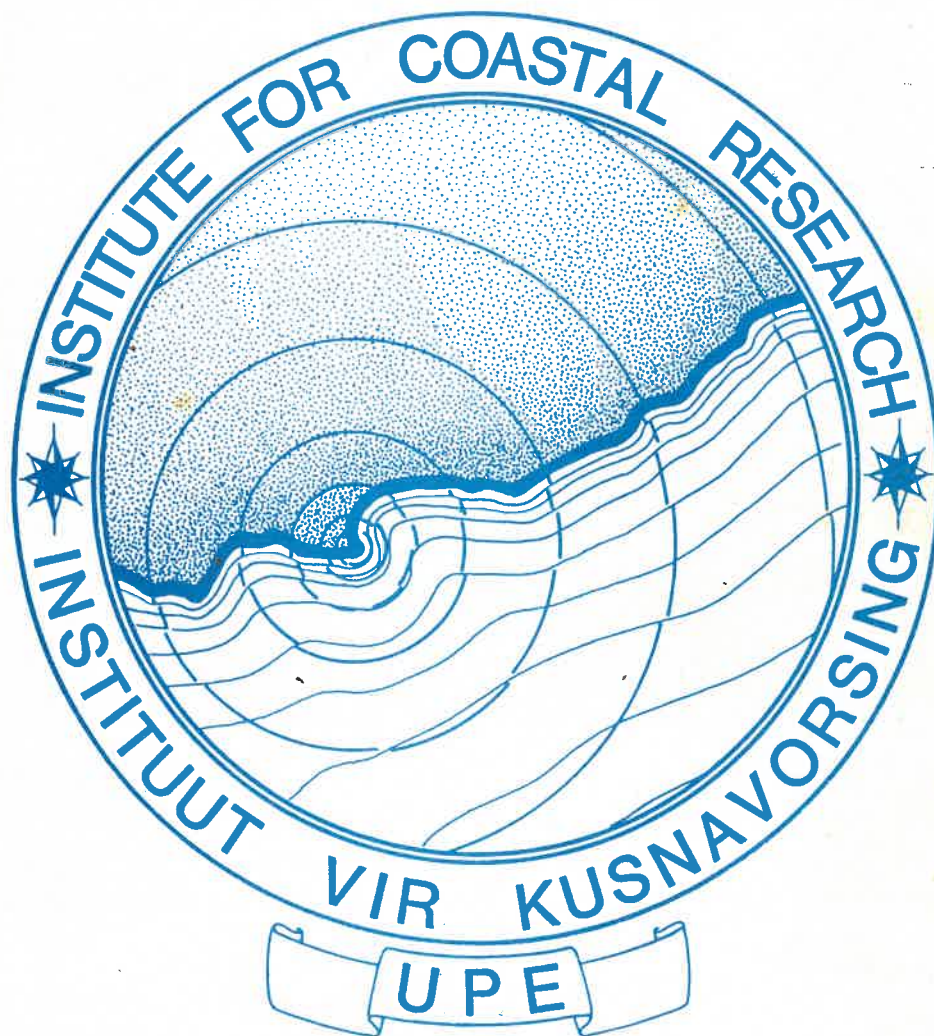


SEDIMENT DISPERSAL IN THE GAMTOOS ESTUARY

J.S.V. Reddering and N.G. Scarr

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ABSTRACT

The Gamtoos estuary exhibits two main styles of sedimentary behaviour. It accumulates sediment during periods of fair weather when sediment dispersal is dominated by the incoming tide, and by aeolian action in the adjacent dunefield. Tide-induced deposition of clay derived from the river catchment basin also takes place during these periods between river floods. Episodic river floods intermittently and severely change the style of sedimentation in the estuary. During such floods erosion of the bed prevails but sediment may accumulate locally.

Tides do not affect sedimentation in the upper estuary to a great extent but river floods erode and re-deposit sediment in this area. The most marked effects occur in the lower Gamtoos estuary where dramatic cyclical changes in the sedimentary environment result from the contrast in tide-dominated conditions compared to river flood-dominated conditions. During the tide-dominated phase of the cycle the tidal inlet tends to migrate northeastward but river floods force the inlet back to its most southwesterly position. The position of the tidal inlet strongly influences tidal circulation in the estuary, a factor which may be significant in the environmental management of the system.

OPSOMMING

Die Gamtoos-estuarium openbaar twee breë sedimentasie-style. Gedurende mooiweerstoeënde word sedimentverspreiding beheer deur die inkomende getye en deur die waaisand-toestande op die aangrensende kusduineveld. Gety-afsetting van klei wat vanuit die opvanggebied afgevoer word, vind ook plaas gedurende die periodes tussen riviervloede. Episodiese riviervloede veroorsaak kortstondige, maar grootskaalse verandering in die sedimentasie- en erosiepatrone in die estuarium. Vloede word hoofsaaklik gekenmerk deur erosie, maar plaaslike afsetting vind ook plaas.

Geen noemenswaardige gety-sedimentasie vind in die bolope van die estuarium plaas nie, maar riviervloede veroorsaak aansienlike sediment-herwerking in die gebied. Die mees prominente verandering as gevolg van sedimentasie vind plaas in die benede estuarium waar groot sikliese kontraste tussen die gety-dominante en riviervloed-dominante prosesse voorkom. Gedurende die gety-dominante fase van die siklus neig die getymonding om noordooswaards te migreer, maar gedurende vloede word die monding na sy mees suidwestelike posisie terug-geërodeer. Die posisie van die getymonding het 'n groot uitwerking op die getywerking en is dus van belang in die omgewingsbestuur van die sisteem.

SEDIMENT DISPERSAL IN THE GAMTOOS ESTUARY

Introduction

The sedimentary characteristics of the Gamtoos estuary were comprehensively discussed by Reddering and Esterhuysen (1984), and little significant change has occurred in the system since that time. This report will review the relevant information and draw comparisons between the sediment distribution recorded in 1982 and that in 1989.

The Gamtoos estuary, in common with many southern African estuaries, exhibits two main styles of sedimentary behaviour. It accumulates sediment during tide-dominated periods of fair weather but erosional episodic river floods intermittently and severely change the style of sedimentation in the estuary. These tide-dominated and riverflood-dominated cycles are an essential component of the long term evolution and behaviour of the southern African estuaries (Reddering, 1987).

The Gamtoos River extends for 60 km between the tidal limit of its estuary and where it branches into two tributaries (total drainage area, 34 500 km²). The Kouga River drains the Kouga Valley which is mostly underlain by quartzite (Reddering and Esterhuysen, 1984: Fig. 2.3) and it supplies a modest volume of mud-depleted sediment to the Gamtoos River and its estuary. The Groot River drains the largest component of the drainage basin and its tributaries drain the shale-dominated units of the Karoo Sequence, supplying most of the sediment of the Gamtoos River. Sediment from the Karoo is generally fine-grained with a high clay content.

This report represents the sedimentological contribution to a multidisciplinary study undertaken by the Institute for Coastal Research at the University of Port Elizabeth as part of its contract with the Department of Environment Affairs.

Tidal inlet behaviour (Reddering and Esterhuysen, 1984)

The most conspicuous physical change in the Gamtoos estuary is the distinct change in position and configuration of the tidal inlet since the 1960s. These lateral shifts of the tidal inlet involve erosion and deposition of significant volumes of sediment. Aerial photographs (Fig. 1) taken in 1960 indicate a) that the inlet was blocked, and b) that it was located about 3 km east of its current (1989) position. The lower 3 to 4 km of the 1960 channel was aligned sub-parallel to the adjacent beach, and a dune barrier separated the lower estuarine channel from the sea. The lower estuary thus resembled a coastal lagoon. It is also apparent that barrier overwash by storm waves, as well as wind action, had caused significant volumes of sand to be deposited into the channel of the lower estuary.

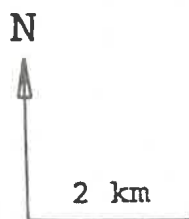
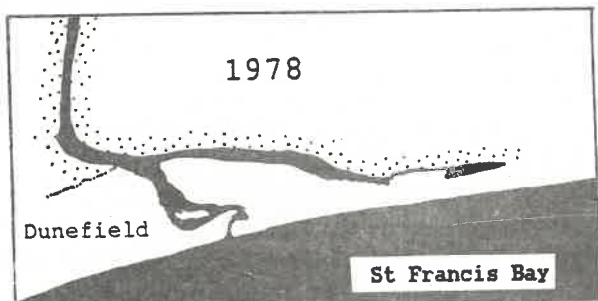
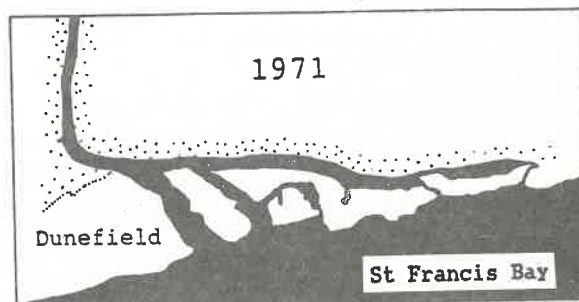
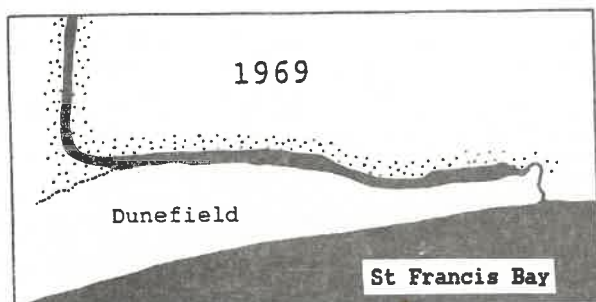
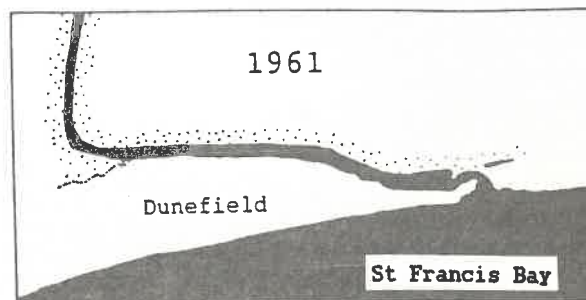
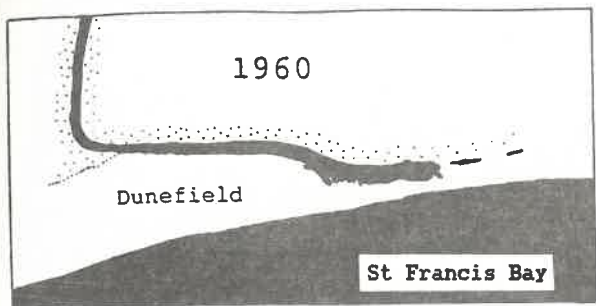


Fig. 1 - The position of the Gamtoos tidal inlet (traced from aerial photographs; Reddering and Esterhuysen, 1984). See Fig. 2 for the locality of these maps. The 1971 condition occurred after the severe river flood that year.

River floods in the Gamtoos estuary tend to breach a connection to the sea very close to the 1978 (Fig. 1) position of the tidal inlet. That the 1960 tidal inlet was situated 4 km east of its 1971 position indicates that it must have migrated there subsequent to the previous significant flood. After 1971 migration resumed and by 1978 the inlet lay 1 km to the east.

By 1961 the tidal inlet was approximately in the same position as in 1960 but it was open and the estuary was tidal. Between 1961 and 1969 the inlet migrated eastward by nearly 1 km and the inlet channel was very constricted.

According to Mr Kingwill, who farms on the lower floodplain of the Gamtoos, the inlet became blocked again and the water in the estuary stagnated. In August 1971 the estuary was subjected to a flood with a very high discharge (probably a 1 in 50 year event, Timmermans, pers. comm.). Initially the water rose abruptly in the estuary since the inlet was blocked at the time. The level dropped somewhat following a breach in the tidal inlet but as the flood gained momentum the water level rose further and the lower floodplains were inundated (Kingwill, pers. comm.). The flood eventually breached a new, straight channel through the dune barrier which caused the water level in the estuary to fall abruptly as the more direct drainage route took effect. The flood had breached no less than five mouths to the sea (Fig. 1) and millions of cubic metres of sediment were scoured from the lower estuary.

The 1978 aerial photographs indicate the westernmost mouth to have prevailed, establishing itself as the tidal inlet in roughly the same position as the current (1989) inlet. The remaining four mouths were blocked by wave action and were soon abandoned. The inlet had resumed its eastward migration.

The mechanism causing the tidal inlet to migrate is one whereby lateral accretion on the western bank causes this bank to migrate eastward whereas erosion by the tides or by minor river floods causes the eastern margin to retreat. Although the detailed processes involved are complicated (Reddering, 1983), a contributory factor has been identified (Reddering and Esterhuysen, 1984). Ongoing aeolian sand deposition from the south-west caused the western margin of the tidal inlet channel to grow in the same direction as the migration of the tidal inlet and substantially aided the migration process. The prevailing longshore drift is in the opposite direction to that of the migration of the tidal inlet.

Sediment in the Gamtoos estuary: types and sources

Sediments in the Gamtoos estuary are derived from three main sources, namely from the marine, aeolian and fluvial environments (Fig. 2). Several key parameters (Figs. 3, 4 and 5) obtained by analysis of sediment samples collected in 1982 (Reddering and Esterhuysen, 1984) and by analysis of a new set of samples collected in 1989 (Appendix 1), indicate

- GAMTOOS ESTUARY -
Sediment Sampling Localities and
Sediment Source

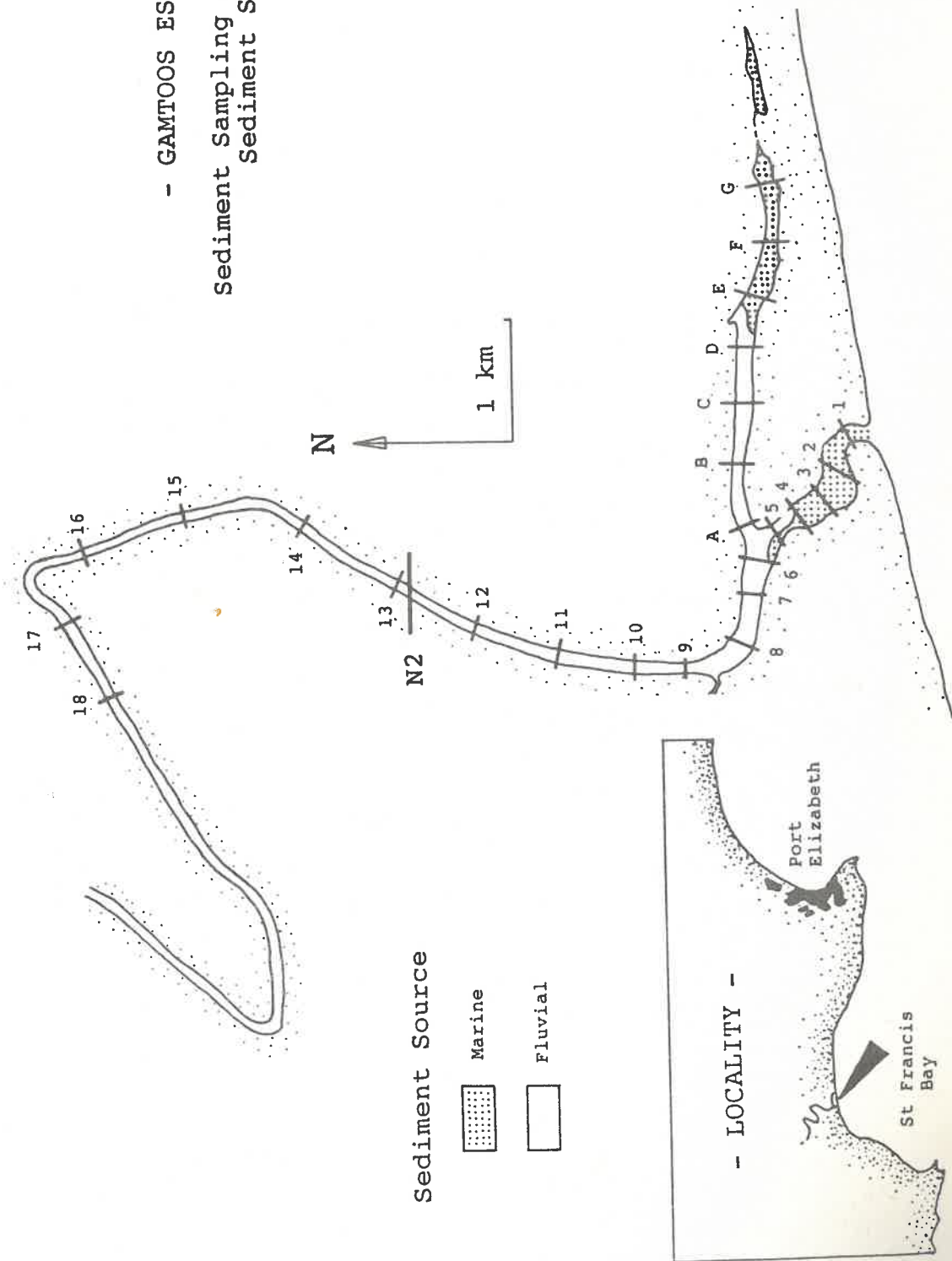


Fig. 2

Sediment distribution – Gamtoos estuary
 Sand distribution: 1982 vs 1989

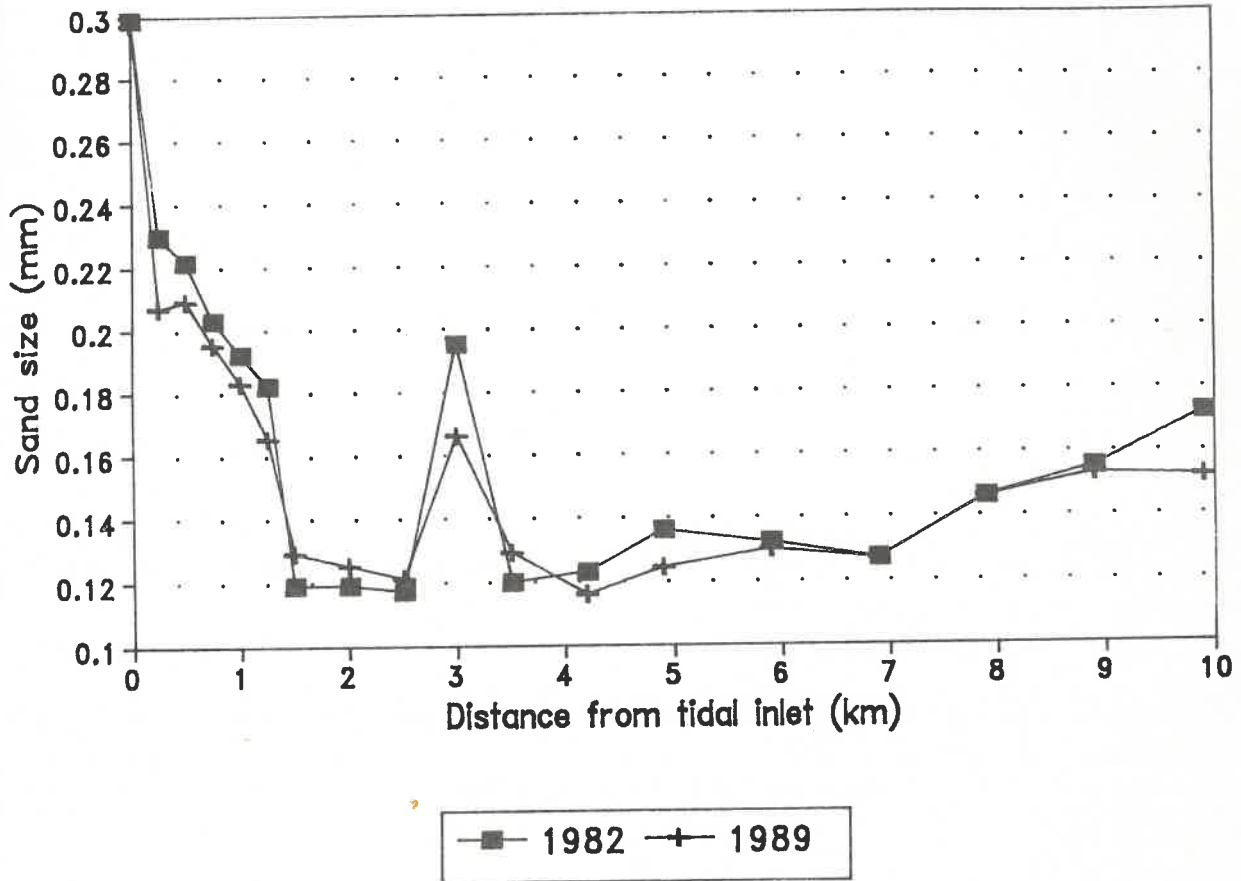


Fig. 3 - The sand grain size distribution along the length of the main estuary channel. Results for 1982 were obtained from Reddering and Esterhuysen (1984). Data for the 1989 sample set are listed in this report: detailed sediment characteristics are presented in Appendix 1.

Sediment distribution – Gamtoos estuary
Mud distribution: 1982 vs 1989

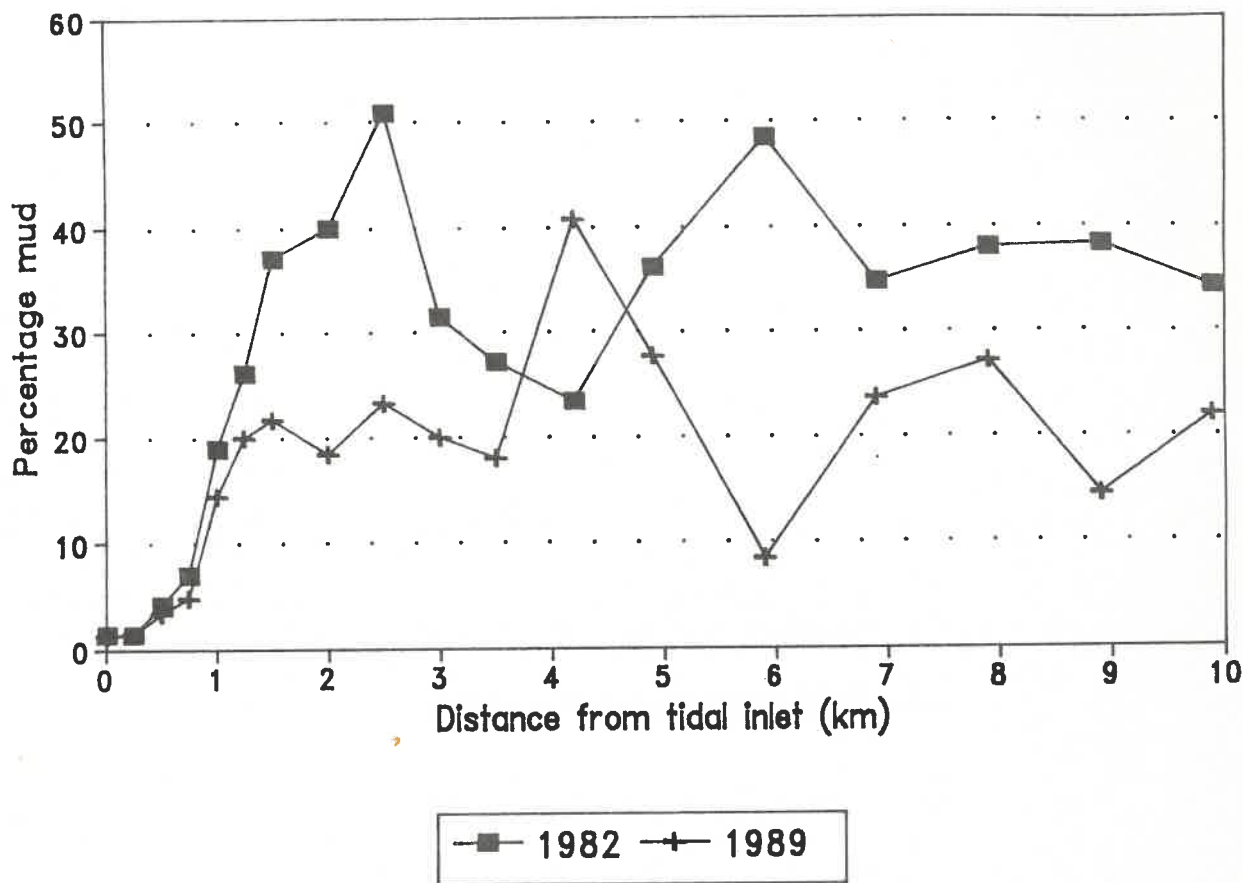


Fig. 4 - The distribution of mud content in the sediment of the Gamtoos estuary. Data sources as listed in Fig. 3.

Sediment distribution – Gamtoos estuary
CaCO₃ distribution: 1982 vs 1989

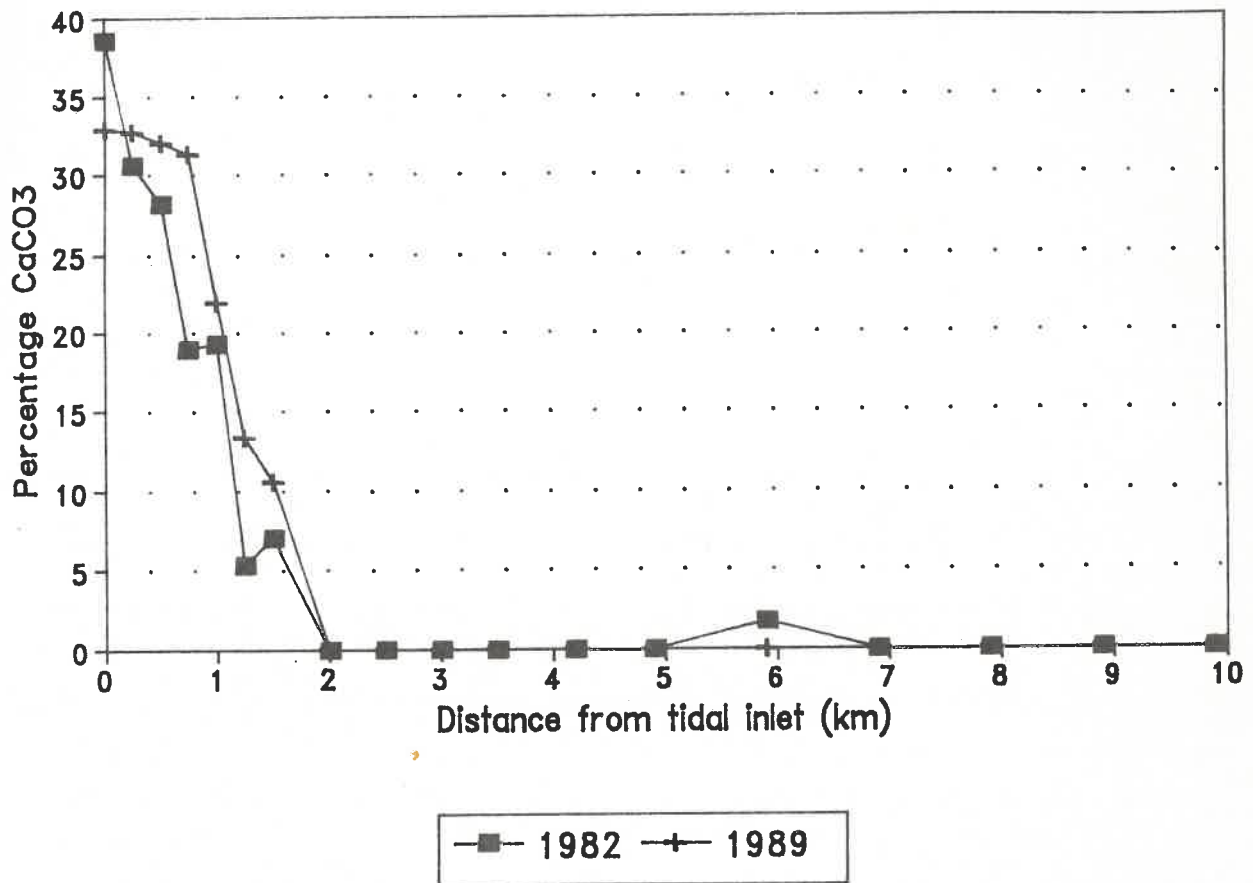


Fig. 5 - The CaCO₃ content in the sediment of the Gamtoos estuary. CaCO₃ indicates a marine source for the sediment in which it occurs. Data sources as listed in Fig. 3.

the distribution trends of the sediment in the estuary. For the purpose of this report the results of all the samples collected on a sample line (Fig. 2) were averaged to obtain the sediment dispersal tendencies along the channel of the estuary.

The sand particle size distribution along the channel changed very little between 1982 and 1989. Marine-derived sand in the inlet is medium-grained but the grain size decreases rapidly to fine-grained fluvial sand in the lower estuary and to very fine-grained sand in the channel stretch occurring between 1,5 to 2,5 km from the inlet. A distinct increase in particle size is observed 3 km up-estuary from the inlet for both the 1982 and 1989 sample sets, even though a severe river flood (Reddering and Esterhuysen, 1984) passed through the estuary in 1983. The flood extensively reworked the sediment in the estuary but did not substantially modify this particle size anomaly. The reason for this local increase in grain size is not known. Beyond this anomalous peak a gradual up-estuary coarsening of the sand fraction is apparent in both data sets.

The mud content of the sediment in the lower 1 km of the estuary is generally low (less than 20%). This is the area occupied by flood-tidal deltas, and where the tide generates the highest water turbulence in the estuary. As a result little mud is deposited in this area. Beyond 1 km from the tidal inlet the values for mud content in both data sets increase (1982: mean = 35,8%, σ = 8,0; 1989: mean = 21,9, σ = 7,6). Apart from the higher general mud content recorded in the 1982 sediment samples there is little correlation between the tendencies of the data sets.

Carbonate content (CaCO_3) in the estuarine sediment is concentrated in the lower estuary (Fig. 5). The carbonate data for the two sample sets are similar and indicate that very little carbonate material occurs at distances more than 2 km up-estuary from the tidal inlet. The highest carbonate content occurs in the coarse-grained fraction of sediment in the tidal inlet. These factors are related since the largest grains in natural beach sand normally consist of shell fragments, the main source of CaCO_3 for these sediments.

Mechanisms of sediment dispersal from different sources

Marine sediment enters the estuary from the surf zone of the adjacent beach and is transported into the estuary, mostly by tidal currents. In the Gamtoos estuary flood tides transport more sand than the ebb tides and this results in a net import of marine sand into the lower estuary. This sand is deposited on large sand bodies, termed flood-tidal deltas, distinctive of the lower estuaries in the south-eastern Cape. These deltas grow by accretion as their fronts migrate into the estuary. Most of the shoaling in the estuary occurs in these lower reaches and is associated with the accumulation of flood-tidal deltas.

Another way in which marine sand is imported into the estuary is by barrier overwash. This process takes place when

episodic storm waves wash from the beach across a barrier into the sheltered estuary or lagoon behind it. During the process large volumes of sand are moved and accumulated on washover fans in the estuary. In the Gamtoos estuary this process prevails in the lagoon created by the abandonment of the eastern tidal inlet in 1971. The aerial photographs indicate that this process was fairly common even when the pre-1971 inlet was open, several kilometres to the east of its current (1989) position. These sand bars may have restricted tidal flow in the approach channel to the inlet and could have contributed towards the tidal inlet being blocked in the past. Depositional forces in the breaker zone of the adjacent beach overcame the diminished erosive force associated with impaired tidal exchange in the lower estuary, leading to blockage of the tidal inlet.

Another indirect source of marine sediment in the lower estuary is the wind-blown sand derived from the adjacent dunefield. This sand, although strictly aeolian, originates from the beach farther to the west. Sufficiently large volumes of sand are transported by wind to drive the periodic eastward migration of the tidal inlet.

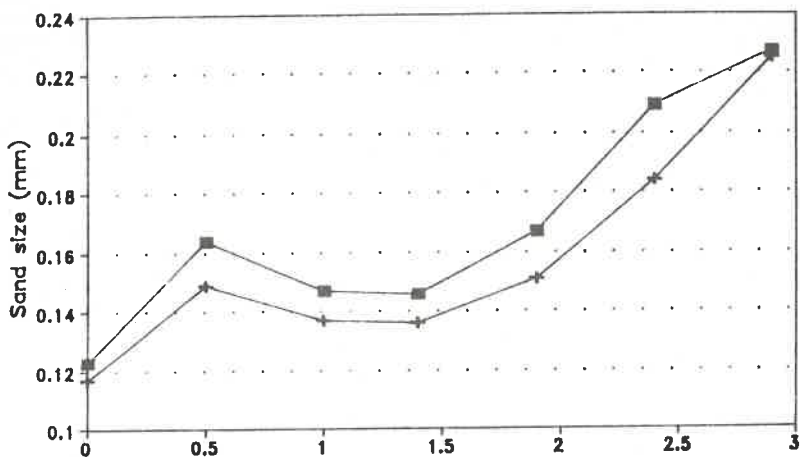
In the absence of river-borne CaCO_3 the distribution of CaCO_3 (Fig. 5) in the estuary provides a reliable indicator of the dispersal of beach-derived sediment introduced by tidal currents or by aeolian transport. In addition, carbonate-bearing dune sand avalanching into the channel is often reworked by tidal currents; this further modifies the dispersal patterns.

Sedimentation in the middle and upper estuary is dominated by material derived from fluvial sources. The sand fraction of the sediment in the Gamtoos estuary consists mostly of fine-grained particles.

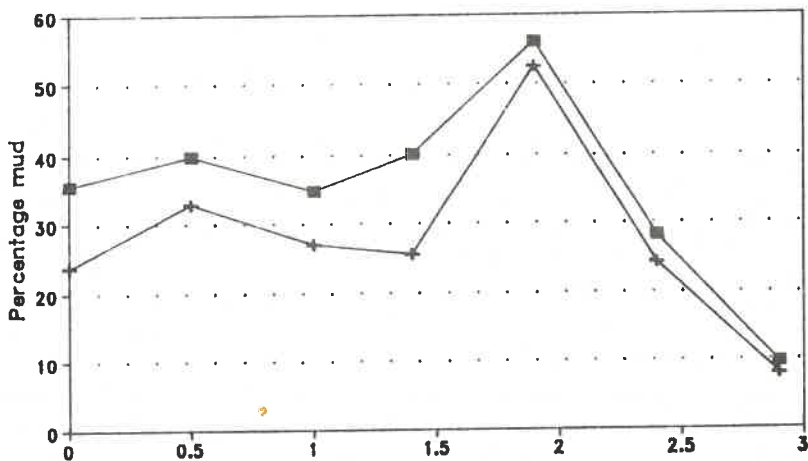
Mud consists of sediment particles smaller than 63μ and constitutes a significant component of the fluvial sediment accumulated in the Gamtoos estuary, especially during fairweather conditions. This silt and clay is mostly derived from the tributaries of the river system that arise in the Karoo, and, although fluvial in origin, this mud is eventually deposited under the influence of the tides.

Clay particles enter the estuary suspended in fresh water. When this happens during a fluvial flood there is no saline water in the estuary and the water turbulence is high, causing the bulk of the clay to be transported in suspension through the estuary out to sea. But during periods of low river discharge the estuary is dominated by the tides. At high tide a salt wedge develops so that the salt water tends to reduce the extent of freshwater discharge through the inlet. When clay-bearing fresh water mixes with the salt water in the estuary individual clay particles are electrostatically attracted to one another so that they flocculate to form composite particles with far greater settling velocities than single clay grains. This causes an accelerated rate of settling of clay particles in areas where river water mixes with tidal estuarine water. Accumulation of mud is further enhanced when fine-grained particles, such

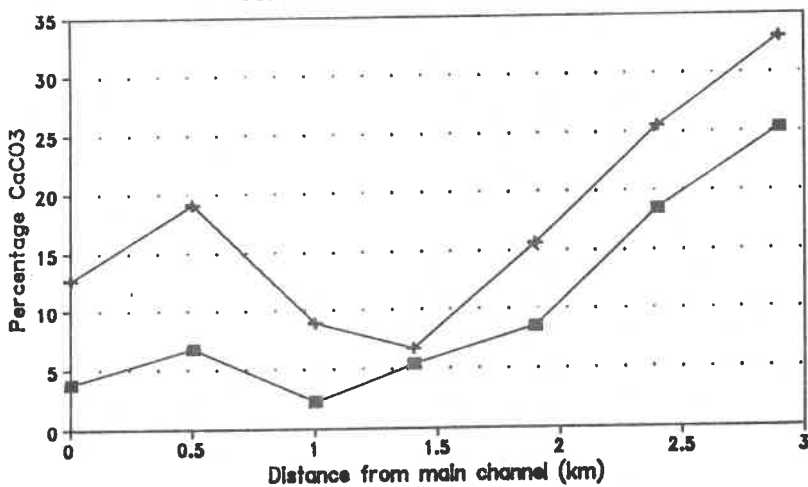
Sediment distribution - Gamtoos lagoon
Sand distribution: 1982 vs 1989



Sediment distribution - Gamtoos lagoon
Mud distribution: 1982 vs 1989



Sediment distribution - Gamtoos lagoon
CaCO₃ distribution: 1982 vs 1989



■ 1982 + 1989

Fig. 6 - Distribution of sand grain size, mud content and CaCO₃ content in the sediment of the Gamtoos lagoon. Data sources as listed in Fig. 3.

as flocs, accumulate below the laminar boundary layer which is commonly developed under flow conditions found in the middle reaches of the estuaries of the south-eastern Cape. It also explains the concentration of mud in the middle reaches of the estuary.

The higher general mud content in 1982 can probably be attributed to a long period of deposition between the 1971 flood and the time of sampling. The 1983 flood probably eroded the greater part of this accumulated mud from the estuary, and together with an extended drought (during which little clay could have been supplied from its main source in the Karoo), it would explain the generally lower mud content recorded in the 1989 sample data set. It is difficult to interpret the detail of the poor correlation between the 1982 and 1989 dispersal patterns of mud along the estuary. In detail the deposition of mud depends on several factors, including river discharge, supply of suitable sediment (two large tributaries with totally different clay yields supply sediment to the estuary), and the extent of the intrusion of the salt wedge. Considering the variability of these factors, poor correlation between the data sets is perhaps to be expected.

Sediment dispersal patterns in the Gamtoos lagoon (Fig. 6) show good correlation between the data sets of 1982 and 1989. This indicates that in this area the sedimentary process has not changed substantially, which is to be expected considering that during the period 1982 to 1989 hardly any changes took place in the configuration and processes in the system. Had the lagoon at any stage between 1982 and 1989 been connected to the sea at its far end, such as pre-1971, the sediment dispersal patterns in the channel would no doubt have been totally different for the two data sets.

The grain size dispersal of the sand in the lagoon is a function of sediment source. Fluvial sediment prevails for roughly the western half of the length of the lagoon from where it joins the main channel of the estuary (Fig. 2). The marine sand in the distal half of lagoon is coarser-grained than its fluvial counterpart in the lower lagoon, a trend also evident in the main channel of the estuary.

The high carbonate content in the lagoon close to where it joins the main channel possibly represents a local source of CaCO_3 since this is the only area in the estuary where burrowing bivalves are conspicuous. Shell gravel paves the channel bottom in the area. Farther up the lagoon the carbonate content drops but increases again in the upper reaches where marine-derived sediment prevails.

The mud content of the sediment in the lagoon increases steadily from where it joins the estuary to a point 2 km farther up the lagoon after which it decreases abruptly towards the head of the lagoon. This curious distribution is problematic but one can speculate that clay in suspension will be deposited in the area where tidal supply of clay is most efficient. Since the water in the blind upper stretch of the lagoon probably has a long residence time the mud would be deposited in the lower reaches of the lagoon

where better supply occurs. Wind-blown sand also enters the lagoon in its upper reaches so that any mud deposited there would be diluted to a greater degree than elsewhere in the lagoon. Why the mud content of the sediment in the lagoon should peak so drastically 2 km from its connection with the estuary remains unexplained.

[The systematic changes between the data sets may also in part be the result of modified laboratory techniques (these have been improved and refined considerably since the work of Reddering and Esterhuysen, 1984).]

Conclusions

Sediment distribution patterns in the Gamtoos estuary result from several sedimentary processes.

Marine sand in the lower estuary is introduced by the tides and by aeolian action. Marine sand, characterized by its high carbonate content, is deposited on large shoals, called flood-tidal deltas, which occur in the lower estuary. During river floods this sediment is scoured from the estuary and transported out to sea.

Sand in the middle and upper estuary originates in the river catchment and is introduced by the river, normally during river floods. Tidal action has little effect on this sand, and bedforms produced during a fluvial flood can be recognized years after the event.

Mud in the estuary is also derived from the catchment but most of it is accumulated after the river water carrying the clay in suspension mixes with salt water in the estuary. As a result mud is accumulated mostly in the middle estuary where most of this mixing takes place.

Sedimentation patterns in the lagoon depend to a very large degree on whether the lagoon is blind at its far end or whether it is the main tidal conduit for the estuary. Since the 1971 flood subdued tidal action has functioned as the main sedimentation agent in the lagoon, and sediment dispersal patterns have changed little since that time.

Migration of the Gamtoos tidal inlet is significant in two respects.

- a) The state of the tidal inlet is largely controlled by the magnitude of the tidal prism. In its current (1989) position the tidal inlet has never been blocked. The tidal inlet was regularly blocked while the inlet was located in its distal easternmost position. This indicates that tidal exchange was less efficient than with the current inlet configuration, even though it had the same potential tidal prism. The difference probably resulted from significantly higher flow restriction of the tide along the lagoonal channel.
- b) When the tidal inlet is in its distal locality, the level of inundation of the floodplain during floods is significantly higher than when the inlet is in its proximal position. The more direct route to sea serves as a rapid

discharge for flood waters.

The eastern distal position of the tidal inlet results from the normal migration tendency of the system: it is a natural situation in the Gamtoos estuary. Yet, from the perspective of managing the system, the current proximal locality of the tidal inlet is preferable.

Firstly, the Gamtoos River system is known for its severe flooding. With the inlet in its distal position the level of inundation on the lower floodplain was considerably higher during the 1971 flood before the waters breached a new, proximal mouth. Since flood damage increases with higher inundation levels the proximal inlet position is preferable from the viewpoint of landowners on the floodplain. The 1 in 50 year flood level in the estuary and its floodplains is thus effectively a function of the location of the tidal inlet.

The second point is more subjective. The inlet is known to close when it is at its distal position. During these periods of closure tidal action ceases and exchange between the estuary and the sea is terminated. In a natural system this would not matter, in fact, it would be part of the normal sequence of events. The Gamtoos estuary is, however, no longer a natural system. As a result of the agricultural activity on the floodplain fertilizers, herbicides and pesticides continuously enter the estuary. If the inlet were to be closed for extended periods these substances would accumulate in the estuarine waters. Fertilizers, in particular, can cause significant algal blooms in the stagnant estuarine waters, possibly causing extensive eutrophication, harmful to much of the normal estuarine biota.

In view of these aspects it may be prudent to monitor the system should the inlet migrate towards the distal end of the lagoon. Should this be deemed necessary an artificial inlet may have to be cut through the barrier to maintain functional tidal circulation in the estuary.

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APPENDIX 1

This section lists the grain size distribution data of sediment samples collected in the Gamtoos estuary. The sample lines are marked on Fig. 2 (Fig. 3.1, Reddering and Esterhuysen, 1984). The positions of the sample stations can be found from the coded station numbers. For example, G5:4T originates from the Gamtoos ("G" in the code) and was collected on line number 5 ("5"), see Fig. 2). It was taken at the bed surface ("T" denotes TOP) at position 4 on that line. This sampling spot is the fourth of the equally spaced sampling localities on the line from the LEFT, looking up-estuary. A second set of samples were collected by coring 0,5 m below the bed surface. These samples are indicated by a "B" (for BOTTOM) in the code instead of "T".

Grain size is listed in PHI-units; mean diameters given in millimetres as well.

[$\text{PHI} = -\log_2(\text{grain size in mm} / 1 \text{ mm})$]

This appendix has 4 sections: section A lists grain size class distributions of the samples; section B lists the corresponding graphical statistical parameters; section C lists the moment statistical parameters; section D gives the moment statistical parameters of the settling velocity of the sand particles in water at 20°C. The settling velocity is listed in CHI-units, and in metres per second.

[$\text{CHI} = -\log_2(\text{settling velocity in ms}^{-1} / 1 \text{ ms}^{-1})$]

APPENDIX 1A

Class distributions of sediment in the Gamtoos estuary.

Sample	%>VCS	%VCS	% CS	% MS	% FS	%VFS	%Mud
G1:1T	0,0	0,0	0,2	39,8	59,2	0,1	0,8
G1:1B	0,0	0,1	14,5	64,7	18,5	0,0	2,1
G1:2T	0,0	0,4	1,7	47,8	48,9	0,4	0,9
G1:2B	0,0	0,8	5,3	64,6	28,0	0,3	1,1
G1:3T	0,0	1,1	9,7	74,7	12,2	1,1	1,2
G1:3B	0,0	0,0	6,6	66,9	23,8	0,4	2,4
G1:4T	0,0	0,1	11,3	78,9	8,9	0,0	0,9
G1:4B	0,0	0,3	7,9	78,8	11,2	1,1	0,8
G1:5T	0,0	0,0	2,2	58,1	37,5	0,8	1,4
G1:5B	0,0	0,0	1,0	49,3	48,6	0,4	0,7
G2:1T	0,0	0,3	0,9	22,3	74,3	1,2	1,0
G2:1B	0,0	0,1	0,2	21,2	77,2	0,6	0,8
G2:2T	0,0	0,1	0,2	13,7	82,8	2,0	1,2
G2:2B	0,0	0,0	0,4	10,5	87,2	0,6	1,4
G2:3T	0,0	0,2	0,0	12,5	84,6	1,1	1,6
G2:3B	0,0	0,3	0,1	36,6	60,8	0,9	1,4
G2:4T	0,0	0,0	0,2	38,5	60,8	0,0	1,3
G2:4B	0,0	0,6	0,0	20,7	76,5	0,9	1,5
G2:5T	0,0	0,0	0,3	13,7	83,2	1,1	2,1
G2:5B	0,0	0,2	0,4	2,3	13,0	18,7	65,4
G2:6T	0,0	0,4	0,0	14,3	83,2	0,9	1,3
G2:6B	0,0	0,1	0,4	62,7	35,8	0,2	0,8
G3:1T	0,0	0,1	0,6	39,2	58,5	0,4	1,1
G3:1B	0,0	2,6	0,0	7,6	83,2	5,4	1,6
G3:2T	0,0	0,0	0,8	41,5	56,3	0,0	1,6
G3:2B	0,0	0,1	0,4	26,6	63,8	2,9	6,2
G3:3T	0,0	0,0	2,2	48,6	47,3	0,5	1,4
G3:3B	0,0	0,2	0,5	8,5	37,6	36,6	16,6
G3:4T	0,0	0,0	0,0	35,7	63,7	0,0	0,8
G3:4B	0,0	0,0	1,7	41,5	55,1	0,4	1,7
G3:5T	0,0	0,0	0,5	14,2	70,0	11,8	3,8
G3:5B	0,0	0,0	0,1	1,5	72,1	23,1	3,2
G3:6T	0,0	0,0	1,4	25,5	71,8	0,5	0,8
G3:6B	0,0	0,0	1,2	26,5	71,8	0,0	1,0
G4:1T	0,0	0,0	1,7	29,5	66,2	1,2	1,4
G4:1B	0,0	0,0	1,3	41,5	56,0	0,4	0,7
G4:2T	0,0	0,2	0,6	32,5	61,5	2,0	3,1
G4:2B	0,0	0,1	1,0	33,0	59,7	2,3	4,0
G4:3T	0,0	0,2	0,6	28,5	61,9	4,0	4,8
G4:3B	0,0	0,0	0,2	25,0	66,4	4,7	3,8
G4:4T	0,0	0,1	0,2	18,1	38,6	26,8	16,3
G4:4B	0,0	0,9	0,0	1,1	46,4	46,8	5,5
G4:5T	0,0	2,2	0,0	11,3	63,1	19,1	4,7
G4:5B	0,0	0,0	1,5	0,9	15,8	71,2	10,8
G4:6T	0,0	0,0	1,1	31,8	65,2	1,1	0,8
G4:6B	0,0	0,3	0,6	30,9	65,0	1,2	2,0

Sample	%>VCS	%VCS	% CS	% MS	% FS	%VFS	%Mud
G5:1T	0,0	0,2	0,7	30,7	66,1	0,8	1,4
G5:1B	0,0	0,0	0,8	28,1	67,5	1,0	2,6
G5:2T	0,0	0,1	0,2	19,7	71,2	2,8	6,1
G5:2B	0,0	0,0	0,4	20,3	67,0	6,9	5,7
G5:3T	0,0	0,2	0,4	23,1	60,0	8,4	8,1
G5:3B	0,0	1,1	0,0	32,8	57,7	3,6	4,8
G5:4T	0,0	0,1	0,1	11,4	30,4	28,8	29,1
G5:4B	0,0	0,0	0,7	2,0	13,1	45,3	38,8
G5:5T	0,0	0,6	0,4	2,3	15,7	51,1	30,0
G5:5B	0,0	0,0	1,8	9,3	32,7	12,2	44,1
G5:6T	0,0	0,0	0,4	16,5	78,9	3,2	1,4
G5:6B	0,0	0,6	0,4	28,6	68,4	1,2	0,7
G6:1T	0,0	0,1	0,3	27,5	70,1	0,9	1,1
G6:1B	0,0	0,2	0,5	48,4	48,8	0,8	1,3
G6:2T	0,0	0,0	6,3	79,1	10,9	0,0	4,1
G6:2B	0,0	0,0	0,8	7,6	27,4	8,7	55,6
G6:3T	0,0	0,0	0,2	32,2	58,8	1,2	7,9
G6:3B	0,0	0,0	0,3	17,5	77,9	1,3	3,2
G6:4T	0,0	0,3	0,1	1,4	51,9	33,5	12,9
G6:4B	0,0	0,0	0,0	9,7	81,7	7,4	1,4
G6:5T	0,0	0,0	0,0	1,0	5,0	45,9	48,3
G6:5B	0,0	0,1	0,1	1,3	4,9	8,7	84,8
G6:6T	0,0	0,3	0,1	0,7	11,0	77,5	10,4
G6:6B	0,0	0,4	1,2	0,0	12,0	79,1	7,5
G7:1T	0,0	0,0	0,5	28,0	70,8	0,3	0,7
G7:1B	0,0	0,1	0,5	15,0	83,2	0,0	1,1
G7:2T	0,0	0,0	1,1	40,1	54,1	0,4	4,5
G7:2B	0,0	0,0	0,2	2,9	9,7	12,4	75,0
G7:3T	0,0	0,0	1,2	2,2	16,5	50,9	29,6
G7:3B	0,0	0,0	0,5	0,5	18,7	76,2	4,6
G7:4T	0,0	0,9	0,0	0,2	9,9	74,9	14,3
G7:4B	0,0	0,1	0,1	0,4	30,4	64,9	4,2
G7:5T	0,0	0,0	0,2	1,0	6,3	65,5	27,0
G7:5B	0,0	0,0	0,2	0,1	0,9	43,0	55,8
G8:1T	0,0	0,4	1,0	8,0	41,9	29,8	18,9
		Solid Bottom					
G8:2T	0,0	0,1	0,6	4,3	5,7	12,7	76,6
		Solid Bottom					
G8:3T	0,0	0,5	0,2	2,6	48,3	42,9	5,5
G8:3B	0,0	0,5	0,1	1,5	74,6	21,7	1,6
G8:4T	0,0	0,1	0,4	8,7	27,2	49,0	14,7
G8:4B	0,0	0,4	0,0	0,9	3,0	72,0	23,7
G8:5T	0,0	0,0	0,0	0,5	38,6	57,8	3,5
G8:5B	0,0	0,0	0,3	0,0	47,9	50,7	2,0
G9:1T	0,0	0,2	0,0	1,6	49,5	40,6	8,0
G9:1B	0,0	0,0	0,1	0,7	4,9	63,3	31,0
G9:2T	0,0	0,0	1,0	31,4	29,0	12,3	26,3
G9:2B	0,0	0,9	0,0	6,5	42,5	45,7	4,6
G9:3T	0,0	0,1	0,1	4,9	33,7	48,1	13,1
G9:3B	0,0	0,2	0,2	0,5	4,2	7,1	87,9
G9:4T	0,0	0,5	0,0	0,8	6,0	77,1	15,7
		Solid Bottom					
G9:5T	0,0	0,0	0,2	1,5	10,1	50,5	37,9
G9:5B	0,0	0,3	0,6	2,1	29,0	60,0	8,0

Sample	%>VCS	%VCS	% CS	% MS	% FS	%VFS	%Mud	
G10:1T	0,0	0,2	0,6	27,1	58,9	5,7	7,5	
G10:1B	0,0	0,0	3,0	44,2	21,5	3,6	27,8	
G10:2T	0,0	0,3	0,1	18,8	27,7	29,2	23,8	
G10:2B	0,0	0,1	0,1	2,4	4,0	5,3	88,0	
G10:3T	0,0	0,0	0,8	13,8	41,5	35,5	9,4	
G10:3B	0,0	0,4	1,0	41,4	52,7	3,0	1,6	
G10:4T	0,0	0,0	0,9	2,5	46,4	42,8	7,6	
G10:4B	0,0	0,0	0,7	33,7	62,4	2,1	1,5	
G10:5T	0,0	0,0	0,6	2,4	15,3	62,5	19,2	
G10:5B	0,0	0,0	0,2	1,5	19,2	66,7	12,4	
G11:1T	0,0	0,3	0,2	6,8	53,1	35,8	3,8	
G11:1B	0,0	0,2	0,2	1,3	10,7	48,2	39,5	
G11:2T	0,0	0,3	0,3	2,2	17,9	49,8	29,5	
G11:2B	0,0	0,0	0,4	1,6	25,6	66,5	5,9	
G11:3T	0,0	0,0	0,1	9,4	36,0	34,8	20,0	
G11:3B	0,0	0,2	0,1	13,1	59,5	24,7	2,5	
G11:4T	0,0	0,1	0,0	2,3	33,9	46,9	16,8	
G11:4B	0,0	0,1	0,1	13,0	81,6	3,7	1,5	
G11:5T	0,0	0,1	0,5	3,3	19,1	26,5	50,5	
G11:5B	0,0	0,0	0,3	0,7	3,7	86,3	9,3	
G12:1T	0,0	0,1	0,8	1,6	5,9	12,5	79,2	
G12:1B	0,0	1,0	0,0	0,2	2,0	13,6	83,4	
G12:2T	0,0	0,0	0,3	0,1	26,7	66,1	6,7	
G12:2B	0,0	0,0	0,3	1,0	63,8	32,6	2,6	
G12:3T	0,0	0,0	0,0	0,4	35,4	53,9	10,4	
G12:3B	0,0	0,0	0,0	4,7	49,3	43,4	2,9	
G12:4T	0,0	0,2	0,4	3,1	8,6	15,0	72,8	
G12:4B	0,0	0,5	0,0	0,5	2,6	28,6	67,9	
G13:1T	0,0	0,3	1,0	14,2	52,0	20,6	11,8	
G13:1B	0,0	0,0	0,4	1,9	5,4	13,4	79,0	
G13:2T	0,0	0,0	0,9	2,6	64,8	22,7	8,9	
G13:2B	0,0	1,5	0,0	0,7	69,6	27,0	1,7	
G13:3T	0,0	0,0	0,0	1,0	32,2	47,0	20,1	
G13:3B	0,0	0,5	0,1	0,9	36,4	57,5	4,6	
G13:4T	0,0	0,0	0,9	1,2	17,0	45,3	36,0	
G13:4B	0,0	0,0	0,0	0,0	1,5	39,1	59,6	
G14:1T	0,0	0,2	0,6	0,6	21,9	68,5	8,3	
G14:1B	0,0	0,2	0,0	0,5	3,8	69,1	26,4	
G14:2T	0,0	0,0	0,0	0,8	31,1	58,2	10,0	
G14:2B	0,0	0,0	0,4	0,3	24,3	73,4	1,9	
G14:3T	0,0	0,0	0,0	4,0	71,5	15,3	9,2	
G14:3B	0,0	0,1	0,2	0,4	64,3	32,5	2,5	
G14:4T	0,0	4,4	4,9	26,9	60,3	2,4	1,1	
		Solid Bottom						
G15:1T	0,0	0,0	0,3	0,3	5,4	52,9	41,0	
G15:1B	0,0	0,0	0,3	2,0	3,7	12,8	81,2	
G15:2T	0,0	0,4	0,2	2,9	31,1	55,6	9,9	
G15:2B	0,0	0,5	0,1	2,6	81,9	13,7	1,2	
G15:3T	0,0	0,5	0,0	6,1	57,2	30,4	5,8	
G15:3B	0,0	0,1	0,4	6,0	81,6	10,2	1,8	
G15:4T	0,0	0,0	1,6	5,5	41,7	43,9	7,4	
G15:4B	0,0	0,3	0,4	1,1	3,9	53,7	40,6	

Sample	%>VCS	%VCS	% CS	% MS	% FS	%VFS	%Mud
G16:1T	0,0	0,1	0,4	2,8	8,1	12,2	76,4
G16:1B	0,0	0,6	0,1	1,5	5,4	12,7	79,6
G16:2T	0,0	0,0	0,0	1,5	68,9	26,1	3,6
G16:2B	0,0	0,2	0,1	1,6	74,5	22,2	1,4
G16:3T	0,0	0,0	0,1	22,0	74,6	2,0	1,5
G16:3B	0,0	0,0	0,0	17,3	79,0	3,0	0,7
G16:4T	0,0	0,0	0,7	11,8	36,9	42,2	8,5
G16:4B	0,0	0,3	0,0	0,4	3,6	50,4	45,3
G17:1T	0,0	0,3	0,8	2,5	12,0	37,0	47,4
		Solid Bottom					
G17:2T	0,0	0,5	0,3	18,1	55,0	15,1	10,9
G17:2B	0,0	0,0	0,7	21,4	68,9	7,6	1,4
G17:3T	0,0	0,0	0,4	7,6	72,0	12,0	7,9
G17:3B	0,0	0,2	0,2	14,6	79,7	4,2	1,1
G17:4T	0,0	0,0	3,0	3,8	33,9	40,7	18,8
G17:4B	0,0	0,0	0,0	1,0	19,6	66,7	13,2
G18:1T	0,0	0,0	1,5	3,0	12,2	30,1	53,2
G18:1B	0,0	0,3	0,0	1,0	5,0	12,1	81,7
G18:2T	0,0	0,0	0,4	8,7	59,0	25,0	7,0
G18:2B	0,0	0,1	0,0	8,8	75,0	14,9	1,1
G18:3T	0,0	0,3	0,1	24,1	64,1	5,5	5,9
G18:3B	0,0	0,0	0,7	35,0	62,6	1,0	0,9
G18:4T	0,0	0,4	0,0	11,2	48,2	29,5	10,9
G18:4B	0,0	0,1	0,0	1,3	18,7	65,8	14,5

Gamtoos lagoon:

Sample	%>VCS	%VCS	% CS	% MS	% FS	%VFS	%Mud
GA:1T	0,0	0,0	0,3	2,1	12,6	77,1	8,3
GA:1B	0,0	0,2	0,5	8,5	53,7	34,2	3,0
GA:2T	0,0	0,0	0,0	1,5	15,2	79,3	4,7
GA:2B	0,0	0,0	0,6	0,5	10,5	81,8	6,7
GA:3T	0,0	0,0	2,3	75,0	21,3	0,6	0,9
GA:3B	0,0	0,5	0,0	0,6	4,8	9,7	84,3
GA:4T	0,0	0,0	0,5	1,4	5,7	45,0	47,5
GA:4B	0,0	0,0	0,2	0,3	1,9	63,5	34,4
GB:1T	0,0	0,1	0,9	5,9	47,4	23,1	22,6
GB:1B	0,0	0,1	0,4	3,0	26,6	27,4	42,4
GB:2T	0,0	0,0	0,2	4,5	7,9	3,2	84,3
GB:2B	0,0	0,0	0,4	5,8	42,8	23,8	27,6
GB:3T	0,0	0,3	1,1	52,9	43,7	0,7	1,3
GB:3B	0,0	0,1	0,9	23,1	44,4	2,6	28,8
GB:4T	0,0	0,0	0,4	2,2	10,2	44,4	43,0
GB:4B	0,0	0,2	0,5	0,7	3,8	82,2	12,5
GC:1T	0,0	0,2	0,5	1,8	20,0	19,3	58,2
GC:1B	0,0	0,4	0,5	7,3	32,7	15,1	43,9
GC:2T	0,0	0,0	0,5	12,9	65,8	19,2	1,7
GC:2B	0,0	0,2	0,0	12,0	59,0	14,1	14,7
GC:3T	0,0	0,1	0,1	3,8	26,0	47,3	22,8
GC:3B	0,0	0,1	0,0	5,7	47,8	27,5	18,8
GC:4T	0,0	0,1	0,4	3,9	14,2	49,6	31,9
GC:4B	0,0	0,4	0,3	3,5	16,0	56,0	23,9

Sample	%>VCS	%VCS	% CS	% MS	% FS	%VFS	%Mud
GD:1T	0,0	0,4	0,0	1,4	19,0	38,4	40,8
GD:1B	0,0	0,1	0,5	2,1	20,8	36,6	39,9
GD:2T	0,0	0,0	0,9	36,8	57,0	4,0	1,5
GD:2B	0,0	0,8	0,5	23,8	52,0	12,8	10,1
GD:3T	0,0	0,0	0,2	0,7	5,6	72,8	20,7
GD:3B	0,0	0,2	0,2	18,1	65,9	11,4	4,2
GD:4T	0,0	0,2	0,4	2,4	9,1	33,8	54,1
GD:4B	0,0	0,1	0,6	1,9	17,1	46,8	33,5
GE:1T	0,0	0,0	0,4	6,8	38,7	14,3	40,0
GE:1B	0,0	0,1	0,6	4,5	8,7	10,5	75,7
GE:2T	0,0	0,1	0,0	0,8	2,5	4,2	92,6
GE:2B	0,0	0,0	0,0	0,4	1,8	4,0	93,7
GE:3T	0,0	0,2	0,5	2,5	17,4	26,2	53,3
GE:3B	0,0	0,2	0,4	2,2	18,0	39,5	39,7
GE:4T	0,0	0,5	2,4	41,7	47,6	2,3	5,6
GE:4B	0,0	0,1	0,3	27,7	52,3	0,9	18,8
GF:1T	0,0	0,0	0,4	19,4	78,2	0,4	1,6
GF:1B	0,0	0,0	0,1	15,9	81,7	0,8	1,5
GF:2T	0,0	0,0	0,0	0,7	2,2	2,1	94,9
GF:2B	0,0	0,0	0,5	2,7	41,1	44,5	11,9
GF:3T	0,0	0,4	0,0	5,5	12,9	10,5	70,8
GF:3B	0,0	0,0	0,1	29,5	66,8	2,3	1,5
GF:4T	0,0	0,1	0,4	22,3	70,4	2,6	4,3
GF:4B	0,0	0,0	2,6	50,4	39,7	0,7	7,0
GG:1T	0,0	0,8	0,0	21,0	76,8	0,2	1,8
GG:1B	0,0	0,0	0,5	11,4	85,5	1,5	1,2
GG:2T	0,0	0,0	0,1	3,3	31,7	40,0	24,8
GG:2B	0,0	0,7	1,2	30,0	61,7	4,5	2,0
GG:3T	0,0	0,0	4,0	58,1	24,5	0,5	12,9
GG:3B	0,0	0,3	2,8	53,3	32,9	1,2	9,5
GG:4T	0,0	0,0	2,0	48,1	46,6	0,4	3,4
GG:4B	0,0	0,0	3,6	52,8	36,1	0,0	7,6

APPENDIX 1B

Statistical parameters of sand from the Gamtoos estuary determined from graphically determined percentiles

Sample	Med.	Mean	mm Mn	Sort	Ske.
G1:1T	2,07	2,06	0,240	0,30	-0,05
G1:1B	1,55	1,55	0,342	0,51	-0,00
G1:2T	2,00	1,98	0,254	0,39	-0,05
G1:2B	1,76	1,75	0,298	0,44	-0,02
G1:3T	1,63	1,56	0,339	0,41	-0,17
G1:3B	1,80	1,73	0,302	0,37	-0,20
G1:4T	1,55	1,50	0,353	0,36	-0,13
G1:4B	1,60	1,56	0,338	0,38	-0,09
G1:5T	1,90	1,89	0,270	0,35	-0,05
G1:5B	1,99	1,96	0,258	0,32	-0,12
G2:1T	2,27	2,21	0,215	0,33	-0,15
G2:1B	2,28	2,24	0,212	0,33	-0,14
G2:2T	2,31	2,28	0,205	0,26	-0,12
G2:2B	2,39	2,35	0,196	0,26	-0,16
G2:3T	2,40	2,35	0,196	0,30	-0,18
G2:3B	2,10	2,08	0,237	0,34	-0,07
G2:4T	2,08	2,06	0,240	0,29	-0,08
G2:4B	2,24	2,21	0,217	0,28	-0,14
G2:5T	2,31	2,28	0,206	0,25	-0,14
G2:5B	3,08	3,03	0,123	0,75	-0,07
G2:6T	2,31	2,28	0,206	0,26	-0,11
G2:6B	1,91	1,92	0,264	0,27	0,02
G3:1T	2,09	2,05	0,242	0,34	-0,11
G3:1B	2,50	2,46	0,182	0,33	-0,13
G3:2T	2,06	2,02	0,246	0,33	-0,10
G3:2B	2,22	2,16	0,224	0,38	-0,16
G3:3T	1,99	1,93	0,262	0,38	-0,14
G3:3B	2,79	2,87	0,137	0,72	0,11
G3:4T	2,09	2,07	0,238	0,26	-0,08
G3:4B	2,06	2,01	0,247	0,38	-0,11
G3:5T	2,46	2,45	0,183	0,43	-0,01
G3:5B	2,73	2,78	0,146	0,37	0,14
G3:6T	2,21	2,15	0,225	0,32	-0,20
G3:6B	2,21	2,17	0,222	0,34	-0,12
G4:1T	2,20	2,12	0,231	0,39	-0,22
G4:1B	2,06	1,99	0,252	0,38	-0,20
G4:2T	2,17	2,12	0,230	0,41	-0,12
G4:2B	2,17	2,11	0,232	0,43	-0,15
G4:3T	2,20	2,15	0,225	0,40	-0,11
G4:3B	2,24	2,21	0,217	0,36	-0,09
G4:4T	2,57	2,63	0,162	0,75	0,08
G4:4B	2,99	2,98	0,126	0,38	-0,03
G4:5T	2,66	2,56	0,169	0,50	-0,19
G4:5B	3,29	3,26	0,104	0,42	-0,08
G4:6T	2,19	2,11	0,232	0,38	-0,21
G4:6B	2,18	2,12	0,230	0,37	-0,18

Sample	Med.	Mean	mm Mn	Sort	Ske.
G5:1T	2,17	2,12	0,230	0,34	-0,14
G5:1B	2,23	2,17	0,223	0,39	-0,16
G5:2T	2,33	2,25	0,210	0,36	-0,21
G5:2B	2,32	2,26	0,208	0,36	-0,15
G5:3T	2,34	2,31	0,201	0,50	-0,05
G5:3B	2,17	2,14	0,227	0,44	-0,07
G5:4T	2,65	2,79	0,145	0,80	0,18
G5:4B	3,27	3,20	0,109	0,51	-0,15
G5:5T	3,31	3,18	0,111	0,48	-0,27
G5:5B	2,67	2,47	0,181	0,64	-0,32
G5:6T	2,41	2,33	0,199	0,34	-0,24
G5:6B	2,22	2,16	0,224	0,37	-0,16
G6:1T	2,16	2,14	0,227	0,29	-0,08
G6:1B	2,00	1,99	0,251	0,38	-0,03
G6:2T	1,56	1,58	0,335	0,35	0,06
G6:2B	2,52	2,56	0,170	0,70	0,06
G6:3T	2,11	2,07	0,238	0,30	-0,15
G6:3B	2,25	2,22	0,215	0,25	-0,12
G6:4T	2,84	2,93	0,131	0,46	0,19
G6:4B	2,46	2,45	0,183	0,32	-0,01
G6:5T	3,65	3,61	0,082	0,25	-0,15
G6:5B	3,23	2,97	0,127	0,88	-0,29
G6:6T	3,35	3,38	0,096	0,33	0,09
G6:6B	3,30	3,31	0,101	0,29	0,05
G7:1T	2,19	2,15	0,225	0,30	-0,12
G7:1B	2,35	2,30	0,203	0,30	-0,17
G7:2T	2,05	2,01	0,248	0,30	-0,14
G7:2B	2,99	2,93	0,131	0,80	-0,07
G7:3T	3,38	3,24	0,106	0,53	-0,28
G7:3B	3,25	3,24	0,106	0,29	-0,05
G7:4T	3,36	3,37	0,097	0,31	0,03
G7:4B	3,13	3,17	0,111	0,32	0,14
G7:5T	3,47	3,47	0,091	0,29	-0,01
G7:5B	3,77	3,76	0,074	0,15	-0,05
G8:1T	2,76	2,77	0,147	0,65	0,01
	Solid Bottom				
G8:2T	3,18	2,75	0,149	1,00	-0,43
	Solid Bottom				
G8:3T	2,95	3,01	0,124	0,48	0,13
G8:3B	2,72	2,77	0,147	0,34	0,14
G8:4T	3,12	2,92	0,132	0,69	-0,29
G8:4B	3,74	3,72	0,076	0,18	-0,13
G8:5T	3,07	3,07	0,119	0,32	0,01
G8:5B	3,01	3,02	0,123	0,28	0,04
G9:1T	2,94	2,91	0,133	0,41	-0,07
G9:1B	3,52	3,52	0,087	0,25	-0,01
G9:2T	2,08	2,31	0,202	0,72	0,32
G9:2B	2,96	2,84	0,140	0,61	-0,20
G9:3T	3,08	2,94	0,130	0,62	-0,24
G9:3B	3,18	3,07	0,119	0,69	-0,16
G9:4T	3,44	3,45	0,092	0,25	0,02
G9:5T	3,40	3,32	0,100	0,39	-0,21
G9:5B	3,16	3,11	0,116	0,45	-0,11

Sample	Med.	Mean	mm Mn	Sort	Ske.
G10:1T	2,20	2,22	0,215	0,41	0,03
G10:1B	1,83	1,86	0,276	0,47	0,06
G10:2T	2,65	2,68	0,156	0,85	0,04
G10:2B	2,82	2,76	0,148	0,91	-0,07
G10:3T	2,87	2,66	0,158	0,64	-0,32
G10:3B	2,05	2,14	0,228	0,40	0,22
G10:4T	2,92	2,95	0,129	0,54	0,07
G10:4B	2,16	2,13	0,229	0,37	-0,10
G10:5T	3,27	3,25	0,105	0,41	-0,05
G10:5B	3,33	3,21	0,108	0,45	-0,28
G11:1T	2,83	2,78	0,146	0,54	-0,09
G11:1B	3,47	3,34	0,099	0,46	-0,26
G11:2T	3,18	3,08	0,118	0,44	-0,23
G11:2B	3,20	3,12	0,115	0,42	-0,19
G11:3T	2,90	2,77	0,147	0,63	-0,21
G11:3B	2,71	2,64	0,161	0,58	-0,13
G11:4T	3,10	2,99	0,126	0,50	-0,21
G11:4B	2,40	2,37	0,194	0,33	-0,10
G11:5T	3,05	3,01	0,124	0,54	-0,08
G11:5B	3,41	3,44	0,092	0,23	0,14
G12:1T	3,18	3,00	0,125	0,75	-0,24
G12:1B	3,77	3,39	0,095	0,54	-0,69
G12:2T	3,12	3,14	0,113	0,28	0,08
G12:2B	2,76	2,89	0,135	0,43	0,30
G12:3T	3,07	3,07	0,119	0,32	0,00
G12:3B	2,95	2,86	0,137	0,44	-0,20
G12:4T	3,10	2,92	0,132	0,78	-0,23
G12:4B	3,72	3,62	0,081	0,28	-0,36
G13:1T	2,76	2,52	0,174	0,58	-0,41
G13:1B	3,29	3,03	0,122	0,74	-0,36
G13:2T	2,73	2,79	0,145	0,41	0,14
G13:2B	2,80	2,82	0,141	0,35	0,06
G13:3T	3,07	3,01	0,124	0,38	-0,15
G13:3B	3,08	3,03	0,123	0,38	-0,14
G13:4T	3,37	3,24	0,106	0,53	-0,24
G13:4B	3,62	3,60	0,083	0,25	-0,11
G14:1T	3,22	3,22	0,107	0,36	0,01
G14:1B	3,49	3,48	0,089	0,25	-0,03
G14:2T	3,11	3,13	0,114	0,36	0,06
G14:2B	3,18	3,20	0,109	0,30	0,07
G14:3T	2,64	2,66	0,159	0,36	0,06
G14:3B	2,85	2,87	0,137	0,35	0,06
G14:4T	2,19	2,03	0,244	0,54	-0,30
	Solid Bottom				
G15:1T	3,54	3,47	0,090	0,34	-0,18
G15:1B	3,69	3,06	0,120	0,85	-0,74
G15:2T	3,09	2,99	0,126	0,41	-0,26
G15:2B	2,62	2,65	0,159	0,31	0,10
G15:3T	2,87	2,77	0,147	0,42	-0,24
G15:3B	2,54	2,54	0,172	0,35	0,02
G15:4T	2,96	2,90	0,134	0,59	-0,11
G15:4B	3,45	3,45	0,092	0,31	0,00

Sample	Med.	Mean	mm Mn	Sort	Ske.
G16:1T	3,02	2,82	0,142	0,74	-0,27
G16:1B	3,30	2,98	0,127	0,79	-0,41
G16:2T	2,83	2,86	0,138	0,32	0,11
G16:2B	2,79	2,77	0,146	0,31	-0,04
G16:3T	2,20	2,19	0,219	0,27	-0,02
G16:3B	2,29	2,27	0,207	0,30	-0,04
G16:4T	2,96	2,75	0,149	0,63	-0,33
G16:4B	3,60	3,57	0,084	0,29	-0,14
G17:1T	3,32	3,18	0,110	0,54	-0,27
	Solid Bottom				
G17:2T	2,52	2,45	0,183	0,57	-0,12
G17:2B	2,37	2,33	0,199	0,44	-0,09
G17:3T	2,57	2,55	0,170	0,37	-0,04
G17:3B	2,33	2,33	0,198	0,32	0,01
G17:4T	3,00	2,92	0,132	0,56	-0,14
G17:4B	3,28	3,22	0,107	0,42	-0,15
G18:1T	3,32	3,06	0,120	0,67	-0,39
G18:1B	3,34	3,15	0,113	0,63	-0,31
G18:2T	2,66	2,68	0,156	0,52	0,04
G18:2B	2,53	2,57	0,169	0,42	0,10
G18:3T	2,21	2,24	0,212	0,36	0,09
G18:3B	2,12	2,12	0,231	0,35	-0,00
G18:4T	2,73	2,67	0,157	0,60	-0,10
G18:4B	3,36	3,24	0,106	0,42	-0,28

Gamtoos lagoon:

Sample	Med.	Mean	mm Mn	Sort	Ske.
GA:1T	3,32	3,32	0,100	0,32	0,00
GA:1B	2,82	2,72	0,152	0,54	-0,20
GA:2T	3,25	3,28	0,103	0,29	0,10
GA:2B	3,35	3,37	0,097	0,29	0,06
GA:3T	1,76	1,75	0,297	0,32	-0,04
GA:3B	3,28	3,22	0,107	0,66	-0,09
GA:4T	3,51	3,44	0,092	0,36	-0,21
GA:4B	3,66	3,66	0,079	0,20	0,01
GB:1T	2,59	2,79	0,144	0,63	0,33
GB:1B	2,90	2,96	0,129	0,72	0,07
GB:2T	2,31	2,50	0,176	0,73	0,26
GB:2B	2,66	2,82	0,142	0,63	0,26
GB:3T	1,97	1,93	0,262	0,30	-0,11
GB:3B	2,18	2,16	0,223	0,44	-0,03
GB:4T	3,46	3,35	0,098	0,47	-0,23
GB:4B	3,51	3,52	0,087	0,26	0,04
GC:1T	2,91	3,06	0,120	0,68	0,23
GC:1B	2,67	2,66	0,158	0,63	-0,01
GC:2T	2,62	2,56	0,170	0,50	-0,13
GC:2B	2,50	2,53	0,174	0,49	0,05
GC:3T	3,15	3,06	0,120	0,60	-0,15
GC:3B	2,80	2,80	0,144	0,52	-0,01
GC:4T	3,53	3,16	0,112	0,65	-0,56
GC:4B	3,29	3,15	0,112	0,49	-0,28

Sample	Med.	Mean	mm Mn	Sort	Ske.
GD:1T	3,22	3,15	0,112	0,55	-0,13
GD:1B	3,20	3,14	0,114	0,57	-0,11
GD:2T	2,12	2,11	0,232	0,38	-0,02
GD:2B	2,26	2,35	0,196	0,56	0,15
GD:3T	3,50	3,49	0,089	0,28	-0,03
GD:3B	2,39	2,42	0,187	0,48	0,07
GD:4T	3,53	3,19	0,109	0,65	-0,51
GD:4B	3,25	3,22	0,108	0,45	-0,08
GE:1T	2,55	2,71	0,153	0,61	0,26
GE:1B	2,74	2,72	0,152	0,94	-0,02
GE:2T	3,13	3,03	0,122	0,80	-0,12
GE:2B	3,30	3,11	0,116	0,71	-0,27
GE:3T	3,07	3,01	0,124	0,55	-0,12
GE:3B	3,16	3,14	0,114	0,50	-0,04
GE:4T	2,03	1,98	0,254	0,41	-0,13
GE:4B	2,16	2,10	0,232	0,37	-0,15
GF:1T	2,30	2,24	0,211	0,31	-0,17
GF:1B	2,32	2,28	0,206	0,28	-0,16
GF:2T	2,82	2,89	0,135	0,85	0,08
GF:2B	3,00	3,03	0,123	0,49	0,05
GF:3T	2,50	2,80	0,144	0,86	0,34
GF:3B	2,22	2,17	0,222	0,39	-0,12
GF:4T	2,31	2,24	0,212	0,37	-0,21
GF:4B	1,94	1,90	0,269	0,39	-0,10
GG:1T	2,27	2,22	0,215	0,30	-0,15
GG:1B	2,42	2,37	0,194	0,29	-0,18
GG:2T	3,06	3,00	0,125	0,68	-0,09
GG:2B	2,20	2,19	0,219	0,41	-0,00
GG:3T	1,80	1,76	0,295	0,39	-0,09
GG:3B	1,89	1,87	0,273	0,39	-0,05
GG:4T	1,99	1,94	0,261	0,42	-0,11
GG:4B	1,88	1,84	0,279	0,41	-0,10

APPENDIX 1C

Statistical parameters of sand from the Gamtoos estuary determined from moment measures.

Sample	Med.	Mean	mm Mn	Sort	Ske.
G1:1T	2,07	2,06	0,239	0,29	0,66
G1:1B	1,55	1,54	0,344	0,52	-0,15
G1:2T	2,00	1,97	0,255	0,42	-0,85
G1:2B	1,76	1,73	0,302	0,48	-1,03
G1:3T	1,63	1,57	0,336	0,48	-0,51
G1:3B	1,80	1,73	0,302	0,46	-0,97
G1:4T	1,55	1,51	0,352	0,42	-0,50
G1:4B	1,60	1,59	0,333	0,45	0,31
G1:5T	1,90	1,89	0,270	0,39	0,03
G1:5B	1,99	1,96	0,257	0,35	-1,09
G2:1T	2,27	2,22	0,215	0,39	-1,09
G2:1B	2,28	2,24	0,211	0,35	-0,83
G2:2T	2,31	2,29	0,204	0,29	0,64
G2:2B	2,39	2,35	0,196	0,31	-2,07
G2:3T	2,40	2,35	0,196	0,34	-2,45
G2:3B	2,10	2,08	0,236	0,36	-0,55
G2:4T	2,08	2,07	0,237	0,18	*****
G2:4B	2,24	2,20	0,217	0,36	-2,68
G2:5T	2,31	2,30	0,204	0,18	*****
G2:5B	3,08	2,99	0,126	0,76	-1,53
G2:6T	2,31	2,28	0,207	0,33	-2,28
G2:6B	1,91	1,92	0,265	0,30	-0,31
G3:1T	2,09	2,06	0,240	0,36	-0,36
G3:1B	2,50	2,44	0,185	0,52	-4,01
G3:2T	2,06	2,02	0,246	0,36	-1,04
G3:2B	2,22	2,18	0,220	0,43	-0,59
G3:3T	1,99	1,94	0,260	0,39	-0,32
G3:3B	2,79	2,83	0,141	0,71	-0,63
G3:4T	2,09	2,07	0,238	0,27	0,29
G3:4B	2,06	2,02	0,246	0,38	0,21
G3:5T	2,46	2,46	0,182	0,47	0,42
G3:5B	2,73	2,76	0,148	0,38	0,02
G3:6T	2,21	2,16	0,224	0,35	-0,47
G3:6B	2,21	2,18	0,221	0,30	1,33
G4:1T	2,20	2,13	0,228	0,43	-0,66
G4:1B	2,06	2,01	0,249	0,38	-0,31
G4:2T	2,17	2,13	0,228	0,44	-0,40
G4:2B	2,17	2,13	0,229	0,46	-0,77
G4:3T	2,20	2,17	0,222	0,47	-0,64
G4:3B	2,24	2,24	0,212	0,42	0,55
G4:4T	2,57	2,60	0,165	0,70	-0,08
G4:4B	2,99	2,95	0,129	0,48	-3,56
G4:5T	2,66	2,56	0,169	0,64	-2,25
G4:5B	3,29	3,25	0,105	0,46	-0,28
G4:6T	2,19	2,13	0,229	0,41	-0,67
G4:6B	2,18	2,14	0,228	0,41	-0,35

Sample	Med.	Mean	mm Mn	Sort	Ske.
G5:1T	2,17	2,13	0,229	0,37	-0,83
G5:1B	2,23	2,18	0,221	0,41	-0,96
G5:2T	2,33	2,27	0,207	0,41	-1,10
G5:2B	2,32	2,31	0,202	0,47	0,21
G5:3T	2,34	2,32	0,200	0,52	-0,44
G5:3B	2,17	2,14	0,227	0,52	-1,03
G5:4T	2,65	2,74	0,150	0,72	-0,09
G5:4B	3,27	3,18	0,110	0,59	-1,85
G5:5T	3,31	3,17	0,111	0,58	-1,83
G5:5B	2,67	2,52	0,174	0,70	-0,93
G5:6T	2,41	2,35	0,196	0,37	0,24
G5:6B	2,22	2,16	0,224	0,43	-1,68
G6:1T	2,16	2,14	0,227	0,34	-1,31
G6:1B	2,00	1,99	0,252	0,40	-0,28
G6:2B	2,52	2,52	0,174	0,66	0,33
G6:2T	1,56	1,57	0,337	0,36	0,49
G6:3T	2,11	2,09	0,235	0,31	1,72
G6:3B	2,25	2,23	0,213	0,29	0,99
G6:4T	2,84	2,89	0,135	0,51	-1,19
G6:4B	2,46	2,46	0,182	0,37	0,34
G6:5T	3,65	3,54	0,086	0,38	1,08
G6:5B	3,23	3,08	0,119	0,74	-0,47
G6:6T	3,35	3,33	0,100	0,43	-2,87
G6:6B	3,30	3,26	0,104	0,49	-4,17
G7:1T	2,19	2,16	0,223	0,30	-0,01
G7:1B	2,35	2,30	0,203	0,34	-1,80
G7:2T	2,05	2,02	0,246	0,33	-0,24
G7:2B	2,99	2,95	0,130	0,64	1,12
G7:3T	3,38	3,24	0,106	0,58	-1,21
G7:3B	3,25	3,25	0,105	0,25	9,39
G7:4T	3,36	3,32	0,100	0,47	-4,15
G7:4B	3,13	3,15	0,113	0,38	-1,44
G7:5T	3,47	3,42	0,093	0,38	-1,24
G7:5B	3,77	3,72	0,076	0,26	-3,19
G8:1T	2,76	2,73	0,151	0,69	-0,96
	Solid Bottom				
G8:2T	3,18	2,86	0,138	0,94	-0,87
	Solid Bottom				
G8:3T	2,95	2,95	0,129	0,54	-1,23
G8:3B	2,72	2,75	0,149	0,45	-1,91
G8:4T	3,12	2,96	0,128	0,68	-0,85
G8:4B	3,74	3,64	0,080	0,48	*****
G8:5T	3,07	3,08	0,118	0,25	*****
G8:5B	3,01	3,04	0,122	0,14	*****
G9:1T	2,94	2,91	0,133	0,46	-1,40
G9:1B	3,52	3,47	0,090	0,39	-2,95
G9:2T	2,08	2,21	0,217	0,68	0,48
G9:2B	2,96	2,85	0,139	0,64	-1,22
G9:3T	3,08	2,97	0,127	0,57	-0,27
G9:3B	3,18	3,01	0,124	0,83	-1,98
G9:4T	3,44	3,39	0,096	0,47	-4,46
G9:5T	3,40	3,32	0,100	0,42	0,16
G9:5B	3,16	3,09	0,117	0,53	-1,66

Sample	Med.	Mean	mm Mn	Sort	Ske.
G10:1T	2,20	2,22	0,214	0,49	-0,15
G10:1B	1,83	1,87	0,273	0,57	0,60
G10:2T	2,65	2,65	0,159	0,76	-0,02
G10:2B	2,82	2,73	0,151	0,89	-0,99
G10:3T	2,87	2,74	0,149	0,57	0,48
G10:3B	2,05	2,10	0,234	0,47	-0,20
G10:4T	2,92	2,93	0,131	0,54	-0,44
G10:4B	2,16	2,14	0,226	0,40	0,04
G10:5T	3,27	3,21	0,108	0,51	-1,54
G10:5B	3,33	3,22	0,107	0,50	-1,45
G11:1T	2,83	2,79	0,145	0,56	-0,82
G11:1B	3,47	3,33	0,099	0,56	-2,56
G11:2T	3,18	3,08	0,118	0,55	-2,09
G11:2B	3,20	3,13	0,115	0,46	-0,92
G11:3T	2,90	2,82	0,142	0,59	-0,29
G11:3B	2,71	2,66	0,158	0,58	-0,34
G11:4T	3,10	3,01	0,124	0,52	-1,09
G11:4B	2,40	2,38	0,192	0,37	-0,18
G11:5T	3,05	2,96	0,128	0,65	-1,28
G11:5B	3,41	3,42	0,094	0,20	*****
G12:1T	3,18	2,99	0,126	0,85	-1,37
G12:1B	3,77	3,37	0,096	1,03	-3,09
G12:2T	3,12	3,13	0,115	0,34	-1,55
G12:2B	2,76	2,85	0,139	0,41	1,34
G12:3T	3,07	3,07	0,119	0,35	-0,18
G12:3B	2,95	2,90	0,134	0,46	-0,48
G12:4T	3,10	2,94	0,130	0,77	-1,02
G12:4B	3,72	3,54	0,086	0,63	-3,63
G13:1T	2,76	2,61	0,164	0,62	-1,15
G13:1B	3,29	3,09	0,117	0,71	-0,90
G13:2T	2,73	2,75	0,149	0,48	-0,56
G13:2B	2,80	2,79	0,144	0,49	-3,14
G13:3T	3,07	3,04	0,121	0,34	4,10
G13:3B	3,08	3,03	0,122	0,48	-2,08
G13:4T	3,37	3,26	0,105	0,51	0,11
G13:4B	3,62	3,59	0,083	0,20	*****
G14:1T	3,22	3,19	0,110	0,46	-2,43
G14:1B	3,49	3,45	0,091	0,38	-4,23
G14:2T	3,11	3,12	0,115	0,38	0,06
G14:2B	3,18	3,19	0,109	0,28	4,20
G14:3T	2,64	2,66	0,159	0,42	-0,15
G14:3B	2,85	2,87	0,137	0,40	-0,84
G14:4T	2,19	2,03	0,246	0,69	-1,37
Solid Bottom					
G15:1T	3,54	3,45	0,091	0,46	-3,63
G15:1B	3,69	3,24	0,106	0,78	-0,46
G15:2T	3,09	2,99	0,126	0,53	-2,26
G15:2B	2,62	2,64	0,161	0,44	-2,16
G15:3T	2,87	2,79	0,145	0,52	-1,69
G15:3B	2,54	2,54	0,172	0,42	-0,80
G15:4T	2,96	2,90	0,134	0,60	-0,75
G15:4B	3,45	3,38	0,096	0,49	-3,03

Sample	Med.	Mean	mm Mn	Sort	Ske.
G16:1T	3,02	2,86	0,138	0,75	-1,07
G16:1B	3,30	3,00	0,125	0,93	-1,79
G16:2T	2,83	2,85	0,139	0,38	-0,63
G16:2B	2,79	2,77	0,147	0,37	-2,01
G16:3T	2,20	2,21	0,217	0,33	1,12
G16:3B	2,29	2,29	0,205	0,34	1,19
G16:4T	2,96	2,82	0,142	0,64	-0,92
G16:4B	3,60	3,53	0,087	0,43	-3,75
G17:1T	3,32	3,14	0,113	0,72	-2,15
	Solid Bt tom				
G17:2T	2,52	2,47	0,181	0,60	-0,70
G17:2B	2,37	2,34	0,197	0,50	-0,27
G17:3T	2,57	2,56	0,169	0,46	-0,79
G17:3B	2,33	2,34	0,198	0,41	-1,00
G17:4T	3,00	2,88	0,135	0,68	-1,35
G17:4B	3,28	3,24	0,106	0,41	-0,04
G18:1T	3,32	3,08	0,118	0,77	-1,52
G18:1B	3,34	3,16	0,112	0,71	-1,96
G18:2T	2,66	2,67	0,157	0,54	-0,11
G18:2B	2,53	2,55	0,171	0,45	-0,06
G18:3T	2,21	2,24	0,212	0,46	-0,49
G18:3B	2,12	2,11	0,231	0,36	0,14
G18:4T	2,73	2,68	0,156	0,61	-0,86
G18:4B	3,36	3,27	0,104	0,42	-0,37

Gamtoos lagoon:

Sample	Med.	Mean	mm Mn	Sort	Ske.
GA:1T	3,32	3,28	0,103	0,41	-0,63
GA:1B	2,82	2,74	0,150	0,56	-0,68
GA:2T	3,25	3,25	0,105	0,24	*****
GA:2B	3,35	3,33	0,099	0,35	0,33
GA:3T	1,76	1,76	0,296	0,36	-0,06
GA:3B	3,28	3,10	0,116	0,93	-2,38
GA:4T	3,51	3,39	0,095	0,51	-1,59
GA:4B	3,66	3,61	0,082	0,36	*****
GB:1T	2,59	2,71	0,153	0,58	0,48
GB:1B	2,90	2,93	0,131	0,69	-0,62
GB:2T	2,31	2,46	0,182	0,63	1,66
GB:2B	2,66	2,76	0,148	0,55	1,04
GB:3T	1,97	1,94	0,260	0,37	-1,16
GB:3B	2,18	2,16	0,224	0,48	-0,63
GB:4T	3,46	3,32	0,100	0,57	-1,68
GB:4B	3,51	3,46	0,091	0,45	-4,31
GC:1T	2,91	2,97	0,127	0,67	-0,80
GC:1B	2,67	2,64	0,161	0,67	-0,78
GC:2T	2,62	2,58	0,167	0,51	0,05
GC:2B	2,50	2,52	0,174	0,54	-0,29
GC:3T	3,15	3,06	0,120	0,59	-0,83
GC:3B	2,80	2,79	0,145	0,55	-0,57
GC:4T	3,53	3,25	0,105	0,68	-1,55
GC:4B	3,29	3,15	0,112	0,61	-2,00

Sample	Med.	Mean	mm Mn	Sort	Ske.
GD:1T	3,22	3,14	0,114	0,59	-1,73
GD:1B	3,20	3,11	0,116	0,62	-1,46
GD:2T	2,12	2,13	0,228	0,43	0,90
GD:2B	2,26	2,31	0,201	0,64	-0,40
GD:3T	3,50	3,45	0,092	0,42	-3,88
GD:3B	2,39	2,41	0,188	0,52	-0,16
GD:4T	3,53	3,26	0,104	0,72	-1,77
GD:4B	3,25	3,17	0,111	0,58	-2,23
GE:1T	2,55	2,64	0,161	0,55	1,19
GE:1B	2,74	2,71	0,153	0,88	-0,53
GE:2T	3,13	3,05	0,120	0,69	-0,62
GE:2B	3,30	3,14	0,114	0,69	-1,23
GE:3T	3,07	2,98	0,126	0,62	-1,36
GE:3B	3,16	3,10	0,117	0,56	-1,32
GE:4T	2,03	1,99	0,252	0,51	-0,38
GE:4B	2,16	2,12	0,229	0,37	0,01
GF:1T	2,30	2,25	0,210	0,33	-1,13
GF:1B	2,32	2,29	0,205	0,28	0,52
GF:2T	2,82	2,84	0,140	0,75	-0,37
GF:2B	3,00	3,02	0,123	0,41	3,73
GF:3T	2,50	2,68	0,156	0,80	-0,29
GF:3B	2,22	2,19	0,219	0,40	-0,04
GF:4T	2,31	2,26	0,209	0,41	-0,68
GF:4B	1,94	1,90	0,268	0,42	-0,10
GG:1T	2,27	2,22	0,214	0,36	-2,01
GG:1B	2,42	2,37	0,193	0,34	-1,39
GG:2T	3,06	3,00	0,125	0,61	-0,27
GG:2B	2,20	2,18	0,221	0,50	-0,83
GG:3T	1,80	1,77	0,293	0,42	0,16
GG:3B	1,89	1,87	0,273	0,46	-0,66
GG:4T	1,99	1,95	0,259	0,42	0,07
GG:4B	1,88	1,85	0,278	0,43	-0,60

APPENDIX 1D

Statistical parameters of settling velocities of sand from the Gamtoos estuary determined from moment measures.

Sample	Sett vel (CHI)	Sett vel (ms ⁻¹)	st dev	skewn
G1:1T	4,735	0,0376	0,49	-2,74
G1:1B	4,204	0,0543	0,59	-0,56
G1:2T	4,635	0,0402	0,58	-1,78
G1:2B	4,382	0,0479	0,60	-1,40
G1:3T	4,236	0,0531	0,56	-0,66
G1:3B	4,399	0,0474	0,54	-1,25
G1:4T	4,168	0,0556	0,49	-1,17
G1:4B	4,262	0,0521	0,53	0,29
G1:5T	4,559	0,0424	0,53	-1,34
G1:5B	4,648	0,0399	0,45	-1,92
G2:1T	4,931	0,0328	0,54	-2,01
G2:1B	4,970	0,0319	0,48	-2,12
G2:2T	4,993	0,0314	0,53	-2,84
G2:2B	5,081	0,0295	0,50	-3,34
G2:3T	5,073	0,0297	0,56	-3,03
G2:3B	4,774	0,0365	0,50	-2,08
G2:4T	4,725	0,0378	0,48	-3,45
G2:4B	4,917	0,0331	0,50	-2,74
G2:5T	4,982	0,0316	0,51	-3,30
G2:5B	5,247	0,0263	1,43	-1,26
G2:6T	5,001	0,0312	0,46	-3,00
G2:6B	4,588	0,0416	0,43	-2,24
G3:1T	4,741	0,0374	0,51	-2,01
G3:1B	5,204	0,0271	0,63	-2,59
G3:2T	4,702	0,0384	0,51	-2,25
G3:2B	4,878	0,0340	0,62	-1,52
G3:3T	4,633	0,0403	0,51	-1,42
G3:3B	5,564	0,0211	0,92	-0,98
G3:4T	4,756	0,0370	0,43	-2,93
G3:4B	4,689	0,0388	0,58	-1,86
G3:5T	5,203	0,0272	0,70	-1,14
G3:5B	5,577	0,0210	0,60	-1,97
G3:6T	4,869	0,0342	0,46	-2,01
G3:6B	4,886	0,0338	0,45	-2,54
G4:1T	4,873	0,0341	0,48	-0,30
G4:1B	4,680	0,0390	0,54	-1,92
G4:2T	4,833	0,0351	0,59	-1,31
G4:2B	4,829	0,0352	0,61	-1,35
G4:3T	4,888	0,0338	0,62	-1,03
G4:3B	4,964	0,0321	0,57	-0,60
G4:4T	5,325	0,0249	0,90	-0,55
G4:4B	5,806	0,0179	0,79	-2,85
G4:5T	5,327	0,0249	0,83	-1,67
G4:5B	6,035	0,0153	0,93	-2,66
G4:6T	4,850	0,0347	0,50	-1,08
G4:6B	4,767	0,0367	0,68	-2,10

Sample	Sett vel (CHI)	Sett vel (ms ⁻¹)	st dev	skewn
G5:1T	4,814	0,0355	0,56	-2,18
G5:1B	4,884	0,0339	0,57	-1,89
G5:2T	5,004	0,0312	0,56	-1,74
G5:2B	5,038	0,0304	0,65	-0,72
G5:3T	5,060	0,0300	0,70	-0,92
G5:3B	4,867	0,0343	0,63	-0,82
G5:4T	5,438	0,0231	0,95	-0,65
G5:4B	5,991	0,0157	0,89	-2,31
G5:5T	6,027	0,0153	0,87	-2,27
G5:5B	5,285	0,0256	0,87	-1,14
G5:6T	5,108	0,0290	0,48	-1,04
G5:6B	4,881	0,0339	0,52	-1,66
G6:1T	4,841	0,0349	0,48	-2,39
G6:1B	4,655	0,0397	0,57	-1,73
G6:2T	4,213	0,0539	0,48	-1,47
G6:2B	5,211	0,0270	0,86	-0,69
G6:3T	4,763	0,0368	0,53	-2,14
G6:3B	4,912	0,0332	0,54	-2,79
G6:4T	5,677	0,0196	0,78	-2,11
G6:4B	5,197	0,0273	0,65	-1,95
G6:5T	6,283	0,0128	1,09	-2,69
G6:5B	5,252	0,0262	1,45	-1,04
G6:6T	6,174	0,0138	0,85	-3,48
G6:6B	6,150	0,0141	0,83	-3,55
G7:1T	4,870	0,0342	0,45	-2,37
G7:1B	5,008	0,0311	0,54	-3,02
G7:2T	4,688	0,0388	0,52	-2,49
G7:2B	5,455	0,0228	1,12	-1,22
G7:3T	5,971	0,0159	1,00	-2,15
G7:3B	6,152	0,0141	0,60	-4,05
G7:4T	6,168	0,0139	0,89	-3,45
G7:4B	6,035	0,0153	0,60	-3,48
G7:5T	6,269	0,0130	0,90	-3,48
G7:5B	6,332	0,0124	1,36	-2,62
G8:1T	5,447	0,0229	0,98	-1,34
	Solid Bottom			
G8:2T	5,508	0,0220	1,20	-0,77
	Solid Bottom			
G8:3T	5,747	0,0186	0,82	-2,06
G8:3B	5,517	0,0218	0,72	-2,54
G8:4T	5,723	0,0189	0,97	-1,44
G8:4B	6,359	0,0122	1,20	-2,80
G8:5T	5,906	0,0167	0,70	-3,32
G8:5B	5,858	0,0172	0,70	-3,74
G9:1T	5,750	0,0186	0,66	-2,20
G9:1B	6,358	0,0122	0,86	-3,77
G9:2T	4,914	0,0332	0,85	0,14
G9:2B	5,684	0,0195	0,80	-1,14
G9:3T	5,783	0,0182	0,84	-1,43
G9:3B	5,483	0,0224	1,31	-1,47
G9:4T	6,266	0,0130	0,91	-3,57
G9:5T	6,074	0,0148	1,01	-2,75
G9:5B	5,996	0,0157	0,66	-1,63

Sample	Sett vel (CHI)	Sett vel (ms ⁻¹)	st dev	skewn
G10:1T	4,950	0,0324	0,63	-0,55
G10:1B	4,547	0,0428	0,71	0,05
G10:2T	5,346	0,0246	0,99	-0,53
G10:2B	5,268	0,0260	1,21	-0,89
G10:3T	5,508	0,0220	0,85	-1,15
G10:3B	4,800	0,0359	0,61	-0,79
G10:4T	5,707	0,0191	0,83	-1,75
G10:4B	4,820	0,0354	0,59	-1,85
G10:5T	6,083	0,0148	0,75	-2,46
G10:5B	6,041	0,0152	0,91	-2,65
G11:1T	5,598	0,0206	0,75	-1,26
G11:1B	6,143	0,0142	0,89	-2,66
G11:2T	5,867	0,0171	0,97	-2,43
G11:2B	5,982	0,0158	0,75	-2,59
G11:3T	5,631	0,0202	0,80	-1,00
G11:3B	5,432	0,0232	0,78	-1,06
G11:4T	5,846	0,0174	0,75	-1,97
G11:4B	5,124	0,0287	0,52	-1,96
G11:5T	5,711	0,0191	0,97	-1,83
G11:5B	6,336	0,0124	0,70	-4,62
G12:1T	5,635	0,0201	1,18	-1,37
G12:1B	5,531	0,0216	1,63	-1,24
G12:2T	5,967	0,0160	0,76	-3,63
G12:2B	5,631	0,0202	0,74	-2,17
G12:3T	5,906	0,0167	0,71	-3,37
G12:3B	5,719	0,0190	0,73	-2,08
G12:4T	5,537	0,0215	1,19	-1,37
G12:4B	6,160	0,0140	1,26	-2,25
G13:1T	5,301	0,0254	0,99	-1,60
G13:1B	5,652	0,0199	1,26	-1,48
G13:2T	5,491	0,0222	0,80	-2,13
G13:2B	5,630	0,0202	0,69	-2,56
G13:3T	5,865	0,0172	0,75	-2,84
G13:3B	5,922	0,0165	0,60	-2,30
G13:4T	6,005	0,0156	0,93	-2,21
G13:4B	6,387	0,0119	1,00	-3,63
G14:1T	6,029	0,0153	0,82	-3,15
G14:1B	6,374	0,0121	0,81	-4,12
G14:2T	5,943	0,0163	0,78	-3,13
G14:2B	6,036	0,0152	0,79	-3,57
G14:3T	5,436	0,0231	0,63	-1,78
G14:3B	5,691	0,0194	0,65	-2,65
G14:4T	4,747	0,0372	0,78	-1,11
Solid Bottom				
G15:1T	6,283	0,0128	0,90	-3,35
G15:1B	5,349	0,0245	1,28	-0,91
G15:2T	5,759	0,0185	0,96	-2,47
G15:2B	5,431	0,0232	0,59	-2,27
G15:3T	5,609	0,0205	0,73	-2,07
G15:3B	5,294	0,0255	0,65	-2,03
G15:4T	5,694	0,0193	0,83	-1,46
G15:4B	6,218	0,0134	0,92	-3,18

Sample	Sett vel (CHI)	Sett vel (ms ⁻¹)	st dev	skewn
G16:1T	5,600	0,0206	0,99	-1,27
G16:1B	5,539	0,0215	1,38	-1,25
G16:2T	5,672	0,0196	0,60	-2,59
G16:2B	5,588	0,0208	0,61	-2,90
G16:3T	4,901	0,0335	0,50	-1,98
G16:3B	4,979	0,0317	0,58	-2,26
G16:4T	5,613	0,0204	0,89	-1,43
G16:4B	6,364	0,0121	0,92	-3,50
G17:1T	5,866	0,0171	1,12	-1,95
Solid Bottom				
G17:2T	5,196	0,0273	0,82	-1,16
G17:2B	5,066	0,0298	0,69	-1,19
G17:3T	5,303	0,0253	0,69	-1,99
G17:3B	5,087	0,0294	0,50	-1,03
G17:4T	5,661	0,0198	0,96	-1,68
G17:4B	6,065	0,0149	0,80	-2,94
G18:1T	5,835	0,0175	1,07	-1,54
G18:1B	5,602	0,0206	1,37	-1,54
G18:2T	5,428	0,0232	0,78	-1,39
G18:2B	5,318	0,0251	0,65	-1,36
G18:3T	4,958	0,0322	0,58	-0,91
G18:3B	4,795	0,0360	0,55	-1,98
G18:4T	5,500	0,0221	0,75	-0,77
G18:4B	6,102	0,0146	0,84	-2,86

Gamtoos lagoon:

Sample	Sett vel (CHI)	Sett vel (ms ⁻¹)	st dev	skewn
GA:1T	6,126	0,0143	0,85	-3,21
GA:1B	5,535	0,0216	0,80	-1,54
GA:2T	6,116	0,0144	0,74	-3,54
GA:2B	6,284	0,0128	0,56	-3,18
GA:3T	4,433	0,0463	0,44	-0,89
GA:3B	5,642	0,0200	1,19	-1,71
GA:4T	6,217	0,0134	0,95	-2,69
GA:4B	6,549	0,0107	0,77	-4,64
GB:1T	5,476	0,0225	0,74	-0,39
GB:1B	5,672	0,0196	0,96	-1,03
GB:2T	4,972	0,0319	1,00	-0,87
GB:2B	5,488	0,0223	0,84	-1,04
GB:3T	4,621	0,0406	0,49	-1,85
GB:3B	4,873	0,0341	0,63	-1,14
GB:4T	5,976	0,0159	1,16	-2,16
GB:4B	6,417	0,0117	0,67	-4,10

Sample	Sett vel (CHI)	Sett vel (ms ⁻¹)	st dev	skewn
GC:1T	5,586	0,0208	1,02	-1,53
GC:1B	5,358	0,0244	0,90	-1,22
GC:2T	5,348	0,0246	0,73	-1,31
GC:2B	5,262	0,0261	0,73	-1,13
GC:3T	5,850	0,0173	0,79	-1,58
GC:3B	5,557	0,0212	0,79	-1,63
GC:4T	5,987	0,0158	1,06	-1,74
GC:4B	5,995	0,0157	0,92	-2,21
GD:1T	5,967	0,0160	0,79	-1,92
GD:1B	5,845	0,0174	0,98	-1,96
GD:2T	4,834	0,0351	0,58	-0,54
GD:2B	5,041	0,0304	0,75	-0,33
GD:3T	6,318	0,0125	0,88	-3,64
GD:3B	5,161	0,0279	0,69	-0,85
GD:4T	5,932	0,0164	1,11	-1,70
GD:4B	5,962	0,0160	0,94	-2,47
GE:1T	5,345	0,0246	0,80	-0,86
GE:1B	5,317	0,0251	1,10	-0,66
GE:2T	5,503	0,0221	1,16	-1,43
GE:2B	5,804	0,0179	0,96	-1,53
GE:3T	5,746	0,0186	0,93	-1,92
GE:3B	5,855	0,0173	0,91	-2,28
GE:4T	4,669	0,0393	0,61	-0,89
GE:4B	4,809	0,0357	0,56	-1,94
GF:1T	4,987	0,0315	0,44	-2,01
GF:1B	5,007	0,0311	0,47	-2,91
GF:2T	5,317	0,0251	1,15	-1,12
GF:2B	5,794	0,0180	0,79	-2,12
GF:3T	5,375	0,0241	0,90	-0,03
GF:3B	4,876	0,0340	0,62	-1,81
GF:4T	4,965	0,0320	0,60	-1,96
GF:4B		Data error		
GG:1T		Data error		
GG:1B		Data error		
GG:2T		Data error		
GG:2B		Data error		
GG:3T		Data error		
GG:3B		Data error		
GG:4T		Data error		
GG:4B		Data error		

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