	(half crab)																																						
ECHINODERMATA																																							
Asterina regularis	(cushion star)																																						
Total Individuals		66	91	68	70	35	89	77	37	71	63	10	18	17	21	9	18	15	14	12	24	75	176	77	68	33	75	49	45	82	102	84	66	64	70	94	55	86	34
Number of taxa		4	3	5	6	6	4	5	3	5	4	1	1	1	1	1	1	1	1	1	1	8	9	6	4	3	2	4	3	9	6	5	5	5	6	7	2	3	3

Appendix III. Surface quadrat counts of benthic invertebrates from 18 sites in Moutere Inlet (December 1990)

Continued — Numbers are counts in 1/16m² quadrats

Scientific Name	Common Name	Site 12					Site 13					Site 14										Site 15									
		a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	f	g	h	i	j	a	b	c	d	e	f	g	h	i	j
ANTHOZOA	(soa anemones)																														
Actinia tenebrosa	(red anemone)	12	30	25	20	19																									
Anthopleura aureoradiata	(mudflat anemone)						1																								
Isactina olivacea	(olive green anemone)																														
MOLLUSCA	(molluscs)																														
AMPHINEURA	(chitons)																														
Amaurochiton glaucus	(green chiton)	1	3	3	4	2	7	2	5		1																				
Chiton pelliserpentis	(snakeskin chiton)																														
GASTROPODA	(univalve molluscs)																														
Amphibola crenata	(mudflat snail)	1																				9	8	6	4	8	5	7	11	6	2
Cominella glandiformis	(mudflat whelk)		1		2			5	1		5																				
Diloma subrostrata	(mudflat topshell)	1			1		1				1																				
Diloma zelandica	(topshell)					1	1			1	1																				
Melagraphia aethiops	(spotted top shell)																														
Microlanchus tenebrosus	(topshell)	1			1	2	1	1	1	1	2																				
Notoacmea helmsi	(estuarine limpet)						5		5		40																				
Potamopyrgus estuarinus	(small snail)																														
Turbo smaragdus	(cats eye)		1	2	3	2		13		1	1																				
Zeacumantus sp.	(spire shell)																														
PELECYPODA	(bivalves)																														
Austrovenus stutchburyi	(cockle)	11	2		5		1	1																							
Crassostrea gigas	(pacific oyster)		2	6																											
Mytilus edulis aotearus	(blue mussel)																														
Paphies australis	(pipi)																														
Paphies subtriangulata	(tuatua)																														
Xenostrobus pulex	(little black mussel)			20																											
POLYCHAETA	(marine bristle worms)																														
Phyllodocidae	(paddle worms)																														
Eulalia microphylla																															
Polynoidae	(scale worm)				1		1				1																				
Serpulidae	(fan worm)																														
Pomatoceros sp.		3	5	15	6		25	70	40	35	30																				
CRUSTACEA	(crustaceans)																														
Elminius modestus	(estuarine barnacle)	150	800	800	600	300	800	100	60	20	600																				
Isopoda																															
Decapoda																															
Crab Holes												6	4	4	4	2	6	6	10	7	8	2	1	2	2	2	2	2		1	1
Halicarcinus whitei	(spider crab)																														
Helice crassa	(mud crab)																														
Hemigrapsus crenulatus	(hairy handed crab)	2		1	3	1	1	1			1																				
Macrophthalmus hirtipes	(stalk-eyed mud crab)		1	5	2	2	1	3			4																				
Petrolisthes elongatus	(half crab)			1			1	1		1	3																				
ECHINODERMATA																															
Asterina regularis	(cushion star)			1				3																							
Total individuals		182	845	878	648	329	846	200	112	59	690	6	4	4	4	2	6	6	10	7	8	11	9	8	6	10	7	9	11	7	3
Number of taxa		9	9	11	12	8	13	11	6	6	13	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	1	2	2

Appendix III. Surface quadrat counts of benthic invertebrates from 18 sites in Moutere Inlet (December 1990)

Continued — Numbers are counts in 1/16m² quadrats

Scientific Name	Common Name	Site 16										Site 17										Site 18									
		a	b	c	d	e	f	g	h	i	j	a	b	c	d	e	f	g	h	i	j	a	b	c	d	e	f	g	h	i	j
ANTHOZOA	(sea anemones)																														
Actinia tenebrosa	(red anemone)																														
Anthopleura aureoradiata	(mudflat anemone)																														
Isactina olivacea	(olive green anemone)																														
MOLLUSCA	(molluscs)																														
AMPHINEURA	(chitons)																														
Amaurochiton glaucus	(green chiton)																														
Chiton pelliserpentis	(snakeskin chiton)																														
GASTROPODA	(univalve molluscs)																														
Amphibola crenata	(mudflat snail)	7	7	5	5	6	5	8	9	7	13	5	2	1	1	3	3	5	1	1		6	1	1		2	1	6	3	4	6
Cominella glandiformis	(mudflat whelk)																														
Diloma subrostrata	(mudflat topshell)																														
Diloma zelandica	(topshell)																														
Melagraphia aethiops	(spotted top shell)																														
Micrelenchus tenebrosus	(topshell)																														
Notoacmea helmsi	(estuarine limpet)																														
Potamopyrgus estuarinus	(small snail)																					240	400	300	200	160	400	150	50	200	300
Turbo smaragdus	(cats eye)																														
Zeacumantus sp.	(spire shell)																														
PELECYPODA	(bivalves)																														
Austrovenus stutchburyi	(cockle)																														
Crassostrea gigas	(pacific oyster)																														
Mytilus edulis aoteanus	(blue mussel)																														
Paphies australis	(pipi)																														
Paphies subtriangulata	(tuatua)																														
Xenostrobus pulex	(little black mussel)																														
POLYCHAETA	(marine bristle worms)																														
Phyllodocidae	(paddle worms)																														
Eulalia microphylla																															
Polynoidae	(scale worm)																														
Serpulidae	(fan worm)																														
Pomatoceros sp.																															
CRUSTACEA	(crustaceans)																														
Elminius modestus	(estuarine barnacle)																														
Isopoda																															
Decapoda																															
Crab Holes		6	6	4	8	10	2	3	7	7	7	8	10	12	10	10	9	12	11	15	13	3	9	14	3	9	7	5	5	5	3
Hallcarcinus whitei	(spider crab)																														
Hoiice crassa	(mud crab)																														
Hemigrapsus crenulatus	(hairy handed crab)																														
Macrophthalmus hirtipes	(stalk-eyed mud crab)																														
Petrolisthes elongatus	(half crab)																														
ECHINODERMATA																															
Astorina regularis	(cushion star)																														
Total individuals		13	13	9	13	16	7	11	16	14	20	13	12	13	11	13	12	17	12	16	13	249	410	315	203	171	408	161	58	209	309
Number of taxa		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	3	3	3	2	3	3	3	3	3	3

Appendix IV. Species and abundance of benthic invertebrates in replicate cores from18 sites in Moutere Inlet (December 1990)

Replicate cores 0.0135m² area, 0.5mm mesh screening.

No.	Scientific Name	Common Name	Site 1					Site 2					Site 3					Site 4					Site 5					
			a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	f
	ANTHOZOA	(sea anemones)																										
1	*Actinia tenebrosa*	(red anemone)																										
2	*Anthopleura aureoradiata*	(mudflat anemone)																1			1	1	1			7		1
3	*Isactinia olivacea*	(olive green anemone)	5	11	13	20		1	1																			
4	NEMATODA	(round worms)						14	1				12		61	20	46						1	2				
5	NEMERTEA	(proboscis worms)	1		1		1	1					2	3	2		1			5	1		10	2	5	3	2	4
6	SIPUNCULA	(peanut worm)																					1		3	2		2
	MOLLUSCA	(molluscs)																										
	AMPHINEURA	(chitons)																										
7	Acanthochitona zelandica	(tufted chiton)																										
8	*Amaurochiton glaucus*	(green chiton)	2		5	4	1	1	1	2						1	2	1								1	1	
9	*Chiton pelliserpentis*	(snakeskin chiton)																					1					
	GASTROPODA	(univalve molluscs)																										
10	*Amphibola crenata*	(mudflat snail)																										
11	*Cominella glandiformis*	(mudflat whelk)							1	2	5					1		2	3	4		6	1		1		12	
12	*Diloma subrostrata*	(mudflat topshell)							1						1			2	1	1		3						
13	*Diloma zelandica*	(topshell)								1									5			1	1	1	1		7	
14	*Melagraphia aethiops*	(spotted top shell)					1															1				1	1	
15	*Micrelenchus tenebrosus*	(topshell)						3							3			6	1	1	1	4	1	1	1		1	2
16	*Notoacmea helmsi*	(estuarine limpet)	1		2	1	3	2	1	2	2						1	4	8	2		4	4		4	5	3	8
17	*Onchidella nigricans*	(shell-less snail)																		1								
18	*Potamopyrgus estuarinus*	(small snail)																										
19	*Turbo smaragdus*	(cats eye)																			1							1
20	*Zeacumantus sp.*	(spire shell)																				1						
21	Unidentified sp.			20	5			24	4		2	2													4	4		
	PELECYPODA	(bivalves)																										
22	*Austrovenus stutchbury*	(cockle)	1	1	2	1		4	5	9	3							61	42	48	37	59	4	9	3	1	9	6
23	*Crassostrea gigas*	(pacific oyster)																2		1	1	1	1				1	
24	*Paphies australis*	(pipi)	2	2		3	3	13	4	2	1	2		2		5	1		1	1	1	1						
25	*Paphies subtriangulata*	(tuatua)																										
26	*Perna canaliculus*	(green lipped mussel)																										
27	*Tellina liliana*	(wedge shell)																	1									
28	*Xenostrobus pulex*	(little black mussel)	1	1								1						75	25	47	10	6	103	88	45	7	20	107
29	Unidentified sp A	(small bivalve)	3	15	1	3	1						21		1	3				2					2			
	POLYCHAETA	(marine bristle worms)																										
	Capitellidae																											
30	*Capitella capitata*			3		1	1						117	125	24	30	18	1			1							
31	*Heteromastus filiformis*												6	1	19	6	10	1	3				2			14	3	
32	Cirratulidae				1			3	3	1	2																	
33	Glyceridae		1		2	1		31	17	15	23	12		1	2	1	2		2	3	3	1	2	1	1			1
34	Maldanidae																									2	1	
35	Nereidae	(rag worms)	1		1	2	3	2		1	1	1	8		3	2	3	4	3	1	1	1	2	5		1	1	4
36	Nephtyidae																											
	Opheliidae																											
37	*Armandia maculata*																											
	Owenidae																											
38	*Owenia fusiformis*																											
39	Pectinariidae																											
40	Phyllodocidae	(paddle worms)	1	1																1			1					
41	*Eulalia microphylla*																	1	2	2		2	1	3	2		1	4

No.	Scientific Name	Common Name	Site 6					Site 7					Site 8					Site 9				
			a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
	ANTHOZOA	(sea anemones)																				
1	*Actinia tenebrosa*	(red anemone)																				
2	*Anthopleura aureoradiata*	(mudflat anemone)		3	3	1												10	4	15	7	3
3	*Isactinia olivacea*	(olive green anemone)																	150			
4	NEMATODA	(round worms)	8	4			1											4		2		
5	NEMERTEA	(proboscis worms)											1			3	1					
6	SIPUNCULA	(peanut worm)																	1	4	1	
	MOLLUSCA	(molluscs)																				
	AMPHINEURA	(chitons)																				
7	Acanthochitona zelandica	(tufted chiton)																				
8	*Amaurochiton glaucus*	(green chiton)																				
9	*Chiton pelliserpentis*	(snakeskin chiton)																	1	4		
	GASTROPODA	(univalve molluscs)																				
10	*Amphibola crenata*	(mudflat snail)																				
11	*Cominella glandiformis*	(mudflat whelk)		1	1	1	1	1	1													
12	*Diloma subrostrata*	(mudflat topshell)		1					2	1									1		1	1
13	*Diloma zelandica*	(topshell)	2			1	1												5	1	8	3
14	*Melagraphia aethiops*	(spotted top shell)																			2	1
15	*Micrelenchus tenebrosus*	(topshell)																				
16	*Notoacmea helmsi*	(estuarine limpet)	1		3		2		1		1								2	3		1
17	*Onchidella nigricans*	(shell-less snail)																	3	1	6	2	3
18	*Potamopyrgus estuarinus*	(small snail)																				
19	*Turbo smaragdus*	(cats eye)																				
20	*Zeacumantus sp.*	(spire shell)																				
21	Unidentified sp.							1	7	2	1							14	10	6	3	8
	PELECYPODA	(bivalves)																				
22	*Austrovenus stutchbury*	(cockle)	23	18	29	20	16	17	17	34	32	31										
23	*Crassostrea gigas*	(pacific oyster)												1				10	19	10	15	2
24	*Paphies australis*	(pipi)																				
25	*Paphies subtriangulata*	(tuatua)																				
26	*Perna canaliculus*	(green lipped mussel)																				
27	*Tellina liliana*	(wedge shell)																				
28	*Xenostrobus pulex*	(little black mussel)					3											2	1	8	2	3
29	Unidentified sp A	(small bivalve)	1	1					1	1												
	POLYCHAETA	(marine bristle worms)																3	8	2	11	
	Capitellidae																					
30	*Capitella capitata*			3		3	1			2	2	2										
31	*Heteromastus filiformis*		22	21	13	7	2			1				1	2							
32	Cirratulidae																	6	9	8	13	
33	Glyceridae					2	1			3									1	1		1
34	Maldanidae																					
35	Nereidae	(rag worms)	1						1	1	1	3						2	2			2
36	Nephtyidae																					
	Opheliidae																					
37	*Armandia maculata*																					
	Owenidae																					
38	*Owenia fusiformis*																					
39	Pectinariidae																					
40	Phyllodocidae	(paddle worms)		1																		
41	*Eulalia microphylla*																			1		

No.	Scientific Name	Common Name	Site 1					Site 2					Site 3					Site 4					Site 5						Site 6					Site 7					Site 8					Site 9				
			a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	f	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
42	Polynoidae	(scale worm)																					1	2	1			1																				
	Serpulidae	(fan worm)																																														
43	*Pomatoceros sp.*				3			5	4	13				32	6			34	8	15			42	40	8	11	9	4																			
44	Sphaerodoridae							5	3																																			8	6	24	1	26
45	Spionidae		24	42	33	25	26	64	26	22	23	12	7		60	24	60	1	1	10	12	14	75	83	162	19	134	109	41	28	60	18	12	5	3	2	16	5		1	3	6	7	233	362	285	210	130
46	Syllidae							1										2	8				2	1																							
47	Terebellidae																		1																										1		
48	Unidentified spp.		8	20	20	20	20	10	8	4	1	5	6	3	34	8		1	2	13	10	4	5	4	5	2	5	10	16	5	12	4	3	2		2	6	2						10	30	15	30	15
	ARTHROPODA	(crustaceans)																																													
49	*Elminius modestus*	(estuarine barnacle)	40	70	150	150	390	7	19	1	2				10	74	1	350	350	41	250	95	210	10	45	18	3			1																	
50	Cumacea	(cumeceans)																			1																								1		
51	Amphipoda													3		1		1	1	1		1	1	1	1																					
52	Isopoda								1					1	1																				49	53	480	83	550		1	2	5	2	12	2	1	12	6
53	Ostracod																																1					6					1				
	Decapoda																								1																			1			
54	*Halicarcinus varius*	(spider crab)																	1				6	5	3			3								1										
55	*Halicarcinus whitei*	(spider crab)																	1					3	1			1	1			1			1						1	3	2	1	2
56	*Helice crassa*	(mud crab)																4	6	4	1	1			2		1										2					3				
57	*Hemigrapsus crenulatus*	(hairy handed crab)												3	1		3	1	4	2	1		1	2	4	1		2						1					1	1	2	1	2		1			
58	*Macrophthalmus hirtipes*	(stalk-eyed mud crab)																																		1		1							1	1
59	*Petrolisthes elongatus*	(half crab)			2		1							1		1							7	1				1																	
	ECHINODERMATA																																														
60	*Asterina regularis*	(cushion star)																					1			1	1																			
61	Ophiuroidea	(brittle stars)																																													
	INSECTA																																														
	Diptera	(flies)																																													
62	*Chironomus sp A*	(midges)																																													
63	Hexatomini	(crane fly larvae)																																													
64	*Limonia nigrescens*	(crane fly larvae)																																													
65	Muscidae																																														
66	Orthocladinae	(midges)																					4	1	3		6	1																	
	Total Individuals		91	186	241	231	452	191	102	75	65	35	179	143	274	185	149	577	479	206	333	200	492	265	309	83	231	275	115	87	110	56	44	76	87	527	148	602	2	4	8	17	13	329	617	401	315	203
	Number of taxa		16	12	16	13	14	20	18	14	12	8	10	11	16	17	14	23	25	23	18	20	31	22	26	16	21	23	12	13	10	11	13	9	12	13	11	10	4	5	5	6	6	20	23	20	19	15

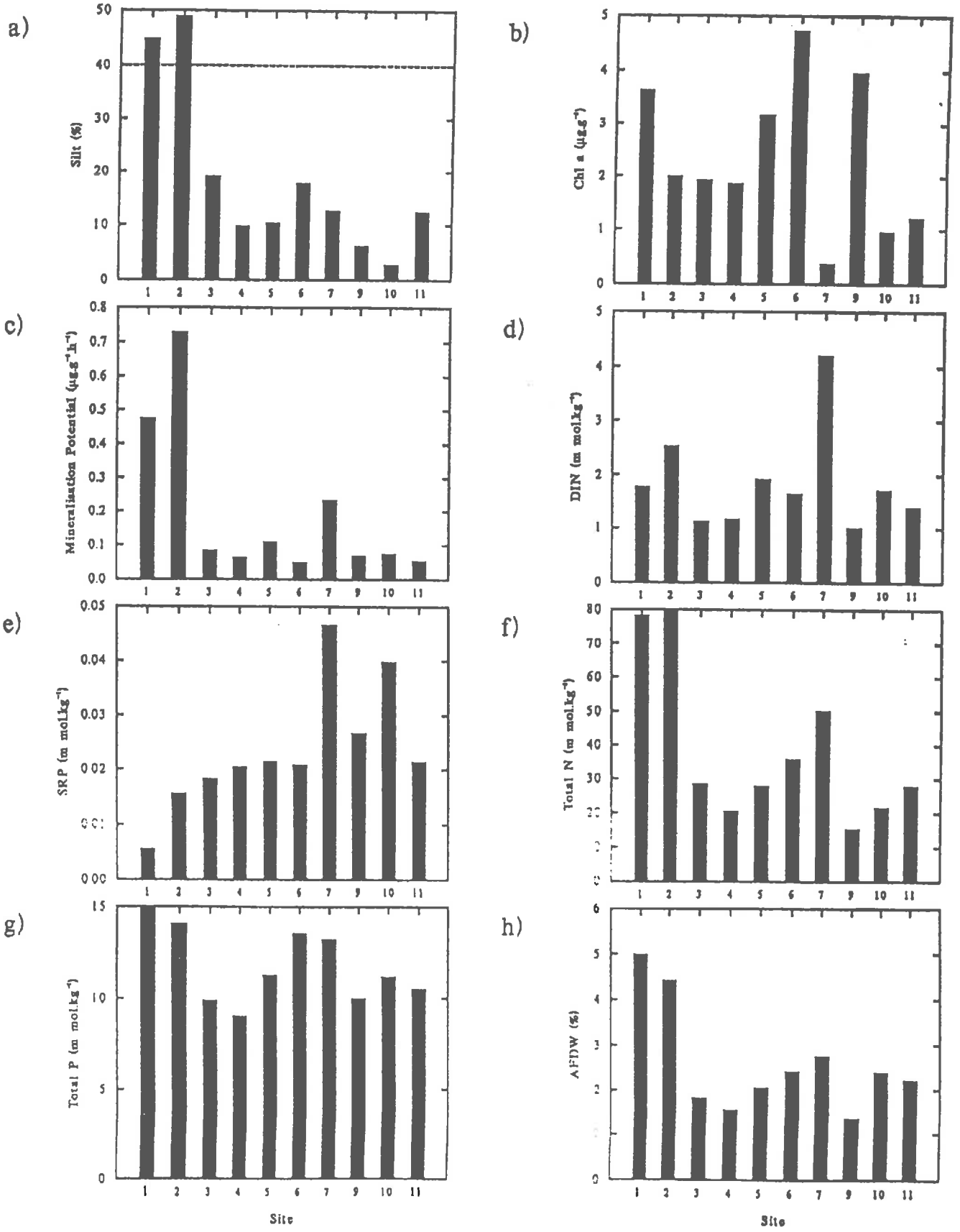
Appendix IV. Species and abundance of benthic invertebrates in replicate cores from 18 sites in Moutere Inlet (December 1990)

Continued — Replicate cores 0.0135m² area, 0.5mm mesh screening.

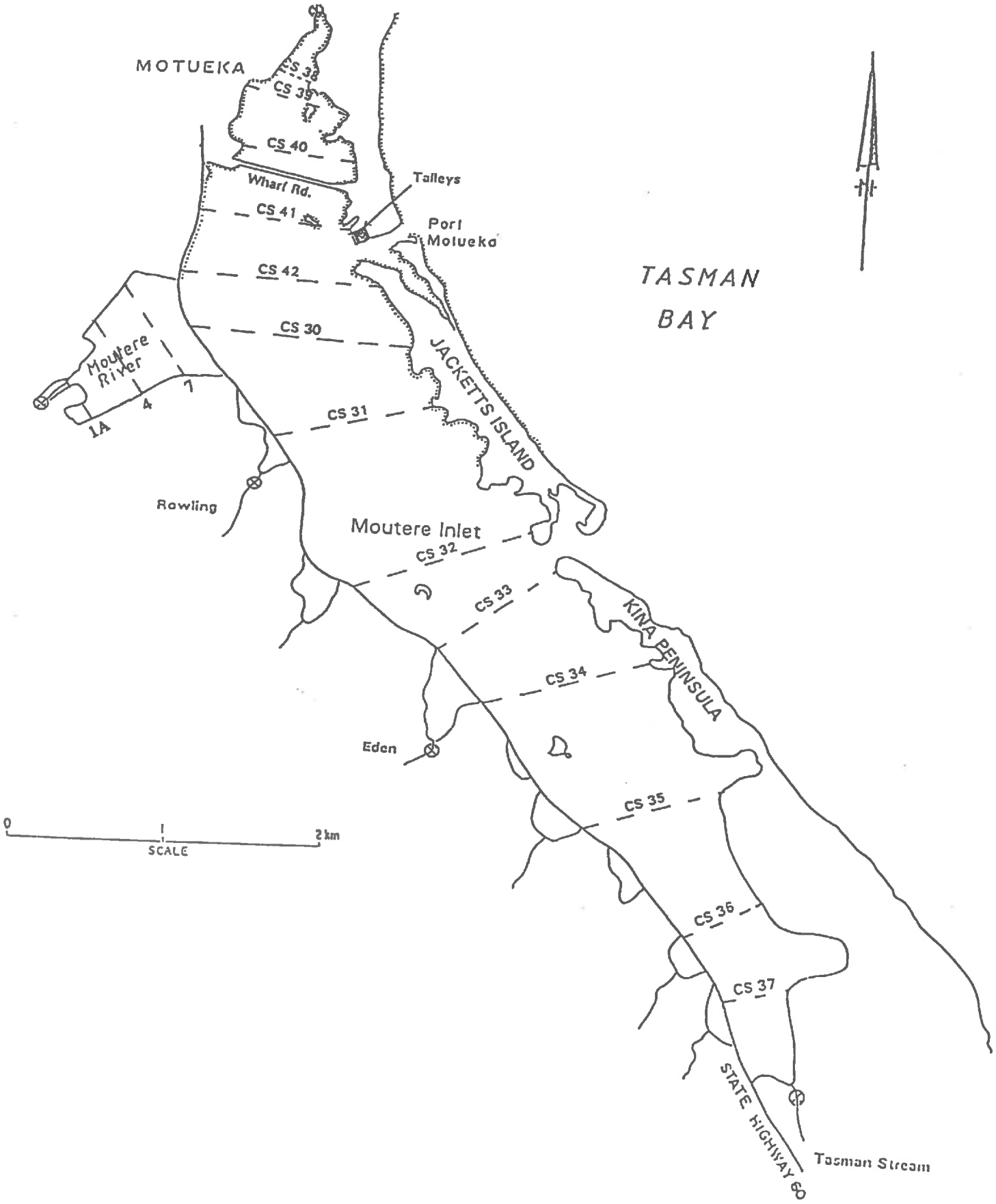
Scientific Name	Common Name	Site 10					Site 11					Site 12					Site 13					Site 14					Site 15					Site 16					Site 17					Site 18				
		a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
ANTHOZOA	(sea anemones)																																													
Actinia tenebrosa	(red anemone)											11	8		8	4																													
Anthopleura aureoradiata	(mudflat anemone)	13	19	17	3	19	26	8	9	46	11						2		1	6										1															
Isactinia olivacea	(olive green anemone)																																												
NEMATODA	(round worms)	1	10											1					1		1									1															
NEMERTEA	(proboscis worms)	3	2	3	2	6				2	1					1	3	4	2	2	3						2																		
SIPUNCULA	(peanut worm)												1		1																			1	1								1		
MOLLUSCA	(molluscs)																																												
AMPHINEURA	(chitons)																																												
Acanthochitona zelandica	(tufted chiton)	2																																										
Amaurochiton glaucus	(green chiton)				1							1	1		2			2	8	3	1																							
Chiton pelliserpentis	(snakeskin chiton)																																												
GASTROPODA	(univalve molluscs)																																												
Amphibola crenata	(mudflat snail)																														1	4	1	1	3	3	2	4		1	2	1	1	1		2	2			1
Cominella glandiformis	(mudflat whelk)	1						1	1		1										1																								
Diloma subrostrata	(mudflat topshell)						3		1												2				1																				
Diloma zelandica	(topshell)			1																																								
Melagraphia aethiops	(spotted top shell)																																												
Micrelenchus tenebrosus	(topshell)	3	1	1																																								
Notoacmea helmsi	(estuarine limpet)	1	6	1			1		1		1	9	8	12	10	2	9	3	1	15	8																							
Onchidella nigricans	(shell-less snail)																																												
Potamopyrgus estuarinus	(small snail)																																												
Turbo smaragdus	(cats eye)											3		1						1																							10	40	118	20	10
Zeacumantus sp.	(spire shell)																																												
Unidentified sp.												2	1																															
PELECYPODA	(bivalves)																																												
Austrovenus stutchbury	(cockle)		2	1	7	9	7	23	5	6	6	2		10		4	2	2	1	3	3						6	5	4	2	7	1			2									
Crassostrea gigas	(pacific oyster)											1																																
Paphies australis	(pipi)						2					1									2								1															
Paphies subtriangulata	(tuatua)						2	2	1	5	3																																		
Perna canaliculus	(green lipped mussel)																2																												
Telina liliana	(wedge shell)	1		1		3																																							
Xenostrobus pulex	(little black mussel)											7		3		1																												
Unidentified sp A	(small bivalve)	1	1	3	2	4	2	4	7	13	6	2		1				9		5							2	2	3	1														
POLYCHAETA	(marine bristle worms)																																												
Capitellidae																																													
Capitella capitata			1	3	1																							1		1														
Heteromastus filiformis			1	4	4	4	10	18	28	30	27						8	3	6		2						20	41	16	26	26				23	13								1
Cirratulidae		8	8	8	3	2							2				5		1																							4	1	5		
Glyceridae			1	1	3	2		2	1		3	9	6	7	6	4	8	12	5	2	1																							
Maldanidae																																													
Nereidae	(rag worms)				1		3	3	1	2	1	1	2	3	1	1			1		1						4			2	4	14	1	1		1								
Nephtyidae				2	2																																				1				
Opheliidae																																													
Amandia maculata				1			1					1	20		5	7	1																										
Owenidae																																													
Owenia fusiformis																	4	4	4																										
Pectinariidae				1		1																																							
Phyllodocidae	(paddle worms)	1	1	1																1																									
Eulalia microphylla																																													

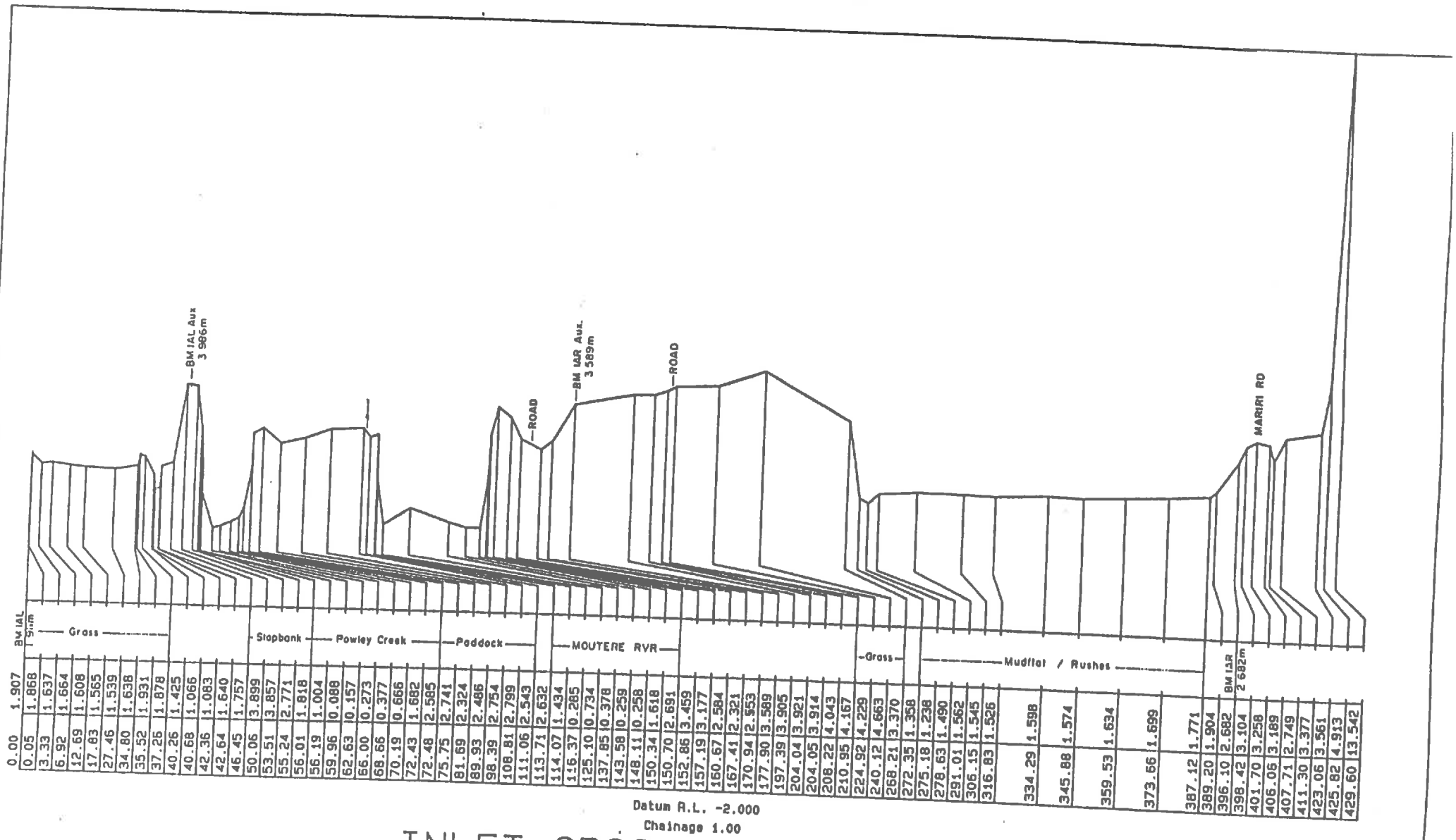
Scientific Name	Common Name	Site 10					Site 11					Site 12					Site 13					Site 14					Site 15					Site 16					Site 17					Site 18				
		a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Polynoidae	(scale worm)																		1		1																									
Serpulidae	(fan worm)																																													
Pomatoceros sp.		50	14	21		2						1				11	29	22	50	9	6																									
Sphaerodoridae		3	6	17	2	26						11	4	1	1	4		3	3	1																									
Spionidae		21	44	50	17	53	60	8	11	34	4	68	159	305	234	26	400	202	214	100	230	1		1	2	1	8	18	4	13	8	1					27		2	8	1	1	1		1
Syllidae		1										1	2								4																								
Terebellidae		1																1		1																									
Unidentified spp.		10	20	20	5	30	14	12	27	12	9	4	8	2	10	10	5	4	4	2	2						15	15	3	5	5				1										
ARTHROPODA	(crustaceans)																																									2	1			
Eliminius modestus	(estuarine barnacle)											380	264	487	411	237	37			580	340				9		12	2	3		41														
Cumacea	(cumaceans)																																												
Amphipoda		3	4	1				1										1	1			3																							
Isopoda						1																																		2					
Ostracod												1				1		1																								155	40	16	1
Decapoda																																													
Halicarcinus varius	(spider crab)	1		1	1												2	1		1																									
Halicarcinus whitei	(spider crab)	6	3	1			11		2	6																																			
Helice crassa	(mud crab)						2		1			3	2	3	2	2			1		1		1	1						1															
Hemigrapsus crenulatus	(hairy handed crab)			1																																			1	2		2			2	1	3
Macrophthalmus hirtipes	(stalk-eyed mud crab)																																												
Petrolisthes elongatus	(half crab)																			1																									
ECHINODERMATA																																													
Asterina regularis	(cushion star)												1				1		1																											
Ophiuroidea	(brittle stars)																		1																											
INSECTA																																													
Diptera	(flies)																																												
Chironomus sp A	(midges)																																												
Hexatomini	(crane fly larvae)																																									2				
Limonia nigrescens	(crane fly larvae)																													1												2		2		1
Muscidae																				2																								1			
Orthocladiinae	(midges)													1		1			1																											
Total Individuals		130	143	161	64	164	162	82	90	164	73	519	480	837	689	318	518	354	308	732	612	4	1	2	12	2	73	85	35	53	98	10	7	3	20	17	28	2	7	8	8	22	200	168	40	18
Number of taxa		22	19	26	16	15	16	12	15	11	13	23	17	15	13	17	19	17	22	17	21	4	2	3	4	3	11	9	9	9	12	7	4	4	7	5	4	3	5	2	5	9	7	7	5	6

Appendix V. Physico-chemical and microbial characteristics of intertidal sediments from the vicinity of the Nelson Regional Sewerage Scheme outfall off Bells Island, Waimea Inlet (June 1991).



Appendix VI. 16 cross-sectional transects of Moutere Inlet; surveyed 1991.





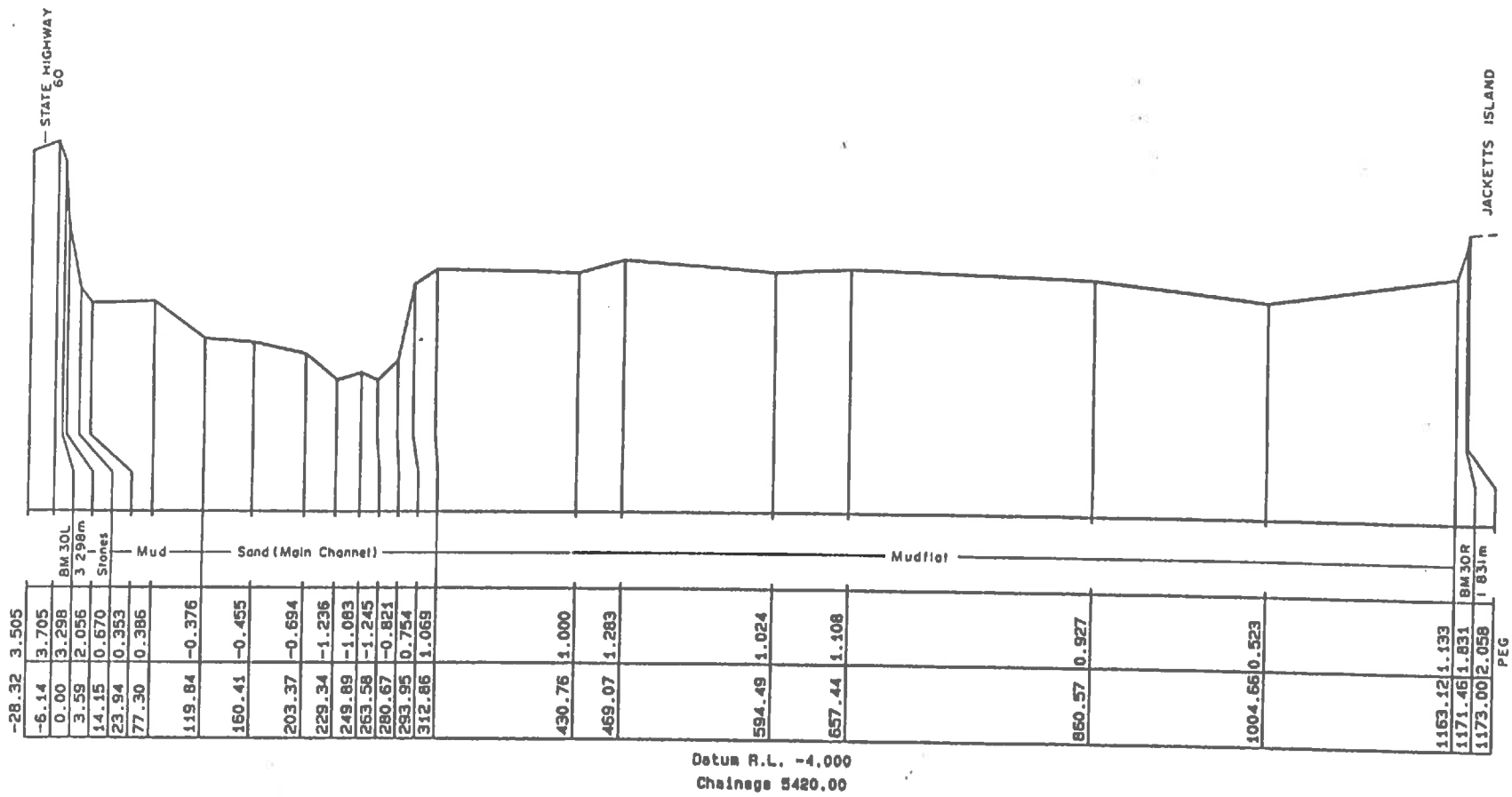
INLET CROSS SECTION NO. 1A

Hz scale 1: 1250 Vt scale 1: 100

JOB: 101	SDR File: SDR00026.101	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS
SURVEYED BY: SMB & ACH 29-Jul-91 14:18			
LB/FB 253	PLOT DATE: 8 AUG 1991		
PLOT SCALE: Horiz 1: 1250 Vert 1: 100			
PLAN FORM - RCS 2	COMPUTOR PLOT BY: SMB		

Plan No 4294

Sht 1 of



INLET CROSS SECTION NO.30

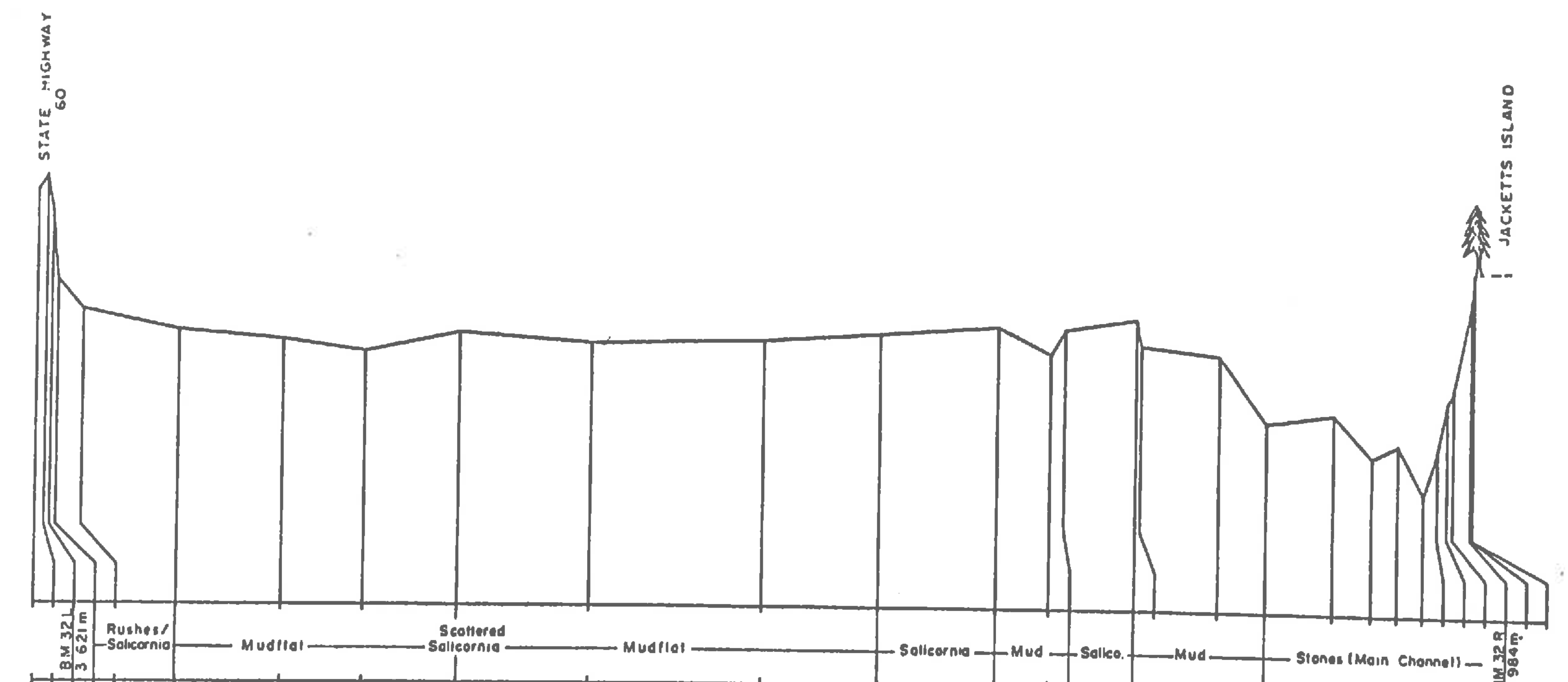
Hz scale 1:4000 Vt scale 1:100

JOB: 101 SDR File: SDR00026.101	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294
SURVEYED BY: SMB & ACH 29-Jul-91 14:18			
LB/FB 253 PLOT DATE: 14 AUG 1991			
PLOT SCALE: Horiz 1:4000 Vert 1:100			
PLAN FORM - RCS 2 COMPUTOR PLOT BY: SMB			Sht 4 of

INLET CROSS SECTION NO.31

Hz scale 1:3000 Vt scale 1:100

JOB: 101 SDR File: SDR00021.101 SURVEYED BY: SHB & TSS 22-May-91 10:19 LB/FB 253 PLOT DATE: 16 JUL 1991 PLOT SCALE: Horiz 1:3000 Vert 1:100 STANDARD RCS PLAN FORM - RCS 2	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294 Sht 5 of



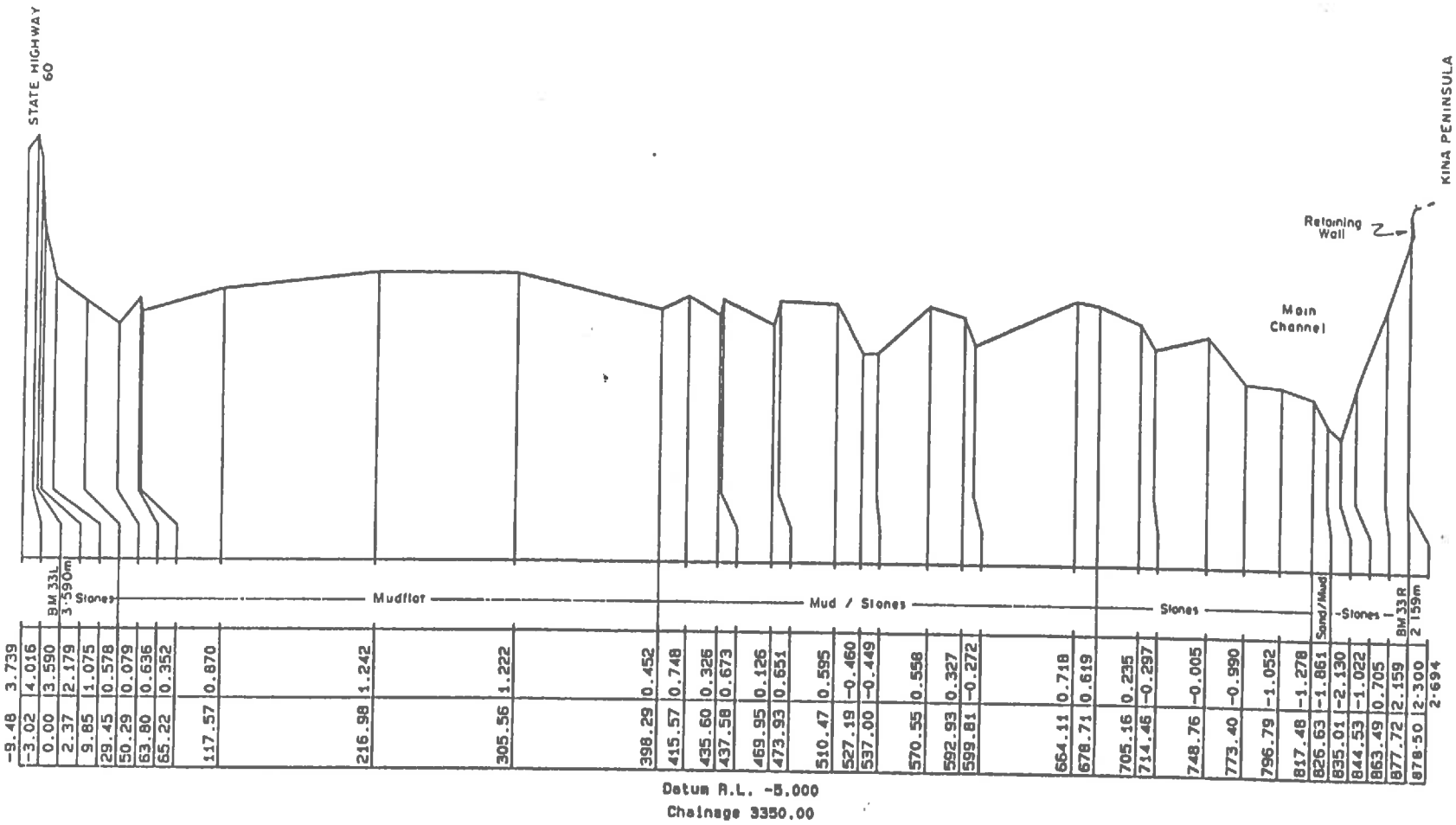
-11.33	3.938
-4.14	4.204
0.00	3.621
4.56	2.248
24.44	1.670
99.29	1.274
178.81	1.095
241.66	0.867
314.13	1.229
416.57	1.031
548.33	1.112
637.95	1.247
727.31	1.409
767.13	0.888
777.81	1.366
832.14	1.588
836.13	1.074
896.68 Peg	0.903
933.01	-0.377
983.82	-0.180
1013.13	-1.014
1032.92	-0.755
1052.52	-1.707
1062.78	-0.858
1070.11	0.101
1074.45	0.312
1087.56	1.984
1089.35	2.330
1089.77	2.605

Datum R.L. -4.000
Chainage 3820.00

INLET CROSS SECTION NO.32

Hz scale 1; 4000 Vt scale 1: 100

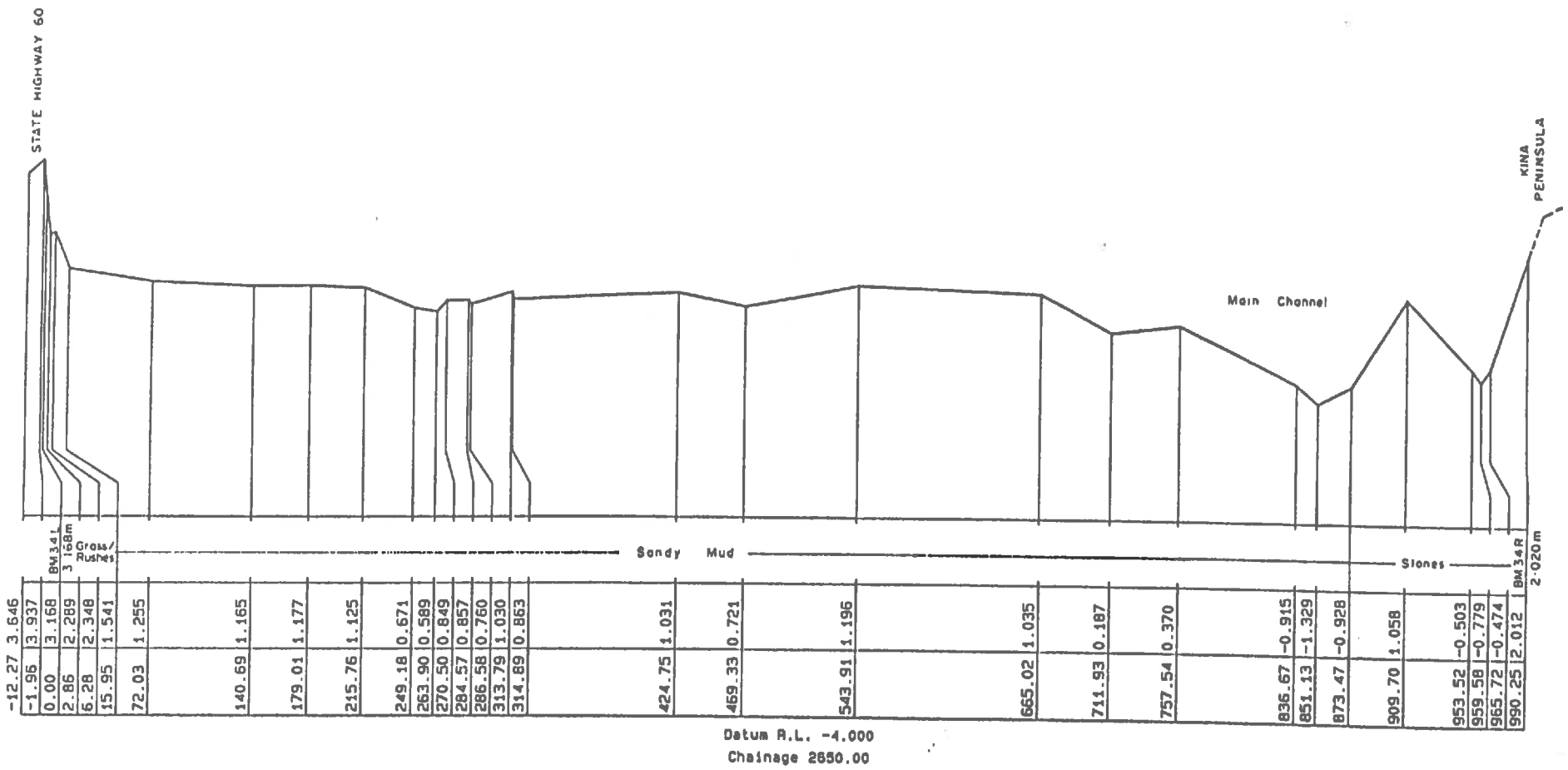
JOB: 101 SDR File: SDR00022.101	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294
SURVEYED BY: SMB & TSS 23-May-91 08:44			
LB/FB 253 PLOT DATE: 15 JUL 1991			
PLOT SCALE: Horiz 1:4000 Vert 1:100			
STANDARD RCS PLAN FORM - RCS 2			Sht 6 of



INLET CROSS SECTION NO.33

Hz scale 1:3000 Vt scale 1:100

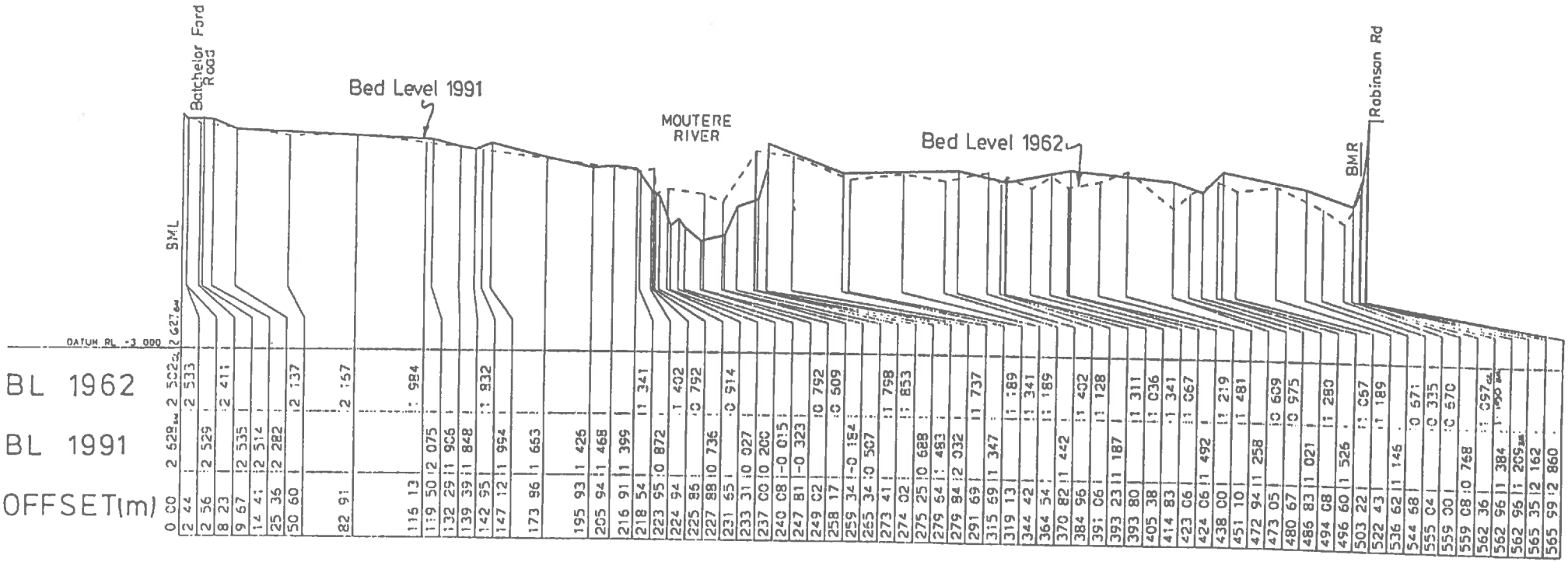
JOB: 101 SDR File: SDR00021.101	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294
SURVEYED BY: SMB & TSS 22-May-91 10:19			
LB/FB 253 PLOT DATE: 16 JUL 1991			
PLOT SCALE: Horiz 1:3000 Vert 1:100			
STANDARD RCS PLAN FORM - RCS 2			Sht 7 of



INLET CROSS SECTION NO.34

Hz scale 1:3000 Vt scale 1:100

JOB: 101 SDR File: SDR00020.101 SURVEYED BY: SMB & TSS 21-May-91 08:39 LB/FB 253 PLOT DATE: 10 JUL 1991 PLOT SCALE: Horiz 1:3000 Vert 1:100 STANDARD RCS PLAN FORM - RCS 2	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294 Sht 8 of



CROSS SECTION No. 4.00

See location plan 4204

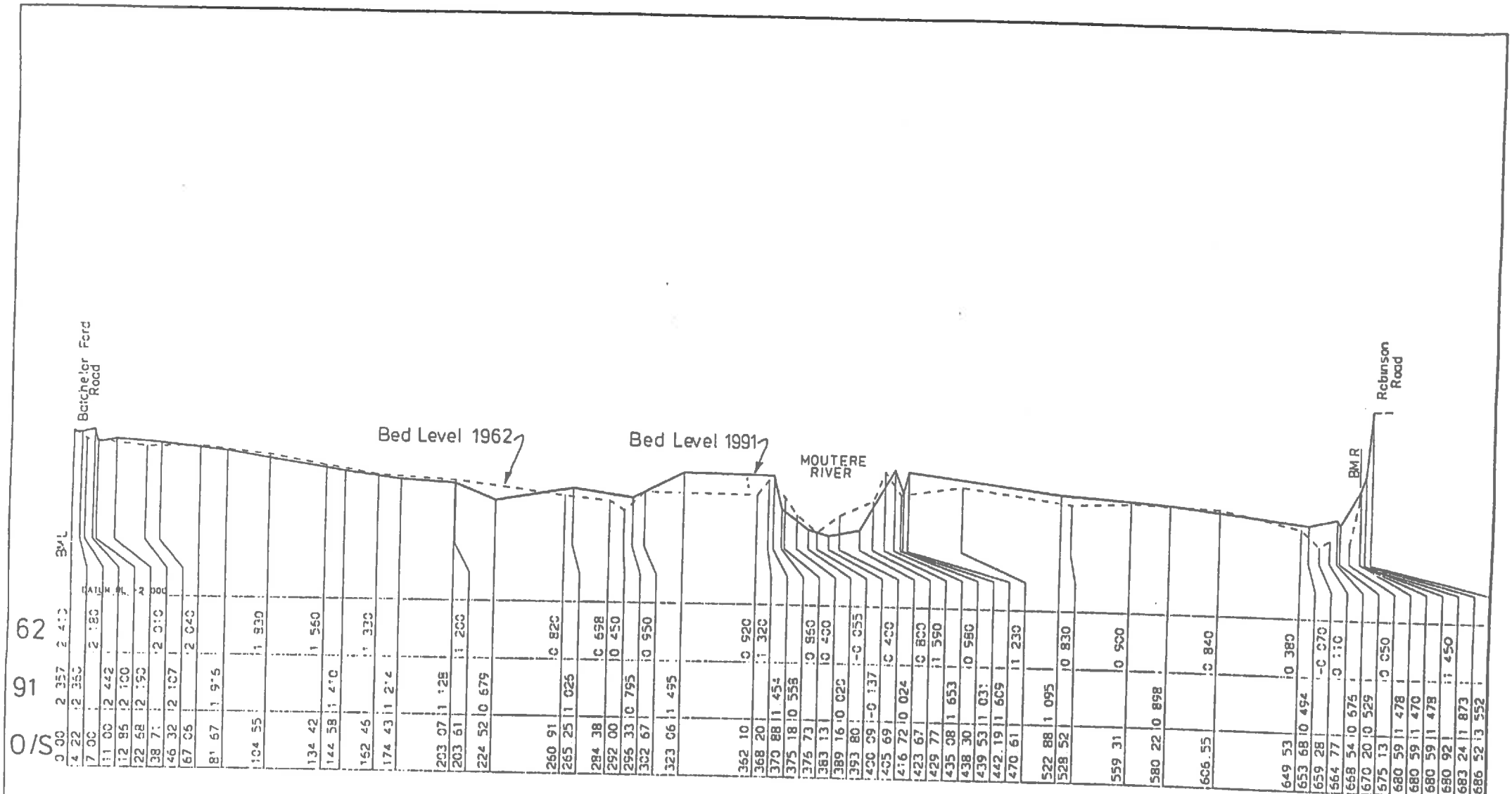
SURVEYED	SMB & ACH		SCALES	HZ 1 2000 VT 1 100			
DESIGNED			JOB NO	101,51			
CHECKED			CLIENT				
DRAWN	MAH		CONTRACT		ROAD NO		
CHECKED			BDGE NO		RIVER NO		
APPROVED			LEVEL DK	253, 94p47	FILMED		

TASMAN DISTRICT COUNCIL

MOUTERE INLET CROSS SECTIONS (COMPARISONS)

PLAN NUMBER

4320



CROSS SECTION No. 7.00

See location plan 4294

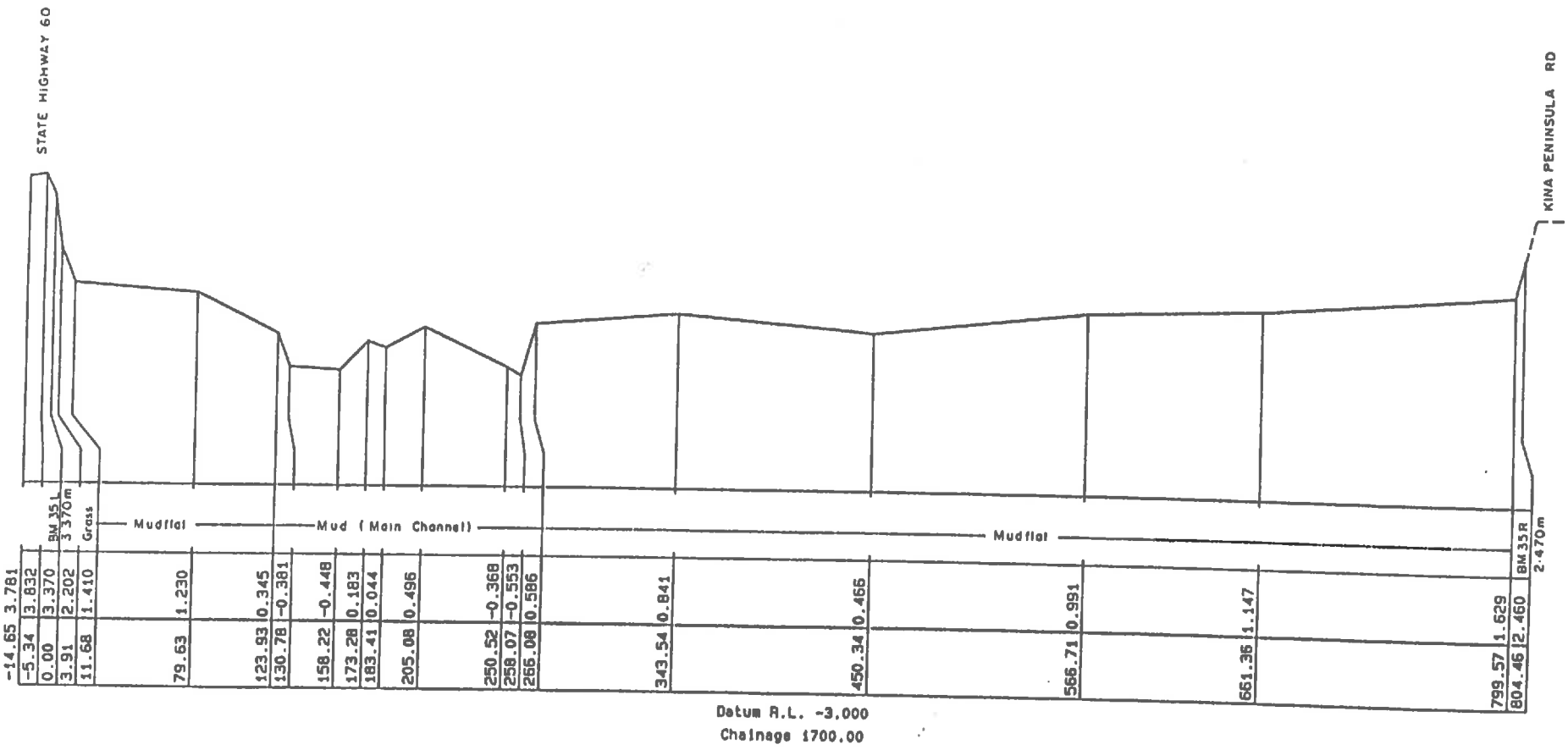
SURVEYED	SMB & ACH		SCALES	HZ. 1 2000 VT. 1:100		
DESIGNED			JOB NO	101, 51		
CHECKED			CLIENT			
DRAWN	MAH		CONTRACT		ROAD NO	
CHECKED			BRIDGE NO		RIVER NO	
APPROVED			LEVEL BK	253, 95p57	FILMED	
			FIELD BK	30	REEL NO	

TASMAN DISTRICT COUNCIL

MOUTERE INLET CROSS SECTIONS (COMPARISONS)

PLAN NUMBER

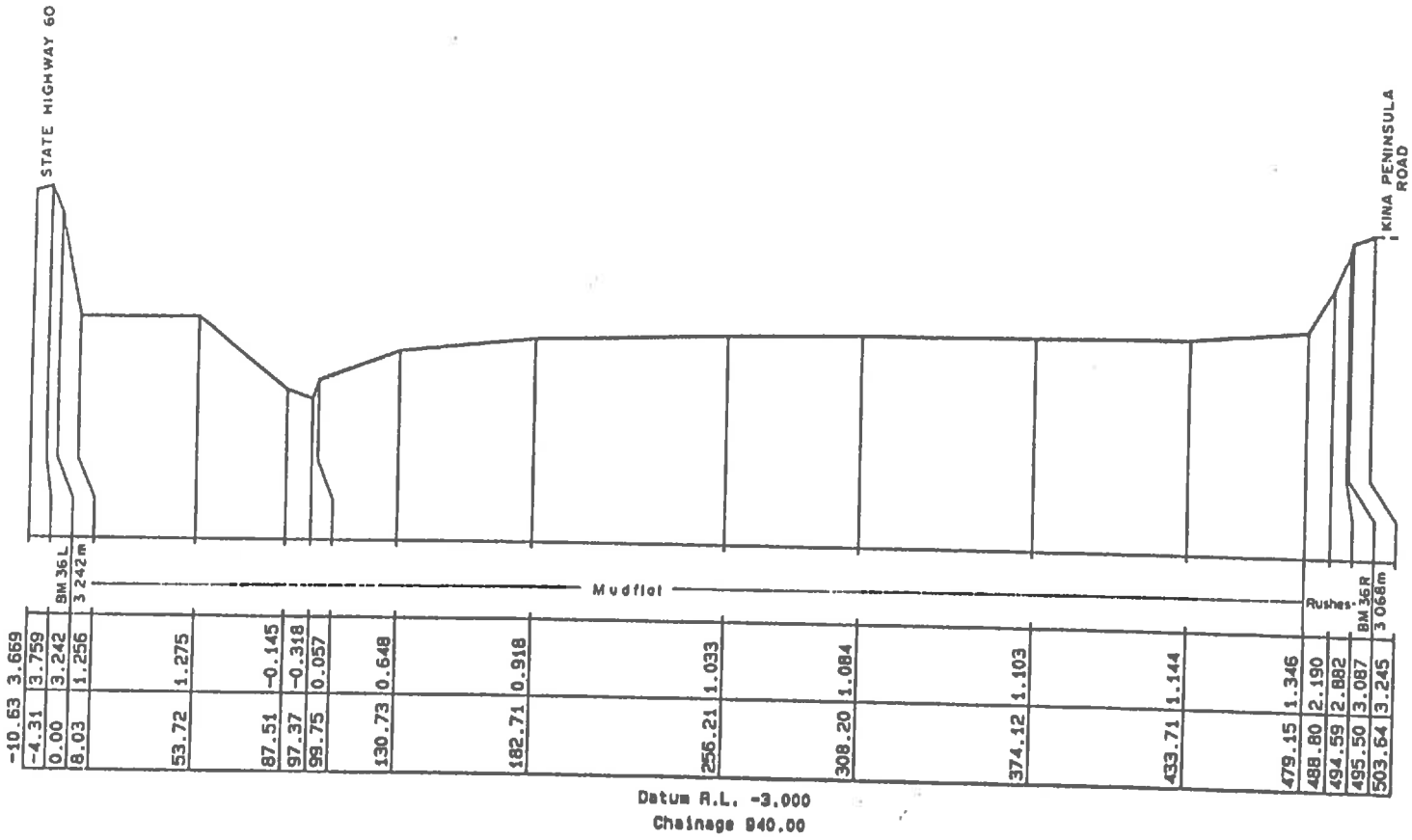
4320



INLET CROSS SECTION NO.35

Hz scale 1:2500 Vt scale 1:100

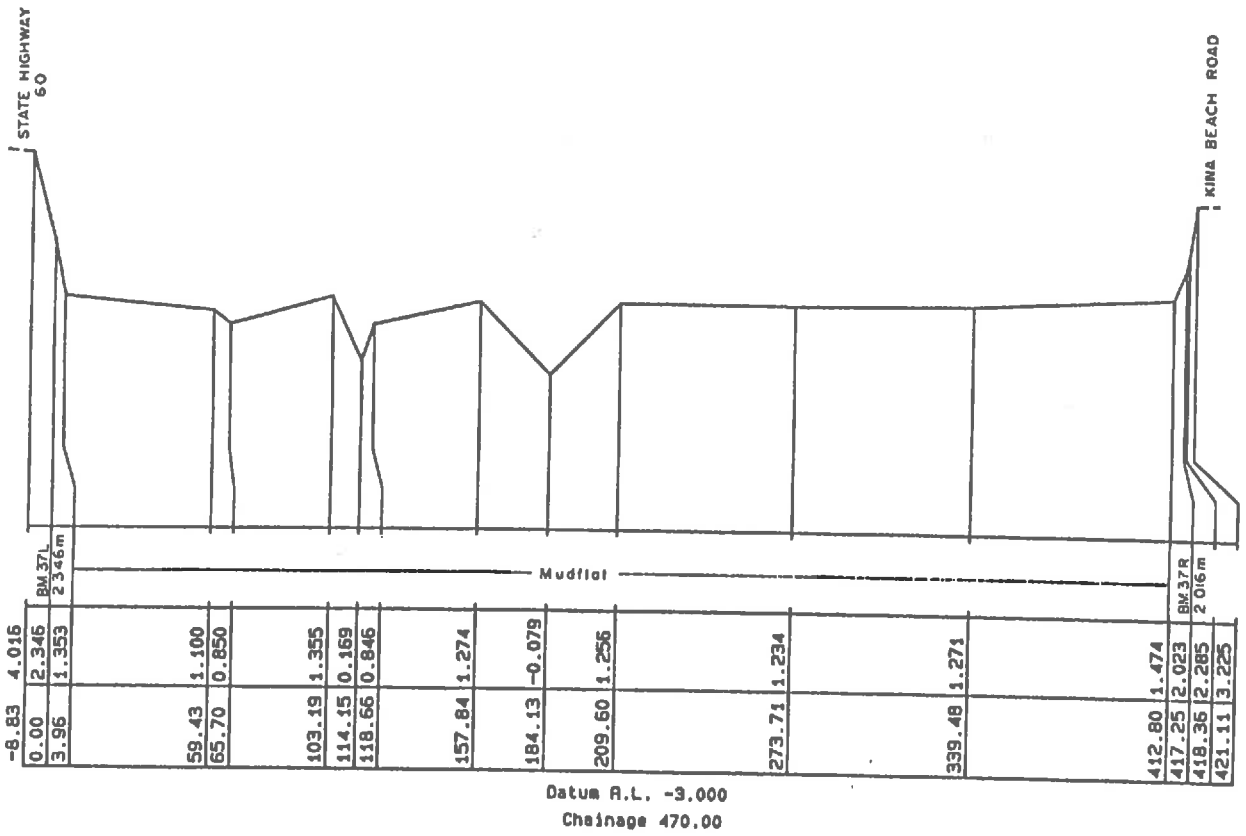
JOB: 101 SDR File: SDR00020.101 SURVEYED BY: SMB & TSS 21-May-91 08:39 LB/FB 253 PLOT DATE: 10 JUL 1991 PLOT SCALE: Horiz 1:2500 Vert 1:100 STANDARD RCS PLAN FORM - RCS 2	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294 Sht 9 of



INLET CROSS SECTION NO.36

Hz scale 1:2000 Vt scale 1:100

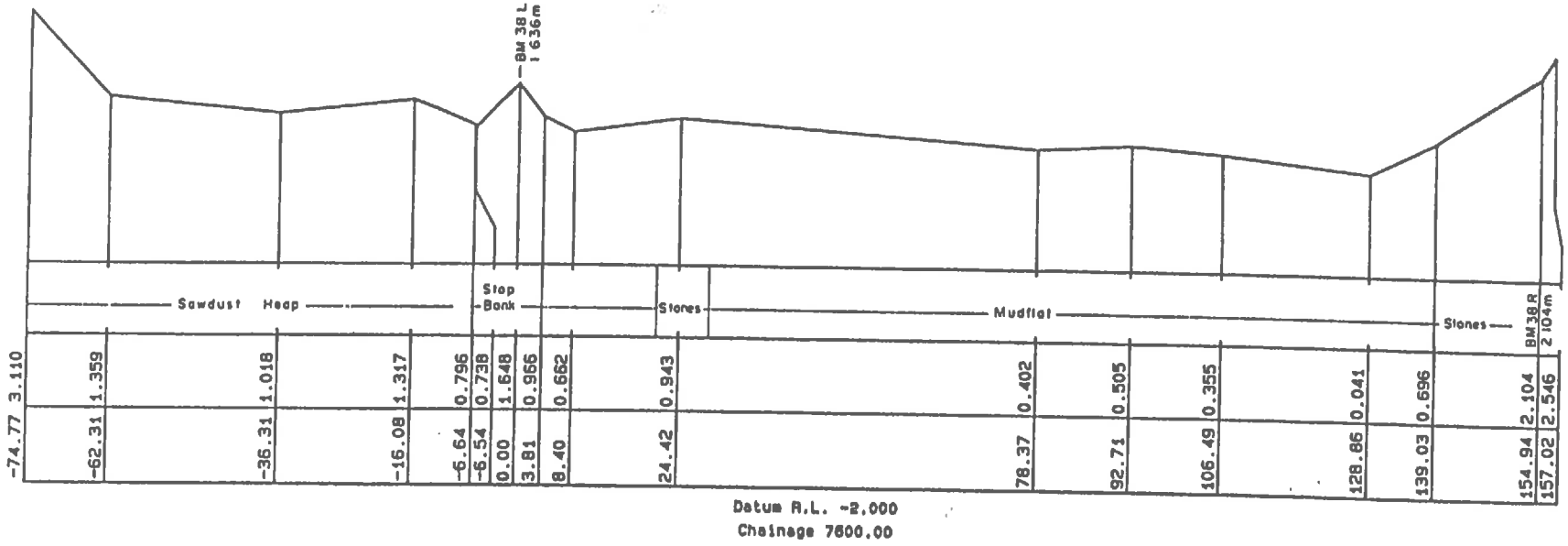
JOB: 101 SDR File: SDR00019.101 SURVEYED BY: SMB & TSS 16-May-91 10:06 LB/FB 253 PLOT DATE: 10 JUL 1991 PLOT SCALE: Horiz 1:2000 Vert 1:100 STANDARD RCS PLAN FORM - RCS 2	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294 Sht 10 of



INLET CROSS SECTION NO.37

Hz scale 1:2000 Vt scale 1:100

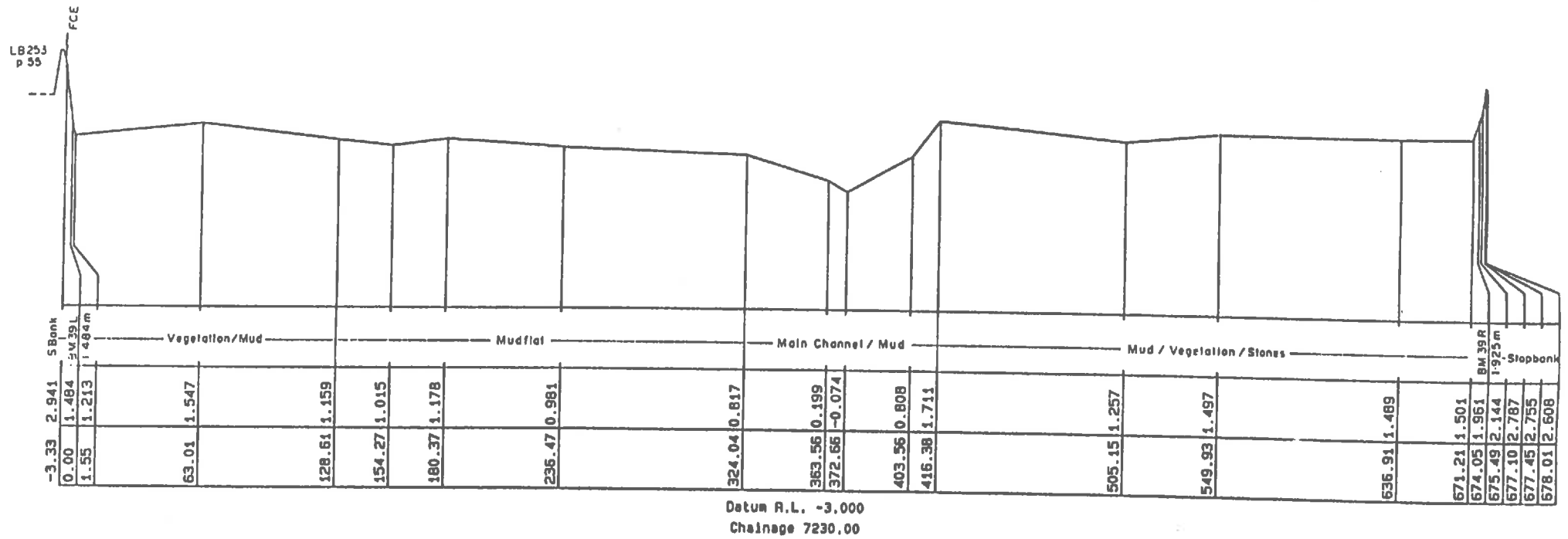
JOB: 101 SDA File: SDR00017.101	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294
SURVEYED BY: SMB & TSS 15-May-91 10:58			
LB/FB 253 PLOT DATE: 8 JUL 1991			
PLOT SCALE: Horiz 1:2000 Vert 1:100			
STANDARD RCS PLAN FORM - RCS 2			Sht 11 of



INLET CROSS SECTION NO.38

Hz scale 1:750 Vt scale 1:100

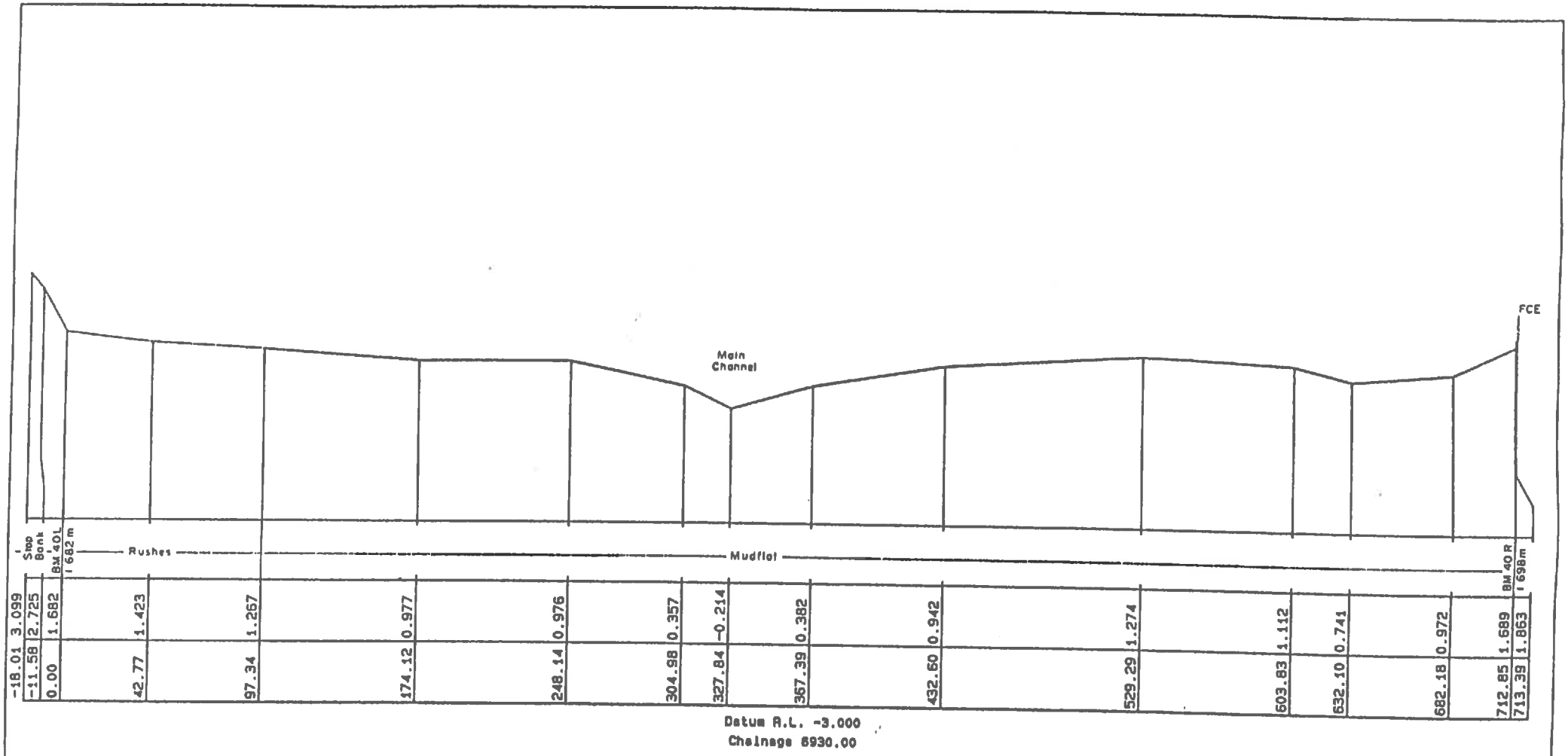
JOB: 101 SDR File: SDR00022.101 SURVEYED BY: SMB & TSS 23-May-91 08:44 LB/FB 253 PLOT DATE: 12 JUL 1991 PLOT SCALE: Horiz 1:750 Vert 1:100 STANDARD RCS PLAN FORM - RCS 2	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294 Sht 12 of



INLET CROSS SECTION NO.39

Hz scale 1:2000 Vt scale 1:100

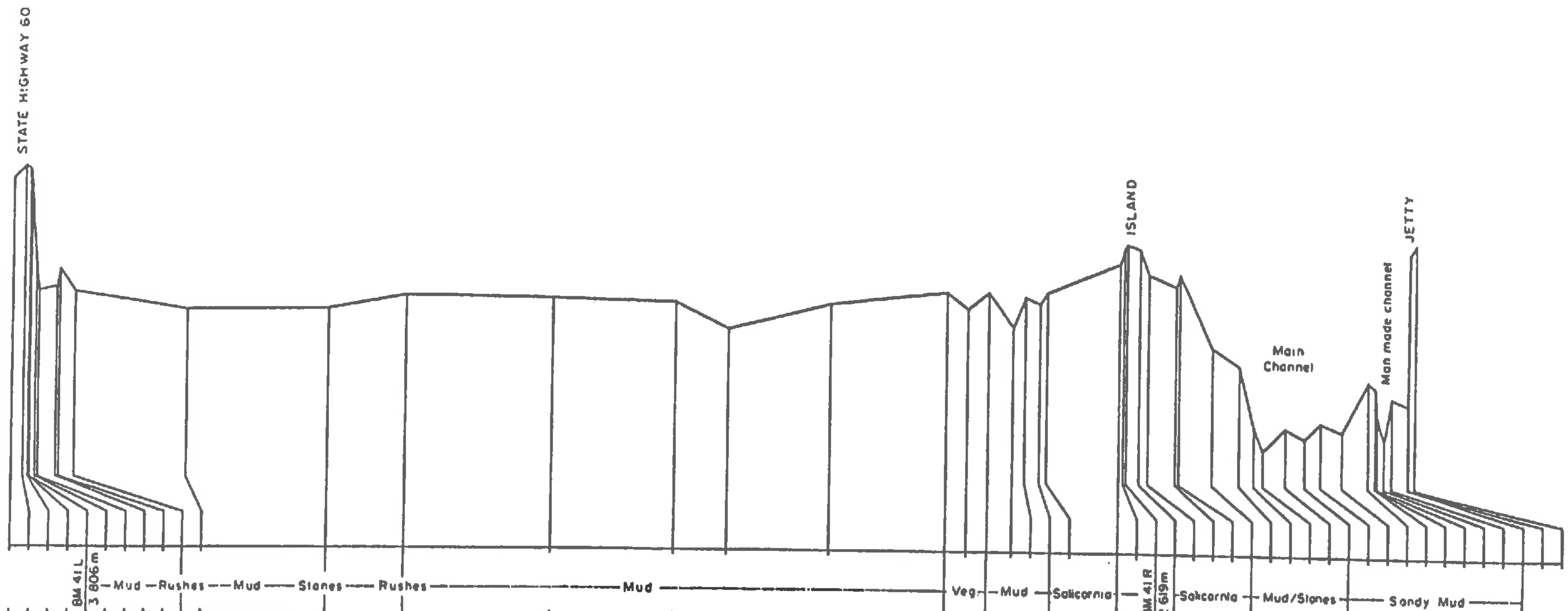
JOB: 101 SDR File: SDR00019.101 SURVEYED BY: SMB & TSS 16-May-91 10:06 LB/FB 253 PLOT DATE: 10 JUL 1991 PLOT SCALE: Horiz 1:2000 Vert 1:100 STANDARD RCS PLAN FORM - RCS 2	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294 Sht 13 of



INLET CROSS SECTION NO.40

Hz scale 1:2000 Vt scale 1:100

JOB: 101 SDA File: SDA00019.101 SURVEYED BY: SMB & TSS 16-May-91 10:06 LB/FB 253 PLOT DATE: 10 JUL 1991 PLOT SCALE: Horiz 1:2000 Vert 1:100 STANDARD RCS PLAN FORM - RCS 2	NELSON-MARLBOROUGH REGIONAL COUNCIL	MOUTERE INLET CROSS SECTIONS	Plan No 4294 Sht 14 of



-11.45	3.843
-3.96	4.096
-1.05	4.036
-0.10	3.830
0.00	3.809
3.31	2.037
5.39	1.483
16.60	1.558
18.68	1.921
28.23	1.452
100.77	1.080
191.45	1.115
240.50	1.393
334.01	1.341
412.21	1.271
445.49	0.719
510.10	1.256
584.27	1.513
597.44	1.167
610.45	1.519
625.83	0.789
633.48	1.427
642.75	1.293
647.27	1.525
693.29	2.167
696.06	2.500
697.92	2.591
705.83	2.484
711.67	1.944
729.36	1.689
731.80	1.943
753.07	0.424
770.32	0.052
779.63	-1.231
785.70	-1.752
799.84	-1.256
811.96	-1.481
822.12	-1.130
835.43	-1.325
851.97	-0.240
856.30	-0.362
856.30	-0.366
857.86	-0.964
862.27	-1.517
867.09	-0.576
877.36	-0.727
877.77	2.471
881.89	2.686

Datum R.L. -4.000
Chainage 8460.00

INLET CROSS SECTION NO.41

Hz scale 1: 3000 Vt scale 1: 100

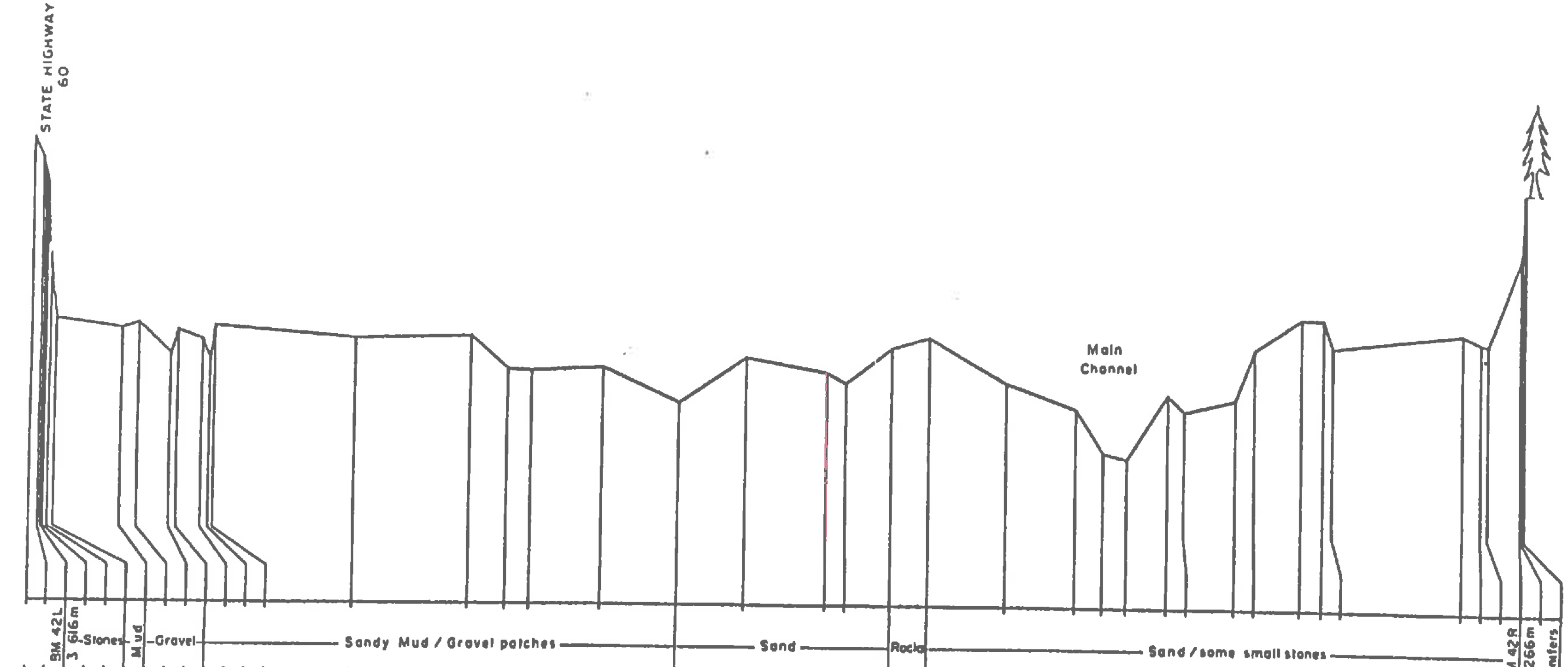
JOB: 101 SDR File: SDR00021.101
SURVEYED BY: SHB & TSS 22-May-91 10: 19
LB/FB 253 PLOT DATE: 16 JUL 1991
PLOT SCALE: Horiz 1: 3000 Vert 1: 100
STANDARD RCS PLAN FORM - RCS 2

NELSON-MARLBOROUGH REGIONAL COUNCIL

MOUTERE INLET CROSS SECTIONS

Plan No 4294

Sht 15 of



Chainage	Level
-9.94	4.233
-2.34	3.857
0.00	3.616
2.17	3.414
5.46	1.812
10.30	0.684
63.35	0.508
76.83	0.614
102.77	-0.012
108.29	0.471
127.94	0.288
134.11	-0.124
138.07	0.572
251.71	0.336
345.74	0.375
375.80	-0.295
395.28	-0.322
451.54	-0.237
514.19	-0.970
568.99	-0.031
634.29	-0.334
649.76	-0.545
686.00	0.180
715.67	0.399
777.98	-0.518
833.59	-1.042
855.66	-1.920
874.62	-2.031
906.84	-0.726
919.77	-1.071
960.62	-0.815
975.72	0.212
1013.21	0.862
1030.90	0.848
1038.66	0.277
1143.04	0.603
1157.64	0.431
1163.40	0.390
1189.44	2.146
1190.67	2.289
1192.93	3.387

Datum R.L. -5.000
Chainage 5870.00

INLET CROSS SECTION NO. 42

Hz scale 1: 4000 Vt scale 1: 100

JOB: 101	SDR File: SDR00022.101
SURVEYED BY: SMB & TSS 23-May-91 08: 44	
LB/FB 253	PLOT DATE: 15 JUL 1991
PLOT SCALE: Horiz 1: 4000 Vert 1: 100	
STANDARD RCS PLAN FORM - RCS 2	

NELSON-MARLBOROUGH REGIONAL COUNCIL

MOUTERE INLET CROSS SECTIONS

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Appendix VII. Account of a visual inspection of Moutere Inlet margins (September 1990) by L. Bamford and A. Fenemor (Nelson-Marlborough Regional Council).

Talley Fisheries, at Port Motueka, north of Jacketts Island, has discharges from fish processing, vegetable processing, fishmeal and stormwater. These discharges are covered by coastal discharge permits with water quality limits and these are monitored. Discharges are to the channel at Port Motueka, so effluent may be carried either out to sea or into the inlet, depending on the direction of the tide.

Fishing boats tie up at the wharf adjacent to Talleys Fisheries and boat sanding and painting are carried out there. At the time of the inspection, a scum from these sanding and painting activities was visible and was observed washing into the Inlet on the incoming tide. A band of scum was also apparent in the middle of the river channel.

North of Port Motueka, Wharf Road cuts across the inlet with a flood control gate across its single culvert. Below this, boats occasionally moor within the channel. Trewavas Street runs directly north from the eastern end of Wharf Road and is lined on both sides with houses. These houses and the motor camp adjacent to Talleys Fisheries are all connected to the sewerage scheme.

The cemetery, which is about 700 metres north of Wharf Road, is separated from the Inlet by a small pine plantation. There was no visually noticeable impact to the Inlet below this. Old Wharf Road forms the northern boundary to the Inlet and a tide gate prevents the intrusion of seawater into Thorp Drain beyond this point. Freshwater input through the tidegate is from freshwater springs (Site FW1).

Motueka Cold Storage Ltd has a coolstore just below Old Wharf Road, at the north-western tip of the Inlet, but separated from it by an approximately six hectare 'reclamation' of sawdust and woodwaste. The company has a permit to discharge uncontaminated refrigeration, condenser and deposit water, at a maximum rate of 26m^3/hour (Discharge Permit 860131). This discharge is to a ditch at the back of the factory, which runs through the sawdust and wood waste dump to the inlet. Leachate from the sawdust/wood waste is visible in the ditch.

A ditch runs from north to south along the western boundary of the sawdust and wood waste dump. Leachate is visible in the ditch and the water is a blackish/brown colour. This ditch continues past a timber yard, towards the old Unilever site near Wharf Road.

There is a discharge of contaminated stormwater from the woodyard. Waste materials, including concrete, wood, metal and household and garden refuse, have been dumped at the back of the timber yard and leachate thereof contributes to the discharge. A clean discharge of piped water runoff enters the inlet just below this industrial area.

The Unilever factory processing discharge pipe is no longer used as the factory is closed. Other activities are now carried on at this site. An irrigation overflow pipe discharges to the Inlet south of the main highway roundabout.

Below and south of Wharf Road the main road continues along the western edge of the Inlet at the edge of the high shore flats and the mudflats towards the Moutere River.

The main road cuts off a section of the Inlet of approximately 80 hectares, which forms a triangular area within Robinson Road and the extension of High Street South. The Moutere River divides this area. At a distance of 800 metres upstream from the bridge, Chings Road Stream and the NZ Company Ditch combine to form the Moutere River, and just below this confluence on the true left bank is Talleys' shell dump at Bachelor Ford. Fish waste has been dumped between the rows of shells and then covered with wood waste. On 7 September there was a leachate discharge from the dump site of approximately 2 litres/second. Opposite the shell dump and on the true right bank of the river is the old Mariri tip which forms a reclamation in the inlet beside the river. There is evidence of small amounts of rubbish still being dumped here.

Adjacent to Robinson Road are a small shell dumping site, an area of sawdust, shells and bark which could be a small composting site, the Mariri tip (now a transfer station), a site where fish waste has been dumped and, in the past, some chemical wastes. There is a small discharge stream flowing out of the hillside just below the latter site and a sample of this water was taken for analysis. This discharge had formed a small ditch and appeared to have iron in it, precipitated from the water. All plant growth is absent on both sides of the ditch. The discharge was found to contain pesticides; Tasman District Council has since sealed the area thought to be leaking pesticides.

Robinson Road meets State Highway 60 at the edge of the inlet and heads back towards Nelson, cutting off a series of small embayments, each of which was inspected. Freshwater input to each embayment was estimated. Dumping and burning of rubbish was common within the embayments. Discharges from septic tanks into some embayments were evident and there is probably septic tank effluent seeping into the inlet from housing and orchard workers' accommodation around the embayment areas.

Spraying of orchards, and fertiliser application are carried out and there will be some contaminated run off to the inlet from these activities.

The eastern boundary of the inlet formed by Kina Peninsula comprises a large area of forested land, some farming and orchard activities, scattered houses and a larger housing settlement at the tip of the peninsula, where the inlet is again open to the sea. Septic tank and farmland drainage on this side would have some impact on the inlet.

Estimated freshwater input on 7 September 1990:

1.	*Site above Talley's shell dump*		*40 l/sec*
2.	*Mariri Tip area*		*30 l/sec*
3.	*Embayments*		*100 l/sec*
4.	*Stormwater and runoff below the embayments*	*approx*	*350 l/sec*