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Grain-Size Analysis of Samples from Cape Roberts Core CRP-3, Victoria Land Basin, Antarctica, with Inferences about Depositional Setting and Environment

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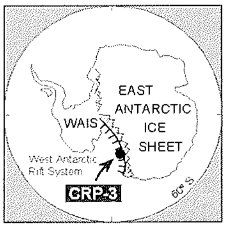

Abstract - Grain-size analyses by sieve and Sedigraph are presented for 115 samples of core from CRP-3, 12 km off the coast of south Victoria Land. The data provide a useful check on visual core descriptions. The geographic setting for the strata sampled, some 790 m of early Oligocene nearshore marine sediments with a persistent glacial influence, is reviewed, and sediment textures interpreted in that context. Sand textures from the CRP-3 samples in the lower part of the core suggest that deposition was initially primarily wave-dominated, but that at times the influence of the waves was over-ridden by episodes of rapid sedimentation. Sedimentary cycles, recognised in the visual description of the core above 485 mbsf, show an increasing proportion of mudstone in the middle of each cycle above 330 mbsf that is interpreted to record periodic sedimentation in deeper water. Sandstone textures in the lower and upper parts of each cycle are interpreted to record departure from and return to shoreface deposition with changes in sea level. Mudstone textures above 176 mbsf indicate sedimentation below wave base. Many of the textures in both sand and mud samples show the coarse "tail" characteristic of ice-rafted debris, but others do not, indicating ice-free periods. Many sandstones below *c.* 200 mbsf have virtually no silt, but significant amounts of clay (6 to 17%) that is thought to be of post-depositional origin.

INTRODUCTION

This paper presents the results of grain-size analyses from 115 samples of the CRP-3 core at depths ranging from 10 mbsf (metres below sea floor) to 788 mbsf, using seive and Sedigraph techniques, and provides an initial interpretation of the textures in the context of the likely environment of deposition. The results are intended to provide reference data to supplement lithological descriptions in the core logs (Cape Roberts Science Team, 2000), and to help with facies interpretation. The analytical technique for the sand fraction (sieving) is simple, physical and widely practised for over a century. Thus the data acquired in this way provide a useful reference point for analyses produced by other faster and more sophisticated techniques, such as the Malvern laser particle size analysis system (Fielding, Dunbar & Bryce, this volume; Naish et al., this volume). In addition the data also provide a useful reference for grain size estimates derived from measurements taken with down-hole logging tools (Bücker, personal communication, 1999).

METHOD

Between 10 and 25 g of sample were disaggregated by crushing gently between wooden blocks and then stirring in distilled water and Calgon for 60 minutes in an ultrasonic bath. A microsample was checked for material not fully disaggregated. If aggregates were found the treatment was continued until disaggregation was complete. The sample was then wet-sieved into sand and mud fractions, and both fractions dried and weighed. The sand fraction (0.063-2 mm) was then dry-sieved and a 1 g sub-sample of the mud fraction analysed by Sedigraph 5100. Because wet sieving invariably retains some coarse silt, dry sieving was extended to catch 4.5 and 5.0 phi fractions. The weights retained were then merged with the Sedigraph results. The analyses are reported in table 1 for each sample as frequency percent at 0.5 phi intervals for the range -1 to 10 phi (2 to 1/1024 mm) and the percent finer than 10 phi.

Around 1/6 of the samples contain more than 2% gravel but only 7 samples had more than 10%. Because of the small sample size (typically between 15 and 30 g) the proportion of gravel cannot be reliably estimated, but the proportion is nevertheless recorded with the results.

RESULTS

The results are presented in appendix 1 (frequency percent) and appendix 2 (summary statistics). They are also summarised as percent sand again the lithologic log in figure 1, along with data from laser-based grain size analysis (Fielding, Dunbar & Bryce, this volume), which is closely comparable. Appendix 2 includes a column for the facies designation for each sample, based on the visual core description. As in CRP-2/2A (Barrett & Anderson, 2000) the size frequency distributions fall into 5 main types (facies after Powell et al., 2000 and Fielding et al., 2000, only slightly modified in Powell, this volume, for CRP-3). These are *mudstone* (facies 1) with less than 10% sand, *sandy mudstone* (facies 2) – mudstones typically with 20 to 40% sand, *poorly sorted sandstone* (facies 3) - broad sand mode with considerable mud, *well sorted sandstone* (facies 4 and 5) – well-defined sand mode and little mud (but see data from analyses), and *diamictite*, (facies 6 and 7 - a wide range of sizes from pebbles to clay with a broad mode in the sand range). Conglomerate is also well represented in the lower part of the core, but cannot be meaningfully measured with a sample size of 20g. The proportions of each facies in the core for three intervals based on sequence stratigraphic characteristics (Fielding, Naish & Woolfe, this volume) are summarised in table 1 to indicate the relative importance of each facies preserved. The table also shows the broad up-core changes from sand and conglomerate in the lower part of the core to mudstone, diamictite and sandstone in the upper part.

For most of the samples the visual core description is confirmed by grain-size analysis, discriminating the basic sediment types of mudstone, sandy mudstone, muddy sandstone and diamictite. However, there are three intervals that were described as sandstone in the visual core description, and yet analyses showed them to be mudstone. These results, which should be taken into account in further detailed studies, are briefly described below:

The interval from 17 to 24 mbsf in unit 1.2 is described in the Initial Report as sandstone of facies 3, but 2 samples analyse as mudstone with 19 and 27% sand, typical of facies 1 or 2.

The interval from 39 to 51 mbsf in unit 1.2 is described as sandstone of facies 3, but 3 samples analyse as mudstone with 9 to 17% sand, typical of facies 1.

The interval from 110 to 114 mbsf in unit 2.2 is identified as sandstone of facies 3, but 3 samples analyse as mudstone with 21 to 25% sand, more typical of facies 1 or 2

The coarser-grained reporting of these sediments reflects the difficulty in estimating mean size in sandy mudstones, especially those in glacial sediments with a significant coarse sandy "tail".

Another difference between the visual core description and the results of the textural analyses is found in the core below 580 mbsf. Most of the core is designated as sandstone of facies 3 (poorly sorted muddy sandstone) with some intervals of sandstone of facies 4 or 5 (moderately to well sorted sandstone). However a comparison of analytical data from this interval indicates that these facies groups have a considerable range in mud content with a high degree

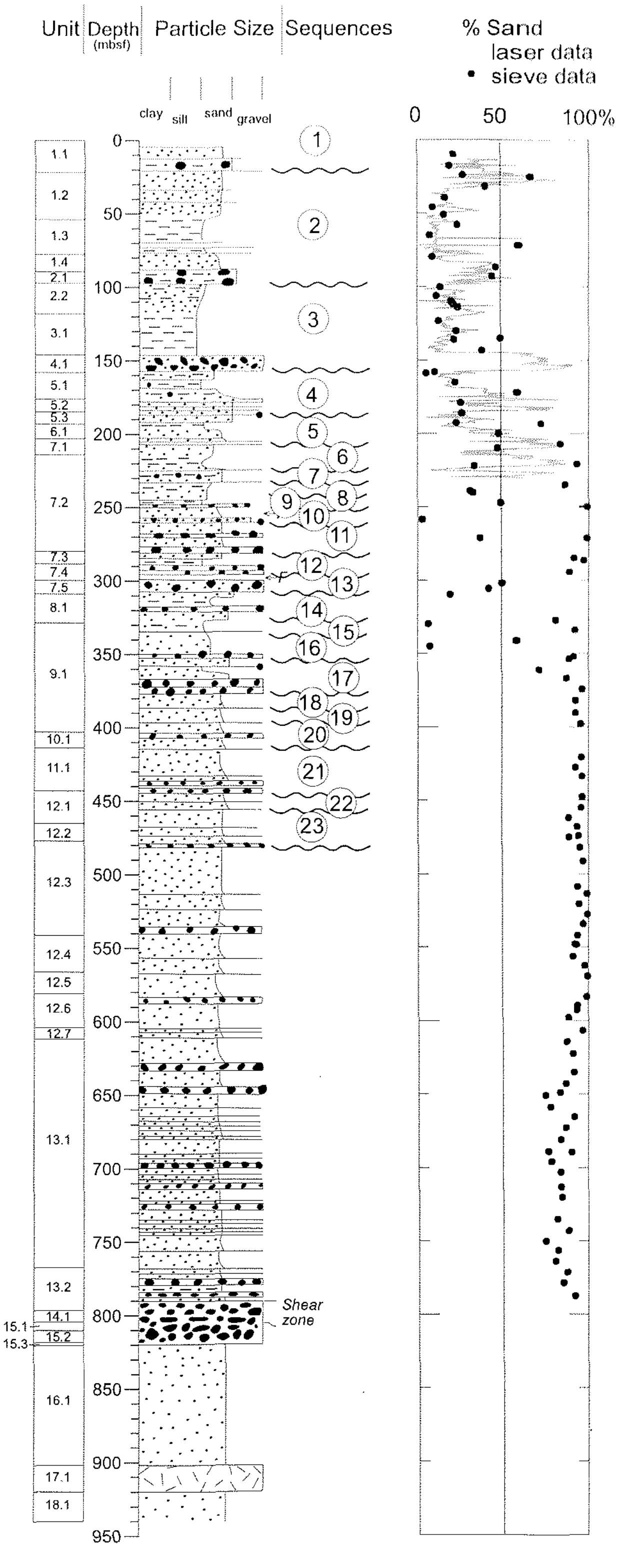

Fig. 1 - Lithologic log for the CRP-3 core, showing unit and sequence boundaries, and variations in percent sand from sieve-Sedigraph analyses. Comparative data for percent sand determined from small (>1 g) samples by Malvern (laser) size analysis (Fielding, Dunbar & Bryce, this volume).

Tab. 1 - Summary of facies abundance in CRP-3 core (data from Powell et al., this volume).

Facies no	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Lithology	*Mudstone*	*Sandy mudstone*	*Muddy sandstone*	*Well-sorted sandstone*		*Diamictite*		*Rhythmite*	*Conglomerate*	
2.8 to 157.22 mbsf (sequences 1-3)										
Thickness (m)	80	7	22	0	4	1	29	3	4	4
Percent	52	5	14	0	3	1	19	2	2	3
157.22 to 329.96 mbsf (sequences 4-13)										
Thickness (m)	40	26	15	0	62	2	1	3	10	14
Percent	23	15	9	0	36	1	1	2	6	8
329.96 to 823.11 mbsf (sequence 14-23 and below)										
Thickness (m)	6	11	136	20	241	0	0	0	34	47
Percent	1	2	27	4	49	0	0	0	7	10

of overlap (Tab. 2). All of the well-sorted sandstones (facies 5) were over 87% sand, but so were a third of those recorded as muddy sandstones (facies 3). A further complexity discussed below is the likelihood that a significant proportion of the clay fraction in most of these samples is post-depositional. Further studies of this interval should take these analytical data into account.

INTERPRETATION OF SEDIMENT TEXTURE IN SAMPLES FROM CRP-3

In this section the textural characteristics of samples from CRP-3 are interpreted in terms of sediment accumulation off a subsiding wave-dominated coast, with modern coastal sedimentation north of Wellington, New Zealand, as an example. This interpretation is predicated on a palaeogeographic model for the early Oligocene of the region developed from both regional geological considerations and information from the Cape Roberts cores. Interpretations are made mainly on differences in sorting of the sand mode (symmetrical and well-sorted is interpreted as wave-influenced) and on the presence/absence of a coarse sand "tail" (interpreted as ice-rafted debris). In addition, a post-depositional inference is made for the presence in many well-sorted sands of a pure clay textural component, which is interpreted as diagenetic in origin.

Tab. 2 - Comparison of percent mud in samples from facies 3 (poorly sorted muddy sandstone) and facies 4 and 5 (moderately and well sorted sandstone) for the interval below 580 mbsf.

	Range in percent mud	*Average*	*Standard deviation*
Facies 3 (19 samples)	1 to 26%	15%	6%
Facies 4 & 5 (8 samples)	4 to 26%	12%	7%

OLIGOCENE PALAEOGEOGRAPHY

A number of features suggest that the entire thickness of Cenozoic strata cored in CRP-3 above *c.*790 mbsf accumulated rapidly on a relatively shallow marine shelf setting within a few kilometres of the Oligocene coast. Marine microfossils, notably diatoms, foraminifera and marine palynomorphs, occur in modest numbers in the upper 330 m of the core, and marine palynomorphs are found in several deeper horizons, including one at 781 mbsf (Cape Roberts Science Team, 2000), supporting the view that the entire section above this is marine. The appearance of the muddy facies in the upper part of the core suggests that subsidence only slightly outpaced sedimentation.

The geography was most likely little different from today, with a straight coast trending north-south, and high mountains to the west. The existence of mountains at this time is inferred from the granitic clasts scattered throughout the core, indicating that they had by then been incised deeply enough to expose the basement that still forms the foothills just beyond Cape Roberts 10 km to the west. The higher slopes of the mountains comprised then, as they do today, relatively soft flat-lying Beacon Supergroup strata, almost a kilometre of quartz sandstone overlain by a similar thickness of Permian-Triassic feldspathic sandstone and mudstone, readily eroded to feed the new offshore basin. The strata included Permian coal beds whose fragments can be found throughout the Oligocene CRP core. Magnetostratigraphy suggests an average sediment accumulation rate of about 600 m/m.y. for the middle (sandstone-dominated) section of the core (magnetozone N1, interpreted as C13n, Florindo et al., this volume). However, one should keep in mind that the entire core includes many disconformities, and that the sedimentation rate for some if not all intervals could well be much higher.

Seismic data and the likely proximity of a coast to the west suggests that the strata cored by CRP-3 accumulated as a tabular body extending seaward from the shoreline. Seismic sections parallel to the depositional strike show stratification to be broadly parallel and with relatively minor channelling, the largest being one around 2 km long and 70 m deep (Henrys et al., 2000). Seismic dip sections also show roughly parallel stratification seaward of CRP-3, but no information is available in a landward direction. The scenario proposed here is very like that of De Santis and Barrett (1998, Fig. 1) for the early Miocene strata in CRP-1, though by then the climate was much colder and influenced by more extensive and at times grounded ice. In the milder early Oligocene times, waves were most likely to have been the strongest physical influence on sediment deposition offshore. Tidal currents were probably quite limited in their strength, assuming that the past tidal range was as small as that of today (maximum spring tide of *c.*1.0 m, Cape Roberts Science Team, 2000).

Coastal climate was cool temperate, inferred from terrestrial palynomorphs in samples throughout most of the sequence, consistently in the upper 400 m of the core and at several further levels down to 781 mbsf. The palynomorphs represent a low-diversity woody vegetation (Raine & Askin, this volume). Nevertheless glaciers from local ice caps or inland ice sheets were discharging ice into the sea from time to time, attested by out-sized and striated clasts at a number of levels throughout the core above 775 mbsf (Atkins, this volume). They might have grounded as far offshore as the CRP-3 site, but if they did then no lithological evidence remains (Powell et al., this volume). Evidence of grounded ice has been well established in the younger late Oligocene-early Miocene strata of CRP-2/2A, where it typically formed the ice-scoured glacial surface of erosion at the base of the many depositional sequences (Fielding et al., 2000). Advance and retreat of a grounded ice margin had far less of an influence in the deposition of strata cored by CRP-3. This is especially so for strata below 330 mbsf, which are described simply in terms of a conglomerate-sandstone motif B that does not involve the direct influence of ice (Fielding, Naish and Woolfe, this volume).

BASIS FOR THE INTERPRETATION

The textural features of the main sediment types recognised from a review of the analytical results are discussed in the context of a nearshore, wave-dominated, micro-tidal setting on a wave-graded shelf with a supply of mixed sediment. The concept of the wave-graded shelf was revived by Swift (1970), and used in many facies-oriented studies in the 1980's (summarised in Elliott, 1986). It has been included in the Swift and Thorne (1991) model for continental shelf sedimentation, and is implicit in the use of textural variation for identifying sequences in sequence stratigraphic analysis (Fielding et al., 2000). In CRP-2A it is also the basis for linking the advance and retreat of the ice margin with the fall and rise in sea level during the deposition of cycles 9, 10 and 11, whose chronology has provided the first direct evidence for orbital forcing of the ancient Antarctic ice sheet at Milankovitch frequencies (Naish et al., 2001).

In brief, a mixture of sand and mud is supplied by rivers to the coast, which in this wave-dominated setting separates into mud largely carried offshore in suspension, and sand that is moved parallel to the coast by longshore drift and tidal currents. This movement will be assisted by sediment resuspension through wave action, and further assisted by tidal currents. Sorting is best on the shore face itself where oscillatory water movement from waves results in highest flow intensities. Variation in texture in this setting can therefore be considered as a spectrum or continuous variation from offshore mud through sandy mud to muddy shoreface sand to well sorted foreshore sand (Fig. 2a). A process-oriented discussion of the wave-grading concept, and its application to modern nearshore sediments can be found in Dunbar et al. (1997).

A modern example of sedimentation on a wave-graded coast has been provided by a coastal transect from sandy beach to offshore mud at PekaPeka, north of Wellington (Perrett, 1990). Since the post-glacial rise in sea level around 6000 years ago sediment has been accumulating from beach to mid-shelf depths (*c.* 50 m) as a seaward-dipping sheet. The sediment comes from rivers eroding the mountains of the southern North Island, and depositing just seaward of the coast, the coarser sandy sediment being distributed alongshore by wave- and tidally generated currents. At the same time this sediment is graded normal to the coast, along with the finer muddy sediment, by low to moderate energy waves (average significant wave height is about 1.3 m and mean zero crossing period between 4 and 5 seconds, Harris, 1990), with the finest sediment carried seaward to settle out from suspension. Figure 2b shows the changing textural pattern in histograms of sea floor samples from offshore mud through sandy mud to muddy sand and well-sorted beach sand at PekaPeka. Although mean spring tidal range is 2.1 m, and shore-parallel tidal currents run at up to 40 cm/sec seaward of the surf zone, this has not affected the shore-normal textural gradient. This model is the subject of continuing study (Dunbar & Barrett (2001).

INTERPRETATION OF SAMPLES FROM CRP-3

The CRP core has been interpreted in the basis of lithofacies patterns to form a series of cycles that are best developed in the upper 330 m. Here a simple interpretation is made of each facies that also happens to be consistent with the sequence stratigraphic model of Fielding et al. (this volume). In the samples from the CRP-3 core the mudstones of facies 1 are

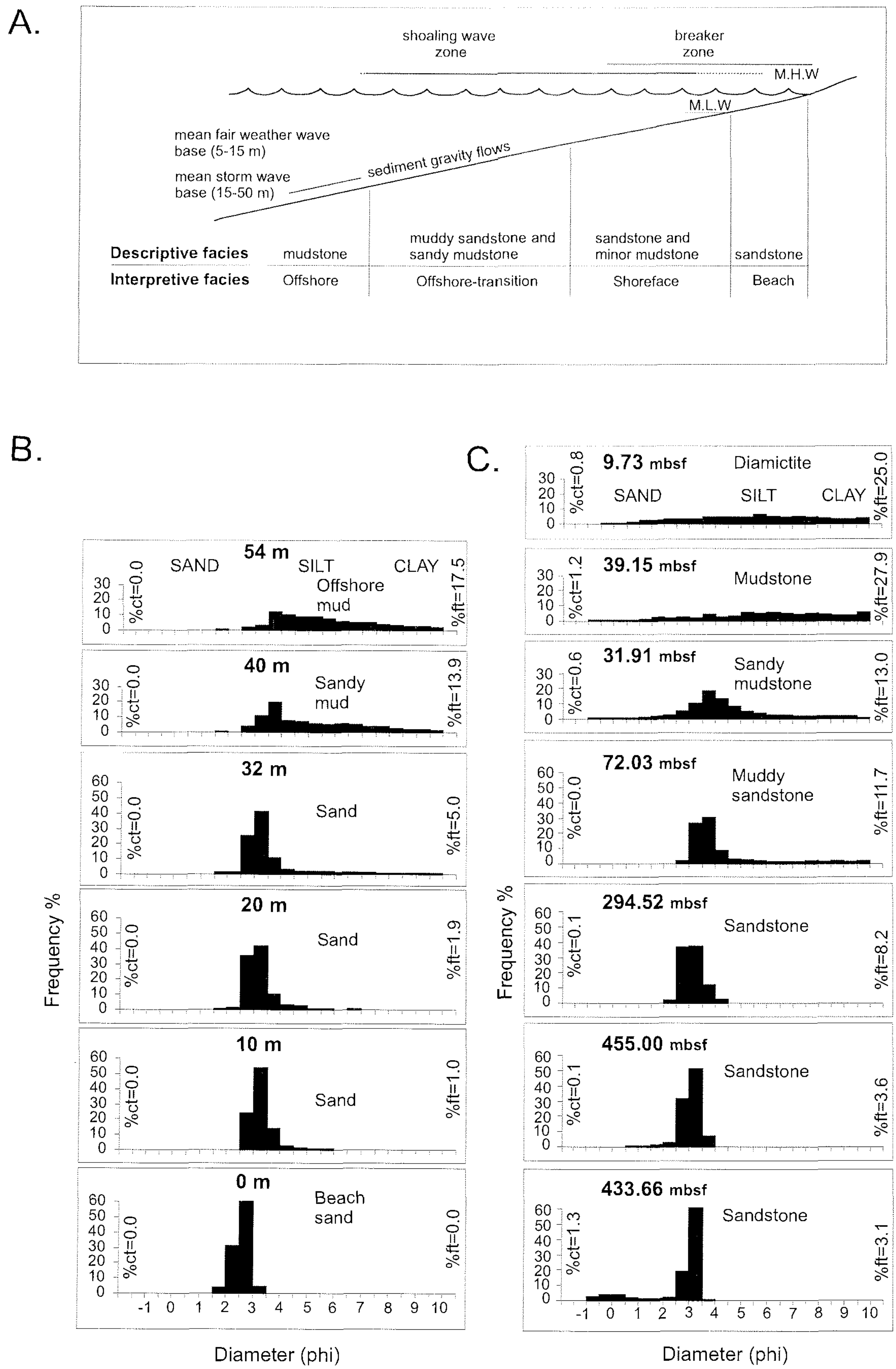

Fig. 2 - Facies model for coastal sedimentation, accompanied by textural data from a transect off a present day wave-dominated coast, and from a selection of CRP-3 samples. A. Model for wave-dominated nearshore coastal sedimentation (from Barrett, 1989, adapted from Elliott, 1986). B. Histograms of modern sea floor sediment from a transect from offshore mud to beach sand off PekaPeka, 50 km north of Wellington, NZ, showing the progressive onshore increase in sand content and improved sorting of the sand mode. Water depth for each sample shown with histogram in m. C. Histograms of CRP-3 samples chosen for illustrative comparison with the sediment accumulating off Peka Peka. Note, however, the coarse tail of coarse sand in samples from 31.91, 39.15, 298 and 433 mbsf, interpreted as ice-rafted debris.

characterised by a broad size distribution mostly in the mud range with a small sand tail (Fig. 2c, 39.15 mbsf). These are interpreted to have been deposited from suspension with virtually no current or wave activity, and hence are considered to represent sedimentation below wave base. This is typically below 15 to 50 m for an open coast depending on fetch (Elliott, 1986) - in an embayment like the Ross Sea in the early Oligocene this depth was most likely around 20 m and unlikely to have been more than 30 m. Sandy mudstone samples typical of facies 2 show a small but distinct typically fine-grained sand mode, carried offshore either by wind or more likely as nearshore sediment suspended and redeposited by density currents during storms (Fig. 2c, 31.91 mbsf). They are presumed to represent deposition closer to the coast and in slightly shallow water. Muddy sandstones typical of facies 3 are interpreted as sediment deposited within a consistently though weakly wave-influenced zone (Fig. 2c, 72.03 mbsf), but these too might represent storm-generated density current sedimentation. The fine to coarse moderately to well sorted sandstones of facies 4 and 5 are interpreted as foreshore and shoreface sands (Fig. 2c, 294.52 mbsf, 455.00 mbsf, 433.66 mbsf).

A feature in many CRP-3 samples of both sand and mud facies is a coarse tail of grains, normally just a few tenths of a percent in each size class, but persisting over several classes and coarser than the expected upper limit of the histogram. This is evident in 6 of the 7 samples from CRP-3 in figure 2c, but is absent in the PekaPeka samples. This tail is interpreted as ice-rafted debris. It can be clearly seen in many samples at various levels in CRP-3, but is plainly absent from others (presence and absence are recorded in appendix 2). The lowest sample that shows an ice-rafted coarse tail is at 756 mbsf.

Diamictites form a significant proportion (19%) of the upper 157m of CRP-3, but are virtually absent below this. Texturally they are sandy mud (example in Fig. 2c) or muddy sand with a variable gravel content, though this cannot be reliably assessed from a 20g sample. Those in CRP-3 are considered to have formed by rain-out processes from melting ice or from debris flows (Powell et al., this volume). Only 3 samples were analysed – insufficient to characterise these sediments as a group. However, their texture is consistent with sedimentation from ice-rafting and suspension below wave base, with little disturbance from traction currents. These sediments may also have been reworked through redeposition by sediment gravity flows, which would not have changed their mixed nature.

The simple model outlined above, used in conjunction with the recognition of ice-rafted debris, can explain the textural patterns of most samples from the upper 330 m. The upper 3 cycles, to 157 mbsf, are inferred to have been deposited mostly below wave base, with only brief periods of shallowing, as the facies proportions in table 3 imply. Cycles 4-14 include more sandstone with well-sorted fine to medium sand modes typical of nearshore or in a few cases even beach deposition. Below Cycle 14 and 330 mbsf, however, the strata are largely sandstone, and while many of the samples still have the well-defined modes typical of the nearshore and shoreface sand above, many others have either a much broader mode or are bimodal (Fig. 3). These are interpreted as either current-deposited or redeposited (distinguished from wave-winnowed sand in appendix 2), perhaps introduced during massive river discharges and buried without sufficient time for wave action to be effective in grading them. Despite this influence the well-sorted sand textures typical of wave-grading are found at a number of levels through the lower part of the core to a depth off 756 mbsf, implying that the depositional environment of these times was a wave-dominated coast characterised by periods of rapid sediment influx.

POSSIBLE POST-DEPOSITIONAL INFLUENCE ON TEXTURE

Most modern shoreface and beach sand on a wave-dominated coast has a mud content of less than 1 percent and near-shore shallow marine sands in depths of reduced wave energy beyond the surf zone have mud contents in the 1 to 20% range. However, for these sediments the mud is always a mixture of silt and clay in subequal proportions. Many sands from CRP-3 have a well-sorted sand mode, very little or no silt and 5 to 21% clay, quite at variance with the texture of modern sand in this setting. This indicates that the clay cannot be of primary depositional origin, and most likely formed after the sand was deposited. The explanation offered here for this texture is that this clay component has been precipitated from circulating pore water after deposition. This explanation is supported and amplified by Wise et al. (this volume), who describe significant amounts of well-crystallised clays in the pores of many sandstones in the lower part of the CRP-3 core, and conclude that they formed by authigenesis.

CONCLUSIONS

The early Oligocene strata cored by CRP-3 to 790 mbsf were deposited in a rapidly subsiding nearshore marine environment with a persistent glacial influence. Grain size analyses from these strata were compared with those from a modern nearshore sediment prism accumulating in a wave-dominated environment in temperate New Zealand. Sand textures from the CRP-3 samples suggest that deposition was initially primarily nearshore and that the influence of

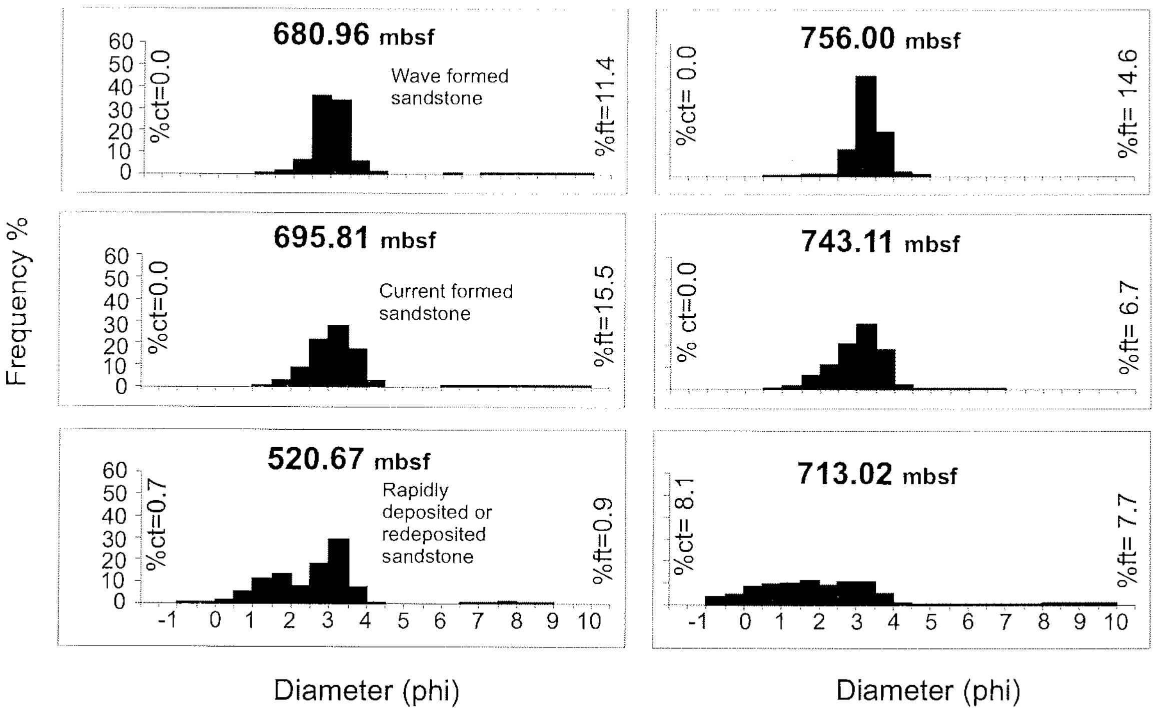

Fig. 3 - Histograms of sandstone samples from the older sand-dominated section of CRP-3, showing typical examples of sand modes interpreted as wave-formed (bell-shaped, narrow), current-formed (bell-shaped, broader) and rapidly deposited (broad, rectangular or bimodal). All but one of the six samples have virtually no silt, but between 7 and 16% clay, which is most likely to have been precipitated after deposition.

the waves was occasionally over-ridden by episodes of rapid sedimentation. The increasing proportion of mudstone above 330 mbsf records more frequent sedimentation in deeper water, but sandstone textures suggest that there are still periods of shallow shoreface deposition. Many of the textures in both sand and mud samples show the coarse "tail" characteristic of ice-rafted debris, but others do not, indicating ice-free periods.

The grain size analyses showed that some of the upper parts of the core were significantly finer-grained than was recognised at the preliminary logging stage, demonstrating the utility of such analyses in describing texturally complex sediments. The analyses also revealed significant amounts (up to 20%) of fine-grained clay that is inferred to be of authigenic origin.

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Appendix 1 - Frequency percent in each size class (limits in phi units) for grain-size analyses (gravel-free) from CRP-3.

Limits	*-0.50*	*0.00*	*0.50*	*1.00*	*1.50*	*2.00*	*2.50*	*3.00*	*3.50*	*4.00*	*4.50*	*5.00*	*5.50*	*6.00*	*6.50*	*7.00*	*7.50*	*8.00*	*8.50*	*9.00*	*9.50*	*10.00*	*Rest*
Sample depth																							
9.73	0.3	0.4	0.5	1.1	2.2	2.7	3.1	3.1	3.5	4.7	4.7	4.8	4.8	6.1	5.2	4.5	5.1	4.4	3.8	3.3	3.0	3.7	24.9
17.37	0.3	0.2	0.3	0.6	1.0	1.7	1.9	2.8	3.3	7.2	7.4	4.6	5.8	4.9	4.1	3.5	3.9	3.5	3.2	2.7	2.8	3.9	30.7
23.72	0.2	0.2	0.3	0.4	0.9	1.8	2.4	4.5	5.8	10.9	9.4	5.5	4.9	4.3	3.5	2.9	3.3	3.1	3.0	3.1	2.9	3.4	23.3
25.12	0.3	0.3	0.5	1.1	3.1	7.7	9.9	14.3	12.9	15.2	9.1	4.7	3.3	2.5	1.6	1.6	1.5	1.4	1.3	1.4	1.1	0.6	4.5
31.91	0.4	0.3	0.6	0.8	1.3	2.1	2.3	5.3	9.9	18.0	13.2	8.0	5.2	4.0	2.8	2.3	2.2	2.0	1.6	2.2	1.8	0.9	13.0
39.15	0.7	0.7	0.5	0.7	1.4	2.4	1.8	2.3	1.9	4.3	2.4	3.2	5.5	5.3	6.0	5.3	4.4	5.2	4.7	3.9	3.9	6.0	27.9
45.73	0.0	0.2	0.1	0.2	0.4	0.6	0.8	1.0	3.0	2.6	1.8	4.7	5.4	7.9	6.1	5.4	5.7	4.3	4.5	4.0	4.0	3.3	33.9
50.85	0.2	0.4	0.6	0.6	1.2	1.9	1.6	1.8	2.5	5.0	2.9	3.2	5.9	6.4	4.5	4.3	4.7	3.9	4.8	3.6	4.3	4.0	31.5
57.79	0.4	0.6	0.7	0.9	1.0	1.3	3.0	5.7	7.7	2.8	1.5	2.2	2.8	4.0	4.4	5.4	5.0	6.3	6.3	4.1	4.2	4.5	25.4
64.82	0.1	0.1	0.1	0.1	0.2	0.4	0.4	0.9	1.3	3.8	5.0	4.1	5.1	5.9	4.6	5.6	5.4	3.8	4.8	4.7	4.8	4.0	34.6
72.03	0.0	0.1	0.1	0.1	0.1	0.1	0.2	2.1	26.6	30.2	8.7	3.2	2.4	1.9	1.4	1.3	1.4	1.6	1.5	1.6	1.5	2.2	11.7
79.66	0.3	0.6	0.4	0.4	1.1	1.2	1.6	1.1	1.0	1.3	2.0	2.7	2.8	5.6	4.4	4.4	4.3	5.4	5.9	5.1	5.0	4.3	39.0
86.64	1.0	1.3	1.4	2.1	3.5	5.7	5.0	8.7	8.7	10.0	6.2	3.0	4.0	2.9	3.3	2.8	2.6	2.5	2.7	2.3	2.2	3.6	14.3
92.88	0.5	0.6	0.8	1.0	1.6	2.5	3.0	8.0	13.1	14.3	7.0	4.5	4.3	4.1	2.7	3.2	2.6	2.7	2.5	2.3	2.3	2.1	14.3
100.11	0.1	0.2	0.3	0.6	1.3	2.1	2.0	2.2	1.9	3.2	4.3	5.2	6.9	7.9	7.7	7.2	6.4	6.6	5.4	4.7	3.4	3.7	16.9
106.15	0.2	0.3	0.5	0.6	1.1	1.7	1.6	2.0	1.6	1.9	3.0	3.7	4.0	5.7	4.7	5.0	5.0	5.9	5.5	4.8	4.9	4.7	31.6
110.03	0.3	0.4	0.6	1.2	2.2	2.7	2.8	3.4	2.9	4.1	5.0	5.7	7.8	8.3	7.8	7.2	6.0	6.5	4.9	4.1	4.2	1.8	10.2
111.88	0.5	0.4	0.7	1.2	2.0	3.3	2.6	3.6	2.7	4.8	4.0	4.7	6.6	6.1	6.1	6.0	5.3	5.0	4.1	2.6	2.6	2.6	22.3
113.98	0.4	0.2	0.3	0.5	1.1	1.4	2.0	3.3	4.5	10.8	8.6	5.2	6.4	4.5	4.2	3.7	2.7	3.4	3.7	3.1	2.9	4.7	22.5
123.20	0.9	0.4	0.3	0.6	1.1	1.9	1.8	2.0	1.6	2.2	2.3	2.9	5.9	6.1	5.6	5.5	5.4	5.7	4.7	4.2	4.3	3.8	30.8
130.18	0.4	0.4	0.6	1.0	2.6	2.9	2.9	3.6	3.4	5.2	4.6	4.7	4.7	4.0	3.7	3.2	3.0	3.7	2.6	3.9	5.6	14.5	18.8
135.21	0.0	0.0	0.0	0.1	0.2	0.2	4.0	9.4	17.4	18.5	6.4	5.5	5.0	4.5	3.1	2.1	2.1	2.0	2.0	1.6	2.9	1.5	11.6
135.99	0.3	0.4	0.5	0.9	1.6	2.5	2.0	3.2	3.6	6.9	5.7	5.7	7.3	6.8	7.1	6.8	4.4	4.7	4.1	2.6	1.7	4.1	17.2
143.37	0.2	0.2	0.4	0.6	1.4	2.6	3.8	7.3	8.2	13.9	9.2	6.2	6.6	4.8	3.8	2.7	2.7	2.7	2.2	1.7	1.9	1.5	15.6
158.20	0.0	0.4	0.3	0.4	0.8	1.1	1.4	1.5	1.4	2.9	3.5	3.6	6.5	3.7	5.1	5.0	4.1	5.2	5.2	4.9	4.6	5.0	33.4
158.80	0.0	0.1	0.3	0.3	0.6	0.4	0.5	0.5	1.5	1.0	1.7	5.7	6.0	8.4	8.1	6.6	6.4	5.2	5.0	4.3	3.7	2.5	31.2
165.14	0.3	0.5	0.5	1.0	1.8	2.9	2.7	3.3	3.4	6.3	7.1	8.1	9.3	9.5	6.5	6.3	5.1	4.2	3.0	3.3	2.7	2.9	9.5
172.07	1.0	1.6	2.3	3.7	6.7	10.8	9.1	9.5	6.9	7.2	5.5	3.4	3.2	2.7	2.5	1.9	1.9	2.0	1.5	1.8	1.6	2.4	11.0
179.04	1.0	0.5	0.5	0.5	1.1	1.3	1.8	3.4	5.0	10.7	11.8	9.8	7.9	6.7	3.9	2.6	2.0	2.5	1.9	1.9	1.9	1.3	19.7
186.14	0.6	0.6	0.9	1.4	2.3	3.7	3.9	4.3	3.7	5.2	4.4	4.5	6.1	8.4	5.6	5.0	3.5	3.3	2.7	2.6	1.9	0.3	25.2
192.76	0.3	0.6	1.1	1.3	2.0	2.4	3.2	4.0	3.2	4.9	6.6	4.2	5.8	6.4	4.9	5.3	5.7	4.0	4.1	3.3	2.3	4.2	20.1
193.49	0.0	0.1	0.1	0.1	0.2	0.3	5.5	17.6	27.8	20.0	7.0	3.3	2.5	2.1	1.9	1.2	1.4	0.9	1.1	0.7	0.9	0.6	5.0
199.96	1.7	1.0	1.5	2.5	4.5	7.8	7.7	8.4	6.2	7.6	5.3	7.2	2.8	2.1	2.0	2.3	1.7	2.4	2.5	2.1	2.5	2.4	15.8
207.00	0.0	0.0	0.2	0.1	1.0	7.8	21.4	34.6	14.1	3.8	1.0	0.2	0.4	0.2	0.4	0.2	0.2	0.2	0.3	0.2	0.3	0.7	12.9
209.77	0.0	0.1	0.1	0.1	0.1	0.3	3.6	9.3	14.1	20.6	9.0	5.2	4.9	3.7	3.2	2.5	2.4	2.0	2.0	1.5	1.9	1.1	12.1
220.90	0.9	0.3	0.4	1.6	8.7	28.9	26.6	17.1	5.4	3.2	1.5	0.5	0.3	0.2	0.3	0.5	0.5	0.5	0.3	0.2	0.2	0.1	1.8
222.11	0.2	0.3	0.6	0.2	0.4	0.5	1.0	5.7	9.0	16.1	11.4	6.8	7.1	5.5	4.3	3.6	2.6	2.3	2.9	1.9	2.0	2.7	12.8
235.05	0.2	0.2	0.2	0.1	0.1	2.5	14.9	28.5	22.5	16.8	4.2	0.8	0.7	0.5	0.7	1.4	1.4	1.0	0.6	0.4	0.3	0.2	1.9
239.20	0.9	0.9	1.3	1.9	2.7	3.2	3.6	5.1	4.6	7.3	8.5	5.9	6.3	4.9	5.1	3.9	3.2	2.6	2.8	3.8	5.1	4.9	11.7
240.31	0.7	1.2	1.7	2.5	3.3	3.1	3.5	5.1	4.6	7.7	7.2	5.5	6.3	5.7	4.6	3.7	3.4	3.1	2.9	2.8	2.7	1.0	17.6
247.27	0.0	0.0	0.0	0.1	0.2	0.2	4.0	9.4	17.4	18.5	6.4	5.5	5.0	4.5	3.1	2.1	2.1	2.0	2.0	1.6	2.9	1.5	11.6
250.06	0.0	0.2	1.2	3.1	6.1	16.3	34.4	26.7	9.9	1.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
258.62	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.5	0.5	0.7	0.7	0.8	1.2	2.3	2.1	3.3	3.5	6.1	6.3	7.3	7.4	7.2	49.1
271.24	0.0	0.0	0.1	0.1	0.1	0.2	1.3	7.5	13.9	14.0	5.9	3.1	3.4	3.0	3.6	2.8	3.2	3.8	3.2	2.8	3.2	3.4	21.3
271.43	1.3	0.7	1.0	2.4	8.4	26.8	28.6	20.9	6.8	2.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
284.98	0.2	0.5	0.2	0.2	0.3	4.2	20.1	41.7	17.5	6.3	1.7	0.5	0.5	0.4	0.6	0.7	1.0	0.8	0.5	0.3	0.3	0.3	1.4
286.56	0.0	0.0	0.1	0.2	0.7	3.0	34.3	46.3	10.1	2.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
294.52	0.1	0.1	0.1	0.1	0.1	0.3	2.2	36.9	37.0	11.8	2.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	8.2
302.03	2.5	1.3	2.0	2.5	4.9	5.7	6.6	9.3	7.3	8.5	5.9	1.9	2.2	2.4	2.7	2.8	1.8	3.1	2.3	2.5	2.0	0.1	19.8
305.65	0.8	0.8	0.7	0.9	1.5	1.9	2.5	7.7	10.3	15.4	6.9	5.0	4.8	4.8	3.6	3.1	2.6	1.9	1.0	0.5	0.5	0.5	22.2
309.69	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	3.1	15.5	14.7	13.8	14.7	9.1	5.2	3.9	2.9	2.8	2.5	1.2	1.3	1.5	7.2
326.97	0.0	0.0	0.0	0.1	0.9	8.3	17.2	25.5	17.6	10.5	3.4	0.9	0.6	0.6	0.5	0.4	0.4	0.7	0.5	0.5	0.7	0.6	9.9
329.63	0.0	0.1	0.1	0.3	0.3	0.3	0.6	0.6	0.7	3.5	4.2	5.8	6.9	6.0	7.5	5.3	5.8	4.8	4.1	7.5	8.0	4.1	23.6
333.96	1.4	2.4	1.9	0.7	0.6	0.5	1.9	20.2	49.8	12.5	1.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	6.3
341.17	1.0	0.8	1.5	2.9	4.9	4.9	7.4	9.1	11.7	14.1	6.3	4.0	3.7	3.0	2.3	1.6	1.3	1.6	1.9	1.9	1.8	1.0	11.3
345.00	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.9	2.4	2.4	2.4	2.4	2.4	3.4	4.8	4.9	5.8	6.5	6.7	6.9	6.0	3.5	37.2
352.17	0.0	0.1	0.5	3.5	18.8	29.7	23.0	11.8	2.5	1.2	0.5	0.1	0.0	0.4	1.1	1.2	1.0	0.8	0.6	0.3	0.3	0.3	2.0
353.83	0.0	0.0	0.0	0.0	0.1	1.5	10.6	38.8	26.2	11.1	2.1	0.3	0.2	0.4	0.5	0.3	0.2	0.3	0.3	0.3	0.2	0.3	6.0
360.99	0.9	0.4	0.6	0.6	1.4	1.6	4.0	16.5	25.6	18.9	5.9	2.2	2.2	1.7	1.8	2.0	1.7	1.3	1.1	0.9	0.9	1.1	6.6
366.61	0.1	0.1	0.1	0.1	0.4	0.5	1.4	10.6	45.7	27.3	4.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	8.5
374.12	3.7	2.9	3.0	4.5	11.1	23.8	23.2	16.5	5.9	1.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	3.2
382.03	0.7	1.8	3.4	6.3	11.6	21.2	23.1	19.7	3.6	0.8	0.3	0.1	0.0	0.1	0.2	0.2	0.5	0.8	1.2	1.0	0.7	0.5	2.3
390.50	0.0	0.3	0.9	2.2	4.9	12.8	26.6	33.2	9.3	1.7	0.6	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.3	0.3	0.2	4.4
397.95	0.3	0.3	1.1	5.5	16.9	27.0	23.0	17.7	2.5	0.7	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.8
420.64	0.3	1.3	5.9	19.5	31.7	22.0	12.7	1.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9
427.77	0.0	0.0	0.0	0.1	0.2	0.5	7.8	43.7	34.9	4.9	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	7.0
433.66	2.8	4.0	3.9	1.9	1.3	1.1	1.6	18.8	60.4	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	3.1
447.67	0.1	0.2	0.4	2.4	10.9	31.9	27.5	20.3	2.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
455.00	0.1	0.2	0.3	0.6	0.9	1.4	2.8	31.8	50.9	6.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6
462.01	0.1	0.1	0.1	0.1	0.2	0.7	2.8	21.1	42.6	20.5	3.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	7.3
468.05	0.0	0.2	0.9	3.2	6.2	11.7	12.8	22.1	27.5	8.8	1.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	4.5
474.17	1.1	1.9	5.2	5.8	12.2	21.9	17.2	12.6	11.4	4.8	0.7	0.5	0.3	0.3	0.4	0.4	0.5	0.5	0.7	0.5	0.3	0.0	0.7
475.00	0.0	0.1	0.0	0.1	0.3	1.5	5.1	13.5	40.4	27.2	3.9	0.1	1.8	0.7	0.4	0.2	0.3	0.4	0.7	0.8	0.9	0.4	0.9
482.12	0.3	0.9	2.6	5.8	13.5	21.7	23.1	23.2	3.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	4.6
491.47	0.0	0.1	0.1	0.3	1.3	6.3	23.3	55.2	9.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9

Appendix 1 - Continued.

Limits	*-0.50*	*0.00*	*0.50*	*1.00*	*1.50*	*2.00*	*2.50*	*3.00*	*3.50*	*4.00*	*4.50*	*5.00*	*5.50*	*6.00*	*6.50*	*7.00*	*7.50*	*8.00*	*8.50*	*9.00*	*9.50*	*10.00*	*Rest*
Sample depth																							
508.66	1.7	3.0	4.2	4.8	6.2	8.0	8.0	23.8	30.2	3.4	0.6	0.2	0.2	0.3	0.2	0.3	0.4	0.7	0.8	0.7	0.6	0.4	1.4
513.67	1.1	0.7	1.0	1.2	4.0	10.9	23.4	46.1	10.0	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
520.67	0.4	0.5	1.7	5.4	11.1	13.2	7.8	17.8	29.0	7.3	0.5	0.1	0.1	0.1	0.1	0.3	0.8	1.2	0.8	0.4	0.2	0.2	0.9
527.70	1.2	1.2	0.9	1.6	6.8	18.9	26.8	39.1	2.5	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
534.44	0.2	0.4	2.4	13.5	31.7	25.3	9.0	10.9	3.0	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1.8
542.24	0.1	0.1	0.3	1.1	5.8	18.8	20.4	19.3	19.6	8.0	0.7	0.1	0.0	0.1	0.1	0.1	0.0	0.2	0.2	0.1	0.1	0.1	4.6
548.13	0.0	0.0	0.0	0.1	0.7	6.7	23.1	34.1	19.7	7.5	1.0	0.2	0.2	0.1	0.2	0.2	0.2	0.3	0.4	0.3	0.3	0.2	4.3
548.42	0.0	0.0	0.0	0.0	0.7	15.9	25.8	31.7	13.2	5.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
556.27	0.2	0.5	0.5	0.1	1.0	2.9	10.5	36.2	28.1	10.7	1.0	0.1	0.0	0.1	0.3	0.4	0.7	0.8	0.8	0.8	0.6	0.8	2.7
562.73	0.2	0.4	2.0	6.1	23.0	42.9	18.1	4.9	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
569.95	0.4	0.4	1.0	1.1	4.9	33.6	41.9	15.4	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
583.84	0.2	0.3	0.9	3.7	15.7	24.6	26.4	21.5	5.2	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
589.77	0.1	0.4	0.4	0.6	2.1	15.3	29.2	31.7	11.9	2.0	0.3	0.1	0.1	0.1	0.2	0.2	0.5	0.8	0.7	0.4	0.3	0.0	2.7
592.76	0.3	0.7	1.1	1.2	1.6	8.5	26.4	34.9	16.0	2.7	0.2	0.0	0.0	0.1	0.1	0.2	0.5	1.0	1.0	0.7	0.4	0.2	2.4
597.95	1.9	3.6	5.4	5.4	4.5	3.3	3.6	20.6	30.4	9.3	0.9	0.0	0.6	0.4	0.0	0.4	0.8	0.9	0.9	0.8	0.6	0.5	5.2
606.85	0.1	0.2	0.8	1.6	3.3	8.5	25.5	50.2	5.9	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2.6
614.31	2.5	3.9	3.1	2.2	5.1	4.6	7.4	51.7	6.0	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	11.4
622.61	0.0	0.1	0.1	0.1	0.3	0.7	1.6	23.8	53.6	10.7	1.7	0.7	0.9	0.6	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	3.6
635.41	1.1	3.6	5.9	6.7	7.6	9.3	13.4	33.9	9.0	0.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	7.0
642.86	0.6	0.7	1.5	3.6	7.2	11.8	18.2	24.0	15.7	3.0	0.3	0.0	0.1	0.0	0.1	0.1	0.2	0.2	0.1	0.2	0.3	0.1	12.1
648.77	0.0	0.1	0.4	0.7	1.8	6.2	18.1	31.4	19.5	5.0	0.7	0.1	0.3	0.4	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.4	12.8
651.02	0.0	0.0	0.0	0.1	0.1	0.3	2.8	15.8	31.0	24.2	3.4	0.3	0.1	0.4	0.6	0.5	0.7	0.5	0.7	0.5	0.5	0.5	17.0
658.83	0.5	0.7	1.4	1.7	1.2	4.0	7.8	23.0	24.6	12.3	1.6	0.7	0.0	0.4	0.4	0.2	0.6	0.5	0.7	0.6	0.5	0.7	15.8
665.71	0.1	0.2	0.7	1.5	3.9	9.8	15.9	30.2	23.4	6.0	1.0	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.1	0.2	6.1
672.82	0.3	0.6	1.4	2.0	3.2	5.5	5.2	16.7	41.3	10.1	0.8	0.1	0.0	0.1	0.2	0.1	0.1	0.2	0.3	0.2	0.2	0.1	11.2
680.96	0.0	0.0	0.0	0.1	0.4	1.8	6.2	35.7	33.4	5.6	0.8	0.2	0.2	0.0	0.3	0.2	0.3	0.4	0.6	0.6	0.8	0.7	11.4
688.96	1.3	2.0	3.4	4.3	4.9	6.2	8.1	18.0	19.3	8.6	1.0	0.1	0.3	0.0	0.2	0.1	0.4	0.7	1.4	1.0	1.1	1.2	16.3
689.69	0.5	0.3	0.6	1.9	4.2	6.7	10.1	24.8	28.9	11.9	2.8	0.4	0.2	0.7	1.2	1.5	1.0	0.8	0.5	0.3	0.3	0.1	0.2
695.81	0.0	0.0	0.1	0.2	0.5	2.5	8.5	21.4	27.7	17.1	2.4	0.1	0.1	0.2	0.3	0.4	0.3	0.4	0.6	0.5	0.6	0.5	15.5
702.99	0.1	0.1	0.4	0.9	2.1	7.8	17.5	28.5	17.3	8.4	1.6	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.6	0.5	0.4	0.4	11.1
713.02	3.8	4.9	8.7	9.7	10.2	11.2	8.8	10.7	10.6	5.1	1.3	0.8	0.5	0.5	0.5	0.3	0.5	0.6	0.8	0.9	0.9	0.9	7.7
720.02	0.3	1.0	2.0	2.0	4.8	6.3	5.5	16.4	27.4	18.4	2.7	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	12.2
734.96	2.0	4.0	7.5	9.3	10.7	12.6	8.7	10.0	11.8	4.8	1.8	0.2	0.0	0.3	0.2	0.6	0.8	0.8	0.9	0.9	0.8	0.8	10.6
743.11	0.0	0.0	0.1	0.4	1.6	6.2	11.2	20.8	29.5	18.1	2.2	0.3	0.4	0.3	0.4	0.3	0.2	0.2	0.3	0.2	0.2	0.2	6.7
750.02	0.1	0.1	0.1	0.1	0.2	0.2	1.3	11.1	34.5	27.0	6.4	1.0	0.5	0.3	0.5	0.7	2.1	2.9	1.8	1.0	0.7	0.3	7.3
756.00	0.0	0.1	0.2	0.3	0.6	1.3	1.2	12.3	45.4	20.4	2.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6
763.61	0.0	0.3	1.3	2.4	9.0	14.4	11.6	13.0	14.9	13.4	2.7	0.3	0.3	0.3	0.5	0.4	0.2	0.5	0.5	0.3	0.2	0.4	12.9
771.24	0.7	1.3	3.1	7.2	14.1	20.0	15.8	13.8	7.4	3.8	0.8	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.5	0.5	0.4	0.3	9.2
778.09	0.3	1.0	2.9	6.8	12.1	18.5	16.2	14.1	7.9	5.2	1.5	0.3	0.2	0.4	0.4	0.4	0.5	0.4	0.6	0.5	0.4	0.5	9.0
787.55	0.2	0.9	2.6	9.0	16.2	20.2	15.8	14.8	8.3	4.0	0.8	0.2	0.1	0.1	0.1	0.3	0.6	0.8	0.7	0.5	0.5	0.4	3.0

Appendix 2 - Statistics for grain-size analyses (percent gravel followed by gravel-free graphic measures of Folk and proportions of sand-silt clay) from CRP-3. Percentiles used for the graphic measures for clay-rich samples were obtained by limiting clay size to 14 phi.
Interpretive elements for each sample are given on the right hand side of the table as follows:
Bottom processes - unsorted/rapidly deposited-redeposited/current/wave Surface processes - ice-rafting */no ice rafting -/can't tell "blank" Diagenetic processes - diagenetic clays */none -/ cant tell "blank".

Interpretation - see caption

Depth	*Weight*	*Gravel*	*Graphic measures (Folk)*			*Proportions*			*F*	*Bottom*	*Ice*	*Diagen*	*Depth*
(m)	*(g)*	*(%)*	*Mean*	*StDev*	*Skew*	*Sand*	*Silt*	*Clay*		*proc*	*rafting*	*clays*	*(m)*
9.73	26.1	0.8	6.9	3.4	0.0	21.8	39.5	38.8	7	uns	*		9.73
17.37	32.5	0.5	7.3	3.4	0.1	19.2	37.6	43.2	3	uns	*		17.37
23.72	18.5	0.4	6.6	3.3	0.3	27.4	36.9	35.7	3	uns	*		23.72
25.12	23.8	3.6	3.8	2.1	0.4	65.4	25.7	9.0	3	rap	*		25.12
31.91	27.3	0.6	5.5	2.9	0.5	40.9	39.7	19.4	3	cur	*		31.91
39.15	12.4	1.2	7.6	3.4	-0.1	16.6	37.1	46.3	3	uns	*		39.15
45.73	24.0	0.0	8.1	2.9	0.0	9.0	41.3	49.7	3	uns	*		45.73
50.85	28.9	1.3	7.6	3.4	-0.1	15.9	35.8	48.3	3	uns	*		50.85
57.79	12.7	0.0	7.1	3.5	-0.1	24.1	31.5	44.4	1	uns	*		57.79
64.82	29.0	0.2	8.1	2.9	0.0	7.5	39.5	53.0	1	uns	*		64.82
72.03	35.2	0.0	5.3	2.7	0.7	59.6	21.9	18.4	3	wav			72.03
79.66	18.2	0.6	8.5	3.0	-0.2	9.1	31.6	59.3	2	uns	*		79.66
86.64	17.5	18.0	5.4	3.6	0.4	47.5	27.3	25.2	7	uns	*		86.64
92.88	31.7	1.0	5.6	3.2	0.5	45.3	31.2	23.5	7	uns	*		92.88
100.11	35.3	5.3	7.1	3.0	0.1	13.9	52.2	34.0	1	uns	*		100.11
106.15	19.7	0.0	8.0	3.2	-0.1	11.5	36.9	51.5	1	uns	*		106.15
110.03	25.3	1.4	6.2	2.9	0.0	20.6	54.3	25.1	3	uns	*		110.03
111.88	25.7	0.5	6.8	3.4	0.1	21.8	43.9	34.3	3	uns	*		111.88
113.98	16.8	0.8	6.7	3.2	0.2	24.5	38.6	36.9	3	uns	*		113.98
123.20	33.6	0.3	7.8	3.2	-0.1	12.8	39.4	47.8	1	uns	*		123.20
130.18	47.3	1.0	7.0	3.4	-0.1	23.1	31.5	45.4	1	uns	*		130.18
135.21	13.1	0.0	5.4	3.1	0.6	49.8	30.6	19.6	1	wav	-		135.21
135.99	32.6	0.2	6.6	3.2	0.1	21.8	48.6	29.6	1	uns	*		135.99
143.37	22.9	0.3	5.8	3.2	0.4	38.6	38.5	22.9	1	uns	*		143.37
158.20	10.7	2.0	8.1	3.0	-0.1	10.2	36.8	53.1	1	uns	*		158.20
158.80	26.8	0.3	8.3	3.0	0.2	5.2	48.1	46.7	1	uns	*		158.80
165.14	31.2	0.1	6.0	2.8	0.2	22.5	56.1	21.4	2	uns	*		165.14
172.07	33.5	8.0	4.5	3.5	0.5	58.8	23.0	18.2	3	rap			172.07
179.04	24.7	0.9	6.4	3.2	0.4	25.9	47.4	26.7	2	rap			179.04
186.14	28.7	0.9	6.5	3.6	0.2	26.6	40.8	32.7	1	uns	*		186.14
192.76	19.7	0.5	6.7	3.4	0.1	23.1	42.9	33.9	3	uns	*		192.76
193.49	45.3	0.1	3.9	1.8	0.5	71.6	20.2	8.2	1	wav			193.49
199.96	42.8	2.2	5.3	3.7	0.4	48.9	25.9	25.3	1	rap			199.96
207.00	27.2	0.0	3.2	2.1	0.6	83.0	2.7	14.3	5	wav	-	*	207.00
209.77	13.5	0.4	5.3	2.7	0.6	48.3	33.1	18.6	5	wav	*	*	209.77
220.90	36.9	23.7	2.3	0.9	0.3	93.1	4.3	2.6	5	cur	*	-	220.90
222.11	14.5	0.1	5.9	2.9	0.5	34.0	43.7	22.3	10	wav	*	*	222.11
235.05	30.7	27.7	3.1	1.1	0.4	86.0	10.6	3.4	5	cur	*	-	235.05
239.20	16.6	1.3	5.8	3.2	0.2	31.6	40.2	28.2	5	uns	*		239.20
240.31	24.7	15.8	6.2	3.8	0.3	33.4	39.6	27.0	1	uns	*		240.31
247.27	13.1	0.0	5.4	3.1	0.6	49.8	30.6	19.6	5	wav	-		247.27

Appendix 2 - Continued.

Depth	*Weight*	*Gravel*	*Graphic measures (Folk)*			*Proportions*			*F*	*Bottom*	*Ice*	*Diagen*	*Depth*
(m)	*(g)*	*(%)*	*Mean*	*StDev*	*Skew*	*Sand*	*Silt*	*Clay*		*proc*	*rafting*	*clays*	*(m)*
250.06	16.7	0.0	2.3	0.6	-0.1	99.0	0.7	0.3	5	wav	-	-	250.06
258.62	19.2	0.0	9.9	2.4	-0.1	2.7	19.9	77.5	1	uns	-		258.62
271.24	24.1	0.0	6.6	3.6	0.4	37.3	28.8	33.9	5	wav	-		271.24
271.43	23.2	1.1	2.2	0.7	0.0	98.9	0.7	0.4	5	cur	*		271.43
284.98	11.6	0.8	2.9	1.0	0.4	91.1	6.1	2.7	5	wav	*	-	284.98
286.56	21.0	0.0	2.6	0.4	0.1	97.1	0.3	2.5	5	wav	-	-	286.56
294.52	14.3	0.1	3.2	1.4	0.5	88.4	3.1	8.5	10	wav	*	*	294.52
302.03	11.4	7.3	5.4	4.0	0.4	50.6	22.8	26.6	5	uns	*		302.03
305.65	30.4	16.8	5.7	3.3	0.4	42.5	32.7	24.8	5	wav	*		305.65
309.69	21.7	0.0	5.5	2.0	0.4	19.3	67.0	13.7	3	?	-		309.69
326.97	33.1	0.0	3.3	2.1	0.5	80.1	7.5	12.3	5	cur	-	*	326.97
329.63	18.7	0.0	7.9	3.0	0.1	6.3	46.3	47.3	5	uns	-		329.63
333.96	14.8	0.3	3.2	1.8	0.2	91.9	1.5	6.5	5	wav	*	*	333.96
341.17	29.9	4.8	4.7	3.2	0.4	58.3	23.8	17.9	2	uns	*		341.17
345.00	20.8	0.0	8.9	3.1	0.0	7.2	32.6	60.2	5	uns	*		345.00
352.17	15.0	0.0	2.1	1.3	0.4	91.2	5.3	3.5	5	cur	-	-	352.17
353.83	28.3	0.0	3.1	1.7	0.5	88.4	4.4	7.2	5	wav	-	*	353.83
360.99	11.3	0.7	4.2	2.3	0.5	70.6	18.8	10.6	5	wav	*		360.99
366.61	14.5	0.0	3.5	1.5	0.4	86.5	4.7	8.8	5	wav	-	*	366.61
374.12	18.1	14.5	2.0	1.0	-0.1	96.0	0.6	3.4	5	cur		-	374.12
382.03	24.9	1.8	2.1	1.6	0.3	92.1	2.3	5.6	5	cur		-	382.03
390.50	27.2	0.1	2.5	1.5	0.3	92.1	2.3	5.6	5	wav		*	390.50
397.95	26.2	0.6	2.0	0.8	0.1	95.1	1.3	3.6	5	cur	*	-	397.95
420.64	26.1	0.2	1.4	0.7	0.1	95.7	0.3	4.0	5	cur	-	*	420.64
427.77	19.6	0.0	3.0	1.5	0.5	92.0	0.7	7.2	5	wav	-	*	427.77
433.66	15.7	1.3	2.9	0.8	-0.5	96.1	0.5	3.3	5	wav	*		433.66
447.67	21.3	0.3	2.1	0.6	0.1	96.3	0.4	3.3	5	wav	*		447.67
455.00	21.6	0.1	3.1	0.4	0.0	95.7	0.6	3.7	5	wav	*	*	455.00
462.01	12.1	0.2	3.3	1.5	0.4	88.1	4.3	7.6	2	wav	*	*	462.01
468.05	11.9	0.0	2.7	1.3	0.1	93.4	1.7	4.8	5	cur		*	468.05
474.17	25.9	1.9	2.1	1.2	0.1	94.3	3.6	2.2	5	rap		-	474.17
475.00	20.2	0.0	3.4	0.8	0.2	88.4	7.8	3.8	5	wav	-	-	475.00
482.12	16.3	0.1	2.1	1.3	0.2	94.7	0.5	4.8	5	cur	-	*	482.12
491.47	23.0	0.0	2.6	0.4	-0.1	96.6	0.3	3.1	5	wav	-	*	491.47
508.66	24.2	4.9	2.5	1.6	-0.1	93.3	2.8	3.9	5	rap		-	508.66
513.67	14.2	7.8	2.5	0.6	-0.3	99.0	0.6	0.4	5	wav	*	-	513.67
520.67	28.3	0.7	2.5	1.2	-0.1	94.3	3.2	2.5	5	rap		-	520.67
527.70	20.8	0.4	2.3	0.6	-0.3	99.3	0.4	0.2	5	wav	*	-	527.70
534.44	9.2	0.1	1.7	0.8	0.3	96.9	0.9	2.3	5	rap	*	*	534.44
542.24	23.8	2.1	2.6	1.5	0.3	93.5	1.3	5.2	5	rap	*	*	542.24
548.13	30.3	1.0	2.8	1.4	0.4	91.9	2.5	5.6	5	wav	*	*	548.13
548.42	23.0	0.0	2.7	1.4	0.4	92.8	1.3	5.9	5	wav	-		548.42
556.27	16.6	0.2	3.0	1.3	0.4	90.8	3.5	5.7	5	wav	*	*	556.27
562.73	29.0	0.0	1.7	0.5	0.0	97.9	0.3	1.9	5	wav		*	562.73
569.95	27.3	1.6	2.1	0.4	-0.1	99.5	0.3	0.2	5	wav	*	-	569.95
583.84	13.6	0.1	2.1	0.7	0.0	99.0	0.6	0.4	3	cur	-	-	583.84
589.77	19.5	0.4	2.5	1.2	0.3	93.6	2.2	4.2	3	wav	*	-	589.77
592.76	25.3	0.1	2.7	1.3	0.3	93.3	2.1	4.7	3	wav	*	-	592.76
597.95	27.6	1.4	2.6	2.3	0.0	87.9	4.1	8.0	3	wav	*	-	597.95
606.85	12.3	0.0	2.5	0.5	-0.2	96.4	0.7	2.9	5	wav	-	*	606.85
614.31	7.2	0.0	2.5	2.2	0.1	86.9	1.1	11.9	5	wav	*	*	614.31
622.61	33.0	0.0	3.2	0.8	0.4	90.8	4.8	4.4	5	wav	-	*	622.61
635.41	16.0	0.7	2.2	2.2	0.1	91.2	0.7	8.1	5	cur		*	635.41
642.86	20.7	1.1	2.6	2.1	0.3	86.3	0.9	12.8	3	cur	*	*	642.86
648.77	22.8	0.0	3.3	2.2	0.6	83.2	2.6	14.2	3	wav	-	*	648.77
651.02	23.3	0.0	5.8	3.5	0.8	74.3	6.6	19.1	3	wav	-	*	651.02
658.83	29.8	0.1	5.2	3.5	0.7	77.2	4.5	18.3	3	wav	*	*	658.83
665.71	28.0	0.3	2.8	1.7	0.3	91.6	1.6	6.8	5	cur		*	665.71
672.82	30.2	0.2	3.1	2.0	0.3	86.4	1.6	11.9	3	wav	*	*	672.82
680.96	20.2	0.0	3.3	1.8	0.5	83.5	2.3	14.1	3	wav	-	*	680.96
688.96	31.5	18.9	4.9	3.9	0.6	76.1	2.9	20.9	3	rap		*	688.96
689.69	19.1	0.0	2.9	1.2	0.1	90.1	8.6	1.2	3	rap	-	-	689.69
695.81	23.6	0.0	5.2	3.2	0.7	78.0	4.3	17.7	3	wav	-	*	695.81
702.99	29.1	0.0	3.1	2.0	0.5	83.4	3.6	13.0	3	wav	-	*	702.99
713.02	22.9	8.1	2.2	2.6	0.3	83.8	5.1	11.1	3	rap		*	713.02
720.02	10.0	0.7	3.1	2.1	0.2	84.0	3.4	12.6	3	wav	*	*	720.02
734.96	29.6	3.1	3.2	3.3	0.5	81.3	4.7	14.0	10	rap		*	734.96
743.11	20.1	0.0	3.1	1.7	0.3	88.0	4.4	7.6	4	cur	-	*	743.11
750.02	14.7	0.0	4.5	2.2	0.7	74.5	14.4	11.1	4	wav	-	*	750.02
756.00	24.6	0.0	3.7	1.8	0.5	81.8	3.4	14.8	4	wav	*	*	756.00
763.61	20.1	0.0	3.5	2.7	0.5	80.3	5.2	14.4	3	cur		*	763.61
771.24	35.3	0.6	2.3	2.2	0.4	87.3	1.8	10.9	3	cur		*	771.24
778.09	27.2	0.2	2.5	2.3	0.4	84.9	4.0	11.1	3	cur		*	778.09
787.55	20.1	0.4	2.1	1.7	0.4	92.0	2.8	5.2	3	cur		-	787.55

Interpretation - see caption (spans the columns F to Depth)